Republic of Iraq
Ministry of Education
General Directorate of Curricula

7

Series of Maths Books for Intermediate stage

Mathematics

First Intermediate

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This series (Maths for Intermediate stage)has been edited by a special tear of specialists in Ministry of Education/ General Directorate of curricul with participation of specialists from universities professors in Ministr of higher Education according to international standards to achieve th goals of designing modern syllabus which helps the students to be:

Successful learners long life

Self-stem individuals

Iraqi citizens feeling proud

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INTRODUCTION

The Maths subject is considered one of the basic courses that helps students to acquire educational abilities to develop his thinking and solving problems and it helping to deal with difficult situations in his life.

As a starting point of attention by the Ministry of Education represented by the General Directorate of curricula to develop the curricula in general and specially of Maths in order to go a long with the technological and scientific development in different fields of life. A plan has set up to edit the series of Maths books for the three stages .Primary stage has been achieved and the work started to continue the series by editing the books of intermediate stage.

The series of new Iraqi Maths Books as a part of General frame work of curricula that reinforces the basic values as Iraqi identity , forgiveness , respecting different opinions, social justice and offering equal chance for creativity and it also reinforces abilities of thinking and learning ,self-efficiency, action and citizen ship efficiency.

The series of Iraqi Math s books has been built on student- centered learning according to international standards.

The series of Iraqi maths books for intermediate stage has been built on six items: learn ,make sure of your understanding, solve the exercises ,solve environmental problems, think and write. The Maths book for first intermediate stage contains four basic fields: integer number operations, Algebra, geometry and measurement, statistics and probabilities for each field. The book consists of seven chapters with its exercises. The maths books have distinguished by presenting material in modern styles that attract and help the student to be active through presenting drills, exercises and environmental problems in addition there are extra exercises at the end of the book that are different from the exercises and drills in the lessons because they are objective so the student can answer through multiple choices and that prepare the student to participate the international competitions.

This book is an expansion for the series of developed Maths books for primary stage and it is also considered as support for the developed syllabus in maths and it also has a teachers book so we hope in applying them ,the student will gain scientific and practical skills and develop their interest to study Maths .

We hope God help us to serve our country and our sons

Authors

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Chapter 1

Integers

The pilot said temperature inside the plane (21) celsius above zero and the temperature outside the plane 51 degrees celsius below zero , the difference between the temperature inside and outside the plane is +21-(-51)

By using numbers and straight line and find the sum or the difference of the following

1. $5 + (-8) =$ .....
2. $3 + 7 =$ .....
3. $-6 - 4 =$ .....
4. $0 + (-10) =$ .....
5. $-9 + 8 =$ .....
6. $7 + (-7) =$ .....

Find the sum or the difference by using the method of signs of each of the following:

7. $18 + 36 =$ .....
8. $27 - 65 =$ .....
9. $-120 - 40 =$ .....
10. $-123 + 35 =$ .....
11. $118 + (-118) =$ .....
12. $300 - 200 =$ .....

Find the product or quotient using the method of signs of following:

13. $3 \times 12 =$ .....
14. $6 \times (-9) =$ .....
15. $-23 \times (-15) =$ .....
16. $72 \div 8 =$ .....
17. $(-125) \div 5 =$ .....
18. $-121 \div (-11) =$ .....

Solve the each of the following open sentences :

19. $15 + \ldots\ldots = 34$
20. $26 - \ldots\ldots = 13$
21. $\ldots\ldots + 47 = 90$
22. $(-8) + \ldots\ldots = 12$
23. $(-9) + \ldots\ldots = -30$
24. $\ldots\ldots - 14 = -44$
25. $3 \times \ldots\ldots = 36$
26. $(-6) \times \ldots\ldots = -54$
27. $\ldots\ldots \times (-5) = 45$
28. $64 + \ldots\ldots = 16$
29. $(-84) \div \ldots\ldots = 7$
30. $\ldots\ldots \div (-9) = 9$

Write three numreical sentences which connect the given numbers in each of the following

31. 21 , 50 , 29

.... = ...

..... + ... = ...

.... = ...

32. 7 , - 28 , 35

..... + ... = ...

.... = ...

.... = ...

Factorize each of the following numbers into their prime factors:

33. $32 =$ .....
34. $96 =$ .....
35. $675 =$ .....

Write the following numbers as exponantial form:

36. $125 = 5 \times 5 \times 5$

$=$ .....

37. $128 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$=$ .....

[1-1] Mental Math and Powers and Scientific notation

Idea of the lesson:

- Operational properties usage of mental math
- Method of calculation of the power and to write a number by using exponent or powers
- Scientific notation of a numbers

Vocabulary:

- Commutativity, associativity, distributivity
- Exponent or powers, base

Learn

If a first hatchery container produced (18) chickens and a second produced (12) chickens in the first stage and 9 chickens in the second stage. How many chickens had produced the containers together?

[1-1-1] Mental Math

You learned previously some of properties of numbers (commutative, associative and distributive) Use the properties of the operations to calculate mentally the numerical centence.

Example (1) **Use the properties of the operations to calculate mentally the numbers of the whole chickens:**
Write the numerical statement which represents the whole numbers of the chickens

$18 + (12 + 9) = (18 + 12) + 9$ Use association property

$= 30 + 9$ Add the numbers inside the brackets first and then find the result

$= 39$

Example (2) **Use (apply) the properties of the operations to calculate mentally :**

i) $9 + 11 = 11 + 9$ Use commutative property to add

ii) $3 \times 12 = 12 \times 3$ Use commutative property to multiply

iii) $(37 + 44) + 6 = 37 + (44 + 6)$ Use association property
Add the numbers inside the brackets first and then find the result
$= 87$

iv) $(13 \times 4) \times 2 = 13 \times (4 \times 2)$ Use association property
Multiply the numbers inside the brackets first and then find the result
$= 104$

Example (3) Juices: **Yousif bought 6 boxes of juice, which every box contains 24 can Using the properties of operations find the number of the each that Yousif had bought**

$6 \times 24 = 6 \times (20 + 4)$ Write 24 as $20 + 4$

$= (6 \times 20) + (6 \times 4)$ Use distribution properties

$= 120 + 24$ Do the multiplication operations first inside the brackets

$= 144$ Find the sum of numbers

[1-1-2] Powers

You can write the multiplication operation $32 = 2x2x2x2x2$ as a power by using the base and the exponent (power) (2^5) which the power 5 assigns the number of the base 2 done by multiplication

Example (4) **Calculate each of the following**

i) $4^3 = 4 \times 4 \times 4$
$= 64$

The number 4 is multiplied by itself 3 times

ii) $8^1 = 8$

Every number of power 1 equals the number itself

iii) $9^0 = 1$

Every number of power 0 equals 1

Example (5) **Write the following numbers by using the powers**

i) $36 = 6 \times 6$
$= 6^2$

Write the given number in terms of 6

The base 6 repeated twice

ii) $81 = 3 \times 3 \times 3 \times 3$
$= 3^4$

Write the given number in terms of 3

The base 3 repeated four times

iii) $1000 = 10 \times 10 \times 10$
$= 10^3$

Write the number in terms of 10

The base 10 three times

[1-1-3] Scientific Notation

You can write the big number as a scientific notation that is a number times a power of 10
For example: $70000 = 7x10^4$, where the power of 10 indicates the numbers of zeros of the given number

Example (6) **Write the following as a scientific notation**

i) $5000 = 5 \times 1000$
$= 5 \times 10^3$

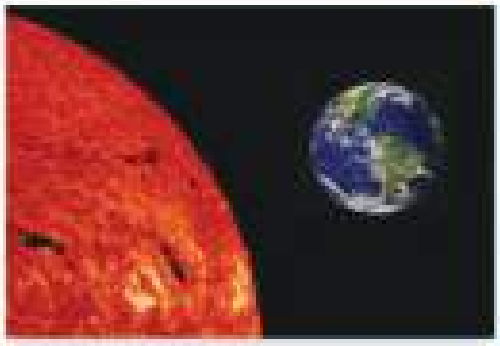
Write the given number in terms of a product of a number times multiple of 10

ii) $640\,000 = 64 \times 10000$
$= 64 \times 10^4$

Write the number 1000 in terms of power of 10

Example (7) space: **The distance between the earth and the sun is about 150 million km. approximately.Write this distance as a scientific notation**

$150\,000\,000 = 15 \times 10\,000\,000$
$= 15 \times 10^7$ km



Make sure of your understanding

Use the properties of operations to evaluate mentally

Q: 1-6 are similar to example 1-3

1 $12 + 41 =$ .....

2 $5 \times 13 =$ .....

3 $(21 + 33) + 9 =$ .....

4 $(10 \times 14) \times 3 =$ .....

5 $6 \times 24 =$ .....

6 $8 \times 107 =$ .....

Calculate the following

Q: 7-12 are similar to example 4

7 $7^2 =$ .....

8 $4^3 =$ .....

9 $12^3 =$ .....

10 $10^6 =$ .....

11 $10^3 =$ .....

12 $16^1 =$ .....

Write the following numbers by using powers

Q: 13-15 are similar to example 5

13 $81 =$ .....

14 $128 =$ .....

15 $100\,000 =$ .....

Write the following numbers on scientific notation or on digital notation

Q: 16-19 are similar to example 6, 7

16 $24 \times 10^6 =$ .....

17 $13 \times 10^5 =$ .....

18 $1350000 =$ .....

19 $5100000000 =$ .....

Solve the Exercises

Use the properties of operations to evaluate mentally

20 $(34+12)+8 =$ .....

21 $(18 \times 11) \times 5 =$ .....

22 $7 \times 31 =$ .....

23 $6 \times (10+3) =$ .....

Evaluate each of the following

24 $8^2 =$ .....

25 $10^6 =$ .....

Write the following number by using powers

26 $225 =$ .....

27 $1000\,000 =$ .....

Write the following number by using scientific notation or digital notation

28 $3 \times 10^9 =$ .....

29 $52 \times 10^3 =$ .....

30 $160000 =$ .....

31 $2000000000 =$ .....

32 **Computer:** The unit measure of capacity of the computer is (byte) and its multiple is kilobyte(KB) which equals one thousand byte, megabyte (MB) equals one million byte. Gegabyte (GB) equals one thousand million byte, and Terabyte (TB) equals one billion byte

Write those units in digital and scientific notation

1KB = 1000 = 10^3 byte

1MB = ... = ... byte

1GB = ... = ... byte

1TB = ... = ... byte

Solve life proplems

33 **Fish:** Bilal bought 6 cans of sardines each can contains 48 fish.
By using the properties of operations find the number of fish that Bilal had bought.

34 **Population:** The population of people of China in 2016 is about 1375850000.
Write the people`s polulation approximated up to hundred million and write it in scientific notation.

35 **Light:** The speed of the light is about 3×10^{8} m/sec.
Write the speed in digital notation.

Think

36 **Correct the Mistake:** Hayfa used the properties of operations to calculate mentally 6x(10+3) so she wrote

$$6 \times (10 + 3) = (6 + 10) \times (6 + 3) = 16 \times 9 = 144$$

Explain the mistake of Hayfa and correct it.

37 **Open Problems:** Write numerical statement , so that you be enable use the property of distribution of multiplication over addition and then find the result

38 **Numerical Sense:** Compare between the following number by using (=,>,<)

i) $5^3 \bigcirc 5^2$ ii) $4^3 \bigcirc 2^6$ iii) $2^3 \bigcirc 3^3$

Write

The result of following by using the properties of operations

i) $(39 + 22) + 8 = \ldots\ldots$ ii) 9×27

[1-2] Ordering Operations on Integer Numbers and Absolute value

Idea of the lesson:

- Using order of operations to find the result of number sentence
- Recognize the absolute value of integer number

Vocabulary:

- Ordering the operations
- Absolute value

Learn:

In the basket there are 8 oranges
If Suad added other oranges in the basket until the number of oranges **4** times reaches and then her sister took 3 oranges from the basket.

How can you use multiplication and subtraction to find the remaining oranges in the basket?

[1-2-1] Ordering Operation on Integers

You had previously learned the integers {...., -3 ,-2 ,-1 ,0 ,1 ,2 , 3 , ...} to find the value of number sentence, use order operations on integer number as follows:

1) Start the operations inside the brackets
2) Multiply and divide from left to right
3) Add and subtract from left to right

Example(1) **Find the number of oranges in the basket**

Write the number of sentence which represents the number of the oranges in the basket

$4 \times 8 - 3$ *do the operation by order*

$32 - 3$ *multiply 4 by 8*

29 *subtract 3 from 32*

Therefore the number remained oranges in the basket is 29

Example(2) **By using order of operation, find the value of each of the following**

i) $(14 - 6) + 40 = 8 + 40$

$= 48$

ii) $(5 - 7) \times (6 + 4)^2 - 30 = -2 \times 10^2 - 30$ *Do the operation inside of the brackets first*

$= (-2 \times 10^2) - 30$ *Put the prefered operation inside the brackets*

$= -200 - 30$

$= -230$ *Add -30 to -200*

iii) $48 \div 6 + 3 \times (-9) - 5 \times 12 = 8 + (-27) - 60$ *Do the order operations from left to right*

$= -19 - 60$

$= -79$

iv) $(56 \div 8)^2 + (72 \div 2) - (2 \times 9) = 7^2 + 36 - 18$ *Do the order operations inside of the brackets*

$= 85 - 18$ *Find 7^2 and add it to 36*

$= 67$ *Subtract 18 from 85*

Example(3) **Fruits:** Ahmad bought 12 kg of apple, 8 kg of orange and 3 kg of banana. He gave half of the quantity of apple and 2 kg of orrange to his sister. How many kilos he had remained with him?

$(12 + 2) + (8 - 2) + 3$

Do the operation inside of the brackets first

$= 6 + 6 + 3$

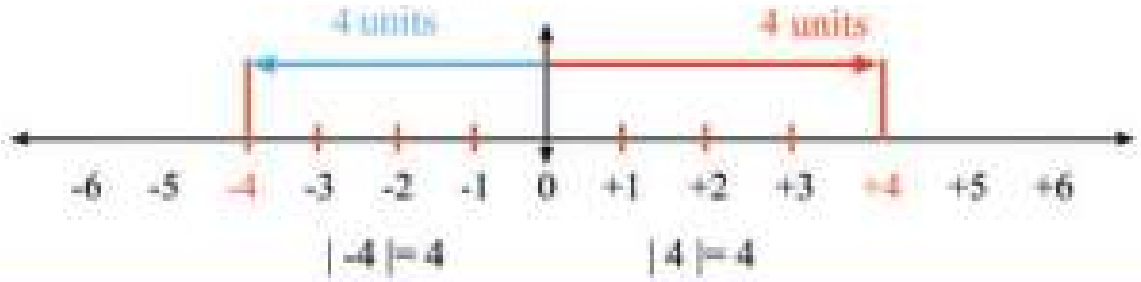
Add the three numbers

$= 15$

[1-2-2] Absolute Value Number

Absolute value of a number: its the distance between the number and zero on the straight line and denoted by $|\ \ |$, you had learned the representation of the positive and negative integers on the straight line, so we will use this representation to declare the meaning of the absolute value

Example(4) Look at the number 4 on right of zero and -4 on left of 0, but their distances are equal, as shown in the diagram



Example(5) **Find the value of the numerical sentences**

i) $|-8| = 8$

ii) $|-12| + |5|^2 = 12 + 5^2$

$= 37$

First find the absolute value the apply the order operation

iii) $|-24 |-3| -7| + 13 = 24 - 3 \times 7 + 13$

$= 24 - 21 + 13$

$= 16$

The sign of the absolute value behaves the same as the brackets

iv) $|48| \div |-6| - |11| \times |-3| = 48 \div 6 - 11 \times 3$

$= (48 \div 6) - (11 \times 3)$

$= 8 - 33$

$= -25$

First: Find the absolute value of the number

Second: Put the brackets on the operation which is necessary in order

Third: Do the operations in order

Make sure of your understanding

Use order operation and find the value of each of the following

1. $45 - 12 + 32 = \ldots\ldots$
2. $5 \times 14 - 82 = \ldots\ldots\ldots$
3. $(24 - 6) \times (30 - 28)^3 = \ldots\ldots$
4. $72 \div 9 + 4 \times (-5) = \ldots\ldots\ldots$
5. $|-15| + |8|^2 = \ldots\ldots$
6. $56 \div 7 + 3 \times (-8) - 2 \times 13 = \ldots\ldots$
7. $|-42| \div (-7) + 36 = \ldots\ldots$
8. $-3 \times 9 + 2|-18| \div 6 = \ldots\ldots$
9. $|-81| + |-3| + 5 \times 4 = \ldots\ldots$
10. $|-17| \times |-6| - 5|-8| = \ldots\ldots$
11. $|-21| \times |-4| = \ldots\ldots$
12. $(-8) \times |-16| + (2|-2|) = \ldots\ldots$

This questions 1-4 are similar to examples 1-2

This questions 5-12 are similar to examples 5

13. **Fish:** Ahmad hunted 24 small fish and 8 big fish, and his brother hunted one half the quantity of small fish, and 3 times the quantity of big fish, finally they ate in a meal together 6 small fish and 3 big fish. How many fish was remaining

The question13 is similar to example 3

Solve The Exercises

Use order operation and find the value of each of the following

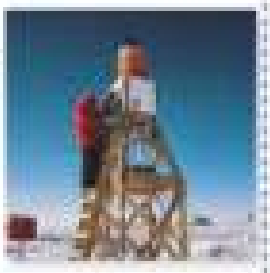
14. $6 \times 12 - 65 + 9 = \ldots\ldots$
15. $(47 - 7) \times (12 - 2)^2 = \ldots\ldots$
16. $49 \div 7 + 6 \times (-9) - 5 \times 14 = \ldots\ldots$
17. $|-35| \times (-4) + 61 = \ldots\ldots$
18. $-6 \times 7 + 3|-15| \div 5 = \ldots\ldots$
19. $|-64| \div |-4| + 16 \times (-3) = \ldots\ldots$

20. **Stationary:** A teacher gave to 34 pupils the following stationaries (copybook, pencils, and erasers), each pupil recieved 8 copybook 6 pencil and 4 erasers. How many eachpiece had the teacher given the pupils?

Solve life problems

21 **Colored penncils:** Sura bought 5 cans of colored pencils, each can contains 12 pencils. She took 20 pencils for herself and she gave the remaining to her four sisters equally. How many pencils had each sisters?

22 **Deer:** There were 30 Deers in the zoo, then the number of Deers had increased to twice, they are arranged into four barns. How many Deers in each barn?



23 **Temperature:** A scientific researcher recorded at south pole 4 records of temperature within 12 hours, the thermometer indicates every four hours as shown in the table below:

Time	Temp C°
10 morning	-16
2 noon	raised 4 degrees
6 afternoon	the temperature was half of the temperature at 2 noon
10 evening	decreased 3 degrees with respec to 6 afternoon

what is the temperature at 10 evening?

Think

24 **Challenge:** Use order operation and evaluate the following

i) $(3|-7| \times |-6| + 7|-8|)^2 = \ldots\ldots$ ii) $10 - 7|-5| - 32 \div |-4|^2 = \ldots\ldots$

25 **Open problem:** Put the number $(72, |-9|, -3, 6)$ in a suitable place of number sentence to get the given result

i) $\ldots\ldots \times \ldots\ldots + \ldots\ldots \div \ldots\ldots = -10$ ii) $\ldots + \ldots\ldots \times \ldots\ldots \div (\ldots) = 54$

26 **Numerical Sense:** Put negative integer number such that its satisfies the following number sentence

i) $3|\ldots\ldots| - 4|\ldots\ldots| = 0$ ii) $18 \div |\ldots\ldots| - 3|\ldots\ldots| = 0$

Write

The result by using order operations

$2|-10| \times |-20| + 5|-30| \div (-15) = \ldots\ldots$

[1-3] Algebraic Statements

Idea of the lesson

- Writing the algebraic statements
- Finding the value of algebraic statements

Vocabulary:

- Variables
- Algebraic statements
- Finding the value of algebraic statement

Learn

There were a number of apples in the basket, Zahra took 3 apples and her mother added 3 times of remaining. How can you express the number of apples in the basket in each case?

[1-3-1] Writing the Algebraic Statements

Variable: It is a symbol which represents a number and the algebraic statement is a set of variables and numbers which are joined by arithmetical operation

Example(1) **Write the algebraic statement which represents the number of apples in the basket:**

First: After Zahra took 3 apples.

Second: After her mother added a number of apples which was 3 times.

First: Consider the number of apples by the variable X

Therefore the remaining apples in the basket is X-3

Second: Number of apples after the additional is $3(X-3)$

Example(2) **Write an algebraic statements which represents each of the following:**

i) Greater than M by sixteen : M+16

ii) Less than L by ten : L-10

iii) Greater than $(x-2)^2$ by five : $(x-2)^2+5$

iv) Less than Y+3 by 4 raised to power 2 : $(Y+3)-4^2$

v) 4 times F+6 raised to power 3: $4(F+6)^3$

vi) K-3 divided by 8 : $(K-3)\div 8$

Example(3) Fruits: **Suhair bought a number of strawberry juice cups in amount 1500 dinars . Write an algebraic statement to represent the price of one cup.**

Represent the numbes of cups of juice which Suhair bought by the variable M

Therefore the price of one cup os 1500÷M whic is the required algebraic statement

[1-3-2] :Substitution in Algebraic Statements

To find the value of algebraic statement is to substitute the variable of algebraic statement by a number

Example(4) **Find the value of algebraic statement of each of the following by using the given variable**

i) $3X - 5^2 \ , X = 20$

$3X - 5^2 = 3\times 20 - 25$ *(Substitute X by 20)*

$= 35$ *(Use order operation and find the result)*

ii) $6\,(Y + 3) - 52 \ , Y = -4$

$6(Y + 3) - 52 = 6\,(-4 + 3) - 52$ *(Substitute Y by -4)*

$= -6 - 52 = -58$ *(Multiply 6 by -1 then find the result)*

iii) $3^2\,(72 \div Z) - 5(\,72 + Z) \ , Z = 8$

$3^2\,(72 \div Z) - 5(72 + Z) = 9(72 \div 8) - 5(72+8)$ *(Substitute Z by 7)*

$= 9 \times 9 - 5 \times 80 = -319$ *(Use order operation and find the result)*

Example(5) **Find the value of algebraic statement of each of the following**

i) $|-18| + X^2 - 99 \ , X = 9$ *(Substitute X by 9)*

$|-18| + X^2 - 99 = |-18| + 9^2 - 99$ *(Find the absolte value and use the order of operation and find the resul)*

$= 18 + 81 - 99 = 0$

ii) $3^2Y \div (-3Y) - |-36| \div (2Y) \ , \ Y = -9$

$3^2\,Y \div (-3Y) - |-36| \div (2Y) = 9(-9) \div 27 - |-36| \div (2\,(-9)$ *(Substitute Y by -9 and find the values of absolute value and use order operation then find the result)*

$= -81 \div 27 - 36 \div (-18)$

$= -3 + 2$

$= -1$

Example(6) **Bassam drew a picture of IRAQ map which contains an Iraqi flag, on rectangular paper its length exceeds 11cm to its width. Write an algebraic statement which represents the area of the picture, then find its area when its width is 39 cm.**

Let width of picture is D

Therefore the length will be D+11

The area = Dx(D+11) , D=39

Dx(D+11) = 39x(39+11)

= 39x(50)

= 1950 cm^2

Make Sure Of Your Understanding

Write algebraic statement which represent each of the following:

1. Greater than N by eighteen
2. Less than Y by thirteen
3. Three times $(x-2)^4$
4. K - 3 divided by 8
5. T - 3 divided by T + 3
6. Seven raised to power 3 multiplied by (L-9)

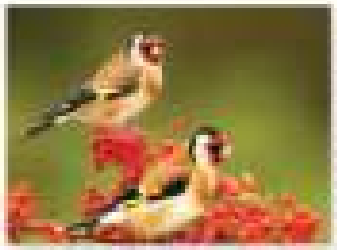
This question 1-6 similar to example 1.2

Find the value of the algebraic statement of each of the following by using the given value of the variable:

7. $4X - 6^2 + 3$, $X = 12$
8. $3(Y + 8) - 67$, $Y = -4$
9. $2(Z - 5) - 3 \times 9^2$, $Z = -30$
10. $2^3(64 \div D) - 3(72 \div D)$, $D = 8$
11. $|-15| + V^2 - 35$, $V = 6$
12. $4Y \div 16 - |-48| \div 2Y$, $Y = -8$

This question 7-12 similar to example 4.5

13. **Birds:** Number of birds had become four times the original number if 20 birds had put inside the cage and the remained birds were distributed among 6 cages. Write an algebraic expression which represents the number of birds in each cage and then find the number of in each cage, if the number before increasing 32 birds



The question is similar to example 3.6

Solve the Exercises

Write an algebraic statement which represents each of the following:

14. Greater then x by nine raised to power 2
15. Five times $(M - 6)^3$
16. (Y - 5) divided by (Y + 5)

Find the value of the algebraic expression of each of the following by using the given value of the variable:

17. $4(Y - 7) - 100$, $Y = -10$
18. $(56 \div D) - 4^2(1 - D)$, $D = 7$
19. $6V + 18 - |-36| + 2V$, $V = -6$

20. **Transportation:** A train started from Baghdad at 12 noon directed to Basrah, and travelled 400 km of velocity 80km/h but the velocity had been decreased due to maintanes works so it had arrived Basrah at night 9 o'clock.

Write an algebraic expression which represent the decreased velocity of the train if the distance between Baghdad and Basrah is 560 km.

Solve life problems

21 **Trees:** If two trees are planted on every 5m long on two sides along one of two streets of Baghdad city. Write a statements that represents the number of trees planted on the street and find the number of the treets if the length of the street is 10 km.

22 **Doves:** Adnan has doves three times of Tahsin has and Fuad has doves twice of Adnan and Tahsin Write an algebraic expression which represents the number of doves that Fuad has and Find the number if Tahsin has 14 doves.

23 **Food:** The tables indicates the quantity of carbonhydrites among different food, according to the following table: Write an algebraic expression which represents the quantity of carbonhydrites in N cup of vegetable and 3 fruits and N cup of milk, then find the quantity when N equals 4

Food	The quantity of carb.
Cup of veg.	12 gm
One piece of fruit	17 gm
Cup of milk	14 gm
Cup of bread	13 gm

Think

24 **Challenge:** **Find the value of an algebraic statement of each of the following by using the given variable:**

i) $3|X-3^2| \times |X-4|^2 + 6|-2|$, $X=6$ ii) $75-8|Y-12|-(2Y\div 6)^2$, $Y=15$

25 **Open Sentence:** **Put the number instead of variables $x=2^4$, $y=|-36|$ in the number sentence to get the given result**

i) $X \times (-2) + Y \div (-3) = -44$ ii) $(2Y-70) \times (X-2^5) = 0$

26 **Numerical Sense:** **Find by using your sense the value of each statement**

i) $3|X-4| \times 4|Y+6|$, $X=14$, $Y=-16$ ii) $|S+3|^2 + 4|V-3|^2$, $S=-23$, $V=4$

Write

The result of the algebraic statement by substituting the given variable

$3^2|-X| \times |-30| + 2^3|-2X|$, $X=1$

[1-4] Solving Equations with One Step

Idea of the lesson:

- Solve the equation that contains add&sub
- Solve the equation that contains mult&div

Vocabulary

- Solve the equation that contains addition
- Solve the equation that contains subtraction
- Solve the equation that contains multiplication
- Solve the equation that contains division

Learn

A cowboy has 128 goats (male and female). If the number of male goats were 25. How many female goats he has?

[1-4-1] Solving the Addition and Subtraction Equations

Addition equation: It is an algebraic expression which contains equality and addition only the solution means to find the value of the unknown value

Subtraction equation: It is an algebraic expression which contains equality and subtraction only the solution means to find the value of the unknown value

Example(1) **Find he number of female goats**

Let the number of female goats be X

Therefore $X + 25 = 128$

First method : By using Mental math. write the equation

$X + 25 = 128$

$103 + 25 = 128$

$X = 103$

Second method : Using the relation between addition and subtraction

$X + 25 = 128$

$X = 128 - 25$

$X = 103$

Example(2) **Solve the subtraction and addition equations by using the relation between addition and subtraction**

i) $Y - 8 = |-30| \rightarrow Y = |-30| + 8 \rightarrow Y = 30 + 8 \rightarrow Y = 38$

ii) $45 - Z = 9 \rightarrow 45 - 9 = Z \rightarrow Z = 45 - 9 \rightarrow Z = 36$

iii) $X + 11 = -33 \rightarrow X = -33 - 11 \rightarrow X = -44$

Example(3)

Honey: **A farmer gathered from his honey hive 36 kg of honey, if he took for himself a quantity of the honey and sold 28 kg of the remaining. How many kilos had taken to himself?**

Let the number of kilograms that took to himself be N

Therefore: $36 - N = 28$

Use the relation between add and subt. $N = 36 - 28$

Therefore: $N = 8$

the number of kilograms that took to himself be 8 kg

[1-4-2] Solving Multiplication and Division Equations

Multiplication equation: It is an algebraic expression which consist of equality and multiplication.

Division equation : It is an algebraic expression which consist of equality and division

Example(4) **Funfair:** **A 160 persons got in a air wheel, if every cabin takes 4 persons.How many cabins were in the air wheel?**

Let the number of cabins be K

Therefore:

$4 \times K = 160$

$K = 160 \div 4$ Use the relation between mult. and div.

$K = 40$ *Therefore the number of cabins are 40 cabins*

Example(5) **Solve the division and multiplication equations by using the relation between multiplication and division**

i) $X \div 7 = 12 \rightarrow X = 7 \times 12 \rightarrow X = 84$

ii) $42 \div Y = -6 \rightarrow -6 \times Y = 42 \rightarrow Y = 42 \div (-6) \rightarrow Y = -7$

iii) $Z \times |-5| = 45 \rightarrow Z = 45 \div |-5| \rightarrow Z = 45 \div 5 \rightarrow Z = 9$

Example(6) **Cheetah:** **Cheetah is the fastest tiger ever known in its family. Find the distance that cheetah travel within 3 hours by speed of 90 km/hr**

Let the distance travelled be D

Therefore

$D \div 3 = 90$

Use the relation between mult. and div.

$D = 90 \times 3$

$D = 270$ Therefore the distance travelled within 3 hr is 270 km

Make sure of your understanding

Solve addition and subtraction equations by using arithmatical sense

1. $X + 4 = 56$
2. $Y - 13 = 36$
3. $77 - z = 13$
4. $61 + X = 19$

Solve the addition and subtraction equations

5. $X + 24 = 15$
6. $Y - 78 = 23$
7. $X + 22 = |-42|$
8. $18 - Y = |-18|$

Solve the division and multiplication equations

9. $8 \times Y = 64$
10. $X \div 7 = -16$
11. $12\,N = -84$
12. $|-3| \times M = 39$
13. $33 \div Y = |-11|$
14. $X \div |-4| = 136$
15. **Space:** The difference of the temperature on the surface of the moon towards the sun and the opposite side is 295 C° Find the temperature on the opposite side if the temperature of the side towards the sun is 107C°

Solve the Exercises

Solve addition and subtraction equations by using arithmatical sense

16. $88 - z = 50$
17. $|-10| + X = 26$

Solve the addition and subtraction equations

18. $M - 44 = -36$
19. $57 - Y = |-57|$

Solve the division and multiplication equations

20. $S \div 13 = -13$
21. $|-9| \times M = 81$
22. $-121 \div Y = |-11|$
23. $X \div |-7| = 205$
24. **Gold:** Sura bought 450000 dinars bracelet of gold. What is the price of one gram of gold if the weight of the bracelet was 10 gm?

Solve life problems

25 **Climbing:** A climber climbed up the mountain for a heiht (L) meters above the level of the sea, and stopped for a while and climbed down a distance 30 meters, so he was at 180 meters height above the level of the earth. Find the highest point that the climber had reached.

26 **Ships:** A ship contains 320 containers stopped at Basrah port and unloaded half of the containers and departed the port. How many containers had remained on the board of the ship? write multiple equation for the problam then find the solution.

27 **Diving:** The coral depth is about 180 m below the level of the sea, if a diver dives towards the coral and get down 75 m below the level of sea. Find the depth that the diver must reach the coral depth.

Think

28 **Challenge:** Solve the two equations and determine whether x = y or not

i) $X + 7^2 = 100$, $71 - Y = |-20|$ ii) $3X = 6^2$, $48 \div Y = 2^3$

29 **Correct the Mistake:** Muntaha solved the following equations $3^3 \div V = 3^2$ So she wrote $V = 3^2$ determine the mistake of muntaha and correct it

30 **Numerical sense:** Show the probability that the value of variable x positive or nagative

i) x =negative integer x integer number

ii) x=negative integer + integer number

Write

solution of the division equation

$$2^5 \div N = 4$$

[1-5] Square root and cubic root

Idea of the lesson:
- Finding the square root of non-negative integer and its application
- Finding the cubic root of integer

Vocabulary:
- Square root
- Pythagorian
- Cubic root

Learn

Bassam drew a tablo of square shaped garden its area was 1296 cm^2. What is the length of the garden that Bassam had drawn ?

[1-5-1] Square Root

To find the square root of a positive integer we follow the steps:
1) Factorize the number into its factors.
2) Take one factor from each pair of the equal factors.
3) Find the product of the factors in 2.

Example(1) **Find the length of the garden**

Let the length of the garden be L

Therefore the area of the garden is

$$L^2 = 1296$$

$$L = \sqrt{1296}$$

Factorize the number 1296 into its factor

$$1296 = 2\times 2\times 2\times 2\times 3\times 3\times 3\times 3$$
$$= 2^4 \times 3^4$$

Take one factor from each pair of equal factors

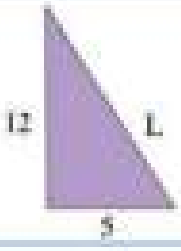
$$L = \sqrt{1296} = 2^2 \times 3^2$$
$$= 4\times 9$$
$$= 36 \text{ cm}$$

1296	2
648	2
324	2
162	2
81	3
27	3
9	3
3	3
	1

Pythagorean Theorem

In a right angled triangle the square of the long side is equal to the sum of the squares of the other two sides.

Example(2) **A right angled triangle whose right sides are 5 cm , 12 cm. Find its hypothenuse.**



$$L^2 = 5^2 + 12^2$$
$$= 25 + 144 = 169$$
$$L = \sqrt{169} = 13 \text{ cm}$$

[1-5-2] Cubic Root

To find cubic root of an integer follow the steps:

1) Factorise the number into its factors
2) Take one factor from each equal three factors
3) Find the product of those factors in 2

Example(3) **Find the cubic root of the integer**

i) $\sqrt[3]{125} = \ldots\ldots$

Factorise the number

$125 = 5 \times 5 \times 5 = 5^3$

Take one factor from each equal three factors

$\sqrt[3]{125} = 5$

ii) $\sqrt[3]{-8} = \ldots\ldots$

Factorise the number

$-8 = -2 \times -2 \times -2 = (-2)^3$

Put the negative sign outside the root and factorize

$\sqrt[3]{-8} = -2$

Put the negative sign outside the root and factorize

$\sqrt[3]{-8} = -\sqrt[3]{8}$, $(8 = 2^3)$

$= -2$

Example(4) **Tortoise (Turtle): A turtle lays a certain quantity of eggs in the sea. Most of hatched eggs are eaten by fish. If a small turtles equals the cubic root of number of alived of the whole number of eggs, find the number of alived turtles if the number of whole eggs is 343.**

$\sqrt[3]{343} = \ldots\ldots$

$343 = 7 \times 7 \times 7 = 7^3$

$\sqrt[3]{343} = 7$ **number of turtles**

Example(5) **Find the value of the algebraic statement state in each of the following by using the given variable**

i) $X - \sqrt{16} + 7$, $X = 10$

Substitute the variable, find the square root and then find the result

$X - \sqrt{16} + 7 = 10 - 4 + 7 = 13$

ii) $6^2(N + \sqrt{25}) - 3(N + \sqrt[3]{125})$, $N = 30$

$6^2(N + \sqrt{25}) - 3(N + \sqrt[3]{125}) = 36\,(30 + 5) - 3(30 + 5)$

Substitute the variable, find the square and cubic roots and use the order operation to find the result

$= (36 \times 6) - (3 \times 35)$

$= 216 - 105$

$= 111$

iii) $(\sqrt{36} - \sqrt{64}) + 13\,M$, $M = 2$

Substitute the variable, find the square root and then find the result

$(\sqrt{36} - \sqrt{64}) + 13\,M = (6 - 8) + 13 \times 2$

$= -2 + 26 = 24$

Make sure of your understanding

Find the square and cubic roots of an integers:

1 $\sqrt{49} = \ldots\ldots$

2 $\sqrt{81} = \ldots\ldots$

3 $\sqrt[3]{1000} = \ldots\ldots$

4 $\sqrt[3]{512} = \ldots\ldots$

5 $\sqrt[3]{-27} = \ldots\ldots$

6 $\sqrt[3]{-216} = \ldots\ldots$

7 ABC is a right triangle in B, if AB=12 cm , BC= 9cm Find the hypotenuse AC

Find the value of the algebraic expression of each of the following bu using the given veriable

8 $2X - \sqrt{25} + 9\ ,\ X = 20$

9 $3(Y + \sqrt[3]{27}) - 24\ ,\ Y = 36$

10 $72 + \sqrt{16}\ M - 31\ ,\ M = 4$

11 $8\sqrt[3]{125} + 2\sqrt{4} - K\ ,\ K = 15$

12 **Geometry:** A house is built on a square shaped ground whose area 1600 m². Find the perimeter of ground.

Solve the Exercises

Find the square and cubic roots of an integers

13 $\sqrt{729} = \ldots\ldots$

14 $\sqrt{64} = \ldots\ldots$

15 $\sqrt[3]{-125} = \ldots\ldots$

16 $\sqrt[3]{-729} = \ldots\ldots$

17 ABC is a right triangle in B, if AB=4 m , BC= 3 m Find the hypotenuse AC

Find the value of the algebraic expression of each of the following bu using the given veriable

18 $3X - \sqrt{49} + 24\ ,\ X = 10$

19 $7\sqrt[3]{1000} + (2\sqrt{25}) - Y\ ,\ Y = 7$

20 **Geometry:** A builder wanted to macavamize the floor of dinning room by arow of flagstones sequre the area of each flagstone was 400 cm². If the length of the room needed 25 flagstone. Find the length of the room

Solve life problems

21 **Sport:** In one of the festival, a square shaped area of 81 m^2 was restricted for dropping parachucists on it. Find the **side** length of the **given** area.

22 **Fishery:** A square shaped zone of the sea was restricted to allow hunting boats to hunt fish. Find the **side** length of the zone if the area was 25 km^2.

23 **Garden:** Karem planted agrass in his square shaped garden of the house, but he made a path width 1m around the grass. What is the area of the garden where the area of the grass was 64 cm^2 ?

Think

24 **Challenge:** Solve the two equations and determine whether x=y or not

i) $X + 8 = \sqrt{49}$, $Y - \sqrt{27} = 18$ ii) $2X = \sqrt[3]{-64}$, $\sqrt{36} + Y = -3$

25 **Correct the Mistake:** Enas solved the equation $|-54| + V = \sqrt{81}$ and wrote $V = -6$ determine the mistake and correct it

26 **Numerical Sense:** Show the probability that the value of the veriable X (positive or negative)

$X = \sqrt{\text{postive integer}} \times \sqrt[3]{\text{integer}}$

Write

The result of an algebraic expression

$$\sqrt[3]{-125} + |-20| - 2\sqrt{25}$$

[1-6] Problem Solving Plan (Guess and Check)

Idea of the lesson:

Using the guess and check to solve the problem

Learn

A square shaped are was restricted of exploring oil whose are 144 km². Find the length of exploring zone

Understand

What is the given in the problem: An exploring oil, square shaped zone whose area 144 km².

What is wanted: To find the length of the exploring oil.

Plan

How can you solve the problems ?

Guess , check and correct answer until you reach the correct answer

Solve

The area of exploring oil zone is 144 km²

The Length of zone x	Area of zone x^2	
10	100	100 less than 144
11	121	121 less than 144
12	144	correct

Therefore length of exploring oil zone is 12 km

Check

Area of exploring oil zone equals 144 km². Since the zone is square shape, so the length equals the width and the area=square of the length

Therefore The length of the zone

$$\sqrt{144} = 12$$

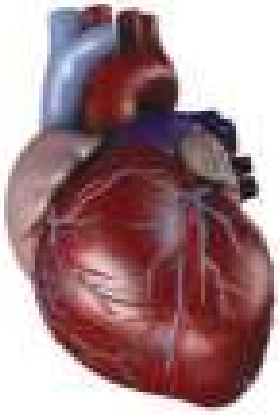
So the gues is correct

Problems

1 **Diving:** A diver got down of depth 40 m below the level of the sea and stopped there, while another diver got down to twice the depth of the first diver and stopped there too, then a third diver got down twice depth of the second. What is the depth from the level of the sea got by the third diver.

2 **Memorial Monument:** The statue of liberity is one of the distinquished landmarks of AL-Tahrir square in Baghdad,it is a rectangular shape. If the length of the statue is 50 m and the area is 200 m^2 Find the width.

3 **Health:** The doctor measures heart impulses for 10 second and multiples by 6 to get the number of impulses per minute if the heart impulse of Ghazi was 120 per minute, so how many impulses of Ghazi's heart in 10 second.



4 **Hair pin:** Dena has 27 pieces of hairpins, and her sister has a number of hair pins equals the cubic root of the quantity that Dena has. What is the number of hairpins her sister has?

Chapter Test

Using the properties of the operations to calculate mentally

1. $5 \times 13 =$ .....
2. $(17 + 8) + 2 =$ .....
3. $(13 \times 11) \times 5 =$ .....
4. $6 \times (30 + 3) =$ .....
5. $9 \times 102 =$ .....
6. $7 \times (1 \times 13) =$ .....

Write the following number by using scientific notation or digital notation

7. $8^2 =$ .....
8. $7^0 =$ .....
9. $15^1 =$ .....
10. $10^4 =$ .....
11. $21 \times 10^2 =$ .....
12. $4 \times 10^1 =$ .....
13. $64 =$ .....
14. $125 =$ .....
15. $1000\,000 =$ .....

Using order of operation ,find the value of each of the following

16. $(32 - 9) \times (14 - 8)^1 =$ .....
17. $88 \div 11 + 7 \times (-4) =$ .....
18. $(5 \times 22) - (6 \times 15) + 10 =$ .....
19. $72 \div 9 + 3 \times (-7) - 3 \times 12 =$ .....
20. $|-36| \div |-6| + 13 \times (-3) =$ .....
21. $|-45| - |-10| + 17 \div (-17) =$ .....

Write an algebraic statement which represents each of the following

22. Greater than X by raised to power 3
23. Less than $7R$ by 50
24. $(H - 45)$ divided by $(H + 4)$
25. 8 raised to power 2 Multiplay by $(Y - 5)$

Find the value of the algebraic statement in each of the following by using the given value for the variable

26. $12X^2 - 7^2 + 5$, $X = 6$
27. $3(Y - 8) - 200$, $Y = -20$
28. $4^1(L - 5) - 9 \times 62$, $L = -35$
29. $(72 \div M) - 3^1(1 - M)$, $M = 9$
30. $|-14| + X^1 - 36$, $X = 3$
31. $2V \div 4 - |-48| + 2V$, $V = -12$

Solve the subtraction and addition equations by using the relation between addition and subtraction

32. $V + 125 = 35$
33. $M - 33 = -66$
34. $64 - Y = |-72|$

Solve the division and multiplication equations by using the relation between multiplication and division

35. $9 \times L = 63$
36. $S \div 7 = -21$
37. $13N = -52$
38. $|-11| \times M = 99$
39. $-125 \div Y = |-25|$
40. $X \div |-8| = 256$

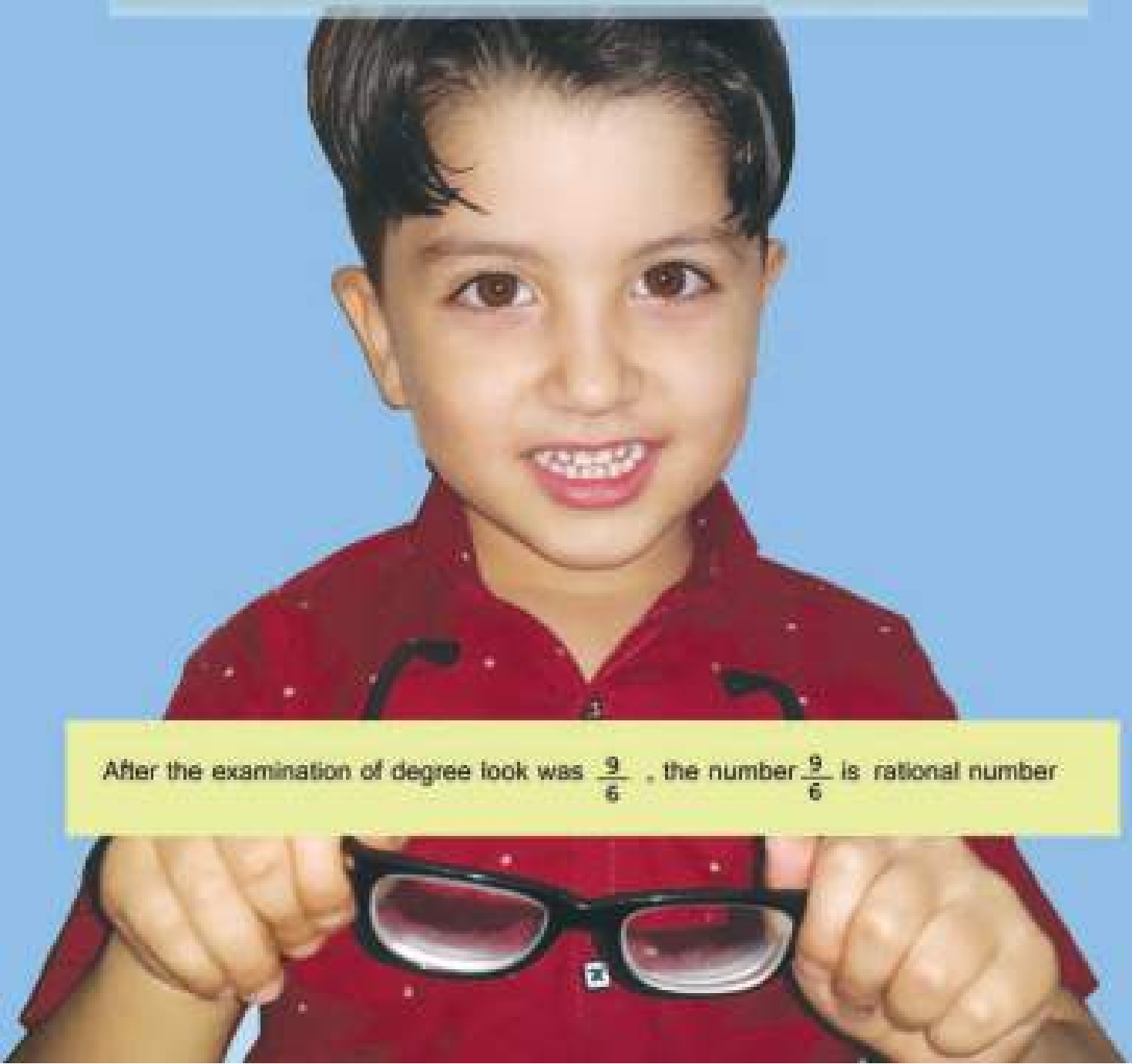
Find the square and cubic root of the integer

41. $\sqrt{225} =$ .....
42. $\sqrt{64} =$ .....
43. $\sqrt{100} =$ .....
44. $\sqrt[3]{-8} =$ .....
45. $\sqrt{729} =$ .....
46. $\sqrt{-1000} =$ .....

47. ABC right angled triangle in B whose $AB = 6$cm , $BC = 8$cm find the hypothenuse AC .

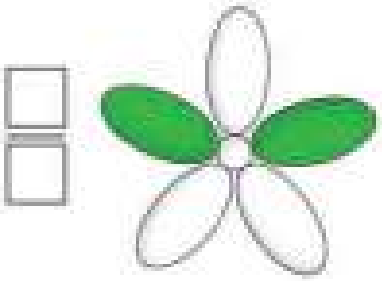
Chapter 2

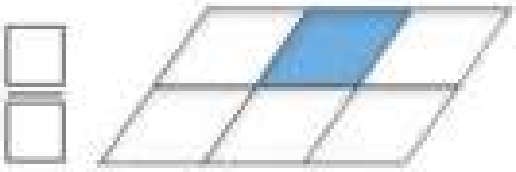
Rational Numbers

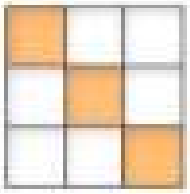


After the examination of degree look was $\frac{9}{6}$, the number $\frac{9}{6}$ is rational number

Write the fraction that represents the colored part

1 

2 

3 

4 

5 

6 

Express the following fractions in the form of figures

7 $\frac{1}{5}$ 8 $\frac{3}{4}$ 9 $\frac{4}{6}$

10 Link each fraction from the first row to the one equivalent to it in the second row

$\frac{14}{30}$	$\frac{12}{21}$	$\frac{3}{9}$	$\frac{15}{20}$	$\frac{10}{16}$	first row
$\frac{3}{4}$	$\frac{7}{15}$	$\frac{5}{8}$	$\frac{4}{12}$	$\frac{4}{7}$	second row

Write the suitable number in $\square$

11 $\frac{4}{6}=\frac{\square}{12}$ 12 $\frac{3}{9}=\frac{\square}{27}$ 13 $\frac{2}{\square}=\frac{14}{49}$ 14 $\frac{3}{5}=\frac{\square}{20}$

[2-1] Concept,Ordering and Comparing the Rational Numbers

Idea of the lesson:
- The definition of Rational Numbers
- The comparison of Rational Numbers
- The arrangement of Rational Numbers

Vocabulary:
Rational Numbers

Learn

A class of 25 students who prefer the following fruits :
15 students prefer orange
6 students prefer grape
and 4 students prefer apple.

[2-1-1] The Definition of Rational Numbers

The numbers that can be written in the form of fractions are called Rational Numbers. They are symbolized by Q

The rational number is any number that can be written in the form of a fraction as $\frac{a}{b}$ where a,b are two integers and $b \neq 0$

"a" is called numerator and "b" is called denominator

The decimal numbers, decimal fractions, fractional numbers, regular fractions and integers are considered rational numbers.

Example (1) : The number of students who prefer any kind of fruits can be expressed as :

The rational number that represent the number of the students who prefer orange is $\frac{15}{25}$

The rational number that represent the number of the students who prefer grape is $\frac{6}{25}$

The rational number that represent the number of the students who prefer apple is $\frac{4}{25}$

Example (2) : Express the following numbers and fractions in the form of Rational Number

i) $2 = \frac{2}{1}$ ii) $1\frac{1}{2} = \frac{3}{2}$ iii) $5 = \frac{5}{1}$ iv) $-7 = \frac{-7}{1}$

v) $1\frac{3}{7} = \frac{10}{7}$ vi) $7 = \frac{7}{1}$ vii) $-4\frac{3}{5} = \frac{-23}{5}$ viii) $0 = \frac{0}{1}$

Example (3) : Express the following decimal numbers in the form of Rational Number

i) $0.11 = \frac{11}{100}$ ii) $0.5 = \frac{5}{10}$ iii) $3.112 = \frac{3112}{1000}$ iv) $0.3 = \frac{3}{10}$

v) $2.1 = \frac{21}{10}$ vi) $0.33 = \frac{33}{100}$ vii) $0.033 = \frac{33}{1000}$ viii) $3.2 = \frac{32}{10}$

[2-1-2] Comparison of Rational Numbers

You have learnt before the comparison of fractions and now you will learn the comparison of rational numbers.

Example (4) :Compare between the rational numbers using these symbols (= , > , <)

i) $\frac{1}{3} \square \frac{3}{6}$

$\frac{2}{6} < \frac{3}{6}$ **Since** $\frac{1}{3} = \frac{2\times2}{3\times2} = \frac{2}{6}$ **so** $\frac{1}{3} < \frac{3}{6}$

Turn both fractions into fractions of similar denominators

ii) $\frac{-4}{5} \square \frac{-5}{7}$

$\frac{-5}{7} = \frac{-5\times5}{7\times5} = \frac{-25}{35}$, $\frac{-4}{5} = \frac{-4\times7}{5\times7} = \frac{-28}{35}$

$\because \frac{-28}{35} < \frac{-25}{35}$

$\therefore \frac{-4}{5} < \frac{-5}{7}$

iii) $\frac{1}{2} \square \frac{2}{4}$

Turn both fractions into fractions of similar denominators

$\frac{1}{2} = \frac{1\times2}{2\times2} = \frac{2}{4}$

$\frac{2}{4} = \frac{2}{4} \Rightarrow \frac{1}{2} = \frac{2}{4}$

Note: $\frac{a}{b} = \frac{c}{d} \Rightarrow a\times d = c\times b$

[2-1-3] Arrangement of Rational numbers

You have learnth arrangement of fractions and you will learn arrangement of rational numbers.

Example (5) Arrange following rational numbers from smallest to greatest

$$-2.4 \ , \ 2\frac{1}{6} \ , 2.3$$

$2.3 = \frac{23}{10}$ Turn the decimal nember into a regular fraction

$2\frac{1}{6} = \frac{13}{6}$ Turn the decimal nember into a regular fraction

$\frac{23}{10} = \frac{69}{30}$, $\frac{13}{6} = \frac{65}{30}$ Turn both fractions into fractions of similar denominators

$\frac{65}{30} < \frac{69}{30}$ By comparing two positive fractions

$\frac{23}{10} > \frac{13}{6}$ $\quad 2.3 > 2\frac{1}{6}$ $\quad -2.4 < 2\frac{1}{6} < 2.3$

Make sure of your understanding

Express following numbers and fractions in the form of rational numbers

This question is similar to example 2.3

1 $0.3 =$ ..... 2 $6 =$ ..... 3 $1.9 =$ ..... 4 $7.45 =$ .....

5 $4\frac{2}{3} =$ ..... 6 $0.8 =$ ..... 7 $2\frac{4}{5} =$ ..... 8 $6\frac{6}{9} =$ .....

Compare between the rational numbers using symbols " = , > , < "

This question is similar to example 4

9 $\frac{3}{8} \square \frac{2}{4}$ 10 $\frac{8}{12} \square \frac{4}{6}$ 11 $\frac{3}{4} \square \frac{3}{7}$

12 $\frac{3}{9} \square \frac{5}{11}$ 13 $\frac{9}{5} \square \frac{4}{6}$ 14 $3\frac{6}{7} \square 4\frac{4}{5}$

Arrange following rational numbers from smallest to greatest

This question is similar to example 3

15 $3.45 \ , \ 3\frac{6}{7} \ , \ 3.5$

Arrange following rational numbers from greatest to smallest .

16 $\frac{2}{3} \ , \ \frac{4}{7} \ , \ \frac{3}{5}$

17 **Length** Usame is 1.43 m tall , Mazen is 1.45 m tall and Azhar is 1.47m tall . Use arragement of rational numbers so that they stand from the tallest to the shortest according to their heights

Solve the exercises

Express the following numbers and fractions in the form of rational numbers.

18 $0.9 =$ ..... 19 $5 =$ ..... 20 $2.8 =$ ..... 21 $3.41 =$ .....

22 $8\frac{3}{7} =$ .....

Compare between the rational numbers using symbols $=$, $>$, $<$

23 $\frac{7}{9} \square \frac{4}{7}$ 24 $\frac{2}{7} \square \frac{5}{8}$

25 $1\frac{9}{10} \square 2\frac{1}{11}$

Solve life problems

26 **School:** A school has 20 teacher of which 12 are female.
i) What is rational number that express number of female teachers at that school ?
ii)What is rational number that express number of male teachers at that school ?

27 **Sport:** The Iraqi Team won the fourth place in the football in the Olympic Games that happened in Athens in 2004.What is rational number that represent Iraq's place compared to other winning 4 teams ?

28 **Nature:** Water takes spaces ob about 0.71 of the Earth's surface. Express ratio of water with rational number.

Think

29 **Challenge:** Hiba has got 0.455 kg of gold and Hala has got $\frac{16}{20}$. Which one has more gold ?

30 **Numerical Sense:** Samer studies 3 hours a day to prepare for his lesson. Express with a rational number how many hours Samer studies ?

Write

An equation involving hours a human sleeps daily according to number of hours of one day in the form of rational number.

[2-2] Operations Over the Rational Numbers

Idea of the lesson:

Four operations on the rational numbers $(+,-,\times,\div)$

Learn

Sami ate $\frac{2}{5}$ of the cake and Amjad ate $\frac{1}{4}$ of another cake. What is the rational number of What Sami and Amjad had eaten out of two cakes.

[2-2-1] Addition of Rational Numbers

You have learnt before four operations on integers and you will use four operations $(+,-,\times,\div)$ on the rational numbers

Example (1) To find rational number of what Sami and Amjad had eaten we add both of rational numbers.

$$\frac{1}{4}+\frac{2}{5}$$

In order to unite the denominators

$$\frac{5\times1}{5\times4}+\frac{4\times2}{4\times5}=\frac{5}{20}+\frac{8}{20}$$

Multiply the numerator and denominator of the fraction $\frac{1}{4}$ by 5

$$=\frac{5+8}{20}=\frac{13}{20}$$

Multiply the numerator and denominator of the fraction $\frac{2}{5}$ by 4

$$\frac{13}{20}$$

what Sami and Amjad had eaten

When adding two rational numbers of similar signs, add their absolute values and their sign for result.

When adding two rational numbers of different signs, subtract their absolute values and use the sign of the number with greater absolute value for the result.

Example (2) Find the result of (-4.5) + (-2.9)

$(-4.5)+(-2.9)$ The numbers are of similar sign

$(-4.5)+(-2.9)=\left|\frac{-45}{10}\right|+\left|\frac{-29}{10}\right|$ Write both numbers in the form of fractions

$\frac{45}{10}+\frac{29}{10}=+\frac{74}{10}$ Using absolute value

$(-4.5)+(-2.9)=\frac{-74}{10}$ Sign of one of the numbers

$(-4.5)+(-2.9)=-7.4$ So

Example (3) Find the result of $(-6.8)+(1.7)$

$(-6.8)+(1.7)$ The numbers are of different sign

$\left|\frac{-68}{10}\right| + \left|\frac{17}{10}\right|$ Write both numbers in the form of fractions

$\frac{68}{10}-\frac{17}{10}=\frac{51}{10}$ Using absolute value

$(-6.8)+1.7=\frac{-51}{10}$ Sign of one of the numbers

$=-5.1$

[2-2-2] Using Additive Inverse in Subtraction

When subtracting a rational number from another , add the first number with additive inverse of second

Example (4) Find the result of

$\frac{5}{4} - \frac{11}{6}$

$\frac{5}{4} - \frac{11}{6}$

$\frac{5}{4} + \left(-\frac{11}{6}\right)$

$\frac{15}{12} + \left(-\frac{22}{12}\right)$

$\frac{22}{12} - \frac{15}{12} = \frac{7}{12}$

$\therefore \frac{5}{4} - \frac{11}{6} = \frac{-7}{12}$

[2-2-3] Maltiplication and Division

Result of multiplying (dividing) two numbers of same sign is a positive rational number
Result of multiplying (dividing) two numbers of different sign is a negative rational number.

Example (5) Find the result of

i) $4.25 \times (-3)$

$\frac{425}{100}\times(-3)=\frac{-1275}{100}$ Result of multiplication of a positive number by a negative number is a negative number.

ii) $\frac{-9}{4}\div\left(\frac{-12}{5}\right)$ Result of dividing a negative number by another negative number is a positive number.

$\frac{-9}{4}\times\frac{-5}{12}=$ Turn $\times$ to $\div$ and then flip the fraction.

$\frac{(-9)\times(-5)}{(4)\times(12)}$ Multiplying the numerators and denominators

$\frac{+45}{48}$ A negative number $\times$ a negative number is positive number

Make Sure you understand

Find result of the followings

1. $\frac{2}{7}+\frac{5}{8}$
2. $\frac{4}{6}+\frac{2}{3}$
3. $\frac{5}{6}+\frac{4}{9}$
4. $\frac{7}{12}+\frac{3}{8}$

Q1-4 are similar to example 1

5. $-4.6+(-3.7)$
6. $-4.6+(-7.9)$
7. $8.5+(-9.6)$

Q5-7 are similar to example 2,3

8. $\frac{3}{4}-\frac{6}{5}$
9. $\frac{7}{9}-\frac{8}{5}$
10. $\frac{11}{10}-\frac{12}{15}$

Q8-10 are similar to example 4

11. $2.10\times(-2)$
12. 4×11.2
13. $-5\times(-3.1)$

Q11-16 are similar to example 5

14. $\frac{8}{9}+\frac{2}{3}$
15. $\frac{6}{7}+16\frac{3}{5}$
16. $\frac{-4}{11}+\frac{-6}{8}$

Solve the exercises

Find result of the followings

17. $\frac{3}{5}+\frac{2}{8}$
18. $\frac{4}{9}+\frac{5}{12}$
19. $-5.2+(-1.7)$
20. $6.4+(-8.7)$
21. $\frac{5}{4}-\frac{8}{7}$
22. $-3\times(-10.3)$
23. $\frac{15}{14}+\frac{2}{3}$
24. $-\frac{9}{10}+\frac{6}{5}$
25. $1\frac{2}{3}\times\frac{-3}{10}$
26. $13.2\div2$
27. $-3\frac{1}{2}+\frac{-2}{7}$

Solve life problems

28 **Pastry:** Sarah bought $\frac{3}{4}$ kg of white flour and $\frac{1}{3}$ kg of brown flour to prepare some pastry. How much flour has Sarah bought ?

29 **Electricity:** Three electric wires equal in length, one of them 2,25m long. What is length all three ?

30 **Drawing:** Ahmed painted a picture of $\frac{3}{4}$ m in length and $\frac{1}{2}$ m in width. What is the area of the picture ?

31 **Tape:** A Tape which is $3\frac{1}{5}$ m long was cut to 4 equal pieces. What is the length of one piece ?

Think

32 Put suitable sign for number between the brackets $4 \times (10,1) = -40,1$

33 What sign should be given to two numbers so that when they are multiplying sign of resulting number is positive

34 Find the result $(-1) \times (-3) \times (-3 \cdot 2)$

35 Absolute of two rational numbers $\frac{1}{5}$, $\frac{3}{5}$

Give them suitable sign so that when they are added the result is $\frac{2}{5}$

Write

Aproblem of diving two rational numbers such that the result is a negative rational number.

[2-3] Percentage and Estimation

Idea of the lesson:
- Finding percentages

Vocabulary:
- Percentage

Learn

Some stores decrease prices of their goods such as clothes and electrical devices by different percentages during some specific days.
And sometimes the prices are increased by different percentages as well.

[2-3-1] Percentage

Percent is a rational number of which its denominator is 100 and is symbolized by %. Rational numbers can be turned to percentage using equivalent fractions. The percentage can be written in the form of a decimal fraction.

Example (1) i) Write the rational number $\frac{20}{100}$ in the form of percent.

$\frac{20}{100} = 20\%$ Write the numerator with symbol of percent. It is read ' 20 percent '.

ii) Write the rational number 33% in the form of decimal fraction.

$33\% = \frac{33}{100}$ Write the percentage as a fraction with the denominator 100

$\frac{33}{100} = 0.33$ Write the fraction in the form of decimal fraction.

Example (2) Purchase: Samir wanted to buy a watch with 50000 ID if the discount on price of the watch was 20% what is the price of watch after discount ?

$20\% = \frac{20}{100} = \frac{1}{5}$ Write percentage in the simplest form

$\frac{1}{5} \times 50000 = 10000$ Find result of multiplying percentage

So the discount on the price of the watch is 10000

$50000 - 10000 = 40000$ Subtract the amount of discount from the price of the watch.

40000 the price of watch after discount

[2-3-2] Estimating the Percentage

You were thought the percent and you will learn its estimation.

Example (3) i) Estimate percentage of the number $\frac{15}{24}$

$\frac{15}{24} \approx \frac{15}{25}$ Approximate the denominator $25 \approx 24$

$\frac{15 \times 4}{25 \times 4} = \frac{60}{100}$ Find an equivalent fraction with the denominator 100

$\frac{60}{100} = 60\%$ Estimation of the percentage

ii) **Palm:** A plantation where trees are sold has 8 palms which produced shoots so the number of palms has become 23. Estimate the percentage of increasing palms.

Use yhe approximation to estimate percentage
23 - 8 = 15 palms

$$\frac{\text{Increasing number of palms}}{\text{Original number of palms}} = \frac{15}{8}$$

$\frac{15}{8} \approx \frac{16}{8}$ Approximate the number to put it in simplest form

$\frac{15}{8} = \frac{2}{1}$ Put the number in the simplest form

$\frac{2 \times 100}{1 \times 100} = \frac{200}{100} = 200\%$ The number is turned to percentage.

Example (4) **Tourism:** A hotel of 54 rooms , 11 of them are empty . Estimate percentage of the empty rooms.

$$\frac{\text{Number of empty rooms}}{\text{Total number of rooms}} = \frac{11}{54}$$

$\frac{11}{54} \approx \frac{11}{55}$ Approximate the number to put it in simplest form

$\frac{11}{55} = \frac{1}{5}$ Put the number in the simplest form

$\frac{1 \times 20}{5 \times 20} = \frac{20}{100} = 20\%$

Make sure of your understanding

Write the following rational numbers in the form of percent.

1 $\frac{1}{100}$ 2 $\frac{14}{100}$ 3 $\frac{74}{100}$

4 $\frac{99}{10}$ 5 $\frac{50}{10}$ 6 $\frac{61}{10}$

7 $\frac{20}{5}$ 8 $\frac{79}{20}$ 9 $\frac{80}{25}$

Write the percentage in the form of decimal fractions for the followings.

10 17% 11 29% 12 98% 13 62% 14 31%

15 16% 16 28% 17 92% 18 67% 19 35%

Estimate the percentage for the following numbers

20 $\frac{7}{9}$ 21 $\frac{12}{21}$ 22 $\frac{33}{49}$ 23 $\frac{10}{99}$ 24 $1\frac{1}{3}$

25 **Birds:** The next schedule shows the colors of birds in a cage . Find the estimated percentage of the birds' color.

Birds	Colors
21	White
18	Yellow
20	Blue

Solve the exercises

Write the following rational numbers in the form of percent

26 $\frac{2}{100}$ 27 $\frac{43}{100}$ 28 $\frac{79}{100}$

29 $\frac{66}{10}$ 30 $\frac{54}{4}$ 31 $\frac{87}{20}$

Write the following percentages in the form of decimal fractions

32 14% 33 70%

Estimate the percentage for the following numbers

34 $\frac{10}{101}$ 35 $2\frac{3}{4}$

Solve life problems

36 **Poultrry:** The production of eggs in a poultry field has increased from 340 eggs to 520 eggs daily. Estimate the percentage of increasing of eggs .

37 **Sport:** The schedule below shows the sports done by some athletes. Estimate the percentage for number of athletes that prefer :

Basketball,Table tennis,Swimming,Biking

Number of Athlete	Sports
13	Basketball
11	Table tennis
10	Swimming
13	Biking

38 Employee earns asalary of 500000 ID, ifhereceived a yearly allowance of 5 % of his salary . Calculate the amount of the increase and the employee's salary after the ancrease?

Think

39 What rational number does this percentage represent 55.5%?

40 Ayman says estimation of percentage for fraction $\frac{11}{24}$ is 70% . If you think he is wrong, correct the mistake

41 Which of two numbers $\frac{8}{9}$ and $\frac{15}{19}$ has a greater estimated percent ?

Write

A problem about finding the percentage for increasing salary of social care in Iraq.

[2-4] Gain and Proportional Division

Idea of the lesson:
- Learning the gain
- Learning Rational Division

Vocabulary:
- Gain
- Rational Division

Learn

A lot of people work in trade, industry so they gain money they need in their daily lives. The money they gain differs according to amount of profit they gain from their trade and industry

[2-4-1] Profit or Gain

You have learnt before the percentage and now you will learn the profit (gain) and rational division
Gain is the amount of profit a dealer makes from his trade or industry.

Example (1)

Maher bought a car with 10 million ID then he sold it with an increase of 10% . What is the amount of gain ?

$10000000 \times 10\%$

$$10\% = \frac{10}{100} = \frac{1}{10}$$

The amount of gain Maher got is $10\,000\,000 \times \frac{1}{10}$
$= 1\,000\,000$.

Example (2) If the cost of manufacturing a refrigerator is 300 000 ID and the ratio of gain is 5% . What is the total price of the refrigerator ?

$5\% \times 300000$ The amount of gain

$$5\% = \frac{5}{100} = \frac{1}{20}$$ Turning ratio to fraction

$\frac{1}{20} \times 300000 = 15000$ The ratio of gain

$15000 + 300000 =$ Total Price = Cost + Gain

$= 315000$ The total price of refrigerator

[2-4-2] Proportional division

If an amount of 40000 ID was divided between two people equality then the lot for each of them would be 20000 ID. But if the amount of money was divided with a specific ratio then their lots would be different.

Proportional division: it is a certain division operation according to known ratio

Example (3) Samer and Ammar gained an amount of money of 150000 ID from their trade. If the division of gain between them was by the ratio 4:6 then what is the lot of gain for each of them ?

The ratio is $\frac{4}{6}$

Amount of lots $4 + 6 = 10$

Samer's lot $\frac{4}{10} \times 150000$

$= 60000$

Ammar's lot $\frac{6}{10} \times 150000$

$= 90000$

Example (4) A factory of tires produces 2400 tires for small and big cars with a ratio of 4:8 . What is the number of tires it produces for ecah (small and big) ?

The ratio is $\frac{4}{8}$

Amount of lots $4 + 8 = 12$

The number of small tires is

$\frac{4}{12} \times 2400 = 800$

The number of big tires is

$\frac{8}{12} \times 2400 = 1600$

Example (5) Includes a commercial enterprise 20 empluyees , where the ratio of the male to female $\frac{3}{2}$,how many empluyees male and female?

The ratio is $\frac{3}{2}$

Amount of lots $3 + 2 = 5$

The number of the male

$\frac{3}{5} \times 20 = 12$

The number of the female

$\frac{2}{5} \times 20 = 8$

make sure of your understanding

find result of the following

1. $9\% \times 5000000$
2. $3\% \times 120000$
3. $5\% \times 200000$
4. $11\% \times 4000000$
5. $6\% \times 350000$
6. $4\% \times 100000$

Q 1-6 are similar to example 1,2

Find the rational division for each of the following

7. 3:5 from 640000
8. 3:4 from 210000
9. 2:3 from 100000
10. 5:7 from 240000
11. 6:7 from 169000
12. 2:9 from 121000
13. $\frac{1}{4}$ from 1000000
14. $\frac{3}{7}$ from 25500
15. $\frac{1}{9}$ from 320000

Q7-15are similar to example 3,4,5

16. Sport: A rectangular football playground with a perimeter 300m the ratio of its width to its length is 2:3. What are the width and length ?

Q 16 are similar to example 4

Solve the exercises

Find the gain of the following

17. $7\% \times 60000$
18. $10\% \times 45000$
19. $20\% \times 600000$

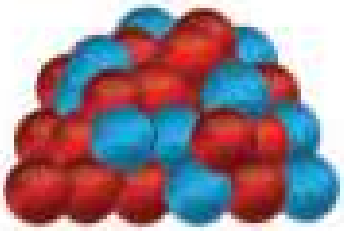
Find the rational division for following

20. 3:5 from 320000
21. 6:8 from 42000
22. 5:9 from 280000

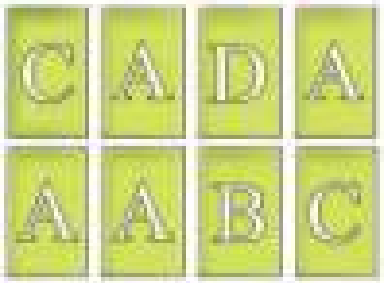
Solve life problems

23 House: Ahmed bought a house with 220 million ID then sold it with a gain of 7%. What is the amount of money he gained from selling the house?

24 Balls: There are 721 balls colored red and blue. If the ratio of the red balls to the blue ones was 3:4. What is the number of each?

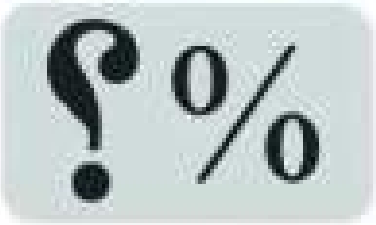


25 Cards: Muhannad offered 30% of his cards group,if he offer 36 cards. How many card in his group?



26 Conclusion:

Ahmed says the following:When we find any percentage of a number the answer is always greater than the same number ,Do you agree with his opinion? Explain this.



27 Fruits:

Box containing the apple and orange ,if the ratio of orange to apple as 5:7 ,How many orange in the box if you know that the total number of fruits are 36?

Think!

28 If the ratio 5% was equal to 10000 dinars, what is the original amount?

Write

A problem about ratio division 1:4.

[2-5] Direct Variation and Inverse Variation

Idea of the lesson:
- Learning direct variation
- Learning inverse variation

Vocabulary:
- Direct variation
- Inverse variation

Learn

Iraq produces three million barrels of oil daily. Oil is considered as Iraq's main source of economic imports. Any increase in its sales is an increase in the country.

[2-5-1] Direct Variation

An increase in an amount according to an increase in another amount with a specific ratio is called direct variation. A mount "A" is directly proportional to amount "B" or A and B are directly proportional if the ratio of A and B is equal to a constant number C. It written as A/B=C

Example (1)

If the price of two television devices is 500 000, what is the price of three devices?
Let A be the price of the televisions and the amount B is the the number of television devices, where the C is the price of one television.

$$\frac{A}{B} = \frac{500000}{2} = 250000 = C$$

$$\frac{\text{total price of TV}}{3} = 250000$$

$$3 \times 250000 = 750000$$

Notice that price of a group of televisions increases according to the increase in their number, so the price of a group of televisions is directly proportional to their number.
Notice in the schedule that the increase is a constant amount.

the prices of TV	250000	500000	750000
number of TV	1	2	3
$\frac{A}{B}=C$	250000	250000	250000

[2-5-2] Inveres Variation

If a car was driven with a certain speed to cover a certain distance in two hours then increasing its speed will lead to decreasing the time needed to cross that distance so if the car was driven with 50km/h then it travels a distance of 100km in two hours and it travels at 100km/h then it covers the distance in one hour.
Notice that increasing the car's speed results decrasing the time needed for it to cover a certain distance.
If increasing a certain amount leads to decreasing another one with a specific ratio then this is called inverse variation.
The amount of A is inversely prorportional to amount of B so the result of their product remains constant as C.
A x B = C

Example (2)

A plane flying with a speed of 400km/h, it traveled a distance between two countries in 5 hours. if it flew at a speed of 1000km/h, how many hours will it need to travel the same distance between the two countries?

Let A be the number of hours needed to cover the distance between two countries and B is the speed of the plane.
A x B = C
5 x 400 = 2000km (this is the distance that the plane travels between the countries)
- A x 1000 = 2000km (when the plane flies at 1000km/h)

$A = \frac{2000}{1000} = 2$ hours (the amount of time needed to travel.

So, the plane needs two hours to cover the distance between the two countries when it flies at a speed of 1000km/h.

Example (3)

Complete the following table that shows the number of trucks and the time needed to transfer products.

Number of trucks	1	2	3	4	6
Number of hours	24	12	8	6	4
Number of trucks x Number of hours	24	24	24	24	24

Make sure of your understanding

Fill the tables below indicating the type of variation;

1

A	10	20	30		50
B	1	2		4	
C	10	10			

2

A	5	20		50	
B	1	4	7		13
C	5	5			

3

A	3	15		39	
B	1		9		17
C	3				

4 If the price of 15 chairs was 105000 dinars, how many chairs can you buy with 140000 dinars?

Q1 - 5 are similar to example 1, 2, 3

5 A bicyclist crosses distance of 3km in 9 minutes, how much time does he needed to cross 15 km?

Solve the exercises

Complete the following tables and mention the type of variation.

6

A	1	2		8	
B	64	32	16		4
C	64	64			

7

A	16	32	64		256
B	8	16		64	
C	2	2			

Solve life problems

8 **Print:** Ahmed types 30 words in a minute to finish his work within 15 minutes, if he types 90 words how many minutes will he need to finish?

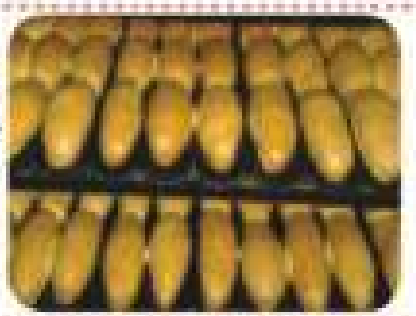
9 **Paint:** Isam painted a room with anew color within 12 hours, if Riyadh helps him to paint another room with same dimension how many hour they need to finish (considering that Riyad complete the work with the same efficiency and speed as Essam)

10 **Production:** A factory has two machines to produce candy. It produces 300 boxes in a week. If a third machine was added to the factory, how many boxes it produces in a week?

11 **Sewing:** A sewing factory consumes 300m of fabric in one hour. How many meters of fabric is produced in 5 hours?

Think

12 A bread-baking oven has got four workers who bake 200 kilos of flour within 18 hours. How many worker does the oven need to bake 300kilos of flour during the same period?



Write

A problem about an amount of money firstly distributed among three people and secondly distributed between four people. Indicate type of variation among the number of people and their lot from the distribution.

[2-6] Estimation of Square and Cubic roots

Idea of the lesson:

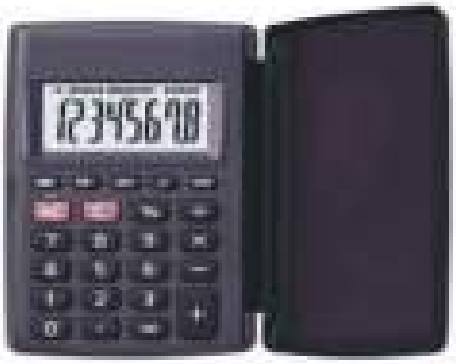
- Estimating square roots
- Estimating cubed roots

Vocabulary:

- Estimated square roots
- Estimated cubed roots

Learn

Squared and cubic roots of play an important role in mathematical operation in different sciences. But sometimes we see numbers of no cubed or squared roots because they are not complete squares or cubes.



[2-6-1] Estimation square roots

You have previously learnt the squared roots and now you will learn the estimation of the square and cubed roots.

To estimate the square root of a number with no square (a number that is not complete square), use the closest square root of a number greater than it (a complete square) and he closest square root (a complete square) of a number less than it.

Choosing the estimated roots of a number is done according to how close that number is to a complete square, if it is closer to the smallest complete square, we choose the numbers 1, 2, 3 after the comma as shown in example 1 (i), but if it was closer to greatest complete square then we choose the numbers 7, 8, 9 after the comma as shown in example 1 (ii). If the number is at the middle of the smallest and the greatest complete squares then we choose the numbers 4, 5, 6 after the comma.

Example (1)

(i) Find $\sqrt{17}$ using the estimated roots.

$17 \approx 16$

$17 < 25 \Rightarrow \sqrt{17} < 5$

$16 < 17 \Rightarrow 4 < \sqrt{17}$

$4 < \sqrt{17} < 5$

The smallest and the greatest numbers are compared below:

$25 - 17 = 8$

$17 - 16 = 1$

The number 17 is closer to 16, therefore;

$\sqrt{17} \approx 4.3 , 4.2 , 4.1$

(ii) Find $\sqrt{7}$ using the estimated roots.

$7 < 9 \Rightarrow \sqrt{7} < 3$

$4 < 7 \Rightarrow 2 < \sqrt{7}$

$2 < \sqrt{7} < 3$

The smallest and the greatest numbers are compared below:

$9 - 7 = 2$

$7 - 4 = 3$

The number 9 is closer to 7, therefore;

$\sqrt{7} \approx 2.9 , 2.8 , 2.7$

Example (2)

Estimate the length of one side of a square piece of cloth which area is 10 cm².

Are of a square = Length of one side x itself

Therefore length of one side is: $\sqrt{10}$

$10 < 16 \Rightarrow \sqrt{10} < 4$ greater complete square close to 9

$10 > 9 \Rightarrow \sqrt{10} > 3$ smaller complete square close to 9

Here 10 is closer to 9, so, the result can be considered as 3

Example (3) Find estimated root of $\sqrt{28}$.

The closest complete square greater than 28 is 36
The closest complete square smaller than 28 is 25

$28 < 36 \Rightarrow \sqrt{28} < 6$

$28 > 25 \Rightarrow \sqrt{28} > 5$

$5 < \sqrt{28} < 6$

Therefore the result is located between 5 and 6

$\sqrt{28} \approx 5.3, 5.2, 5.1$ so, the result can be considered as 5

[2-6-2] Estimation of Cubed Roots

To estimate cubed root of a number that does not have cubed root use the cubed root of a number greater than it and the cubed root of smaller number than it, then find the estimated roots.

Example (4) (i) Find $\sqrt[3]{30}$ using the estimated roots

$30 < 64 \Rightarrow \sqrt[3]{30} < 4$ The closest complete cube greater than 30 is 64
The closest complete cube smaller than 30 is 27

$27 < 30 < \sqrt[3]{30} > 3$

$3 < \sqrt[3]{30} < 4$

$64 - 30 = 34$ The number 30 is closer to 27

$30 - 27 = 3$

$\sqrt[3]{30} \approx 3.3, 3.2, 3.1$ So, the result is similar to 3.

(ii) Find $\sqrt[3]{201}$ using the estimated roots

$201 < 216 \Rightarrow \sqrt[3]{201} < 6$

$125 < 201 \Rightarrow \sqrt[3]{201} > 5$

$5 < \sqrt[3]{201} < 6$

The closest complete cube greater than 201 is 216
The closest complete cube smaller than 201 is 125

$125 < 201 < 216$

$216 - 201 = 15$

$201 - 125 = 76$

The number 201 is closer to 2016

$\sqrt[3]{201} \approx 5.9 , 5.8 , 5.7$

Make sure of your understanding

Estimate result of the following roots

1 $\sqrt{8}$ 2 $\sqrt{50}$ 3 $\sqrt{111}$

Q :1-12 are similar to Ex:1,3,4

4 $\sqrt{370}$ 5 $\sqrt{13}$ 6 $\sqrt{99}$

7 $\sqrt[3]{24}$ 8 $\sqrt[3]{145}$ 9 $\sqrt[3]{33}$

10 $\sqrt[3]{230}$ 11 $\sqrt[3]{891}$ 12 $\sqrt{1680}$

13 **Area:** A squared piece of land with an area of 145 m². Find the length of its side using the estimated squared roots.

Q :13 is similar to Ex:2

Solve the exercises

Estimate result of the following roots

14 $\sqrt[3]{13}$ 15 $\sqrt{123}$

16 $\sqrt{275}$ 17 $\sqrt[3]{88}$

18 $\sqrt[3]{166}$ 19 $\sqrt{71}$

20 $\sqrt{175}$ 21 $\sqrt[3]{710}$

Solve life problems

22 **Garden:** A square shaped garden in a house with an area of 101 m^2 estimate the one of side of it using the squared roots.

23 **Drawing:** Hussam drawed a small square shaped picture , its area was 635 cm^2, estimate the length of one side of the picture using the estimation of sqiuared roots.

24 **Furniture:** Bashar bought a square shaped carpet, its area was 22 m^2. Estimate the length of the one side of the carpet using squared roots.

25 **Area:** Square piece of land shaped side length 10m , and another land area of more than 20 m^2 first piece, Estimate using square roots as the side length of the second piece.

Think

Find the results of the following expressions, by using the estimation of square roots.

26 $\frac{2+\sqrt{26}}{2}$ 27 $\frac{7-\sqrt{37}}{2}$ 28 $\frac{9+\sqrt{17}}{3}$

Write

A problem about using the estimation of squared roots in finding the squared root of a number such that its squared root is greater than 25 and smaller than 26.

Chapter Test

Express the following numbers and fractions in the form of rational numbers

1. 4.9
2. 0.29
3. $2\frac{1}{3}$
4. 8
5. 25.9

Compare the following numbers by using (= , > , <)

6. $\frac{9}{16} \square \frac{4}{7}$
7. $\frac{12}{25} \square \frac{6}{8}$
8. $\frac{4}{100} \square \frac{12}{300}$

Arrange the rational number from the smallest to the greatest

9. $5.3 , 4\frac{1}{4} , -5.4$
10. $7.4 , 3\frac{1}{2} , 4\frac{1}{3}$
11. $-4.5 , 4.22 , \frac{13}{3}$

Find the result of the following operations

12. $\frac{14}{9} + \frac{3}{5}$
13. $\frac{3}{10} + \frac{6}{4}$
14. $-4.2 + (-2.8)$
15. $7.6 + (-6.5)$
16. $\frac{7}{4} - \frac{19}{6}$
17. $\frac{8}{9} - \frac{3}{7}$
18. $8.4 \times (-3)$
19. $\frac{11}{9} \div \frac{4}{5}$

Write the following rational numbers in form of percentage

20. $\frac{8}{100}$
21. $\frac{3}{4}$
22. $\frac{4}{5}$
23. $\frac{3}{15}$

If the ratio of gain is 90 %, estimate the gain for the following numbers

24. 102
25. 1250
26. 3624
27. 5487
28. 20312

Find the rational division for each of the following

29. $2:3$ from 15350
30. $1:2$ from 216
31. $4:5$ from 1800

32. A rectangular computer screen, the ration of its width to its length is 2:3 and it's perimeter is 130 cm . What is the length and width of the screen?

33. A street needs 25 light columns, how many columns do three streets need to enlighten them?

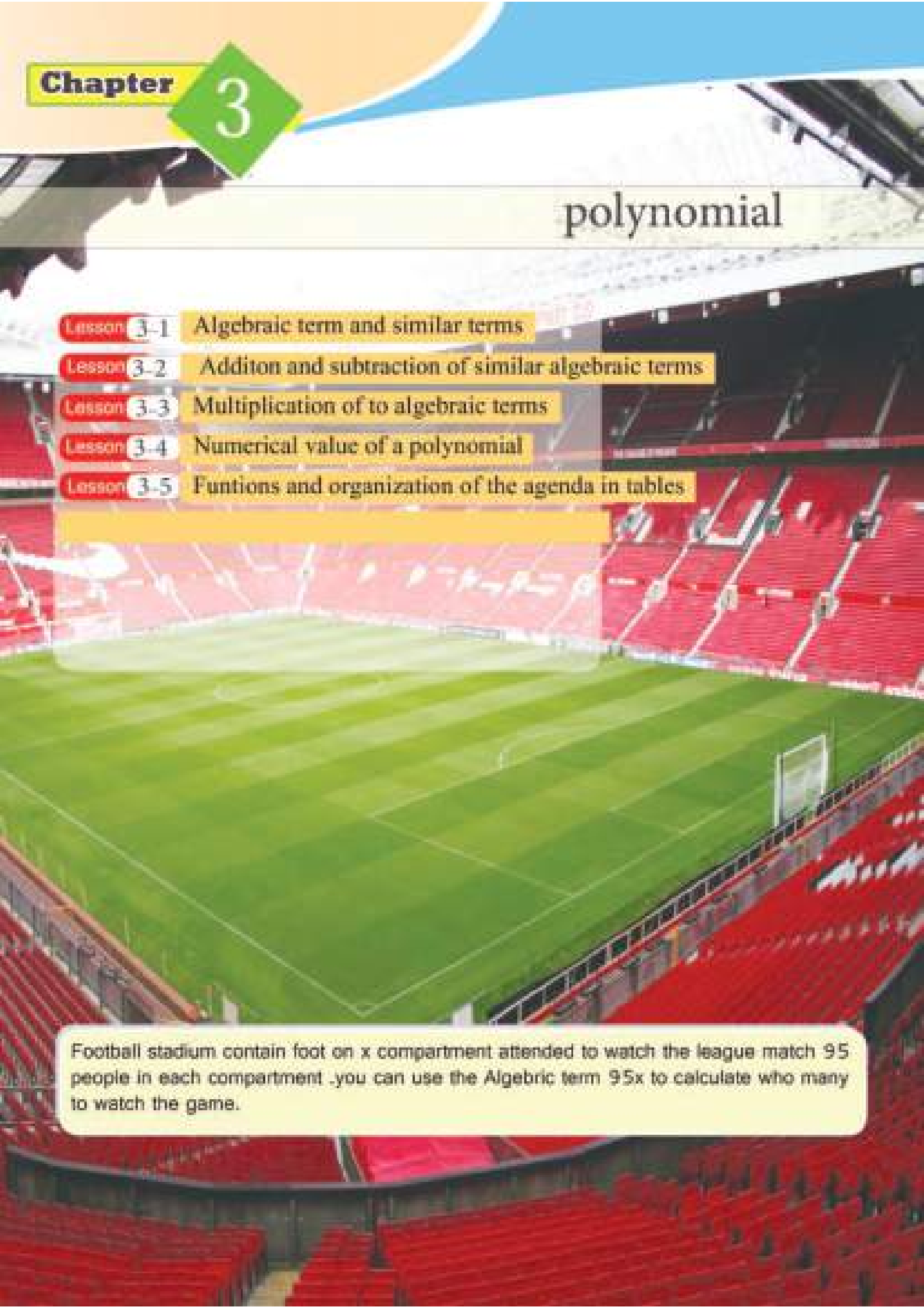
34. A piece of ground was divided to three pieces, each piece's area was $400m^2$ What is the area of each piece, if it was divided to six pieces?

Estimate the following roots.

35. $\sqrt{41}$
36. $\sqrt{14}$
37. $\sqrt{500}$
38. $\sqrt[3]{80}$
39. $\sqrt[3]{210}$
40. $\sqrt[3]{745}$

Chapter 3

polynomial



Football stadium contain foot on x compartment attended to watch the league match 95 people in each compartment .you can use the Algebric term 95x to calculate who many to watch the game.

Pretest

Use the operations arrangement to calculate mentally:

1. $14 + 15$ .....
2. 6×12 .....
3. $(25 + 35) + 9$ .....
4. 8^2 .....
5. $(10)^2$ .....
6. $(15)^2$ .....

Use the ordering operations and find the result of the following:

7. $(6 - 7) \times (10 + 4)^2 - 20$
8. $100 \div 4 + 2 \times (-2)$
9. $50 \div 5 + 4 \times (-4)$
10. $5 - 6 \times 10^2 + 4 - 2 \times (-4)$
11. $(56 \div 7)^2 + (60 \div 3)$
12. $(6 \times 20) + 2(-4) \div 6$

Find the value of the following algebraic expression:

13. $4X - 6^2$, $X = 3$
14. $2X + 8$, $X = 4$
15. $7(x - 3)$, $X = -1$
16. $\sqrt{36}\ y - 4$, $y = 2$
17. $|-9| + y^2 - 25$, $y = -5$
18. $3Z + 4$, $Z = -1$

Solve the addition and subtraction equations for the following:

19. $X - 9 = 8$
20. $Z - 4 = 8$
21. $h + 3 = 12$
22. $27 - Z = 24$
23. $y + 3 = 9$
24. $v - 5 = 10$
25. $y + 11 = 11$
26. $X + |-10| = 5$
27. $\sqrt{16} + y = 4$

Solve the multiplication and division equations for the followings:

28. $x \div 8 = 2$
29. $Z \div 6 = 3$
30. $r + \sqrt{49} = 7$
31. $48 \div y = \frac{1}{6}$
32. $X \times \frac{1}{2} = 2$
33. $X \times \frac{1}{12} = 6$
34. $71 \times y = 213$
35. $8 \times y = 64$
36. $7 \times k = 42$

Find the value of the square and cube roots for each of the following:

37. $\sqrt{64}$
38. $\sqrt{100}$
39. $\sqrt{81}$
40. $\sqrt{144}$
41. $\sqrt{900}$
42. $\sqrt{625}$
43. $\sqrt[3]{-125}$
44. $\sqrt[3]{216}$

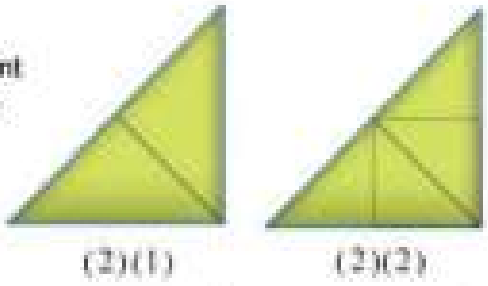
[3-1] Algebraic term and similar terms

Idea of the lesson:
- Learn the algebraic terms
- Learn the similar algebraic terms

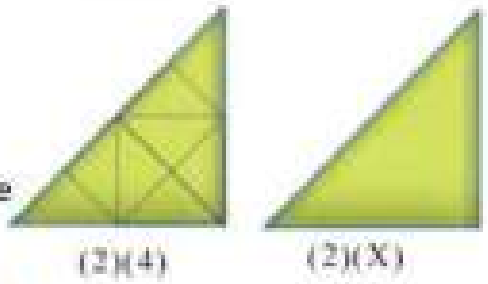
Vocabulary:
- Algebraic terms
- Coefficient
- Variable
- Similar algebraic terms
- Dissimilar algebraic terms

Learn

The following figures represent different styles of the number of triangles in each shape



(2)(1) (2)(2)



(2)(4) (2)(X)

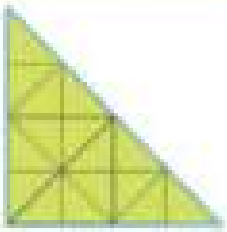
i) What is the value of x in figure 4?
ii) The number 2 is called a constant (factor) and the symbole x is called a variable.
iii) While the (2)(X) is called an algebraic term.

[3-1-1] Algebraic term

It consists of the multiplication of two parts, the numerical part (factor) and the symbolic (variable)

Example (1) **Find the number of the triangles in figure 4**

We draw the fourth figure by forming right triangles.
So the number of triangles is 16 or (2)(8)
and by the symbols it is written as 2x where x=8



16=(2)(8)

Example (2) Determine the coefficient and the symbolic part of each of the following algebraic terms

	Algebraic terms	Coefficients	Symbolic part
i	$14xy$	14	xy
ii	$-24zy^3$	-24	zy^3
iii	$\frac{1}{5}hkz$	$\frac{1}{5}$	hkz
iv	$5zy$	5	zy
v	$-16xy^2z^3$	-16	xy^2z^3

	Algebraic terms	Coefficients	Symbolic part
i	$\|-3\|xy$	+3	xy
ii	$\sqrt[3]{125z^2w}$	5	z^2w
iii	$\sqrt{100hk^2}$	10	hk^2
iv	$\frac{3}{60}x^2yz$	$\frac{1}{20}$	x^2yz
v	$-\frac{2}{3}rv^2$	$-\frac{2}{3}$	rv^2

Example (3) Health: **The algebraic terms $\frac{H}{15}$ is used to calculate the amount of blood in human body in liters where H is the weight of a person in kilograms. Determine the factor and variable in the algebraic term.**

$$\frac{H}{15} = \frac{1}{15} H$$

$\frac{1}{15}$ = factor (coefficient)

H = variable

[3-1-2] similar terms

They are the terms that include same variables as their powers while factors are not similar

Example (4) **Determine the similar terms among the following algebraic terms:**

$\frac{1}{4}$ wy, b , 46d , 3zy , 5d , $\frac{3}{2}$ zy , 15b , x^2 , 4wy

Look for similar variables with similar powers

Similar terms:

{ 5d , 46d } , { $\frac{3}{2}$ zy , 3zy } , { 15b , b } , { $\frac{1}{4}$ wy , 4wy }

This terms have the same variable

While the term x^2 does not have a similar term

Example (5) **Match each algebraic term in the first colomn with similar to algebraic term in the second column**

1st column	2nd column
6x y	2ab
2ab	56 G h
nm	$\frac{81}{13}$ nm
$\frac{21}{5}$ cd	34 x y
6 zd	-92 zy
45Gh	cd

i) Find the similar variable to the same power .
ii) Draw a line from column one to column two.
iii) Repeat the same steps for the rest of the terms.

Make sure of your understanding

Write the coefficient and the variable for each of the following algebraic terms:

1. $-40\,x^2y^3$ ..... coefficient , ... variable
2. $\frac{12}{5}\,Wz$ ..... coefficient , ...variable
3. $7abc$ ..... coefficient , ...variable
4. $\frac{-2}{9}\,h^2k$ ..... coefficient , ...variable
5. $100cd$ ..... coefficient , ...variable

Q 1-5 are similar to example 2

Write five similar terms for the following algebraic term.

6. $x^2y^5z^4$ ....., ..., ..., ..., ...

Determime the similar algebraic term:

7. $11\frac{xy}{z}$ a) $11\frac{xz}{y}$ b) $11\frac{zy}{x}$ c) $11\frac{xy}{z}$
8. $8x^3y$ a) $6x^2y$ b) $-6x^2y$ c) $-6x^3y$

Q 6-7 are similar to example 4

Solve the exercises

Write the coefficient and variable for the following algebraic terms:

9. $24xyz$ ..... coefficient , ... variable
10. $|-8|r^2v^2$ ..... coefficient , ... variable
11. $\sqrt{121}\,h^2k^2$ .....coefficient , ... variable
12. $\frac{10}{12}\,r^2v$ ..... coefficient , ... variable
13. $\frac{xy}{Z}$ ..... coefficient , ... variable

Determine the similar algebraic term for the givn term:

14. $|-5|xy$ a) $5x^2y$ b) $5xy^2$ c) $12xy$
15. $\sqrt[3]{8}\,zw^2$ a) $2z^2w^2$ b) $8zw^2$ c) $16z^2w$

Write five dissimilar terms for the following algebraic term:

16. $\sqrt{16}\,zy^2$ ....., ..., ..., ..., ...

Solve life problems

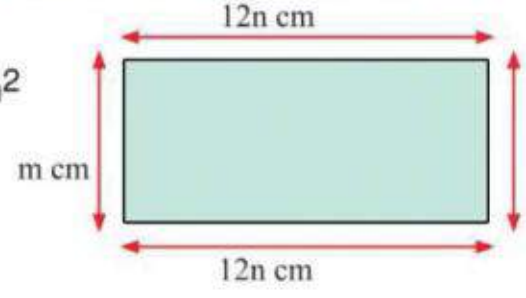
17 **Sience:** The algebraic term $\frac{25x^2}{4}$ is the distance that the body moves it when falling off a height in x seconds. Determine the coefficient and its variable

18 **Shopping:** Sarah took note in the selling record that she sold $4x^2$ clothes and $10xy$ of bags. Determine the coefficient and its variable according to Sarah`s notes about the sold clothes and bags.

19 **Zoo:** A paralelogram shaped zoo with an area of $12z^2yw$, determine the coefficient and its variable

Think

20 **Challenge:** The area of this shape is $12nm\ cm^2$ Determine the coefficient of an algebraic term and its symbolic part



21 **Open problem:** If the relation $\frac{1}{2}xy$ represents the area of the triangle, give an example form life represents that relation

22 **Numerical sense:** A pharmacist sold patient a treantment that cost 10 xy and another pharmacist sold it with 12 xy, are these terms similar? Determine their coefficients and variables

Write

Four similar algebraic terms and determine the coefficient and variable for each of them.

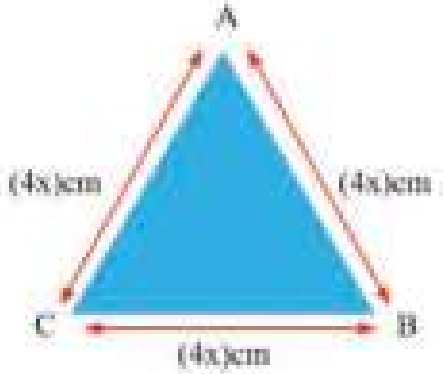
[3-2] Additon and subtraction of similar algebraic terms

Idea of the lesson
- Addition of the similar terms
- Subtraction of the similar terms

Vocabulary:
- Addition of the similar terms
- Subtraction of the similar terms

Learn

Sura has a piece of cardboard in the shape of an equilateral triangle. How can Sura find its perimeter ?



[3-2-1] Additon of similar terms

Addition of similar terms in order to add similar terms write them in front of the symbolic part and add their coefficient

Example (1) **Find the shape of perimeter above**

$P = AB + BC + CA$ — Assumming that the perimeter of the triangle is P, Write the rule of the perimeter of a triangle

$P = 4X + 4X + 4X$ — Substitute the length of one side

$= (4 + 4 + 4)\,X$ — Add the coefficients

$= 12X$ — Simplify

the perimeter of the a cardboard piece is 12x cm

Example (2) **Add the similar algebraic terms**

i) $\frac{-1}{8}\,w^2z\ ,\ \frac{5}{8}\,w^2z\ ,\ \frac{-3}{8}\,w^2z\ ,\ \frac{7}{8}\,w^2z$

$\left(\frac{-1}{8} + \frac{5}{8} + \frac{-3}{8} + \frac{7}{8}\right) w^2z = \left(\frac{-1 + 5 + (-3) + 7}{8}\right) w^2z = \frac{8}{8}\,w^2z = w^2z$

ii) $5x^2y^3z^4\ ,\ 12x^2y^3z^4\ ,\ \frac{1}{5}\,x^2y^3z^4$

$\left(5 + 12 + \frac{1}{5}\right) x^2y^3z^4$ — Add the coefficients

$\left(\frac{25 + 60 + 1}{5}\right) x^2y^3z^4 = \frac{86}{5}\,x^2y^3z^4$ — Equalize the denominators, Simplify

iii) $|-4|\,r^2v\ ,\ \sqrt{4}\,r^2v\ ,\ 2r^2v$

$(4 + 2 + 2)\,r^2v = 8r^2v$

Example (3) Geometry: **A rectengular playground with specified dimension**
Find the perimeter of the rectangle.

the perimeter of the rectangle is M

$M = AB + BC + CD + DA$
$= 3y + 2x + 3y + 2x$
$= (3 + 3)\,y + (2 + 2)\,x$
$= 6y + 4x$

so the perimeter of the rectangle is $6y + 4x$ cm

[3-2-2] Subtraction of similar terms

When subtracting similar terms, subtract the coefficients i.e the minuend is added with the additive inverse so the subtraction operation is turned to addition

Example (4) **Find the result of the following**

i) subtract 2xy from 10xy
$= 10xy - 2xy$
$= (10 + (-2))\,xy$
$= 8xy$

ii) from $24z^2wy$ subtract $-32z^2wy$
$24z^2wy - (-32z^2wy)$
$(24 - (-32))z^2wy$
$= 56z^2wy$

iii) from $9r^2v^2$ subtract $|-6|\,r^2v^2$
$= 9r^2v^2 - 6r^2v^2$
$= (9 - 6)\,r^2v^2 = 3r^2v^2$

iv) from $\sqrt{169}\,hk$ subtract $7hk$
$= 13hk - 7hk$
$= (13 - 7)\,hk = 6hk$

Example (5) **Find the result of the followings**

i) from $15xyz$ subtract $-15\,xyz$

(minuend − subtrahend)
$= (15-(-15))xyz$ subtract the coefficient
$= (15 + 15)\,xyz$
$= 30xyz$

ii) from $\frac{3}{14}hk$ subtract $\frac{-5}{7}hk$

(minuend − subtrahend)
$= \left(\frac{3}{14} - \frac{-5}{7}\right)hk$ subtract the coefficient
$= \left(\frac{3}{14} + \frac{5}{7}\right)hk$ equalize the denominators
$= \left(\frac{3}{14} + \frac{10}{14}\right)hk$ simplify
$= \frac{13}{14}hk$

Make sure of your understanding

Find the result of the addition of similar terms for each of the following:

1. $6wz^2$, $24wz^2$, $18wz^2$
2. $-4x^2$, $2x^2$, $\frac{1}{5}x^2$

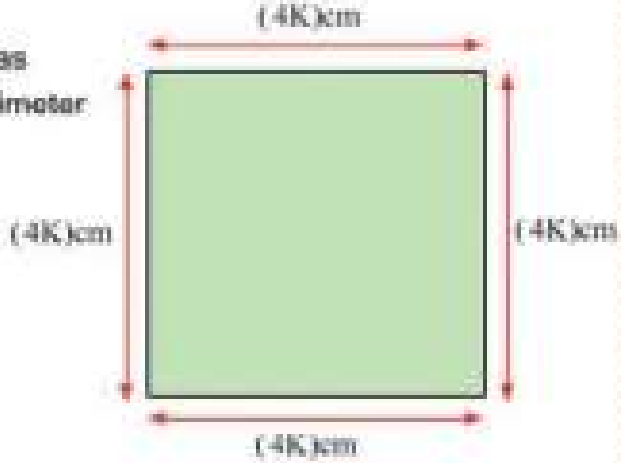
Q 1-2: are similar to example 1, 2

Find the subtraction result for each of the following:

3. $6zwy$ $\quad -7zwy$
4. $\frac{-1}{5}ab$ $\quad \frac{-3}{5}ab$

Q 3-4: are similar to example 4, 5

5. A squared piece of land with dimension as shown in the figure, find the squares perimeter



Q 5: is similar to example 3

Solve the exercises

Add the following similar algebraic terms:

6. $-5x^2$, $2x^2$, $\frac{1}{5}x^2$
7. $\sqrt{169}x^4y$, $13x^4y$, x^4y
8. $\frac{1}{6}xyz$, $10xyz$, $20xyz$
9. $|-9|r^2v$, $|-8|r^2v$, $|3|r^2v$
10. $\frac{3}{10}hk^2$, $\frac{1}{2}hk^2$, $\frac{1}{5}hk^2$

Subtract the first algebraic term from the second for the followings:

11. $20r^2v$, $40r^2v$
12. $4xyz$, $16xyz$
13. $|-9|ba$, $|-20|ab$
14. $\frac{1}{5}h^2k$, $\frac{1}{25}h^2k$
15. $\frac{1}{3}ab^2$, $12ab^2$

Solve life problems

16 **Stationery:** **Ahmed sold stationary with 6k dinars and Mohammed sold seem with 10k dinars. Find how much they both have earned?**

17 **Find the subtraction result of the algebraic term -6hk from each of the following terms**

i) $7hk$ ii) $\frac{1}{5}$ hk

iii) $3hk$ iv) $|-10|hk$

v) $(-5)hk$ vi) $\sqrt[3]{216}$ hk

vii) $6hk$ viii) $\sqrt{25}$ hk

18 **Find the result of subtraction the algebraic term $10x^3y$ form each the following algebraic terms**

i) $\sqrt{100}x^3y$ ii) $-8x^3y$

iii) $4x^3y$ iv) $-12x^3y$

viii) $20\ x^3y$ vi) $-5\ x^3y$

vii) $15x^3y$ viii) $2x^3y$

Think

19 **Challenge:** A triangular piece of land with perimeter $(9xy)$ m. If the addition of two sides is $(5xy)$ m. What is the length of third side?

20 **Open problem:** A ranch for raising rabbits contained $50m^2n$ female rabbits and $20\ m^2n$ male rabbits, what is the sum of the rabbits in the ranch (both male and female) and what is the sum of their difference?

21 **Numerical Sense:** The algebraic terms $18x$, $23x$, $23x^2$,y^2 either you add or subtract to get the result $5x$, $7y^2$ or choose an algebraic limet to get $7\ y$

Write

A problem from real life solving the addition or subtraction of similar terms

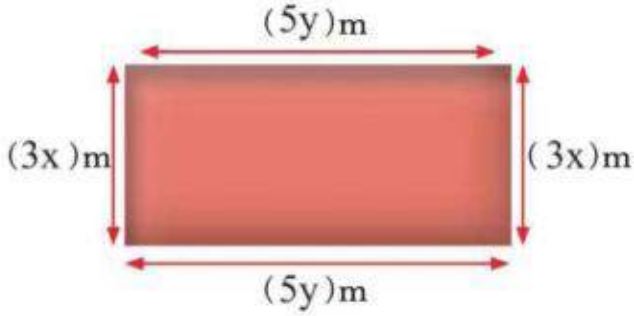
[3-3] Multiplication of algebraic terms

Idea of the lesson:
- Multiply an algebraic term by another algebraic term
- Multiply an algebraic term by algebraic amount

Vocabulary:
- Algebraic term
- Algebraic amount

Learn

In alongside figure, a rectangle with the dimension 5y, 3x in meters. What is its area



[3-3-1] Multiplication of Two Algebraic Terms

When multiplying an algebraic term with another algebraic term, their coefficient are multiplied first then their symbolic parts

Example (1) **Find the area of the rectangle in learn section:**

Suppose that the area of rectangle A

A=(length) x (width)

$A = 3x \times 5y$ *Write the rule of the rectangular area*

$A = (3)(5)(xy)$ *Multiply the coefficient and multiply the veriables*

$A = (15)\,xy$ *Simplify and find the result*

So the area of the rectangle = 15 xym²

Example (2) **Find the result of the multiplication?**

$(3zw)(6xy)$

$= (3)(6)(zwxy)$

$= 18zwxy$

$|-5|zw(\sqrt{49}\,rb)$

$= (5)(7)(zwrb)$

$= 35zwrb$

Example (3) **Find the result of the multiplying all three terms.**

$(\frac{1}{3}h^3), (\frac{12}{5}k^2), (\frac{2}{3}L^4)$

$(\frac{1}{3})(\frac{12}{5})(\frac{2}{3})(h^3k^2L^4)$ *Multiply the coefficient and multiply the veriables*

$= \frac{8}{15}h^3k^2L^4$ *Simplify and find the result*

Example (4) **What is the area of the triangle if its base is 4x and its height is 8y meters?**

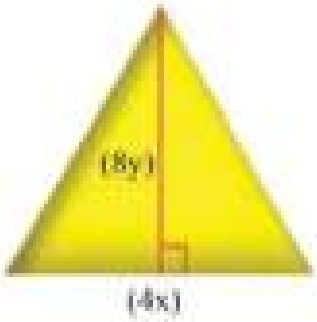
Suppose the area of the triangle is A

$A = \frac{1}{2} \times X \times Y$ *Write the rule of the perimeter of a triangle*

$A = \frac{1}{2} \times 4x \times 8y$

$A = \frac{1}{2}(4)(8)(xy)$ *Multiply the coefficient and the variables*

$A = 16xy$ *simplify and find the result*



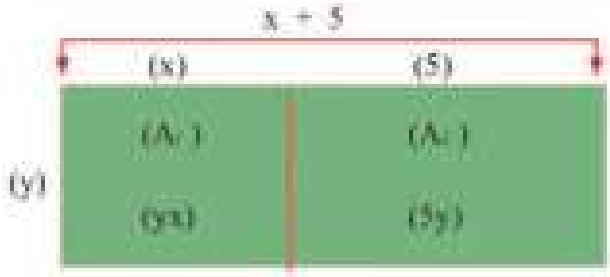
[3-3-2] Multiplication of Algebraic Terms by Algebraic a mount

When multiplying an algebraic term by an algebraic amount of two terms or more, we multiply the algebraic term by the terms of the algebraic amounts by using the distribution

Example (5)

Find the result of the following

Use the figure to find the result y and the width x+5 draw a rectagnle with the length



Suppose that the area of the rectangle is A

$A = y(x + 5)$ *The area of the original rectangle*

$A_1 = yx$ *the area of the rectangle 1*

$A_2 = 5y$ *the area of the rectangle 2*

$A = A_1 + A_2$

$y(x + 5) = yx + 5y$ *by substitution of the area*

$y(x + 5) = yx + 5y$ *using the distribution porperty*

Example (6) **Find the result**

$2x(3y - 5z + 9)$

$2x(3y - 5z + 9)$ *using the distribution porperty*

$2x(3y) - (2x)(5z) + (2x)(9)$

$6xy - 10xz + 18x$ *simplify and find the result*

$\frac{1}{5}(Z + 3 + 3y)$

$\frac{1}{5}(Z + 3 + 3y)$ *using the distribution porperty*

$\frac{1}{5}(Z) + \frac{1}{5}(3) + \frac{1}{5}(3y)$

$\frac{1}{5}Z + \frac{3}{5} + \frac{3}{5}y$ *simplify and find the result*

Example (7) **Industry:** A factory for making soap has a special offer for the distributors so that if one distributor bought 4 boxes, each box contained x pieces of soap, 7 free pieces soap were added too. write the relation which represent the request one of the distributors for 10 offers.

$4x + 7$ *the nember of soap pieces for one offer*

$10\,(4x + 7)$ *the nember of soap pieces for 10 offer*

$10\,(4x) + 10\,(7)$ *use the distribution porperty*

$40x + 70$ *simlify*

Make sure of your understanding Find the multiplication result for the following :

Q 1-12 are similar to example2,3,6

1. $15x\,(4y)$ .....
2. $20x\,(3y^2)$ .....
3. $12\,n\,(5m)$ .....
4. $-3z\,(4w^2)$.....
5. $10h^2\,(4k^2)$.....
6. $17n(m+3)$ .....
7. $4x\,(8y+4z+5)$.....
8. $6z(3z+w^2+2m+3)$.....
9. $7(2x^2+5z)$ .....
10. $30(9h+4)$.....
11. $3x^2(4z+y-1)$.....
12. $14(5w^3+y^2)$ .....

Solve the exercises

Find the result of multiplication of the following :

13. $7x(5y)$.....
14. $5h(2y+3x+4)$.....
15. $3h(2x+4n)$ .....
16. $2k(2m^2+3n)$ .....
17. $15y(2x^2+3x+1)$.....
18. $4k(z+\frac{1}{2}w)$ .....
19. $\sqrt{4}\,(2m+7n)$.....
20. $zw^2(3x+4y+1)$ .....
21. $\sqrt[3]{27}\,(x+3)$.....
22. $|-x|\,(y^2+z+3)$.....
23. $(60r)(10v^2)$.....
24. $|-2z|\,|4y|$ .....
25. $\sqrt{25x}\,(15z+4y)$.....

Solve life problems

26 **Healty:** The averege human heartbeat of an unsporting x year old male is given by the rule n(220-x) and for the female n(226-x) as their hearts work with a percentage n out of their maximum power. Use distribution to make the rules in the simplest form.

27 **Sport:** A rectangular basketball playground with a length of $3x^2$ and width of $2y^2-4y+1$. What is the area of the playground.

28 **Transporration:** Four trains, the first and second consist of x carts, the third and fourth consist of y carts. If each cart is enough for 60 passengers then how many passengers

Think

29 **Challenge:** If the algebraic amount is $10y^2-5y+3$ and when multiplied by an algebraic term the result is $30y^2-15y+9$. What is that algebraic term?

30 **Open problem:** Given a problem from real life about the area of a figure whose base is x^2 and height is $3y+5$

31 **Numerical sense:** When multiplying the algebraic term $10xy$ by the algebraic amount (z^2+w^2+10). What is the result of the amount?

Write

When multiplying the algebraic amount by an algebraic term. What are the resulting terms called?

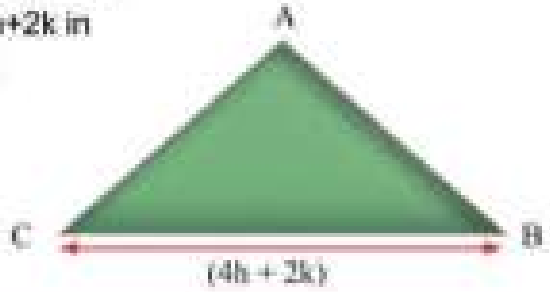
[3-4] Numerical value of a polynomial

Idea of the lesson:
- Finding the numerical value of the polynomial by substitution of the value of variable

Vocabulary:
- substitution
- Variables

Learn

Look at the equilateral triangle, if one of its sides was 4h+2k in meters where h=2 , k=4. Find the perimeter?



Each veriable in algebraic term or polynomial has a numerical value or more when it substituts it gives the numerical value of the term or the polynomial.

Example (1) **To find the perimeter of a triangle**

First method: We can substitute the variables h and k to find the length of one side then add up all three

Suppose that the triangle's perimeter = P

$P = (4h+2k)+(4h+2k)+(4h+2k)$ Write the law of triangle perimeter

$P = [(4(2)+2(4))+(4(2)+2(4))(4(2)+2(4))]$ substitute the values of h=2 , k=4

$= 16 + 16 + 16 = 48$ simplify

So the perimeter of the triangle is 48 m

Second method: Add the algebraic amounts then make it up for the values h=2 , k=4

Suppose that the triangle perimeter is p

$P = (4h+2k)+(4h+2k)+(4h+2k)$

$=(4h+4h+4h)+(2k+2k+2k)$ Write the rule of triangle perimeter

$=(12h)+(6k)$

$=(12(2))+(6(4))$ substitute the values of h=2 , k=4

$=(24)+(24)$

$= 48$ m simplify

So the perimeter of the triangle is 48 m

Example (2) Calculate the value of $\frac{4}{|x|}+2\sqrt[3]{y}$ where $x=-2$, $y=8$

$=\frac{4}{|x|}+2\sqrt[3]{y}$

$=\frac{4}{|-2|}+2\sqrt[3]{8}$ *substitute* $x=-2$, $y=8$

$=\frac{4}{2}+2(2)$ *simplify*

$=2+4=6$ *result*

Example (3) Geometry: Find the perimeter of the following figures if h=7 , k=4

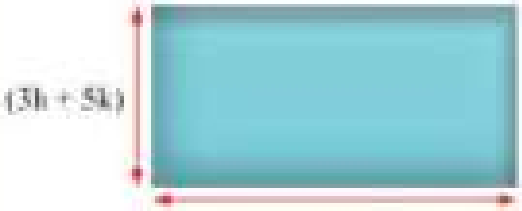


figure (1)

figure (2)

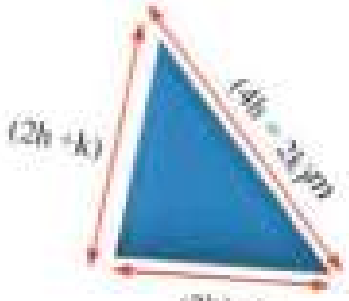


figure (3)

Suppose that perimeter of the rectangle is P

P = 2 × (Width + Length)

P = 2 [(3h+5k)+(5h+7k)] *Write the rule of the rectangle perimeter*

= 2 [(3h+5h)+(5k+7k)]

= 2 [(8h)+(12k)]

= 2 [(8(7))+(12(4))] *substitute* h = 7 , k = 4

= 2 [56 + 48] *simplify*

= 208 *result*

So the perimeter of the rectangle is 208 m

Suppose that perimeter of the square is P

P = 4 [(2h+3k)] P = 4 × (Length of the side)

= 4 [(2h+3k)] *distribution property*

= 8h + 12k *add the similar terms*

= 8(7) + 12(4) *substitute* h = 7 , k = 4

= 56 + 48 *simplify*

= 104 *result*

So the perimeter of the square is 104 m

The sum of all its sides = P

$P = (2h+k) + (2h)+(4h+2k)$

$= (2h+2h+4h) + (k+2k)$ *add the similar terms*

$= (8h) + (3k)$

$= 8(7) + 3(4)$ *substitute* $h = 7$, $k = 4$

$= 56 + 12$ *simplify*

$= 68$ *result*

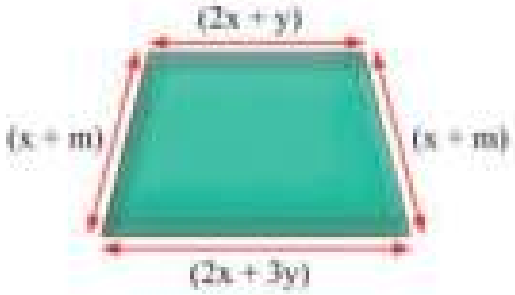
So the triangle's perimeter is 68m

Make sure of your understanding

Find the numerical value for the following expression.

Q 1-6 are similar to example 2

1. m^2+m-3n^2+4 , $m=3$, $n=2$
2. $5x^2+7y^2+4x-2$, $x=4$, $y=5$
3. $W+W^2-Z+Z^2$, $W=1$, $Z=-2$
4. $5h^2+12K$, $h=-2$, $k=-1$
5. $4+5a+15b$, $a=2$, $b=2$
6. $8w-7z+12$, $w=3$, $z=3$
7. Find the perimeter of the figure if $x=5$, $y=1$, $m=3$



Q 7 are similar to example 1,3

Solve the exercises

Calculate the value of each expression if $a=9$, $b=15$, $x=3$, $y=8$

8. b^2-5xy
9. $4b-5a$
10. $2ab$
11. $4y+8x-6$
12. $7y+4+5x$
13. y^2-5a

Choose the corect answer for the following:

14 x^3+y^3 ..... , $x=2$, $y=4$

a) 18 b) -72 c) 72 d) -18

15 $x^4+y^3-z^3+w$ ..... , $w=2$, $x=1$, $y=2$, $z=-6$

a) -227 b) 227 c) -205 d) 205

16 $\frac{x+y}{z^3}$ ..... , $x=8$, $y=2$, $z=5$

a) $\frac{-2}{5}$ b) 2 c) $\frac{2}{5}$ d) -2

17 $|x-y|$ ..... , $x=-8$, $y=-3$

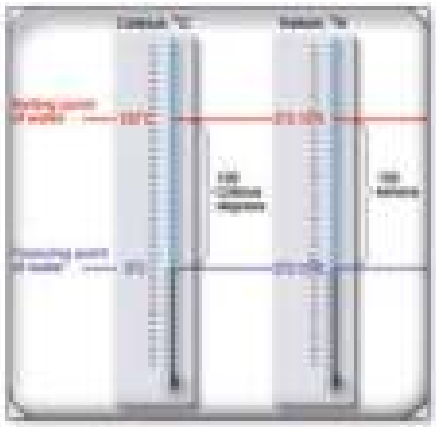
a) -5 b) 11 c) 5 d) -11

18 $\sqrt{x}+\sqrt[3]{7-y}$ ..... , $x=1$, $y=8$

a) 5 b) 0 c) 1 d) -1

Solve life problems

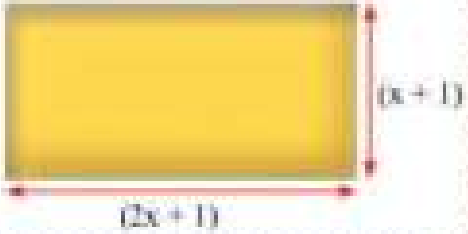
19 **Temperature:** Relation between celsius temperature and Kelvin temperature is K=273+C Find the temperature of K if C=-10



20 **Econemic:** Ahmed gets a constant salary of 500 thousand dinars, and 5 thousand dinars for every extra work hour. During the month he worked for (M) hours. What expression represents what Ahmed earns through the month and what is the numerical value of the expression if M=50

Think

21 Challenge: A rectangle whose perimeter is 28 cm has dimension as shown in the figure What is x?



Write

A comparison between the expression and the numerical value and give examples.

[3-5] Funtions and its organization of the agenda in tables

Idea of the lesson:
- Know the function and how it organized in table
- Finding the function rule

Vocabulary:
- Function
- Function table
- Function rule

Learn

Zaid earns 15 thousand dinars a day from the market. What is the amount of money he earns in five days?

Function: is a relation which determines one out put value for each input value
Function table is the table that arranges the values of the input and the output.
Function rule is the formula used the substitute the input value in order to get the output value

Example (1) **Find how much Zaid earns in five days.**

Inputs, outputs and function rule can be arranged in the following table.

Input number of days	function Rule by 15	Output money
1	15×1	15
2	15×2	30
3	15×3	45
4	15×4	60
5	15×5	75

So Zaid earns 75 thousand dinars in five days.

Example (2) **If the function rule is x^2+4x+1 Make a table to find the outputs for these inputs {2 , 4 , 6 , 8}**

Input	Function x^2+4x+1	Output
2	$(2)^2+4(2)+1$	13
4	$(4)^2+4(4)+1$	33
6	$(6)^2+4(6)+1$	61
8	$(8)^2+4(8)+1$	97

Example (3) **Write the function rule of the following inputs and outputs:**

Input	Function	Output
1	$20(1)^2$	20
2	$20(2)^2$	80
3	$20(3)^2$	180
4	$20(4)^2$	320

i) function rule is $20X^2$

Input	Function	Output
1	$(1)^3+1$	2
3	$(3)^3+1$	28
5	$(5)^3+1$	126

ii) function rule is X^3+1

Input	Function	Output
27	$27\div 3$	9
30	$30\div 3$	10
60	$60\div 3$	20

iii) function rule is $X\div 3$

Input	Function	Output
4	$4\div 2-1$	1
6	$6\div 2-1$	2
8	$8\div 2-1$	3

iv) function rule is $\frac{x}{2}-1$

Input	Function	Output
2	-3 (2)	-6
4	-3 (4)	-12
5	-3 (5)	-15

v) function rule is $-3x$

Make sure of your understanding

1 If the function is rule $|y| + 2y$ make a table and indicate the outputs.

Input	Function $\|y\| + 2y$	Output
1		
2		
0		
-1		
-2		

Q 1 : is similar to example 2

Write the function rule for the following inputs and outputs:

2 Function rule

Input	Function	Output
1		1
2		3
3		5

Q 2 - 3 : are similar to example 3

3 Function rule

Input	Function	Output
2		6
4		18
6		38
8		66

Solve the exercises

4 If the function rule is $|w| + w \times 2$ what are the outputs for the following inputs

Input	Function $\|w\| + w \times 2$	Output
2		
1		
0		
-1		

5 Write the function rule for the following

Input	Function	Output
10		110
11		132
12		156
13		182
14		210

the function rule is

Solve life problems

6 **Giraffe:** A girraffe sleeps 4.5x +1 hours daily. How many hours does the girraffe sleep in five days

Input (days count)	Function 4.5x +1	Output (number of the hours the girraffe)

Think

7 **Correct the mistake:** If Zeena is 10 years older than her sister then the function correct rule is 10x+1. Is the answer correct or not? Explain your answer.

8 **Open problem:** Write a problem from real life that can represent the function rule y^2+1.

9 **Numerical sense:** Ali used the function rule 100+25y to count the money where y is the number of months. How much money Ali collect in four months?

Write

Relation between inputs, outputs and function rule.

Chapter Test

Write the coefficient (C) and the variable (V) for each of the following algebraic terms:

1. $|-xz|$
2. $25z^2y$
3. $10\frac{zw}{y}$
4. $\sqrt{144}\,r^3v$
5. $\frac{12}{15}xyz$
6. $\frac{-1}{2}hk^2$

7. Link each algebraic terms in row 1 to the one similar to it in row 2

$\frac{14}{5}xy$	$\frac{1}{3}x^2y$	$10zw$	$15r^3v$	$\sqrt{625}\,h^2k^2$
$\frac{1}{4}x^2y$	zw	$\sqrt{100}\,r^3v$	$3a^2b^3$	$\sqrt[3]{27}\,h^2k^2$

Find the result of the following algebraic terms:

8. $5z^3h + 7z^3h + z^3h$
9. $|-3|xy + 4xy + 3xy$
10. $x^2z^2y^2 + \frac{1}{4}x^2z^2y^2 + \frac{3}{16}x^2z^2y^2$
11. $6hk + \frac{1}{3}hk + 9hk$
12. $\frac{1}{5}ab^2 - \frac{7}{10}ab^2 + 5ab^2$
13. $2r^3v + \frac{1}{4}r^3v - 8r^3v$
14. $3x^2y^3 - 5x^2y^3 + 7x^2y^3$
15. $10xy^3 - 8xy^3 + 4xy^3$

Find the result of multiplying the algebraic terms:

16. $2x(\frac{1}{2}y + 8z + 4)$
17. $2y(x + z + 7)$
18. $(10x)(12y)$
19. $(6xy)(3z)$
20. $|-2|(6z + 6)$
21. $\sqrt{25}(x + y + 1)$

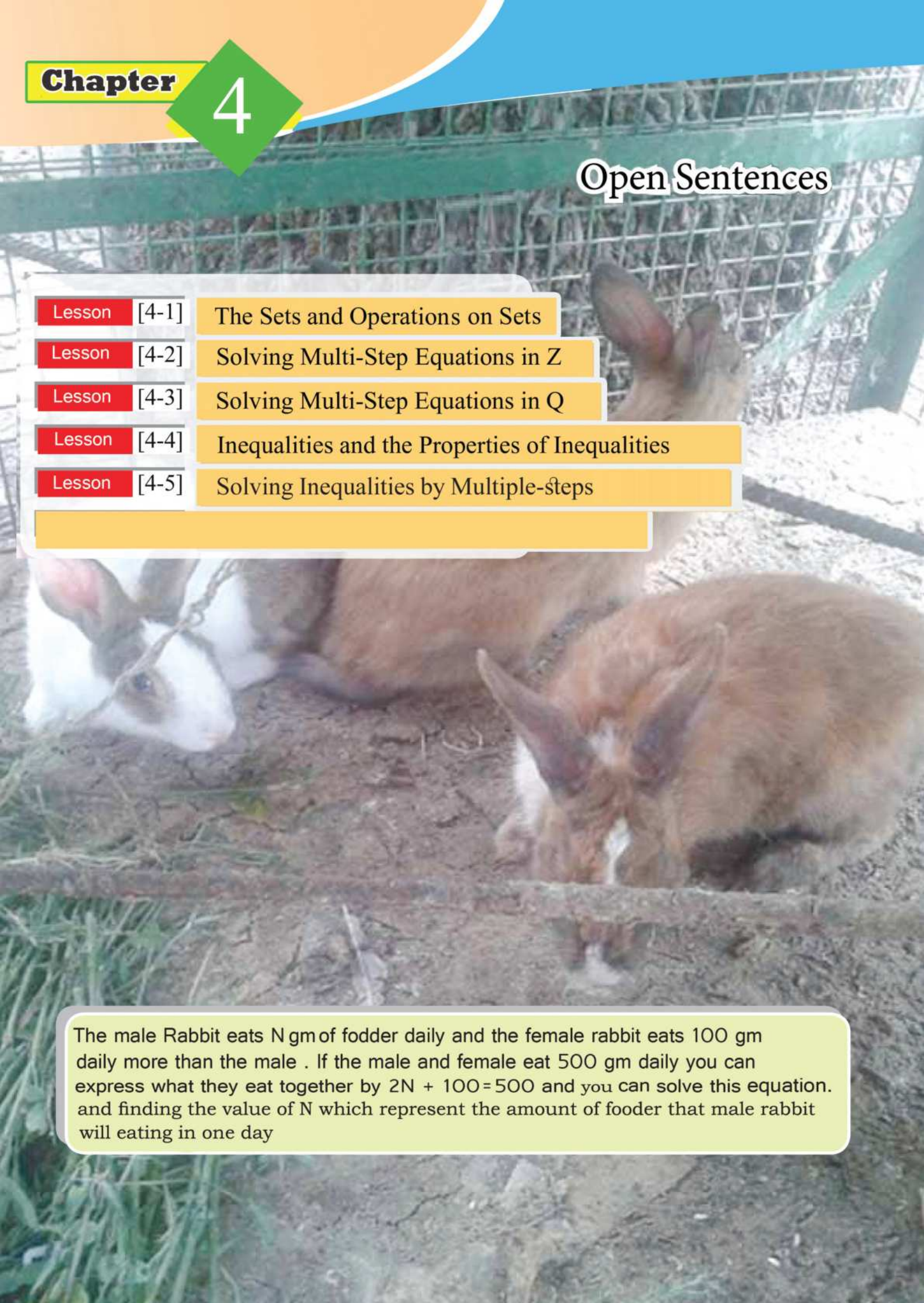
Find the numerical value of the following algebraic amounts:

22. $4zw^2y + 6y + z^2$ $\quad w = 2\ ,\ y = 4\ ,\ z = 1$
23. $2h^2 - 3k + 1$ $\quad h = 5\ ,\ k = 6$
24. $3r^2 + 2v + 16$ $\quad r = 3\ ,\ v = 7$

25. **Make a table for the rule of the function 3y + 10 for four values to the variable y.**

Chapter 4

Open Sentences



The male Rabbit eats N gm of fodder daily and the female rabbit eats 100 gm daily more than the male . If the male and female eat 500 gm daily you can express what they eat together by 2N + 100 = 500 and you can solve this equation. and finding the value of N which represent the amount of fooder that male rabbit will eating in one day

Pretest

Solve the following open sentences

1. $(-6) + \ldots = 15$
2. $(-5) + \ldots = -20$
3. $\ldots - 13 = -33$
4. $2 \times \ldots = 24$
5. $(-4) \times \ldots = -32$
6. $\ldots \times (-5) = 35$
7. $49 \div \ldots = 7$
8. $(-84) \div \ldots = 7$
9. $\ldots \div (-3) = 12$

Find the value of the algebric expression for each of the following using the given value of the variable

10. $3^3(L - 5) - 7 \times 2^2$, $L = -8$
11. $(36 \div N) - 3^2(1 - N)$, $N = 6$
12. $|-12| + X^3 - 24$, $X = 2$
13. $2Y \div 4 - |-24| \div 2Y$, $Y = -6$

Solve the following equations

14. $X + 80 = 30$
15. $D - 11 = -55$
16. $54 - Y = |-64|$
17. $4 \times L = 48$
18. $X \div 3 = -21$
19. $11N = -88$
20. $|-6| \times M = 66$
21. $-125 \div K = |-5|$
22. $Y \div |-7| = 63$

Find the value of the squared and cubiced roots for the following integers

23. $\sqrt{81} = \ldots$
24. $\sqrt{16} = \ldots$
25. $\sqrt{100} = \ldots$
26. $\sqrt[3]{-8} = \ldots$
27. $\sqrt[3]{125} = \ldots$
28. $\sqrt[3]{-1000} = \ldots$

Write the following algebric a mount in the simplest form.

29. $3XY + 7X^2 - 2XY - 3X^2 = \ldots$
30. $4(X - 2Y) + 5(Y - 2X) = \ldots$
31. $14Z^2 \div 7Z + 9X^3 \div 3X^2 = \ldots$
32. $5Y(3 + 2X) - 3X(6 - Y) = \ldots$

Find the numerical value for the following algebric a mount

33. $7X + 9X^2 - 5X$, $X = 2$
34. $8(3 + 2Y) - 2(Y - 4)$, $Y = 7$
35. $3X + |X| - (5 - X)$, $X = -5$
36. $12(Y^2 \div 3) + (Y^2 + 3)$, $Y = 3$

[4-1] The Sets and Operation on Sets

Idea of the lesson:

Introduction to the set and the element

Introduction to subset, finite set and infinite set

Introduction to operations and sets (union and intersection)

Vocabulary:

Set, element, belong, empty set, subset, finite set, infinite set, union, intersection.

Learn

Bees live in the form of groups (sets), each group represents a bee cell. The bee cell contains the queen, the male and female bees. Each individual in the cell has its own role in that small community. If we represent the cell by the symbol A, and each individual by x, then the cell can be written in the form sets as follows; A= {x:x represents an individual in the cell}

[4-1-1] Set and the Element

A set: is a group of things which are completely defined, each thing the set contains is called an element of the set.The set is expressed by putting its elements between braces { }. It can also be written by giving a common description among all its elements, for example the set Gavernorates of Iraq cities, { x : x is an Gavernorates of Iraq}

Example (1) Write the elements of the set B which is the set of odd integers between 2 and 12.

The numbers are 3, 5, 7, 9, 11

Write the elements in set form

$B = \{3, 5, 7, 9, 11\}$

$3 \in B$, $5 \in B$, $7 \in B$, $9 \in B$. $11 \in B$

The number 4 does not belong to set B , $4 \notin B$

Example (2) Write the set M that represents even integers between 14 and 16.

There is no even integer between 14 and 16, so this set is an empty set and is written as follows; $M = \varnothing$ (it is read as phi)

[4-1-2] The Finite and Infinite Set and the Sub Set

The number of elements of finite set can be determined, while the number of infinite set can not be determined. If each element in set B belong to set A, then set B is called a subset of set A. It is symbolized and read as follows; $B \subseteq A$ (B is subset of A)

B and A are equal sets if $B \subseteq A$ and $A \subseteq B$ that they contain the same elements so A = B.

Example (3) Write the elements of the following sets then determine which one is finite or infinite.

i) $A=\{x : x \text{ is an integer gerater than } -3 \text{ and less than } 3\}$

$A=\{-2, -1, 0, 1, 2\}$

The number of element in the set is five so it is a finite set.

ii) $B=\{x \in Z : x > 6\}$

$B=\{7, 8, 9, 10, 11, ...\}$

x is integer greater than 6

If he number of elements of the set can not be determined so it is an infinite set.

Example (4) $A=\{-4, -3, -2, -1, 0, 1, 2, 3, 4\}$, $B=\{-3, -1, 0, 2\}$, $C=\{-4, -2, 4, 6\}$

Explain whether C and B are subsets of set A or not? And why?

$B \subseteq A$ B is a subset of A because each element that belongs to set B also belongs set A

$C \not\subseteq A$ C is not subset of A beause the element 6 only belongs to set C and not in A

[4-1-3] Operations on Sets

The intersection set A and B is the set whose elements belong to set A and B.

The intersection set can be expressed as follows;

$A \cap B = \{x : x \in A \text{ and } x \in B\}$

A union set of both A and B is the set whose elements belong to either set A or set B.

The union set can be expressed as;

$A \cup B = \{x : x \in A \text{ or } x \in B\}$

Example (5) $A=\{a, b, c, d, e, f, g, h\}$, $B=\{b, d, e, f, k, m\}$, $C=\{a, g, h, n\}$

Find; i) $A \cap B$ ii) $B \cap C$ iii) $B \cap A$ iv) $B \cup C$ v) $C \cup B$

i) $A \cap B = \{a, b, c, d, e, f, g, h\} \cap \{b, d, e, f, k, m\} = \{b, d, e, f\}$

ii) $B \cap C = \{b, d, e, f, k, m\} \cap \{a, g, h, n\} = \varnothing$

iii) $B \cap A = \{b, d, e, f\}$

notice that $A \cap B = B \cap A$ This is called commutative for intersection operation

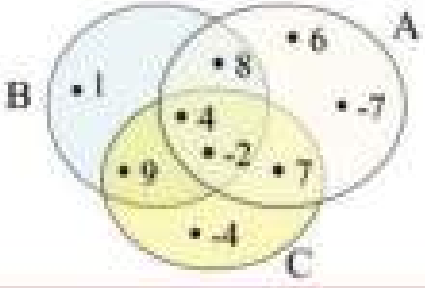
iv) $B \cup C = \{b, d, e, f, k, m\} \cup \{a, g, h, n\} = \{b, d, e, f, k, m, a, g, h, n\}$

v) $C \cup B = \{b, d, e, f, k, m, a, g, h, n\}$

notice that $B \cup C = C \cup B$ This is called commutative of union operation

Example (6) $A=\{-7, -2, 4, 6, 7, 8\}$, $B=\{-2, 1, 4, 8, 9\}$, $C=\{-4, -2, 4, 7, 9\}$

Represent the intersection of the three sets in Venn diagram then finding the following sets;



i) $A \cap B$ ii) $B \cap C$ iii) $A \cap C$

$A \cap B = \{-2, 4, 8\}$

$B \cap C = \{-2, 4, 9\}$

$A \cap C = \{-2, 4, 7\}$

Make sure of your understanding

Write the elements of the following sets

1. $Z^- = \{ x \in Z : x > 0 \}$
2. $A = \{ y \in Z : y < -3 \}$
3. $A = \{ x \in Z : x \text{ is an odd number between 6 and 12} \}$
4. $B = \{ x \in Z : x \text{ is a positiv number which is multiplier 2} \}$
5. $D = \{ x \in Z : -4 < x < 3 \}$
6. $K = \{ x \in Z : x \text{ is an odd number be divided on 2 with out remainder} \}$

Questions 1-6 are similar to examples 1-2

Determine which of the following sets are finite or infinite

7. $B = \{ -6, 2, 1, 5, 9, 12 \}$
8. $C = \{2, 4, 6, 8, 10, \ldots\}$
9. $A = \{x \in Z : \text{is divisor of the number 8}\}$
10. $D = \{x \in Z : -1 < x < 5\}$
11. $D = \{x \in Z : x \text{ is a number divisible by 3 without a reminder}\}$

Questions 7-11 are similar to example 3

If $A = \{a, c, d, e, g, h, i, k\}$, $B = \{a, b, e, f, k, m\}$, $C = \{b, e, g, f, n\}$ find

12. $A \cap B$
13. $A \cap C$
14. $B \cap A$
15. $B \cup C$
16. $A \cup B$
17. $A \cap B \cap C$

Questions 12-17 are similar to examples 5-6

Solve the exercises

Write the elements of the following sets then determine which are finite or infinite

18. $Z^- = \{x \in Z : x < 0\}$
19. $A = \{y \in Z : 33 < y\}$
20. $D = \{x \in Z : -6 < x < 3\}$
21. $A = \{x \in Z : x \text{ is an even number between 7 and 14}\}$

Determine which of the following sets are finite and infinite

22. $A = \{x \in Z : \text{is divisor of the number 9}\}$
23. $D = \{x \in Z : -3 < x < 4\}$
24. $D = \{x \in Z : x \text{ is divisible by 5 without a remining}\}$

Put one of these symbols in the correct blanks ($\notin$, $\nsubseteq$, $\in$, $\subseteq$, $\cup$, $\cap$, $=$) so that the statements is true

25. $\{4, 5, 6, 7, 8\}$ ..... $\{x \in Z : 3 < x < 9\}$
26. $\{-1, 0, 1, 3, 5\}$ ..... $\{x \in Z : -2 < x < 7\}$

Solve life problems

Temperatures: the following sets represent the minimum temperatures of some countries in three consecutive days.

$A = \{ -5 , -4 , -1 , 0, +2, +8 , +19 \}$

$B = \{ -5 , -2 , -1 , +1 , +2 , +6 , +20 \}$

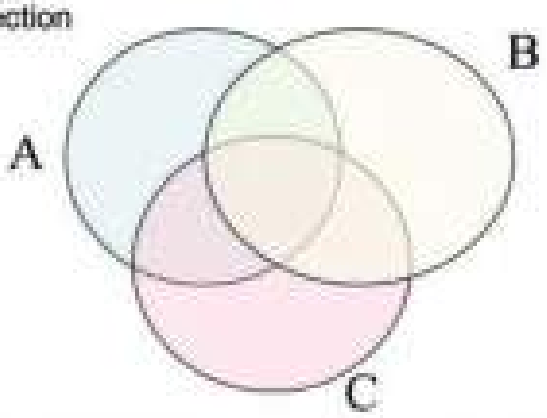
$C = \{ -9 , -4 , -1, 0 , +8 , +10 , +20 \}$

Find the following sets

27 $A \cap C$ 28 $A \cap B$ 29 $A \cap B \cap C$

30 $A \cup C$ 31 $A \cup B$ 32 $A \cup B \cup C$

33 Draw Venn diagram showing the intersection of all three sets



Think

If the sets are;

$A = \{ -3, -2 , -1 , 0, 1, 2 , 3 , 4 \}$,

$B = \{-3, -1, 1 , 3, 5, 6\}$,

$C = \{ -2, 1, 3, 4, 7, 8\}$

Then prove the following

34 $A \cap B = B \cap A$ 35 $A \cap C = C \cap A$

36 $A \cup B = B \cup A$ 37 $A \cup C = C \cup A$

38 $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

39 $A \cup (B \cap C) =)(A \cup B) \cap (A \cup C)$

Write

Elements of the intersection sets

$$\{ x \in Z : -5 < x < 1 \} \cap \{ x \in Z : -2 < x < 6 \}$$

[4-2] Solving Multi-Step Equations in Z

Idea of the lesson:
Solving equations involving more than one operation on the set of integers.

Vocabulary:
Solving equation

Learn

A farmer gained from his production of orange that he sold 200 boxes on the first day, and 350 on the second. 150 boxes were left in the farm, So how many boxes were produced?

[4-2-1] Solving Equations Contains Addition and Subtraction Operations

Every open sntence contains an equality sign called "equation". An equation that contains that contains one of the symbols X, y, z, ... is an equation with one variable and from first degree. you have learned the solution for this equations which containing only one operation and now you will learn solving equations involving two operations; addition and subtraction solving them requires many steps

Example (1) Find the number of the boxes the farmer had produced.
suppose the total of boxes produced is x.

So the equation that represents the problem is;

$x - 200 - 350 = 150$

$x - 550 = 150$

$x = 150 + 550$ use the relation between addition and subtraction

$x = 700$ So the farmer's production was 700 boxes of orange

Example (2) Solve the following equation using the relation between addition and subtraction.

i) $y - 22 + 18 = |-45| \rightarrow y - 4 = 45 \rightarrow y = 45 + 4 \rightarrow Y = 49$

ii) $63 - Z = 13 - 3^2 \rightarrow 63 - Z = 13 - 9 \rightarrow 63 - Z = 4 \rightarrow Z = 63 - 4 \rightarrow Z = 59$

iii) $2x - x + 10 = -55 \rightarrow x + 10 = -55 \rightarrow x = -55 - 10 \rightarrow x = -65$

iv) $\sqrt{16} - y - 4 = 5^2 \rightarrow 4 - y - 4 = 125 \rightarrow 0 - y = 125 \rightarrow y = -125$

4.2.2 Solving Equations Contains Multiplication and Division Operations

You have practiced solving equations involving both operations; addition and subtraction. Now you will learn solving equation involving multiplication and division operations together.

Example (3) In the fun fair there is a roller coaster train consisting of many trolleys. Each trolley can take 8 persons . If 120 persons were on that train in three rounds, then how many trolleys does the train contain?

Suppose the number of trolley is N.

$3 \times 8\,N = 120$

$24\,N = 120$ Multiply 3 by 8

$N = 120 \div 24$ Use the relation between multiplication and division

$N = 5$

So number of trolleys of the train is 5.

Example (4) Solve the following equations using the relation between multiplication and division.

i) $2x \div 9 = 8 \rightarrow 2x = 8 \times 9 \rightarrow 2x = 72 \rightarrow x = 72 \div 2 \rightarrow x = 36$

ii) $60 \div 3y = -5 \rightarrow -5 \times 3y = 60 \rightarrow -15y = 60 \rightarrow y = 60 \div (-15) \rightarrow y = -4$

iii) $z \times |-7| = 98 \div 2 \rightarrow z \times 7 = 49 \rightarrow z = 49 \div 7 \rightarrow z = 7$

iv) $\sqrt[3]{27}\ y \div 10 = \sqrt{64} \times 6 \rightarrow 3y \div 10 = 8 \times 6 \rightarrow y = (8 \times 6) \times 10 \div 3 \rightarrow y = 160$

Example (5) Solve the following equations using the relation between operations.

i) $9X + 2 = 16 - 34 \rightarrow 9X = 2(16 - 34) \rightarrow 9X = -36 \rightarrow X = -36 \div 9 \rightarrow X = -4$

ii) $4(Y-5) = 10^2 \rightarrow 4Y - 20 = 100 \rightarrow Y = (100 + 20) \div 4 \rightarrow Y = 120 \div 4 \rightarrow Y = 30$

iii) $\sqrt{64} - Y = 2^3 \div 4 \rightarrow 8 - Y = 32 \div 4 \rightarrow Y = 8 - (32 \div 4) \rightarrow Y = 8 - 8 \rightarrow Y = 0$

iv) $\sqrt[3]{27}\ Z \div 3 = \sqrt{49} - 7 \rightarrow 3Z \div 3 = 7 - 7 \rightarrow Z = (7 - 7) \times 3 \div 3 \rightarrow z = 0$

Always remember! When using multi-step equations you might need to arrange the operations on integers .

Make sure of your understanding

Solve the following equations using the relation between addition and subtraction.

1. $y - 15 + 12 = |-53|$
2. $72 - z = 18 - 5^2$
3. $4x - 3x + 60 = -75$
4. $\sqrt{25} - y - 6 = 2^4$

Questions 1-4 are similar to examples 1-2

Solve the following equations using the relation between the multiplication and division.

5. $3x \div 8 = 27$
6. $75 \div 5y = -3$
7. $z \times |-11| = 88 \div (-4)$
8. $\sqrt[3]{125}\ y \div 6 = 9^2 \times 10$

Questions 5-8 are similar to examples 3-4

Solve the following equations using the relation between the operations

9. $13y \div 2 = 48 - 35$
10. $6(x + 2) = 6^3$
11. $\sqrt{121} + z = 7^3 \div 49$
12. $\sqrt[3]{216}\ x \div 2 = \sqrt{100} - 22$
13. $z + |-19| = 96 \div (-3)$
14. $\sqrt[3]{8}\ y \div 5 = 10^3 - 900$

Questions 9-14 are similar to examples 5

Solve the exercises

Solve the following equations using the relation between addition and subtraction.

15. $84 - x = 16 - 3^3$
16. $\sqrt{36} - N - 7 = 5^2$

Solve the following equations using the relation between multiplication and division.

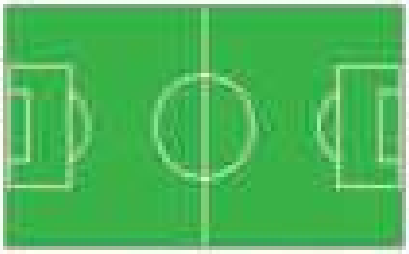
17. $5y + 6 = 35$
18. $81 \div 9z = -3$
19. $N \times |-25| = 758 \div (-5)$
20. $\sqrt[3]{64}\ x \div 7 = 8^2 \times \sqrt{100}$

Solve the following equations using the relation between operations.

21. $17x \div 3 = 57 - 40$
22. $\sqrt{81} + z = 3^4 \div 9$
23. $\sqrt[3]{-125}\ N + 2 = \sqrt{36} - 6$
24. $2x + |-12| = 66 \div (-11)$

Solve life problems

25 **Sport:** If you knew the perimeter of a football playground is (340m) and the length of the playground is more than its width is (50m). What is the length of the football playground?



26 **Agriculture:** A rectangular piece of ground. Line its squared half to make a garden whose one side is (6m). If the area of the land is ($72\ m^2$), what are its dimensions?

27 **Diving:** Three dolphins dived underwater, the first dolphin went down (20m) more than the second dolphin, the second dolphin dived to a depth of (5m) less than the third. If the depth that the three dolphins reached is (250m), what is the location of each of them according to water surface level?

Think

28 **Challenge:** Solve both equations and determine whether x=y or not.

i) $x + 3^2 = \sqrt{25} - 14$, $45 - 3y = |-15|$ ii) $6x + 1 = 7^2$, $-24 \div y = \sqrt[3]{-27}$

29 **Correct the Mistake:** Sohad solved the equation $2^3 + 2z = 34 - 6^2$. She wrote z=4 determine Sohad mistake and correct it.

30 **Numerical Sense:** The addition of two consecutive integers is -7, what are the integers?

Write

Solve the following equation

$6^2 \div x - 15 = \sqrt{9}$

[4-3] Solving Multi-Step Equations in Q

Idea of the lesson:
Solving equations involving more than one operation in Q.

Vocabulary:
Additive inverse
Multiplication inverse
Solving an equation

Learn

A swimming pool whose width is less than its length by (10m), its perimeter is (100m), what are the pool's dimensions?

You have previously learned solving equations of one variable involving more than one operation, its solution requires many steps in the set of integers. Now you will learn solving equation of one variable ($ax+b=c$, $a\neq0$) in the set of rational numbers using the following steps.

1- Adding -b (additive inverse) to the number b on both sides of the equation.

2- Multiplying both sides of the equation by 1/a (multiplicative inverse of the number a).

The result is the solution of the equation (the value of the variable).

Example (1) Find the length and the width, suppose that the length of the pool is x is 10 unit longer than its width

$2(x + x - 10) = 100$ write the equation

$2(2x - 10) = 100$

$4x - 20 = 100$ write it in simple from

$4x - 20 + 20 = 100 + 20$ add additive inverse of -20 which is +20

$4x + 0 = 120$

$4x \times \frac{1}{4} = 120 \times \frac{1}{4}$ multiply both side by $\frac{1}{4}$

$x = 30$

The length of the pool is 30m and its width is 20m.

Example (2) Solve the equation $5x - 3^2 = 12$, where $x \in Q$

$5x - 3^2 = 12$ write the equation

$5x - 9 = 12$ (Add additive inverse of -9 which is +9)

$5x - 9 + 9 = 12 + 9$

$5x + 0 = 21$

$5x \times \frac{1}{5} = 21 \times \frac{1}{5}$ (Multiply both side by 1/5)

$x = \frac{21}{5}$

Example (3) Swimming Pool: Find diameter of a circular swimming pool with length of (perimeter) is (11m).

$\pi R = 11$ (Suppose diameter is R)

$\frac{22}{7} R = 11$ (Substitute constant π) $\frac{22}{7}$

$\frac{7}{22} \times \frac{22}{7} R = 11 \times \frac{7}{22}$ (Multiply by inverse of the constant)

$1 \times R = \frac{7}{2}$

$R = 3.5$ (So the diameter of the pool is 3.5 m)

Example (4) Solve the following equation $7x - 2 = 2x + \sqrt{64}$ where $x \in N$

$7x - 2 = 2x + \sqrt{64}$ (Write the equation)

$7x - 2 = 2x + 8$ (Write it in the simplest form)

$7x - 2 + 2 = 2x + 8 + 2$ (Add additive inverse of +2 as -2)

$7x + 0 = 2x + 10$ (0 is neutral element in addition operaion)

$7x = 2x + 10$

$7x - 2x = 2x - 2x + 10$ (Add the additive inverse of 2x which is -2x)

$5x = 0 + 10$

$\frac{1}{5} \times 5x = \frac{1}{5} \times 10$ (Multiply both sides by $\frac{1}{5}$)

$x = 2$

Example (5) Solve the following equation $\sqrt[3]{27}\, y \div 6 = |-\frac{1}{2}| + \sqrt{16}$ where $y \in Q$

$\sqrt[3]{27}\, y \div 6 = |-\frac{1}{2}| + \sqrt{16}$

$3y \div 6 = \frac{1}{2} + 4$ (Write each side in the simplest form)

$3y \div 6 = \frac{1}{2} + \frac{8}{2}$ (Write number 4 in the form of a fraction whose denominator is 2)

$\frac{3Y}{6} = \frac{9}{2}$ divided numerator and the denominator of the left side by 3

$\frac{Y}{2} = \frac{9}{2}$ (Use proportionality properties to find the value of the variable)

$y = 9$

Make sure of your understanding

Solve the following equation in Q.

1. $2x - 12 = 24$
2. $6^1 - z = 2Z - 12$
3. $5y + 3 = y - 61$
4. $\sqrt{81} - x = 27 + 2x$
5. $8x \div 16 = 5 + \frac{1}{2}$
6. $\sqrt[3]{125} \div 2N = -10 + 5^2$
7. $|-13|\, y = 56 \div (-7)$
8. $\sqrt{49}\ z \div 3 = 10^3 \div 10$
9. $18y - 3 = 36 - 11y$
10. $9(x + 5) = \sqrt{64}$

Questions 1-4 are similar to examples 1-3

Questions 5-10 are similar to examples 4-5

Write the equation that represents the problem then find the solution of the following:

11. Two consecutive odd numbers,their sum is 12,what are the numbers?
12. Right -angled triangle ,the length of the two angled sides are 4 cm and 3 cm ,what is the length of the hypotenuse?
13. An integer composed of two digits ,the digit of its ones is two times to the digit of its tens, the sum of its ones and its tens is 12,what is the number?

Questions 11-13 are similar to example 3

Solve the exercises

Solve the following equations in Q.

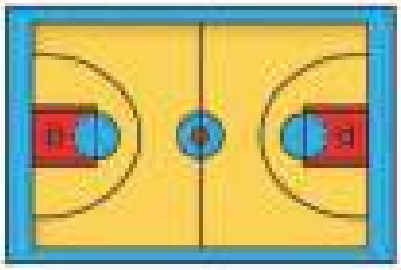
14. $\sqrt{64} - 2x = 23 + 3x$
15. $2x \div 16 = 7 + \frac{1}{3}$
16. $|-28|\, x = 63 \div (-9)$
17. $\sqrt{16}\ z \div 2 = 73 \div 7$
18. $\sqrt{25} + y = \frac{1}{5} + 6$
19. $\sqrt[3]{-8}\ y \div 13 = 1 - \frac{5}{13}$
20. $(4x - 2) \div 3 = (4x + 2) \div 5$
21. $7(2y + 14) = 3(3y + 14)$

Write an equation that represents the problem then find the solution to each of the following

22. What is the number that if we add half of it then its quarter to it we will get 28?
23. Two consecutive positive integers, their sum is 19, what are the numbers?

Solve life problems

24 **Sport:** If the perimeter of of a basketball playground is 86m and the length of the playground is 13 m longer than its width, what is its length?



25 **Cloths:** A tailor has a piece of fabric, its length is 25 m, he made 8 suits to his customers and added one meter of the fabric excessed . What is the length of the piece fabric which he used for each suit?

26 **Camels:** A herd of camels where the number of females is three times the number of males. The herd consumed 7000 liter of water with a rate of 70 liter for each camel. What is the number of male and female camels in the herd?

Think

27 **Challenge:** Solve both equations and determine whether x=Z or not :

i) $2x+5^2=\sqrt{9}-x, 6z-63=1-|-20|$ ii) $8x+12=7^2+2x$, $-37+z=2+\sqrt[3]{-27}$

28 **Correct the mistake:** Suhair solved the following equation she wrote y=7 determine Suhair mistake and correct it

$\sqrt[3]{-125}+5y=6^2+6y$

29 **Numerical Sense:** An integer composed of two digits , the digit of its tens digit is three times the number of its ones digits. The sum of its tens and ones is 12. What is the number?

Write

solution of the following equation

$|-26|+y=18-\sqrt{16}$

[4-4] Inequalities and the Properties of Inequalities

Idea of the lesson:
*Introduction to the inequalities with one variable and representing them on the number line
*Introduction to inequalities properties

Vocabulary:
Inequality, less than (<), greater than (>), less than or equal to ≥, greater than or equal to ≤, addition property, subtraction property, multiplication property, division property.

Learn

In a cage of canary birds, there are 4 yellow, 7 red, and x white ones.
Represent each of the following statements with an inequality;
*The number of red birds is greater than number of yellow birds

*The number of white birds is less than the number red birds
*The number of white birds is less than or equal to the number of red birds
*The number of red birds is greater than or equal to the sum of both yellow and white birds

[4-4-1] Inequalities in One Variable

Each open sentence that contains one of the inequalities relations ($<$, $>$, $\leq$, $\geq$) is an inequality. An inequality containing one of the algebraic symbols x, y, z, ... is called an inequality in one variable as in: $x>6$

Example (1) Represent each statement in LEARN section with an inequality

The number of red birds is greater than the number of yellow birds; $7>4$
The number of white birds is less than number of yellow birds; $x<7$
The number of white birds is less than or equal to number of yellow birds; $x \leq 4$
The number of red birds is greater than or equal to number of yellow and white birds; $7 \geq 4 + x$

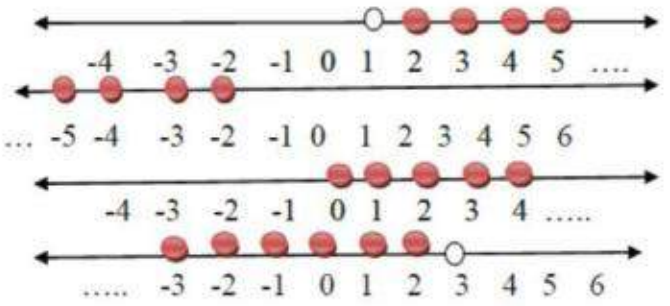
Example (2) Represent the following inequalities on the number line if $x \in Z$.

i) $x > 1$

ii) $x \leq -2$

iii) $x \geq 0$

iv) $x < 3$



Properties of Inequalities

Addition property — Multiplication property
Subtraction property — Division property

We will get to know each property by the following examples

Example (3) Addition property

If 12>7, then 12+2>7+2, therefore 14>9
For every a, b, c ∈ Q, if a > b then a + c > b + c
When same number is added to both side inequality arrangement does not change

Example (4) Subtraction property

If 8>5, then 8-3>5-3, therefore 5>2
For every a, b, c ∈ Q, if a > b then a - c > b - c
When same number is subtracted from both side inequality arrangement does not change

Example (5) Multiplication property

i) If 7 > 4 and 3 > 0, then 3x7 > 3x4 or 21>12
For every a, b, c ∈ Q, c > 0 if a > b then a c > b c
When both side inequality is multiplied by same number arrangement does not change

ii) If 9 > 6 and -2 < 0, then -2x9 < -2x4 or -18<-12
For every a, b, c ∈ Q, c < 0 if a > b then a c < b c
When both side inequality is multiplied by same negative number arrangement changes

Example (6) Division Property

i) If 15 > 6, then $\frac{15}{3} > \frac{6}{3}$ or $5 > 2$

For every a, b, c ∈ Q, c > 0 if a > b then a/c > b/c
When both side inequality is divided by same number arrangement does not change

ii) If 20 > 8, and -4 < 0, then $\frac{20}{-4} < \frac{8}{-4}$ or $-5 < 2$

For every a, b, c ∈ Q, c < 0 if a > b then a/ c < b/ c
When both side inequality is divided by same negative number arrangement changes

Note: All above properties are true for $\geq$, $\leq$

Make sure of your understanding

Represent the following inequalities on the number line if $x \in Z$

1. $x < 2$
2. $x > 5$
3. $x < -4$
4. $x \leq -3$
5. $x \geq 0$
6. $x \leq 3$

Questions 1-4 are similar to example 2

Write one example for each property

7. For Every $a, b, c \in Q$ If $a > b$ then $a + c > b + c$
8. For Every $a, b, c \in Q$ If $a \geq b$ then $a - c \geq b - c$
9. For Every $a, b, c \in Q$ If $a > b$ and $c > 0$ then $ac > bc$
10. For Every $a, b, c \in Q$ If $a \geq b$ and $c > 0$ then $\frac{a}{c} \geq \frac{b}{c}$

Questions 7-10 are similar to examples 3-6

Solve the exercises

Represent the following inequalities on the number line if $x \in Z$

11. $x \leq -3$
12. $x \geq -1$
13. $x \leq 5$
14. $x > 0$

Give one example for each property

15. For Every $a, b, c \in Q$ If $a \geq b$ then $a + c \geq b + c$
16. For Every $a, b, c \in Q$ If $a > b$ then $a - c > b - c$
17. For Every $a, b, c \in Q$ If $a > b$ and $c < 0$ then $ac < bc$
18. For Every $a, b, c \in Q$ If $a \geq b$ and $c > 0$ then $\frac{a}{c} \geq \frac{b}{c}$
19. For Every $a, b, c \in Q$ If $a > b$ and $c < 0$ then $\frac{a}{c} < \frac{b}{c}$

Solve life problems

The following sketches on the number line represent the solution set of inequalities on integers.

Write each inequality.

20 .....

21 .....

22 .....

23 .....

Think

Write the property which represent the following

24 If 15 > 7 and -3 < 0, then -3x15 < -3x7 or -45<-21

25 **Correct the mistake:** Anwer write the property

Every a, b, c ∈ Q, if a ≥ b and c < 0, then $\frac{a}{c} \geq \frac{b}{c}$

determine Anwer mistake and correct it

26 **Numerical Sense:** write the inequality that represents the following statement

i) The set of all rational numbers less than or equal to -5

ii) The set of all rational numbers greater than 0

Write

One example for the following

Every a, b, c ∈ Q, if a > b and c > 0, then $\frac{a}{c} > \frac{b}{c}$

[4-5] Solving Inequalities by Multiple-Steps

Idea of the lesson:
*Solving inequalities in one variable using many steps

Vocabulary:
*Linear inequality
*Solution set

Learn

In order for the farmer Ahmed to make profit from his production of wheat, his production needs to be more than 64 tons in two consecutive years. If his production in the first year reached 38 tons, how much at least does he need to produce the next year in order to reach the profit required?

[4-5-1] Solving Inequalities by One-Step

The solution set of an inequality in one variable to the power 1 as in: $ax + b > 0$ is the set of numbers at which if they were substituted by the variable the inequality becomes correct.

Example (1) Find the least production quantity possible (of wheat) in the second year.so that Ahmed makes profit out his production.
Suppose that his production of the second year is x

$$x + 38 > 64$$

$x + 38 - 38 > 64 - 38$ (Subtract 38 from both sides of the inequality)

$$x > 26$$

Ahmed needs to produce more than 26 tons of wheat in the second year to make the gain required

Example (2) Use addition and subtraction properties, and solve each inequality on Q.

i) $x + 3 < 10$

$x + 3 - 3 < 10 - 3$

$x < 7$

ii) $y - 23 \geq 9$

$y - 23 + 23 \geq 9 + 23$

$y \geq 32$

Example (3) Use multiplication, and division properties to solve each inequality on Q

i) $\frac{z}{12} > \frac{1}{4}$

$\frac{z}{12} \times 12 > \frac{12}{4}$

$z > 3$

ii) $-5x \leq 35$

$\frac{-5x}{-5} \geq \frac{35}{-5}$

$x \geq -7$

[4-5-2] Solving Inequalities by Multi-Steps

Solving an inequality involving different operations requires using inequalities properties and many steps. The solution set can be represent on the number line.

Example (4) Use the inequality properties to solve each inequality.

i) $4y + 13 < 29 , y \in Z$

$4y + 13 - 13 < 29 - 13$ (Subtract 13 from both sides)

$4y < 16$ (Divide both sides by 4)

$y < 4$

$\{\ldots , -2 , -1 , 0 , 1 , 2 , 3\}$ (Writing inequality in form of infinite set)

(Representing solution on the number line)

ii) $-5(x - 6) \geq 45 , x \in Q$

$-5x + 30 \geq 45$

$-5x + 30 - 30 \geq 45 - 30$ (subtract 30 from both sides)

$-5x \geq 15$

$\frac{-5x}{-5} \leq \frac{15}{-5}$ (divide both side by -5)

$x \leq -3$

S= {x: x ∈ Q : x ≤ -3}, writing solution of the inequality in the form of an infinite set.

Example (5) Use the inequalities properties and find the solution set for the following inequality.

i) $7(2y + 6) < \sqrt{36} + 4y , y \in Q$ (Find the value of the squared root)

$14y + 42 < 6 + 4y$

$14y - 4y + 42 < 6 + 4y - 4y$

$10y + 42 < 6$

$10y + 42 - 42 < 6 - 42$ (Subtract 42 from both sides)

$10y < -36$

$\frac{10y}{10} < \frac{-36}{10}$ (Divide both sides by 10)

$y < -3.6$

S= {y: y ∈ Q : y < -3. 6}, writing solution of the inequality in the form of infinite set.

Make sure of your understanding

Use addition and subtraction properties to solve each inequality in Z.

1. $x + 1 < 8$
2. $x - 12 \geq 24$
3. $6 + z \leq 34$
4. $y + 42 > 0$

Questions 1-4 are similar to example 2

Use multiplication and division properties to solve each inequality in Q.

5. $\frac{x}{15} > \frac{1}{7}$
6. $-9z \leq 63$
7. $2x < \frac{1}{5}$
8. $3y \geq -31$

Questions 5-8 are similar to example 3

Use inequality properties to solve each inequality.

9. $6x + 14 < 50$, $x \in Z$
10. $-3(y - 8) \geq 39$, $y \in Q$
11. $6(2z + 4) > 2z$, $z \in Q$
12. $2(x - 9) \leq \sqrt{25} - 3x$, $x \in Q$

Questions 9-12 are similar to examples 4,5

Solve the exercises

Use addition and subtraction properties to solve each inequality in Z.

13. $y + 3^2 \geq 48$
14. $\sqrt[3]{8} + x \leq 34$
15. $5^2 + z \geq 25$

Use multiplication and division to solve each inequality in Q.

16. $\frac{x}{13} > \frac{1}{5}$
17. $-6y \leq 16$
18. $5z \geq \frac{2}{3}$
19. $\frac{11}{y} < -10$

Use inequality properties to solve each of the following

20. $3^2(5z + 9) \geq 40z$, $z \in Q$
21. $3(x - 1) \leq \sqrt{49} - 3x$, $x \in Q$
22. $-5(y - 5) > \sqrt{121} - 8y$, $y \in Q$
23. $\frac{z}{11} + 5 \leq \sqrt{100}$, $z \in Q$

Solve life problems

Write an inequality that represents the problem then find the solution to each of the following

24 Twice a number plus 3 greater than 5

25 Half a number minus 7 less than 9

26 The sum of a number with 5 less than or equal to 9

27 One third of a number minus 2 greater than or equal to 10

28 Find the greatest positive integer that if 10 was added to four like it , the result would not be greater than 300

29 Find the smallest positive integer that if one third of of it was subtracted from two like it , the result would be greater than 11.

30 The owner of sweets factory needs 30 eggs as a constant consumption when making any amount of dough. Each dough requires 3 eggs. What is the maximum number of dough that can be made if he does not consume more than 400 eggs?

Think

31 **Challenge:** Solve the following inequalities

i) $\frac{x}{5} \leq x , x \in Q$

ii) $\sqrt{x^2} - \sqrt{49} < 0 , x \in Q$

32 **Correct the mistake:** Hussam and Firas both solved the following inequality. $-4y - 12 \leq 24$ Each of them came up with a different result. Find the mistake and correct the solution.

Firas's Solution	Hussam's Solution
$-4y - 12 \leq 24$	$-4y - 12 \leq 24$
$-4y - 12 + 12 \leq 24 + 12$	$-4y - 12 + 12 \leq 24 + 12$
$-4y \leq 36$	$-4y \leq 36$
$\frac{-4y}{-4} \leq \frac{36}{-4}$	$\frac{-4y}{-4} \geq \frac{36}{-4}$
$y \leq -9$	$y \geq -9$

Write

The steps of solving inequality

$5^2 (2z + 7) \geq 45z , z \in Q$

Chapter Test

write the elements of the following sets, then determine which of them is finite set or an infinite

1 $Z^+ = \{ x \in Z : x > 0 \}$ 2 $A = \{ y \in Z : y \leq -2 \}$

3 $B = \{ x \in Z : -5 \leq x < 2 \}$ 4 $K = \{ x \in Z : x$ is an even number between -9 and 9 $\}$

If $A = \{ -4, -3, -1, 0, , 2, 4, 7 \}$, $B = \{-4, -1, 0, 3, 5, 6, 7\}$, $C = \{ -1, 2, 3, 5, 6, 8\}$ are three sets

Then find;

5 $A \cap B$ 6 $B \cap A$ 7 $A \cap C \cap B$ 8 $A \cup B$ 9 $C \cup A$

Solve the following equation using relation between addition and subtraction in Z.

10 $x - 13 - 3^2 = |-20|$ 11 $72 - y = 20 - \sqrt{25}$ 12 $3N - 2N + 30 = \sqrt[3]{-8}$

Solve the following equation using relation between multiplication and division in Z.

13 $4x + 5 = \sqrt{64}$ 14 $64 + Z = |-7| + 1$ 15 $y \times |-22| = 60 + (-5)$

Solve the following equation in Q.

16 $5z - 3^2 = 3z - 49$ 17 $\sqrt{16} - 4y = 31 + 6y$ 18 $7x + 8 = 5 + \frac{1}{5}$

19 $\sqrt[3]{-125} + 2y = 7^2 - 9$ 20 $|-11| x = 72 + (-8)$ 21 $\sqrt{121}\, z + 2 = 6^2 + 6$

22 $\sqrt{36} + \frac{1}{2} x = \frac{1}{3} + 4$ 23 $\sqrt[3]{-8}\, y + 24 = -\frac{2}{6}$ 24 $3z - |-15| = 81 + (-3)$

Represent the following inequalities on the number line where $x \in Z$

25 $x < -6$ 26 $x > 0$ 27 $x \leq 3$ 28 $x \geq -2$

Write one example for each of the following

29 Every a, b, c $\in Q$, if $a > b$ and $c < 0$ then $ac < bc$

30 Every a, b, c $\in Q$, if $a \geq b$ and $c > 0$ then $\frac{a}{c} \geq \frac{b}{c}$

Use properties of inequalities to solve each of the following

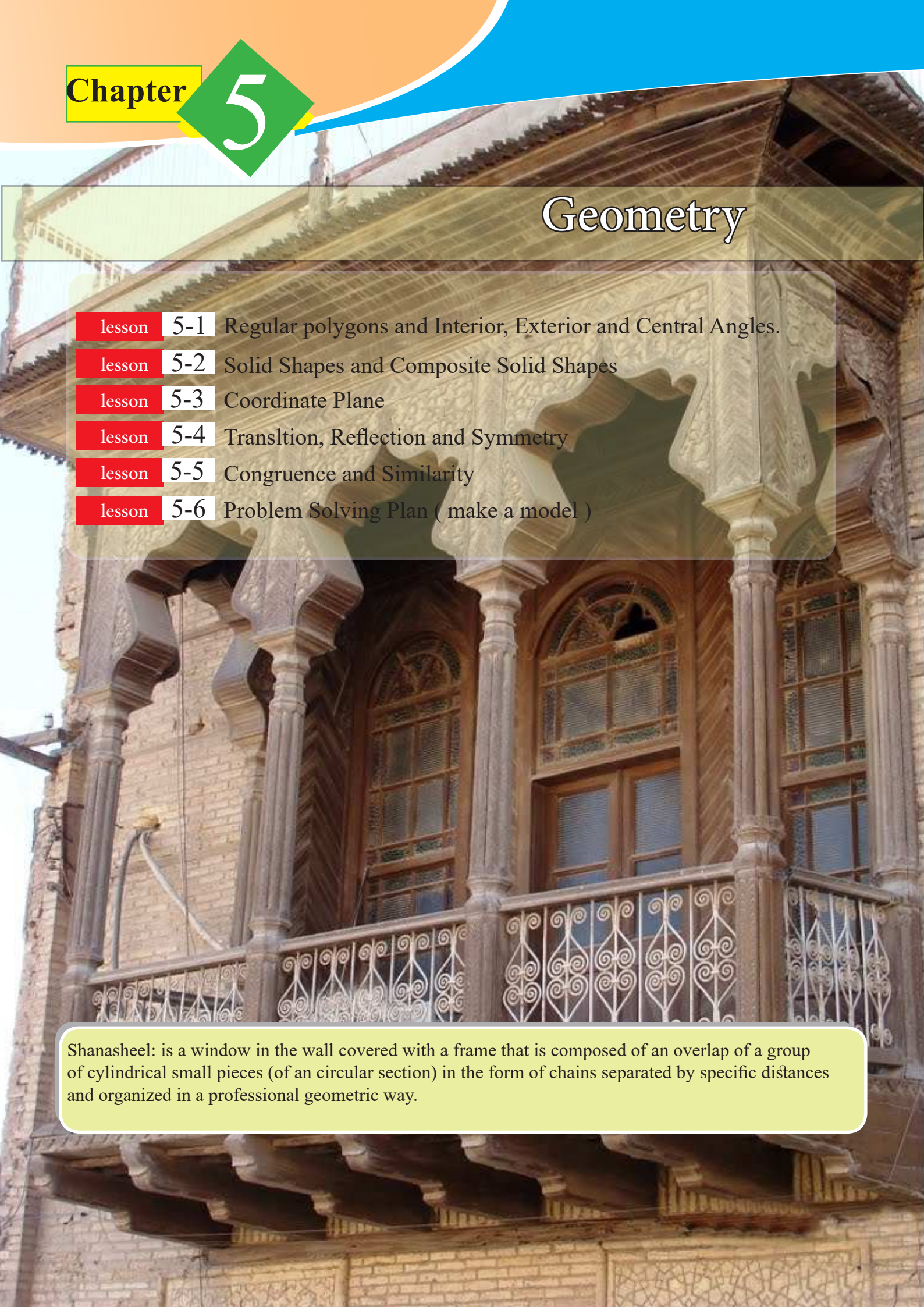
31 $2x + 10 < -66$, $x \in Z$ 32 $-8(y - 7) \geq 48$, $y \in Z$

33 $2^4(3x + 2) \leq 41x$, $x \in Q$ 34 $2(z - 5) > \sqrt{81} - 7z$, $z \in Q$

35 $\sqrt{-27}\,(y + 8) > 5y - 4$, $y \in Q$ 36 $\frac{1}{3}(y - 7) \leq \sqrt[3]{125} - \frac{y}{12}$, $y \in Q$

Chapter 5

Geometry



Shanasheel: is a window in the wall covered with a frame that is composed of an overlap of a group of cylindrical small pieces (of an circular section) in the form of chains separated by specific distances and organized in a professional geometric way.

Pretest

Detemine the points on the squares web and define the resulting shape.

1 A (3,5) , B (5,5) , C (4,7)

2 A (5,5) , B (6,7) , C (8,7) , D(9,5)

3 A (1,1) , B (1,4) , C (3,1) , D(3,4)

4 A (1,2) , B (5,4) , C (5,2) , D (1,4)

Define some of the simple plane shapes from the following component shapes

5 

6 

Plot the points on the coordinate plane then figure out the resulting shape for each of the followings.

7 A (1,2) , B (1,8) , C (3,5)

8 A (1,1) , B (1,4) , C (2,3) , D(2,5)

9 A(-1,-1) , B(-2,-3) , C(-6,-1) , D(-4,-3)

10 A (1,-1) , B (4,-1) , C (1,-4) , D(4,-4)

Find the value of algebraic statement of each the followings by using the given variable.

11 $2(n-3)+5$, $n=4$

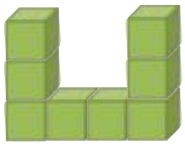
12 x^2+2x+2 , $x=-1$

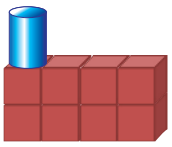
13 $\frac{x^2}{2}+3x+7$, $x=4$

14 $\frac{2x}{6}+8$, $x=-3$

Draw on the net of the square of the following three projection.

15 

16 

17 

Determine the shape whose projections are given as shown in the followings.

18 

19 

20 Determine a model of a peripheral alignment using a pattern of squares and isosceles triangles.

[5-1] Regular polygons and Interior, Exterior and Central Angles.

Idea of the lesson:
*describing the polygons, determinating them and determinating the interior, exterior and central angles and measuring them.

Vocabulary:
*Interior angles
*Exterior angles
*Central angles
*Cononvex polygon
*Concave angles

Learn

In the picture on the side, there are traffic signs with different shapes including regular and irregular polygons.

Classify the convex and concave polygons.

[5-1-1] Convex and Concave polygons

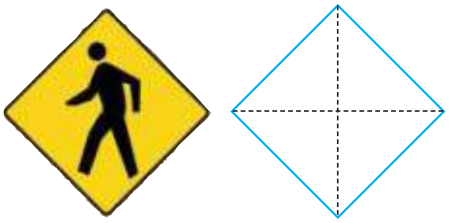
You have previously learned the definition of the polygon and you got to know the regular polygon and the irregular one. In this lesson you will be introduced to the convex polygon and the concave polygon and you will learn to measure the interior, exterior and central angles of polygons.

The polygon is called concave if at least one of its diagonal contained points located outside the polygon.

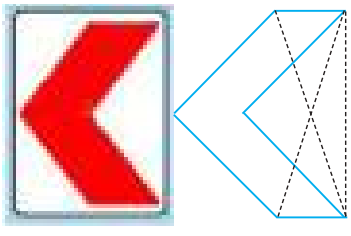
A polygon is convex if the points found in each diagonal were inside the polygon.

Diagonal of the polygon: is each segment line connecting two non-adjacent vertices in the polygon and it is not a side in it.

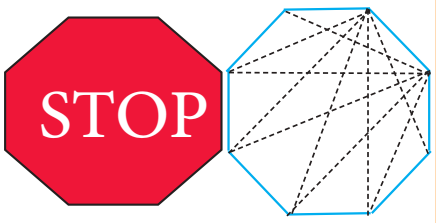
Example (1) Introduce the shapes in learn paragraph and ditermin whether they are concave or convex polygons.



A convex quadrilateral polygon
because all points of its diagonals are inside the polygon.



A concave hexagon polygon
because it contains diagonal out of the polygon (hexagon)



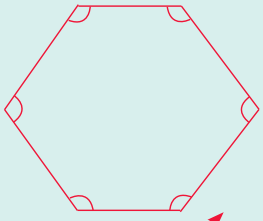
A convex octagon polygon
because the points of its diagonals are all inside the polygon (octagon).

[5-1-2] Interior, Exterior and Central angles in Polygons

Interior angle: it is the angle confined between any two adjacent sides in the polygon.

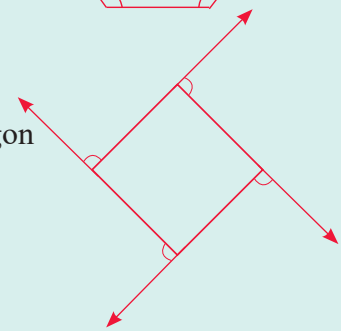
sum of interior angles in the polygon is equal to $(n-2) \times 180^{o}$

where the number of sides is equal to **n**.



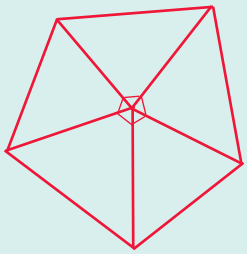
Exterior angle: it is the angle confined between any sides in the polygon and the extension of the adjacent side to it.

sum of exterior angle of the regular polygon is equal to 360°.



Central angle: it is the angle whose vertex is the center of the regular polygon and its opposite side is one of the sides of the regular polygon.

Central angle of the regular polygon is equal to $\frac{360^{\circ}}{n}$



Example (2) Find the sum of Measure of the interior angles in a regular hexagon.

Write the rule : $(n-2) \times 180^{o}$

The number of sides in a regular hexagon is 6.

So substitute 6 for n: $180^{o} \times (6-2)$

So the sum of Measure of the interior angles in a hexagon is : 720^{o}

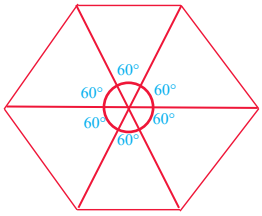
Example (3) Find the central angle of the polygon in example 2

Write the rule = $\frac{360^{\circ}}{n}$

The number of sides in a hexagon is 6.

So substitute 6 for n = $\frac{360^{\circ}}{6}$

So the Measure of the central angle in a regular hexagon is 60°

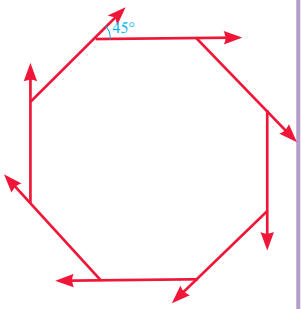


Example (4) Find the measure of each exterior angle in a regular octagon.

sum of exterior angle of the regular polygon is 360°.

There are 8 congruent interior angles so there are 8 congruent exterior angles = $\frac{360^{\circ}}{8}$

The measure of each exterior angle in an octagon is 45°



Make sure of your understanding

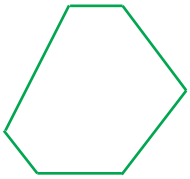
1 Complete the following table.

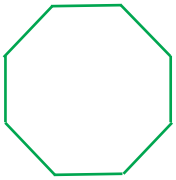
Question 1 is similar to example 2

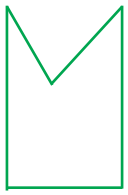
Number of sides	polygon	Sum of interior angles
3		180^0
4		
	pentagon	

Which of the following polygon is concave and which is convex?

Questions 2-7 are similar to example 1

2 

3 

4 

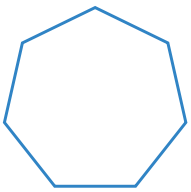
5 

6 

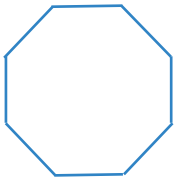
7 

Find the measurement of each interior angle in the following polygons:

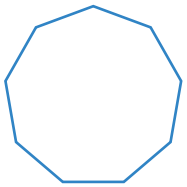
Questions 8-10 are similar to example 2

8 

Heptagon
7 sides 7 vertices

9 

Octagon
8 sides, 8 vertices

10 

Nonagon
9 sides, 9 vertices

Which polygon has a total interior angles of?

11 540° 12 1260° 13 1620°

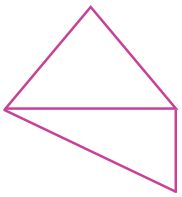
What's the measurement of the central angle of the regular polygon in the following ?

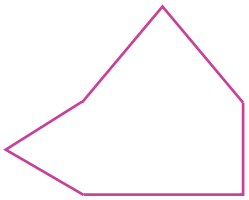
Questions 14-16 are similar to example 3

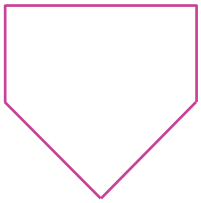
14 Pentagon 15 Octaagon 16 Decagon

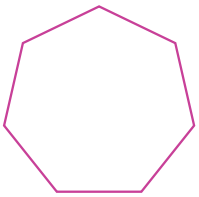
Solve the Exercises

Which of the following polygon is concave and which is convex?

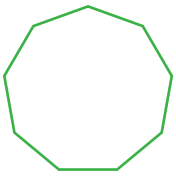
17 

18 

19 

20 

Find the measurement of each exterior angle of the following polygons

21 

22 

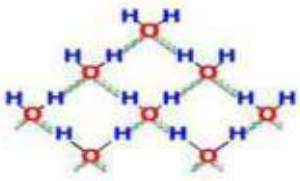
Solve the problems

23 Mosaic: the picture of mosaic represents the ceiling of one of the archaeological palaces, name the polygons found in it and determine whether they are concave or convex?

24 Call's Bee: a bee cell represents a hexa-polygon(hexagon) what is the measurement of its exterior angle?

25 Chemistry: what polygon forms the molecule of hydro-gen with oxygen in the picture?

what is the sum of measurement of its interior angle?



Think

26 Open problem: give an examples of two polygons (triplex, pentagon) that represent things in life and find the measurement of their interior, exterior angles.

27 Challenge: which regular polygon has a central angle of 90° ?

Write

Explain the relationship between the number of a regular polygon`s sides and the measurement of each interior angle it contains.

[5-2] Solid Shapes and Composite Solid Shapes

Idea of the lesson:
Distinguishing the Polyhedron forms (solid shapes) and the composite Polyhedron forms and determining the number of faces, vertices and edges of each Polyhedron form (solid shape)

Vocabulary:
*Face *Edge
* Vertix *Prism
*Base

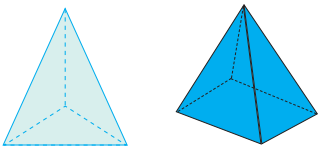
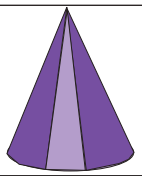
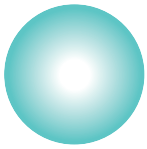
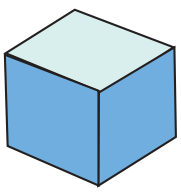
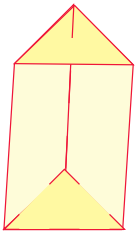
Learn

The Iraqi museum is one of the biggest and oldest museum in Iraq. It was establish in 1923. It contains monumental groups chronicling Mesopotamia.
The entrance of the Iraqi museum is represented by polyphonic forms (solids). The gate is composed of a rectangular parallelepiped.

Properties of Solid Shapes

You have previously studied the polyphedron shapes and some of their properties and in this lesson you will learn more about them.
polyphedron shapes: (three dimensional solids) are shapes of length, width and height. The following words are used to describe them in this lesson: edges, faces, vertices as shown in the example.

Example (1) What are the properties of solids ?

Shape	Properties
Pyramid	It has at least three triangle faces, one base in the form of a polygon. The shape of the base determines the name of the pyramid. 
Cone	It has got only one base. The base is circular. It has one vertex. 
Cylinder	It has two parallel and congrueut circular bases. It has no vertices nor edges. 
Sphere	All the points on its surface have the same distance from the center are far away from the sphere due to distance from the center are equal. It has no forces, bases, edges or vertices. 
Prism	It has at least three faces each of which is a parallelogram. The upper and lower faces are called the bases of the prism. And its bases are parallel congruent polygons. The shape of the base represents the shape of the prism.  

Example (2)

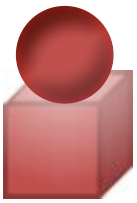
Classify the composite solid shapes which are formed the composite solid and determine the number of bases faces , edges and vertices :

the composite solid shape consists of
cone : one base , one vertice no face , no edge .
cylinder : two bases , no vertices , no edge .

Example (3)

Classify the composite solid shapes which is formed the composite solid and determine only the number of faces and vertics :

the composite solid shape consists of
cube : six faces , eight vertices and 12 edges.
sphere : no faces and no vertices.



Example (4)

Classify the composite solid shape which the tower in the picture is formed of, and

Determine the number of faces and edges of each solid shape.

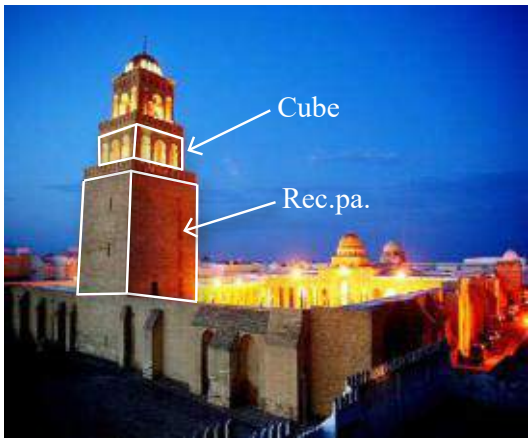
The tower consists of
i) quadrilateral prism (rectangular parallelepiped)
ii) quadrilateral Prism (Cube)

Number of faces : 6

Number of edges : 12

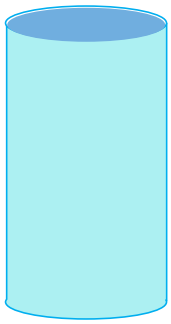
Number of vertices : 8

NOTE : A rectangular parallelepiped and a cube both have the same number of faces , vertices and edges.

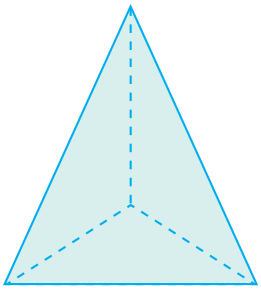


Example (5)

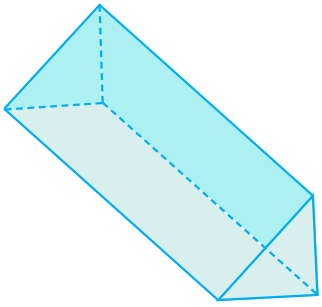
Determine the base for each solid shapes and then classify it:



Circle, Cylinder



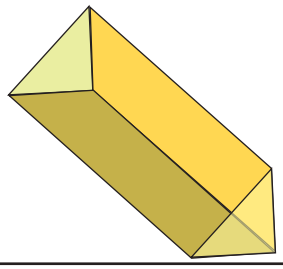
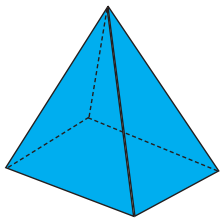
Triangle, Pyramid



Triangle, triangular prism

Make sure of your understanding

1 Fill the blanks in the following table:

solid shapes			
No. of faces	5		
No. of edges			
No. of vertices	6		

Questions 2-4 are similar to examples 5

Determine the base shape of the followings and classify them.

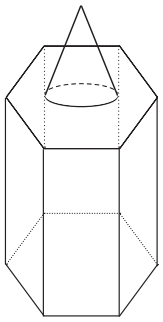
2 

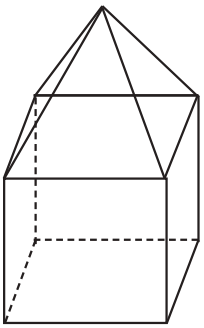
3 

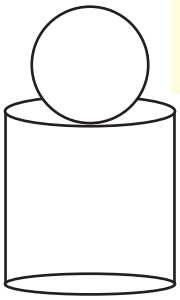
4 

Classify the composite solid shapes and Determin the number of bases faces, edges and vertices of the following :

Questions 5-7 are similar to examples 3-4

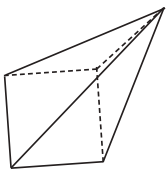
5 

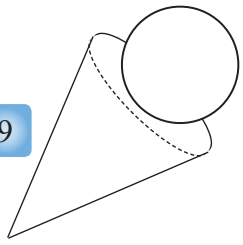
6 

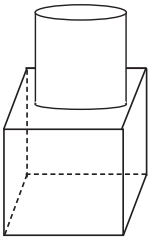
7 

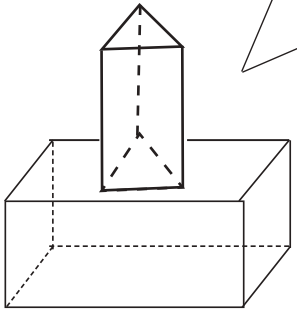
Solve the Exercises

Classify the composite solid shapes and Determin the number of bases, faces, edges and vertices of the following :

8 

9 

10 

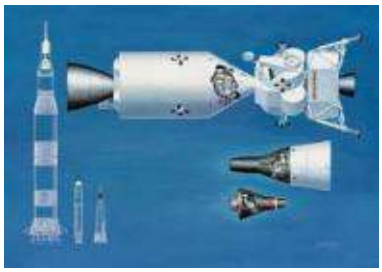
11 

Solve the problems

12 **Education:** What is the solid shape wich represants the Math book ? and what is the number of virtices , faces and edges of the shape of math book?

13 **School:** Search in the class for the solid geometrical figures and classify them.

14 **Space:** Determine the two solid shapes in the pictures and classify them.



15 **Monuments:** Determine the number of virtices, faces and edges in each solid shapes in the pictures below.

16 **Monuments:** Determin the shape of the bese and draw the solid shape which represants the pyramid in near by the picture.

Think

17 Use the properties you have learnt about solid geometrical shapes to compare between quadrilateral prism and quadrilateral pyramid.

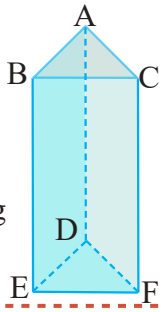
18 What is the solid geometrical shape which has one base and only triangular faces.

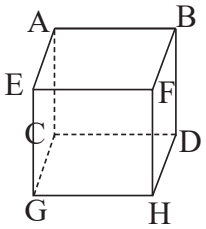
Use the near by geometrical shapes to determine the following :

19 Two parallel planes

20 Two intersecting lines

21 Two points that formed a diagonal when aline drawing between them





Write

the name of solid trinagular shape which has curved face and has no vertex on and no edges.

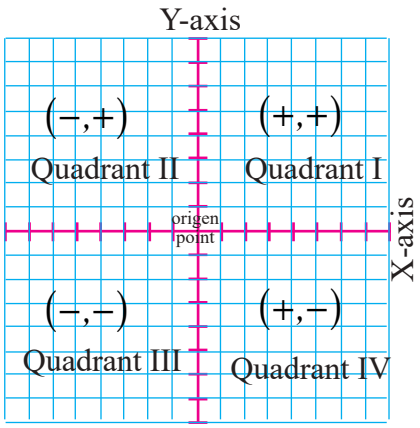
[5-3] Coordinate Plane

Idea of the lesson:
*Representation ordered pairs and recognizeditin coordinate plane.

Vocabulary:
* Coordinate plane
* X-axis
* Y-axis
* Origin
* Coordinates of the point
* Ordered pairs

Learn

The coordinate plane consists of the intersection of two perpendicular straight lines. The horizontal straight line is known as the x-axis and one vertical on it is called the y-axis. They both intersect at a point called the origin.



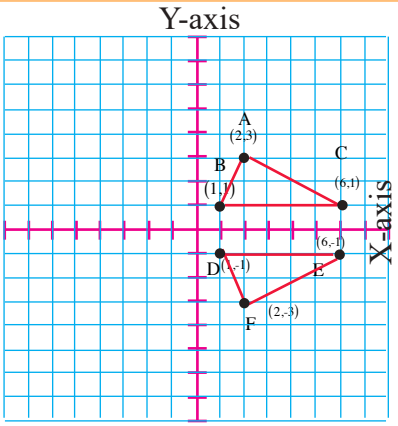
5-3-1] Recognized quadrants in coordinate plane

The coordinate plane is divided into four parts known as quadrants; first quadrant, second quadrant, third quadrant, and fourth quadrant.

Example (1) Determine each points belong to which quadrant in the given coordinate plane.

i) Points A,B,C are located in the first quadrant
ii) Points D,E,F are located in the fourth quadrant

Link the points of the first and fourth quadrants, what do you notice?
Two triangles have the same angles , sides and area .

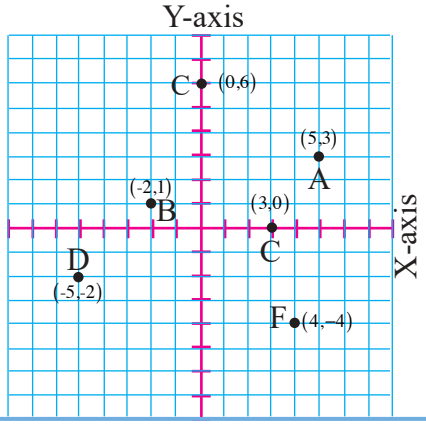


[5-3-2] Representing points in coordinate plane

Points are represented on a coordinate plane by ordered pairs (x,y). An ordered pair consists of two numbers. The first number x represents the x-axis (units to the right or to the left). The second number y represent the y-axis (units upwards or downwards)

Example (2) Represent each ordered pair with a point on the coordinate plane and determine which quadrant each point is located at.

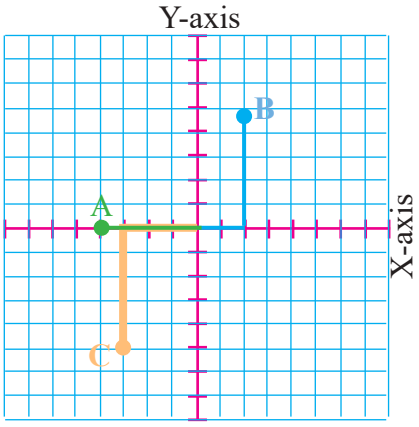
i) (5,3) Located in the first quadrant
ii) (-2,1) Located in the second quadrant
iii) (0,6) Located on y-axis
iv) (-5,-2) Located in the third quadrant
v) (3,0) Located on x-axis
vi) (4,-4) Located in the fourth quadrant



[5-3-3] Determination of coordinates points in coordinate plane by ordered pair

Example (3) Determine the coordinates of each point in the given coordinate plane.

i) Coordinates of point A
move from the origin to the left and count four units. A(-4 , 0)
ii) Coordinates of point B
move from the origin to the right and count two units. and upward five units B(2,5)
iii) Coordinates of point C
move from the origin to the left and count three units, then 5 units to downwards. C(-3,-5)

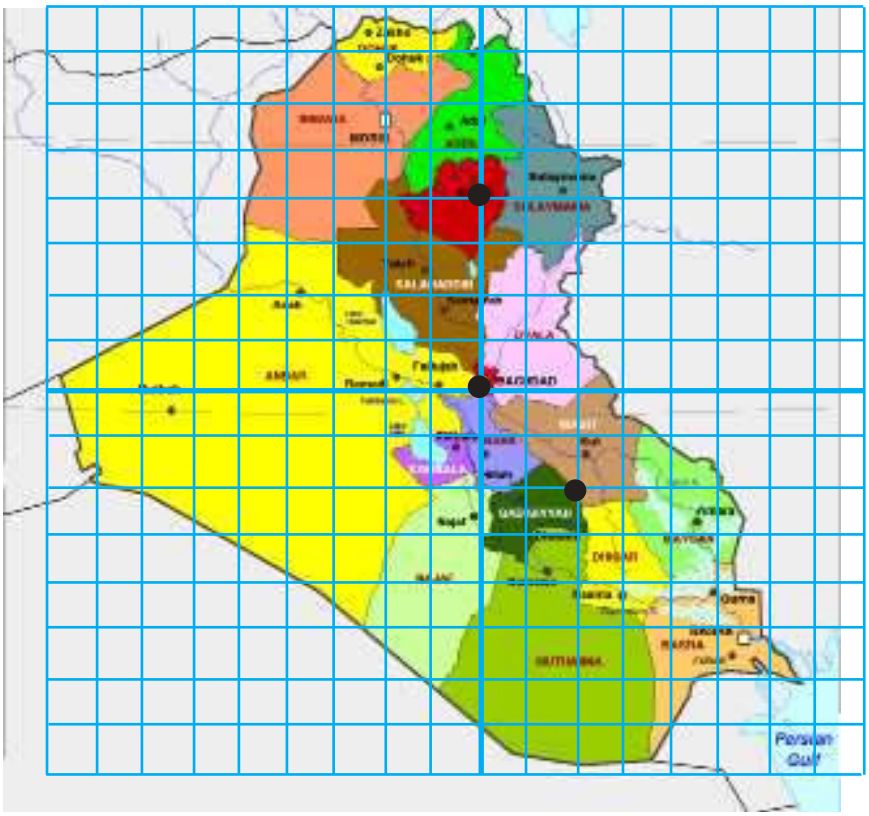


Example (4) The map was divided to a coordinate plane where the x-axis represents the distance crossed to the right or to the left and y-axis represents the distance crossed upwards or downwards. Which city is the point (2, -2) located at.? In which quadrant?

Start from the origin, move two units to the right and two units downwards to find the point (2,-2) at Al-Qadisiya City, it is in the fourth quadrant.

Start from the origin and move four units upward to find the point (0,4) in Kirkuk City, it is located on y-axis.

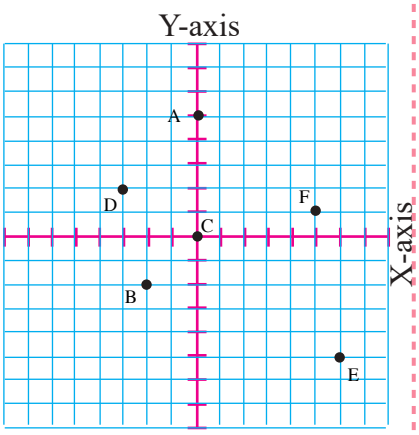
Determine at less two points at following (Basra, Ninawa, Anbar)



Make sure of your understanding

Determine the quadrant of each point belongs to, then write the ordered pairs.

Questions 1-6 are similar to example 1



1 A

2 B

3 C

4 D

5 E

6 F

Draw the coordinate plane on a graphing paper then represent each ordered pair with a point, name it and determine which quadrant or axis it is at?

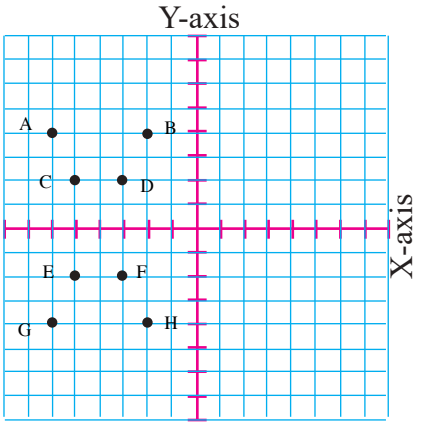
7 (-3,-2) 8 (0,1) 9 (-2,0) 10 (4,-1)

11 (4,3) 12 (5,-6) 13 (-2,9) 14 (8,0)

Questions 7-14 are similar to example 2

Solve the Exercises

15 Determine the quadrant of each point belongs to given coordinate plane and write the ordered pair of each point.



16 In the question (15) link the points in each quadrant what you note?

Draw the coordinate plane on a graphing paper then represent each ordered pair with a point, and name it, then determine the quadrant or axis it is at?

17 (0,-5) 18 (0,4) 19 (-2,5) 20 (4,-6)

21 (6,0) 22 (-1,-7) 23 (4,5)

Solve the problems

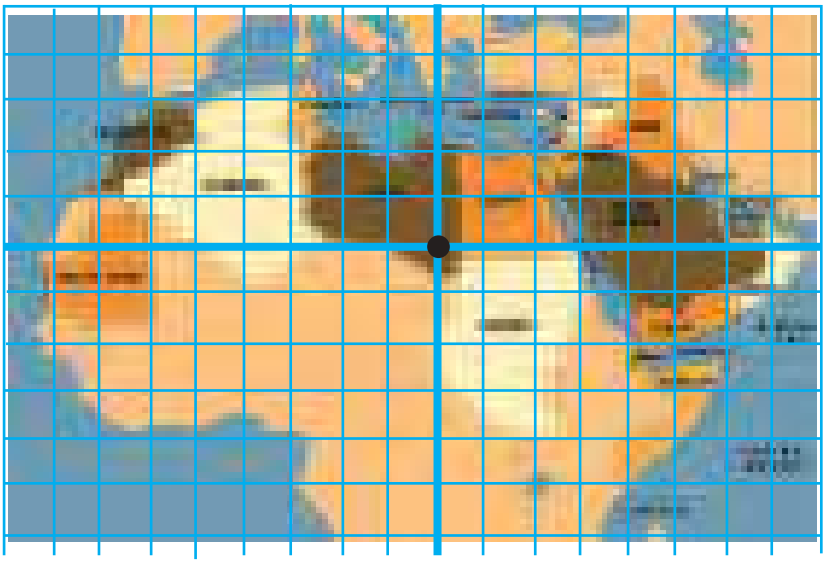
Represent the ordered pairs on the coordinate plane, and draw segments between the points (the dots)and name the resulting shape and which quadrant located in?

24 A (0,2) , B(0,-2) , C(2,2) , D(2,-2)

25 E(-6,-3) , F(-3,-1) , G(4,-1) , H(4,-6)

Geography: use the coordinate lines and determine some points which fixed the following:

26 Egypt 27 Sudan 28 Iraq 29 Algeria



30 Geometry: Graphically show four points on the coordinate plane that they form the vertices of a rectangle once they are linked together then determine the ordered pairs.

Think

31 Mention the x-axis of a point on y-axis.

32 Mention the y-axis of a point on x-axis.

33 Open problem: The quadrant where a point is located can be determined without the need to recourse with a graphical representation in a new way, give an example about it?

34 Challenge: Give the reason why the location of point (-2,2) is different from that of the point (2,-2).

Write

Three ordered pairs representing a right triangle when representing them on the coordinate plane .

[5-4] Translation, Reflection and Symmetry

The idea of the lesson
* Learning the translation, reflection and symmetry and drawing them.

Vocabulary:
* Translation
* Reflection
* Symmetry
* Axis of symmetry
* Line of reflection.

Learn

Symmetry is aproperty many things can be described with such as Symmetry shapes. A human is said to be symmetric as well since his right half is symmetric to his left half.

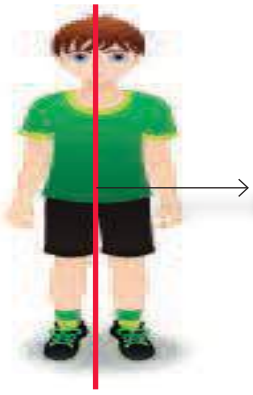
[5-4-1] Axes of Symmetry

A symmetric shape around on axis can be pleat on a straight line, as a result you get two congruent halves.
The line of pleating in this condition is called the axis of symmetry.
The symmetry around the y-axis for the point (x,y) can be expressed as (-x,y).
And the symmetry around the x-axis for point (x,y) can be expressed as (x,-y)

Example (1)

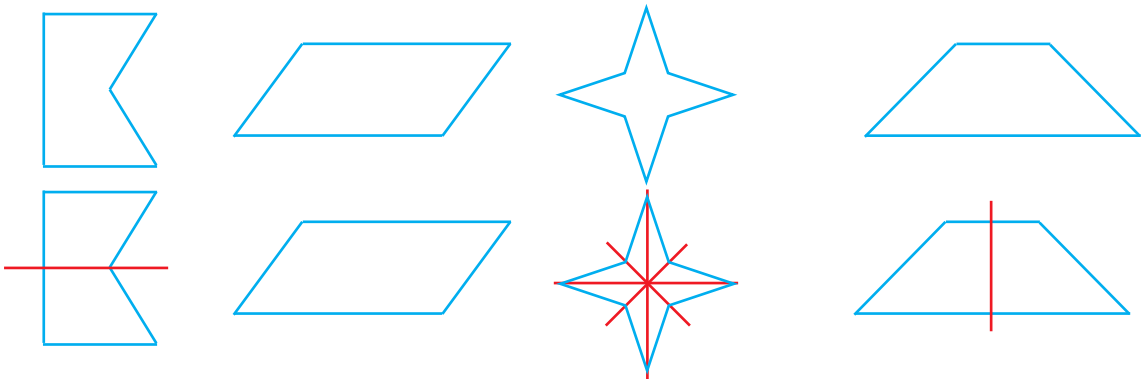
Is there an axis of symmetry for the human in the picture in Learn paragraph?

A vertical axis of symmetry can be drawn to divide the body in the picture into two congruent halves where the right side of the human body is congruent to its left.



Example (2)

Determine the axis of symmetry for the following shapes.



Horizontal Axis of symmetry

There are no axes of symmetry

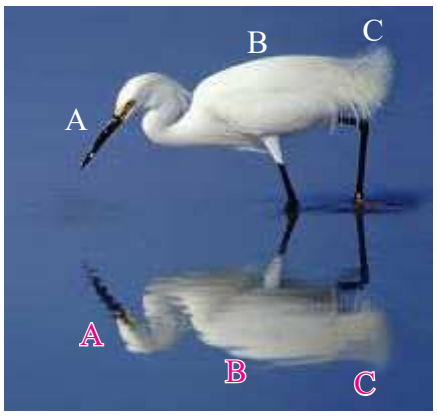
It has many axes of symmetry (Horizontal , Vertical and Diagonal)

Vertical Axis of symmetry

[5-4-2] Reflection

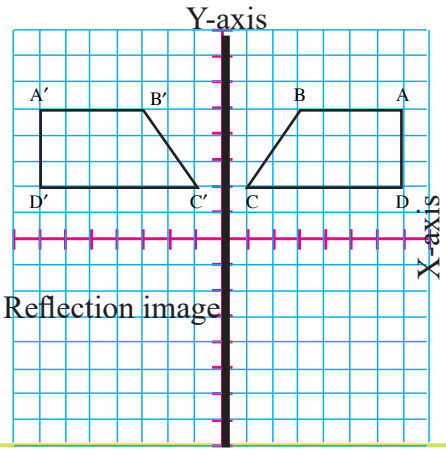
Reflection: is the transfer of a shape to its opposite / reflected image for example, the shape of letter **P** according to a vertical line (reflection axis) or (a mirror) is **q**.

Example (3) In the given picture, compare the shape of the bird with its picture in the weter.



i) Look at the points on the shape, what is their arrangement?
The points A,B,C are arranged in clockwise direction.
ii) How does their arrangement seem in the weter?
They are now anti-clockwise are arranged C,B,A .

Example (4) Copy the shape ABCD on a graphing paper then draw its image for a reflection accross line shown.

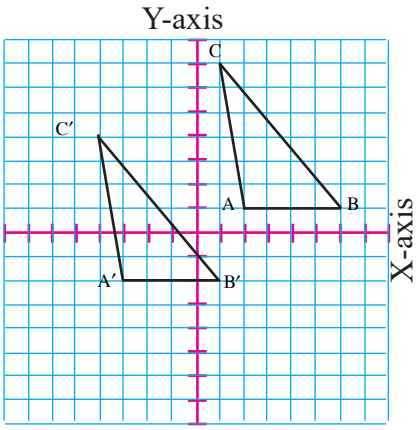


i) Find the ordered pairs which represents each points of A B C D .
ii) Find the number of units between each vertex and the reflection line.
iii) Create a point to each vertex on the other side of the line with the same distance.
iv) Link the new vertices (points) to form of its reflection image A´ B´ C´ D´.

[5-4-3] Translation

Translation: translating is a shape from one location to another without rotating it.
Translation can be expressed in the form of ordered pair (x+a,y+b) as for translating point (x,y) where a unit horizontally and b unit vertically.

Example (5) Copy the triangle ABC on a graphing paper then draw its translation image by 5 units to the left and 3 down.



i) Move each vertex of tringle ABC, 5 units right and 3 down. The translation of point A (2,1) is represented by (2-5, 1-3) in order to be A ´ (-3,-2)
The translation of point B (6,1) is represented by (6-5, 1-3) in order to be B ´ (1,-2)
The translation of point C (1,7) is represented by the ordered pair (1-5,7-3) in order to be C ´ (-4,4)

ii) Link the new vertices to form the image of triangle after translation A´B´C´

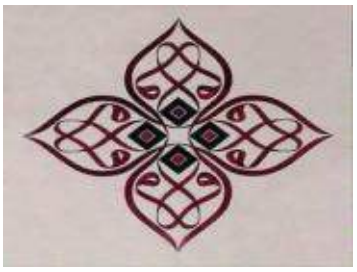
Make sure of your understanding

Look at the shapes in the following pictures and mention their axes of symmetry? If it's found!

Questions 1-3 are similar to example 2

1 

2 

3 

4 Draw the shape A B C D whose vertices coordinates areA(1,1), B (4,2), C (4,1), D (1,2) Then draw its reflected image with respect to the x- axis and write the vertices coordinates.

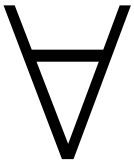
Question 4 is similar to example 4

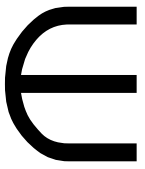
5 Point B was translated downwards with 2 units and 6 units to the right. What are the coordinates of point B if point B´ was (2,1)?

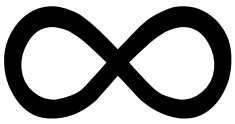
Question 5 is similar to example 5

Solve the Exercises

Use the shapes shown below and determine if the letter has an axis of symmetry , draw all symmetry axes if it's found.

6 

7 

8 

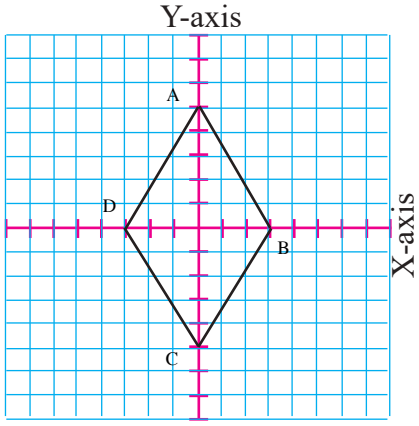
Draw the triangle ABC whose coordinates areA (3,4) , B (1,2) , C (4,1) then draw its image on a graphing paper and write its coordinates after making the following transltions:

9 Reflection with respect to the y-axis.

10 Translation of one unit to the left and 4 down.

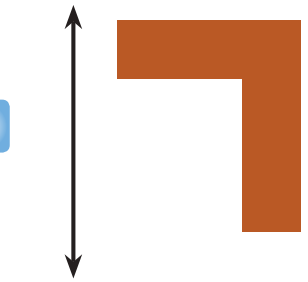
11 Translation 3 units to the right and 2 units up ward.

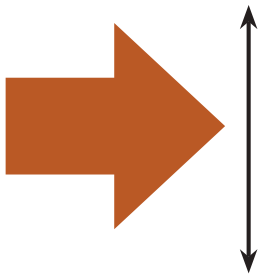
12 If the rhomboid was translated 4 units to the right and 1 upwards. What are the coordinates of point C´?

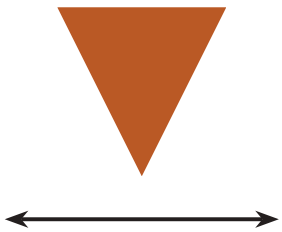


Solve the problems

Copy these shapes on a graphing paper then draw the reflection image with respect to the line as shown.
Describe the type of the symmetry if it's found.

13 

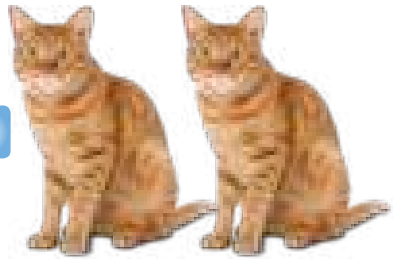
14 

15 

Describe the kind of translation for each shapes, if its found.

16 

17 

18 

19 Hand works : Show reflectinos for some shapes in the following picture and show the parts that havent translation.

20 Geometry: A circle whose radius is 5 units and its center is the point (3,3). If a translation was done by 2 units upwards and 3 units to the left. What are the new coordinates of the center and find the radias of the circle? what do you notice .

Think

21 Numerical Sense: Draw the octagonal on the graph paper then draw its reflection with respect to the y- axis. Write its coordinates after the reflection.
The coordinates are A (2,2) , B (3,2) , C (1,3) , D (1,4) E (2,5) , F (3,5) , G (4,4) , H (4,3)

22 Challenge: Suppose that point A´(-3,5) is an image of apoint A (3,5) in the reflection, which axis was the reflection made up on ? Find the reflection without graphing according to which axis. Explain the answer

Write

A real-life problem where translation is used on a certain shape.

[5-5] Congruence and Similarity

Idea of the lesson

Determining the congruent shapes, and distinguishing the similar shapes, and finding the measure of an angle, and the unknown length in a pair of congruent shapes.

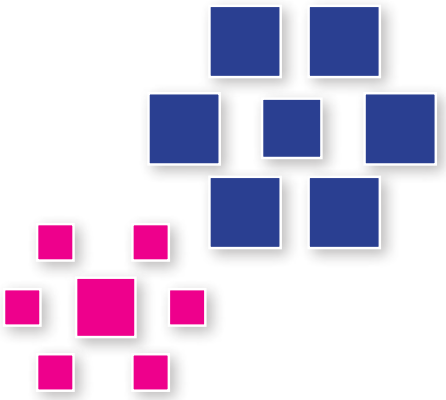
Vocabulary:

Congruence
Similarity
Corresponding angles
Corresponding sides

Learn

Look at the shapes, which of the squares in the middle is bigger than the other?

Are all the blue squares congruent to the red ones?



[5-5-1] Congruence

Congruence; is the equality of sides and angles of a polygon with those of another polygon. The symbol of congruence is ' ≅ ' .

Example (1)

In learn paragraph above, both squares at the middle with blue colour are congruent to check that you can simply put the first middle square on the second middle square to notice the complete congruence. While the other squares in the two sketches are similar to one another.

Example (2) Distinguish the congruent shapes in each picture

In the picture above all shapes are congruent.

All toys in the picture are not congruent.

The group of balls are not congruent, since each one has different shape and size.

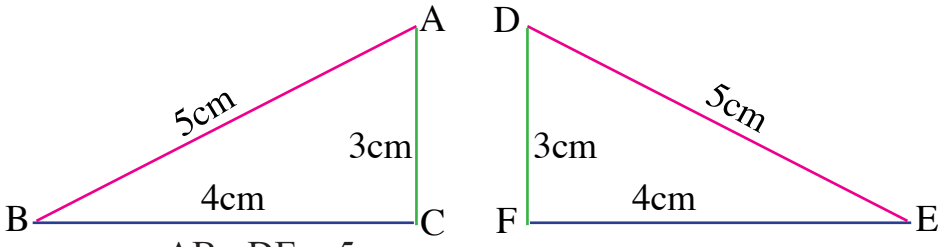
[5-5-2] Congruence Polygons

-Two triangles are congruent if their sides are congruent.
-Shapes which are containing more than three sides must congruent in sides and measure of their angles.
-If two polygons are congruent we can find the measure 0f an unknown angle or length of an unknown side.

Example (3)

Are the two triangles congruence?

If each side of the first triangle congruence each side of the second then both triangles are congruence.



AB =DE = 5cm

AC=DF=3cm

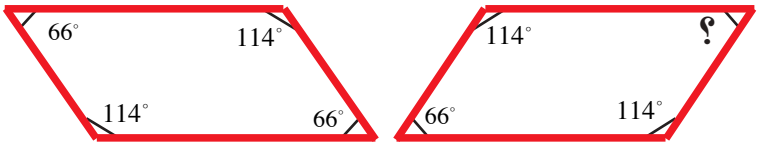
BC=EF=4cm

$\triangle ABC \cong \triangle DEF$

Example (4)

Find the measurement of the unknown angle for the given shape.

Since both shapes are congruent then the measurement of their angles are congruence as well. So the measurement of the unknown angle in the figure is 66° .

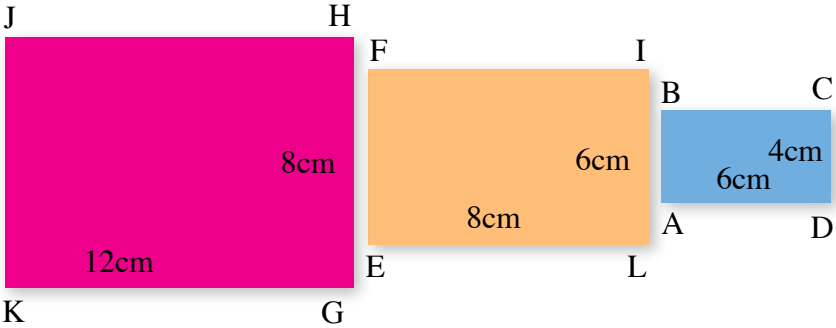


[5-5-3] Similarity

Shapes having the same shape and their corresponding sides are proportional. The symbol of similarities is '~ '.
-Their sides are proportional.
-The measure of their angles are congruence.

Example (5)

Which of the followings quadrangles are similar to rectangle ABCD ?
In order the quadrangles to be similar their corresponding sides must be proportional such that :
The shape of the blue quadrangles is not similar to the shape of the yellow quadrangles since the length of their sides are not proportional.
The shape of the blue quadrangles is similar to the shape of the red quadrangles since their sides are proportional.



$$\frac{AD}{EL}, \frac{DC}{LI} \Rightarrow \frac{6}{8}, \frac{4}{6}$$

$$\frac{3}{4} \neq \frac{2}{3}$$

$$\frac{AD}{KG} = \frac{DC}{GH} \Rightarrow \frac{6}{12} = \frac{4}{8}$$

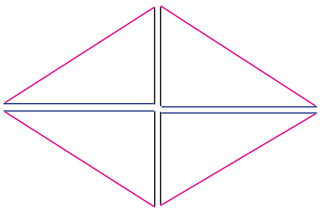
$$\frac{1}{2} = \frac{1}{2}$$

$\therefore$ ABCD ~ KJHG

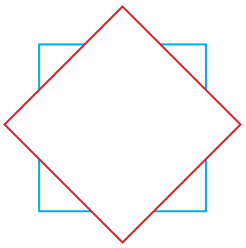
Make sure of your understanding

Questions 1-3 are similar to example 2

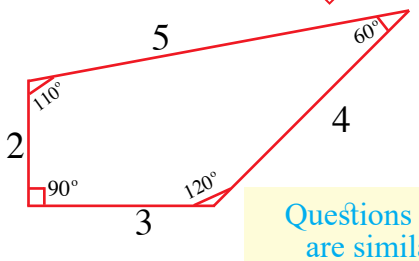
Distinguish the following congruence shapes:

1 

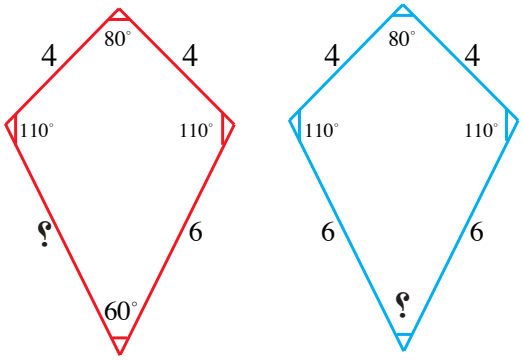
2 

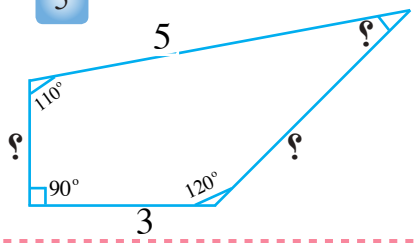
3 

Find the measurements of the unknown angles and lengths of the unknown sides in the following congruency shapes:



Questions 4-5 are similar to example 4

4 

5 

Solve the Exercises

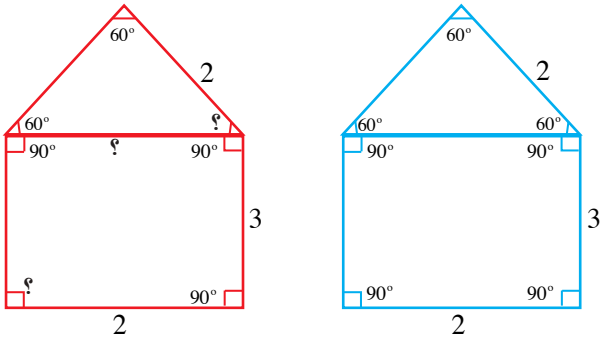
Distinguish the congruence shapes:

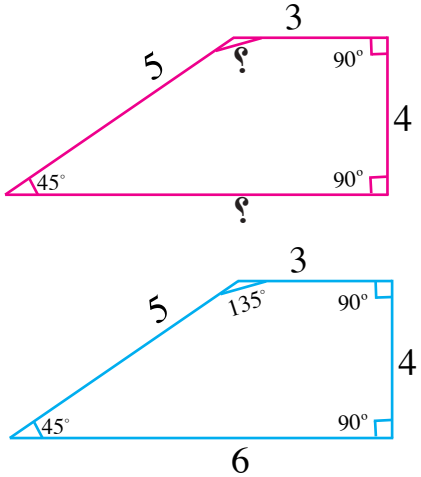
6 

7 

8 

Find the measurements of angles, and lengths of the unknown sides the following congruency shapes.

9 

10 

Solve the problems

Distinguish the following congruence shapes:

11 

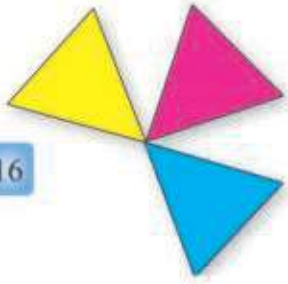
12 

13 

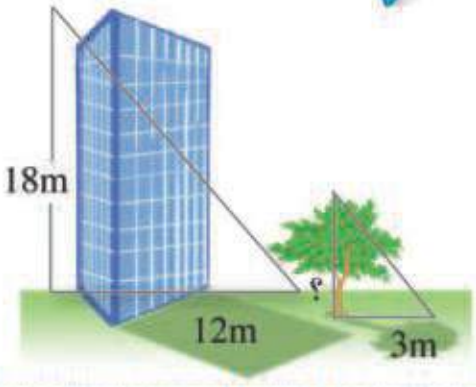
Determine whether the folowing polygons are congruent or not.

14 

15 

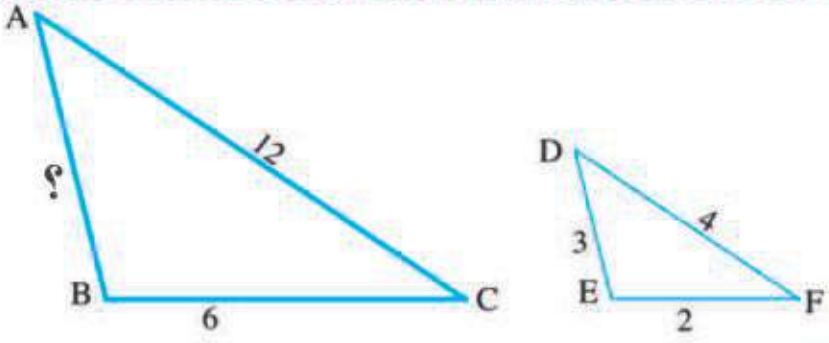
16 

17 Geometry: In the following figure, a building with a height of 18 m forms a shadow of 12 m length, what is the height of nearby tree forming a shadow of 3m length?

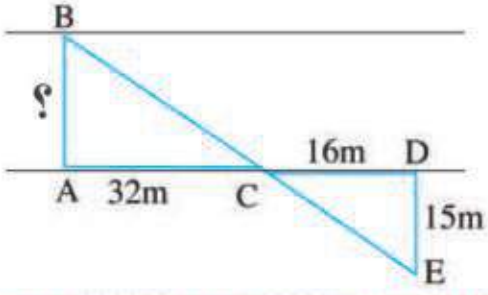


Think

18 Challenge: If the triangle $\Delta ABC \sim \Delta DEF$. What's the length of AB?



19 If the triangle $\Delta ABC \sim \Delta DEC$, whats the length of AB ?



Write

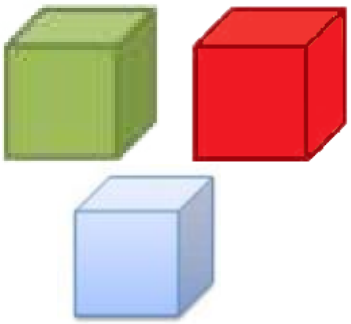
When are the similar polygons congruent?

[5-6] Promblem Solving Plan (make a model)

The idea of the lesson
Solve the problems by using a plan (make a model)

Learn

Zeina tried arranging 3 cubes in different ways. What are the possible ways to arrange the three cubes in different ways and side by side?



UNDERSTAND

What are the givens in the problem? 3 colouer cubes that must be arranged side by side.
What is asked in the problem? Number of possible ways possible in order to do that.

PLAN

How the solve the problem? Make a model to clarify those different ways of arranging the cubes.

SOLVE

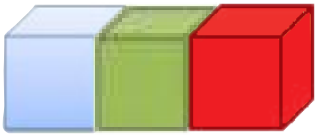
1

2

3

4

5



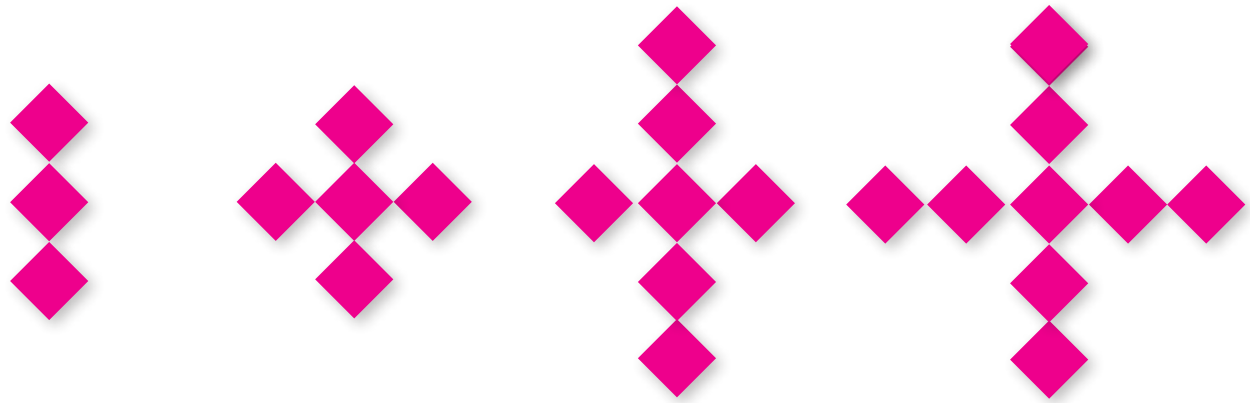
6

CHECK

Check the above pictures which amang all possible different ways of arranging the cubes.

Problems

1 Patterns: How many squares are there in the shape No.8 according to the following pattern?



shape (1) shape (2) shape (3) shape (4)

2 Basketball: 6 friends came together to form a basketball team, how many teams can be formed of 5 players?

3 Colours: Asmaa needs two colouring kits to draw 5 paintings. What is the least number of paintings she can draw/paint with 10 kits?

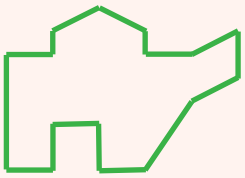
4 Kitchin tools: Aleen has 6 coloured cups, she wanted to offer juce in 5 different cups , how many times she can do it ?

Chapter Test

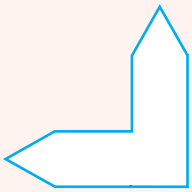
1 What is the polygon which the sum of its interior angles 1980°? and what is the magnitude of its exterior angle?

2 What is the polygon which the sum of its interior angles 1800° and what is the magnitude of its exterior angle?

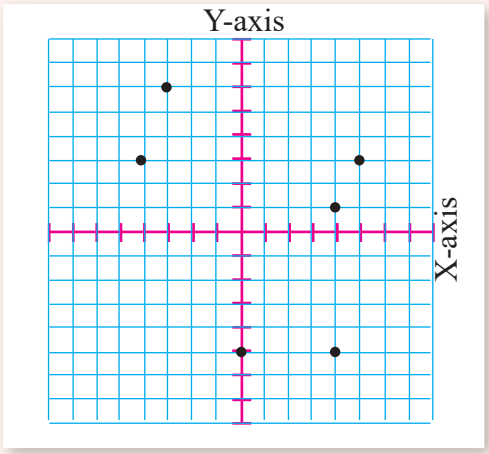
Which one of the polygon is concave or convex?

3 

4 

5 

6 Determine the quadrant of each points on the coordinate plane.



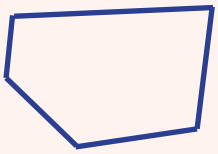
7 Represent each ordered pair in questions 6.

Find the of number of the faces , edges and vertices for;

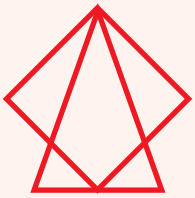
8 hexagon pyrimid

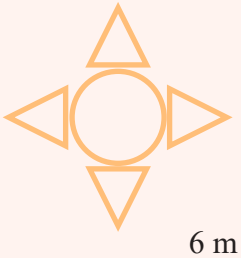
9 heptagon prism

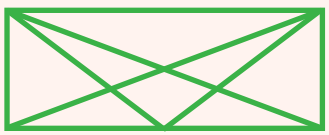
10 Copy the shape on a graphing paper and then drow its reflection image and translation image by 5 units up wards.



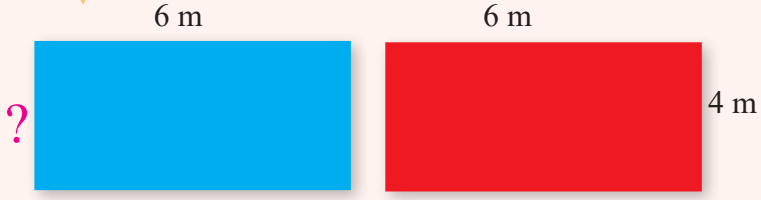
Draw the symmetry axes and name it if its found.

11 

12 

13 

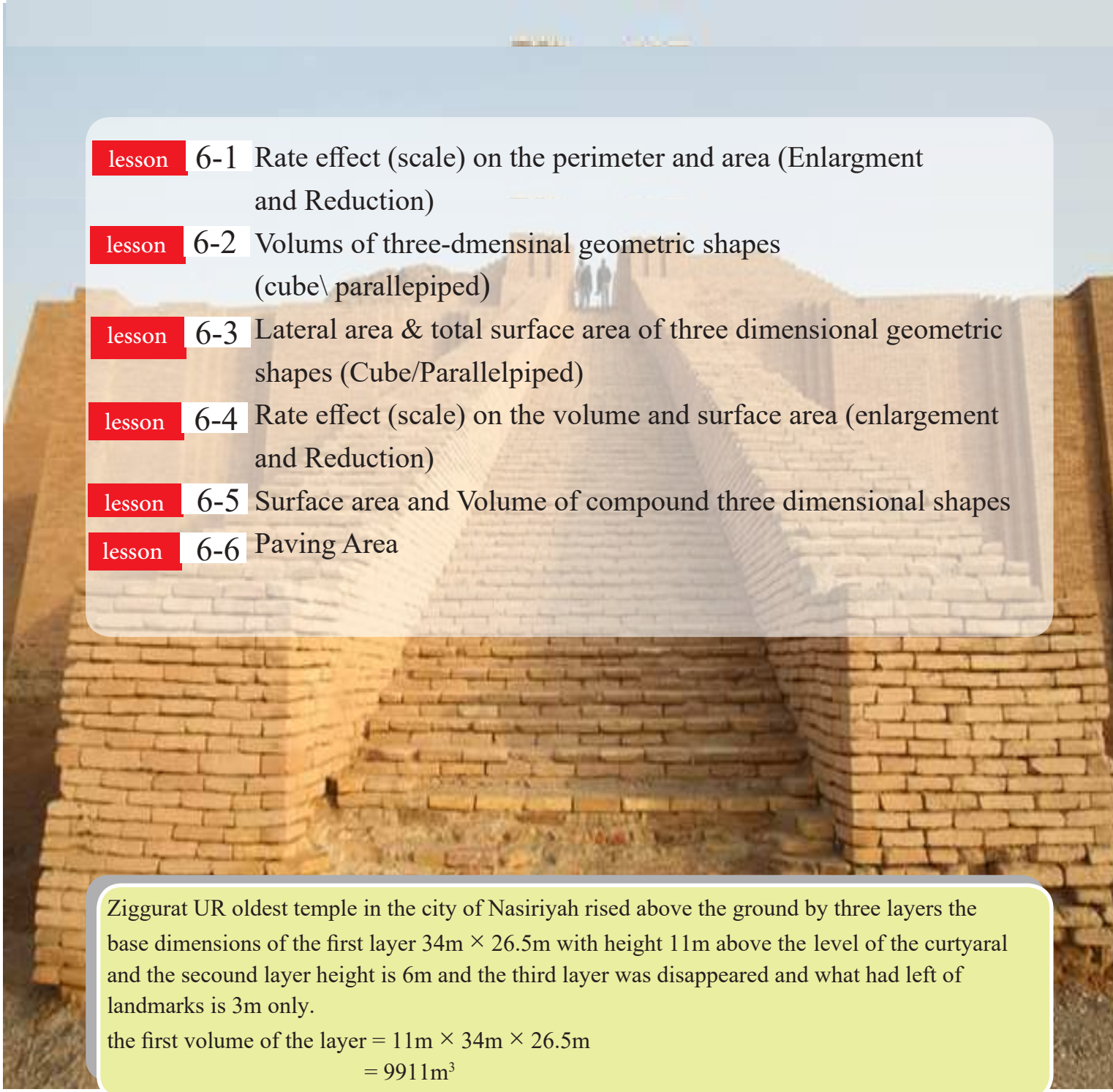
14 Find the length of missing side in the following figure ?



15 Draw a hexagon on a grid paper and determine its points and divide it into congruent triangles and find the number of triangles, draw the translation of a hexagon by 2 units down for each point .

Chapter 6

Measurement : Area and Volume



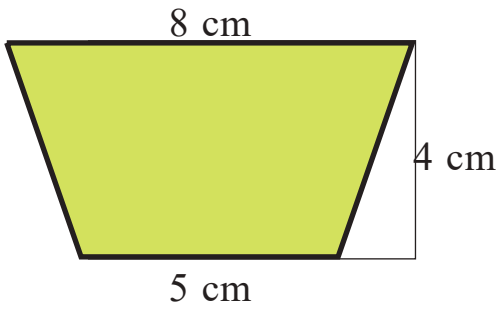
Ziggurat UR oldest temple in the city of Nasiriyah rised above the ground by three layers the base dimensions of the first layer 34m × 26.5m with height 11m above the level of the curtyaral and the secound layer height is 6m and the third layer was disappeared and what had left of landmarks is 3m only.

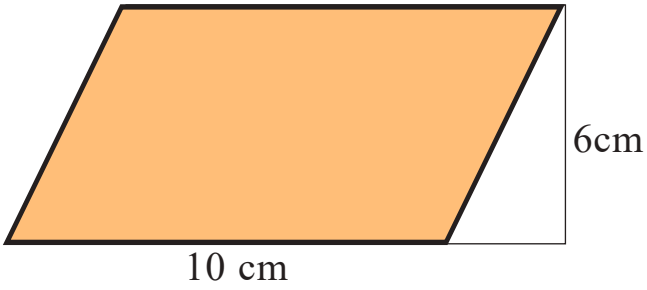
the first volume of the layer = 11m × 34m × 26.5m

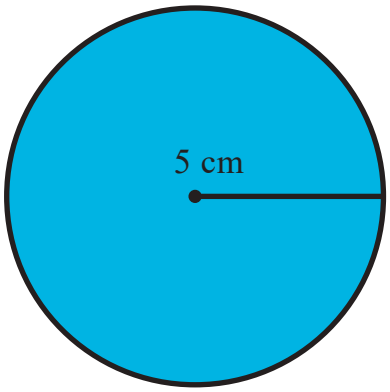
$= 9911m^3$

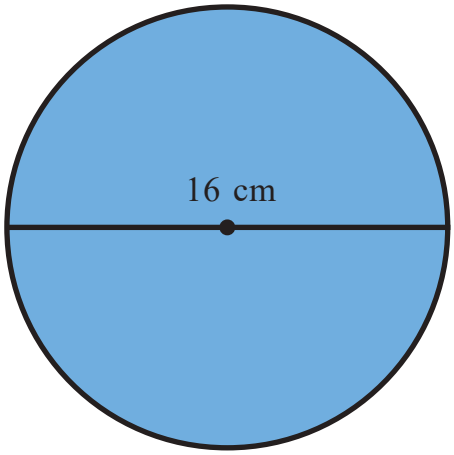
Pretest

1. Calculate the area of the parallelogram whose base length is 20cm and height is 5cm.
2. Calculate the area of a trapezoidal, the length of both of its bases are 6m and 8m, its height is 5m.
3. Calculate the circumference of a circle whose radius is 14cm.
4. Calculate the area of a circle whose radius is 10cm.
5. The area of a circle is 616cm^2, calculate its circumference.
6. The circumference of a circle is 132cm, calculate its area.
7. Find the area of each of the folowing.

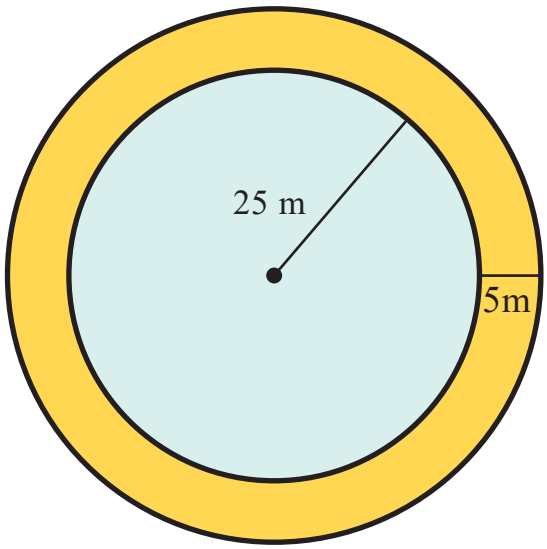








8. A circular garden with radius 25m is surrounded by a paved gangway of 5m width. Calculate the area of the gangway and its (outer) circumference.

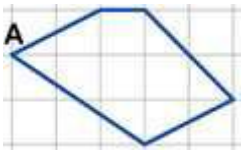


[6-1] Rate effect (scale) on the perimeter and area (Enlargement and reduction)

Idea of the lesson
The enlarement and reduction effect of geometrical shapes on their perimeters and areas.

Vocabulary
*Dilation. center of dilation.
*Dilation
*Dilation coefficient.
*Enlargment
* reduction

Learn



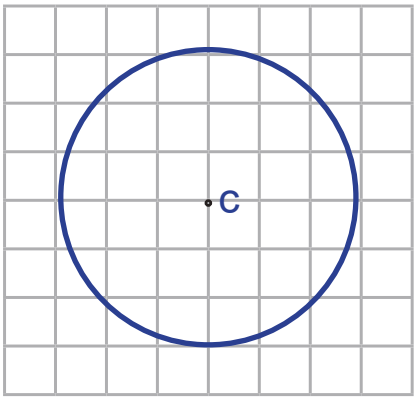
The following figure shows a grid. Each square on the grid is 2cm. Re-draw the irregular pentagon using a grid whose each square side is 4cm in length.Use point "A" as a start point.
Measure the length of the sides in the figure in both cases. Compare them and conclude the relation between two measurements. Now, guess the length of the side of the square paper in the grid to make a second copy of the shape such that its dimensions would be half of those of the first copy (original shape).

[6-1-1]The Concept of Extensibility and Center Dilation

Dilation : Is the resulting from enlargement or reduction a given shape. The image is smilar to the original one and has symmetrical dimensions.
The centre of dilations is one of the points in the original shape. When measuring we fix it in order to adjust the shape measurements.
Dilation coefficient: is the ratio of the image's dimensions to the original shape dimensions.

Example (1) Draw the dilation, draw a circle with centre "C" and let its radius be 3 squares of the paper using the compass.

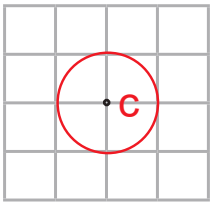
Drawing a picture of this circle is asked on another grid of the same squares size using a dilation of center "C" and $\frac{1}{3}$ as coefficient.



Step 1: We choose a point in the middle (at the center) of the new squares paper and we show it as and name it C^{-} as a center of dilation.

Step 2: Focus the needle of the compasson on one of the points of the squares in the grid and we move the second arm by one square.

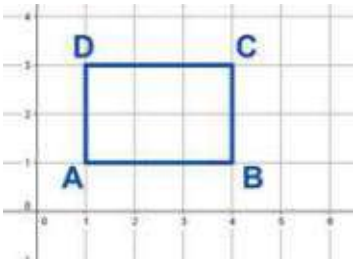
Step 3: We focus the compass on point C^{-} and move the other arm to draw the new circle.



Step 4: Using the compass, calculate the length of the new circle's radius. You will find that it is one square. As a conclusion, the circle's radius was dilated by coefficient $\frac{1}{3}$.

Example (2) Let ABCD be a rectangle whose vertices are A(1,1), B(4,1), C(4,3) and D(1,3). Draw it then draw a dilation to it, let its centre be origin point and its coefficient be 2.

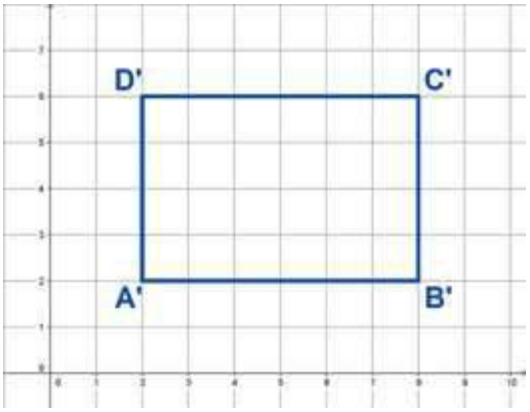
Obviously the dimensions of the rectangle are 2,3 of the squared units. Draw rectangle $A'B'C'D'$ with dimensions 4,6.



Notice that;

$$\frac{A'B'}{AB}=\frac{6}{3}=2\ ,\ \frac{C'D'}{CD}=\frac{6}{3}=2$$

$$\frac{A'D'}{AD}=\frac{4}{2}=2\ ,\ \frac{B'C'}{BC}=\frac{4}{2}=2$$



Such that;

$A(1\ ,\ 1) \rightarrow A'(2\ ,\ 2)$
$B(4\ ,\ 1) \rightarrow B'(8\ ,\ 2)$
$C(4\ ,\ 3) \rightarrow C'(8\ ,\ 6)$
$D(1\ ,\ 3) \rightarrow D'(2\ ,\ 6)$

So, rectangle $A'B'C'D'$ is enlargment in of the rectangle ABCD and the coefficient of the dilation is 2.

Example (3) **TV screen:** The TV secreen is characterized by its ability to change the image dimensions such that if the original image dimensions shown on the screen are 100cm, 52cm. If we reduction the width by an dilation coefficient of $\frac{3}{4}$, how would the perimeter and image area be?

$P = 2 \times (L+W) = 2 \times (100+52) = 304$ cm
$A = L.W = 52 \times 100 = 5200 cm^2$

And when reduction is applied the image dimensions become as follows

$$L = \frac{3}{4} \times 100 = 75cm\ ،\ W = 52 \times \frac{3}{4} = 39\ cm$$

Such that;

$P' = 2 \times (39 + 75) = 228$ cm

$A' = L\ .W = 39 \times 75 = 2925\ cm^2$

Notice that;

$$\frac{p'}{P}=\frac{228}{304}=\frac{3}{4}\ ,\ \frac{A}{A'}=\frac{2925}{5200}\ =\frac{9}{16}=\frac{3}{4}\times\frac{3}{4}$$

[6-1-2] Enlargement and Reduction

If we check examples 2 and 3 we conclude that.

- The dilation whose coeficient is greater than 1 leads to enlargement that the shape's dimensions are dilated by the same amount of the dilation coeeficient.
- The ditation whose coefficient value is between 0 and 1 leads to redution that shape's dimensions are dilated out by the value dilation coefficient.
- The dilation coefficient of the perimeter (enlargement or reduction) is the same as the expansion coefficient of the shape's dimensions.
- The dilation coefficient of the area (enlargement or reduction) is the square of the dilation coefficient of the shapes dimension.

Make sure of your understanding

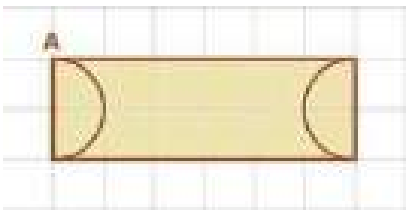
1 On a grid, graphically show a right triangle whose vertices are A(2,1), B(2,4), C(5,1), find its area, then graphically show the triangle resulting from enlargement in by the coeffcient 3.

2 On a grid, graphically show a circle whose centre is the origin and its radius is 3cm. Calculate its perimeter and area. Draw an image of it under the effect of;
A) enlargement in with coeffcient 2
B) reduction with coeffcient $\frac{1}{3}$ and calculate its perimeter and its area.

Questions 1-2 are similar to examples 1,2

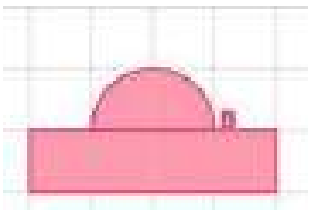
Solve the Exercises

3 On a grid, draw the following shapes then draw their dilation by using the given information.



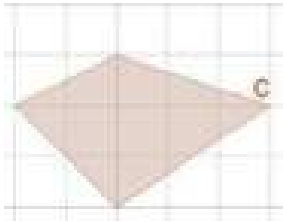
dilation center A

coefficient of dilation 2



dilation center B

coefficient of dilation $\frac{1}{4}$



dilation center C

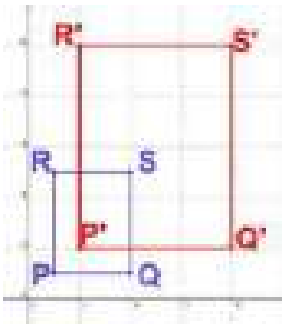
coefficient of dilation $\frac{2}{5}$

4 Find the coordinates resulting from the expansion of the quadrilateral shape ABCD in each of the following cases using the given expansion coefficient if the center of dilation is the origin point.

i) A (0 , 3) , B (2 , 1) , C (0 , -2) , D (-2 , -1) coefficient of dilation = 4

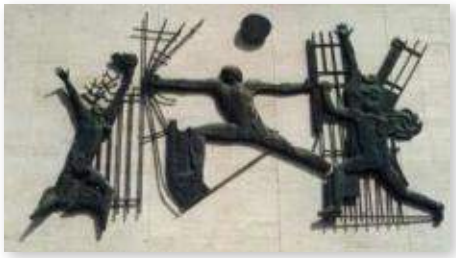
ii) A (-3 , 2) , B (3 , 3) , C (5 , -2) , D (-2 , 0) coefficient of dilation = $\frac{2}{3}$

5 If you knew one of the polygons in the given figure is an exdilation of the other. Find the coefficient and show whether it is enlargement or reduction.

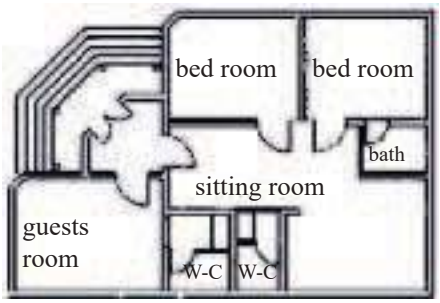


Solve the problems

6 Abdulla designed a scheme of a part of the Freedom Statue with dimensions of 50cm, 15cm. If he wanted to reduction the scheme using the coefficient $\frac{1}{5}$, calculated the perimeter and the area of the redution scheme.



7 Design: Ahmed is a construction engineer who is used to fullfilling the projects of building residental buildings in his daily notebook, and when the desing is finished he dilation it in by a coefficient of 10 on a maps paper. If the dimensions of the bedroom on the map are 3.5 cm , 4.8 cm. What is its area? and what is the perimeter?



8 The convex lens is used as a magnifying lens, if a body is put between the lens and its focus.
If you take a look at the letter "M" written on the paper whose height is 3mm. The len's reduction is $\frac{5}{3}$.
What is its height after being dilated?

Think

9 Challenge: An irregular geometrical shape. Describe its picture under the effect of expansion of coefficient (3).

10 Open Problem: Graphically represent a square, then show an image of it under the effect of dilation with coefficient greater than 1. Then represent the resulting image dilated by a coefficient less than 1. Expect the value of dilation coefficient between the original shape and the resulting shape. Explain why and check your answer.

11 Numerical sense: What do you expect the image of the shape will be if it was under the effect of dilation as in the following cases;
i) the dilation coefficient is 1
ii) the dilation coefficient is 0

Write

A general mathematical formula to find the new coordinates of the ordered pair (x,y) under the effect of dilation by coeffiecient "k".

[6-2] Volums of three-dimensional gemetric shapes (cube\ parallelpiped)

Idea of the lesson

Getting to know how to extract the volume of a cube and a parallelepiped.

Vocabulary

* Solid
* Prism
* Edge
* Vertex
* Face
* Length
* Width
* Height.

Learn

An solid shape like the table and the cube is characterized by having three dimensions unlike the standard shape (plane shape) which has only two dimensions. The three dimension are: length, with and height.

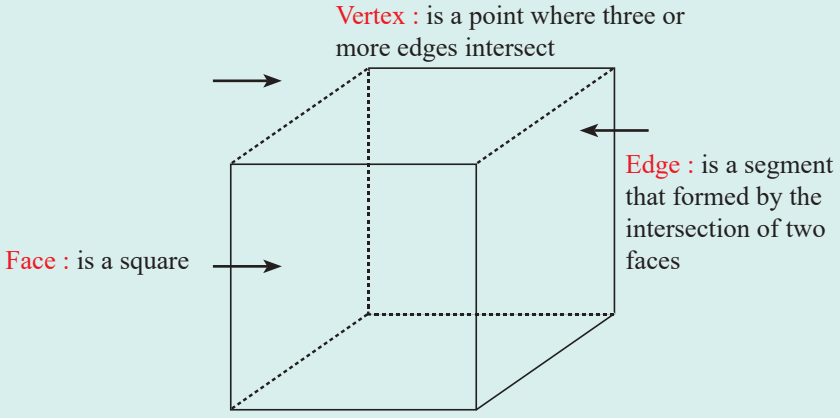
In the language of Geometry science, each body of many surfaces has two bases parallel regular congruent polygons called (the regular prism).

A prism is classified according to its base shape. So the prism is quadrilateral if its base had a quaternary shape as in the cube and cuboid (parallelpiped).

[6-2-1] Cube

The cube is a body whose 6 faces are squares. It can also be called a quadrilateral prism, its height is equal to its base side. In other words the three dimensions of the cube are equal.

As in details: The cube consists of six equal faces, eight vertices or right angles, and twelve edges.

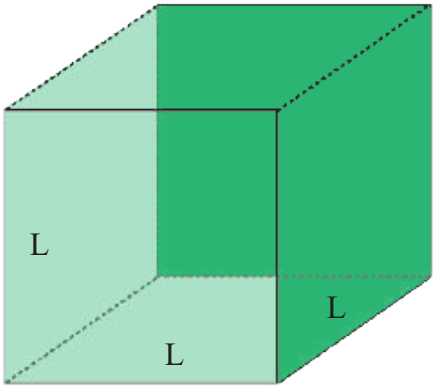


Volume of a Cube

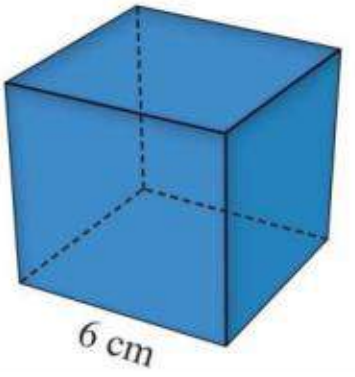
Volume = edge length x edge length x edge length

$$V = L \times L \times L$$

Where V is volume of the cube and L represents the cube edge.



Example (1) Find the volume of a cube whose edge length is 6cm.



Use the cube volume rule in symbols

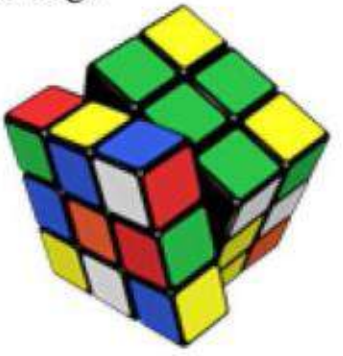
$V = L \times L \times L$
substitute and simplify
$V = 6 \times 6 \times 6 = 216\ cm^3$

so the volume of cube is $216\ cm^3$

Example (2) The rubik's cube consist of 27 different colored tiny cubes, the tiny cube's side is 1.9 cm and we can calculate the volume of the rubik's cube in two ways.

Notice that :

First method: $1.9 \times 3 = 5.7$ cm is the length of rubik's cube adge
the volume of the rubik's cube is :
$5.7 \times 5.7 \times 5.7 = 185.193\ cm^3$



the volume of the tiny cube is:
$1.9 \times 1.9 \times 1.9 = 6.859\ cm^3$

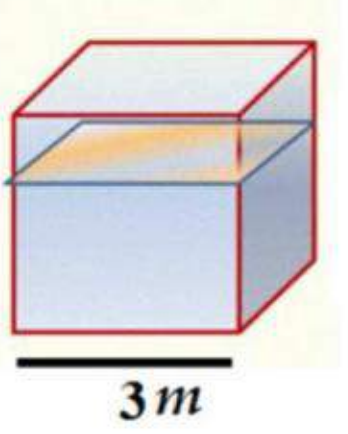
Second method: so the volume of the rubiks cube is
$27 \times 6.859 = 185.193\ cm^3$

Example (3) A cubed water tank whose edge is 3m, water is poured into it with a rate of $9m^3$ per hour. Calculate the time needed for it to be filled.

The capacity of the tank means how much water it can hold in and it is exactly the volume of the cubed tank.

$V = L \times L \times L$
$V = 3 \times 3 \times 3$
$V = 27$

So tank capacity equals; $27\ m^3$



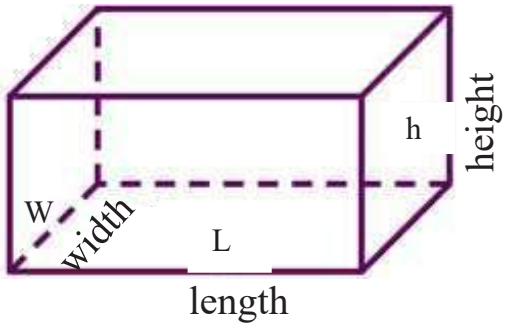
The water is poured inside the tank with a rate of $9\ m^3/h$.
So the time needed for the tank to be filled can be concluded by dividing the tank capacity by the water flow rate;

$27 \div 9 = 3$ hours

[6-2-2] Parallelepiped

A parallelepiped is a body whose both of its bases are rectangular and all of its side faces are rectangular as well. and each two opposite faces in it are congruent.
Its volume is measured as follows;
V = base area x height
V = L x w x h

Where "L" is base length, "w" is base width, and "h" is height



Example (4) Find the volume of the parallelepiped whose its dimensions are 8cm, 4cm, 3cm.

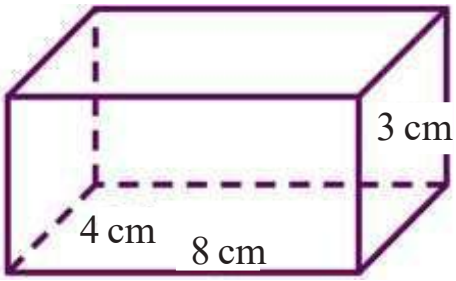
Use parallelepiped volume rule in symbols;

$V = L \times w \times h$

Substitute and simplify

$V = 8 \times 4 \times 3 = 96$

So parallelepiped volume is $96\ cm^3$



Example (5) A parallelepiped of squared base whose its edge length is 8cm and the height is 10cm. Find its volume.

Use parallelepiped volume rule in symbols;

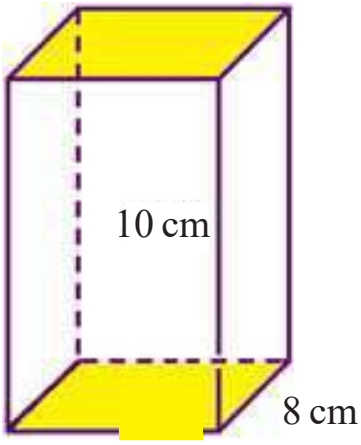
$V = L \times w \times h$

Substitute and simplify

$V = 8 \times 8 \times 10$

$V = 640$

So parallelepiped volume is $640\ cm^3$



Example (6) Fishbowl: The bowl is in the form of a parallelepiped whose dimensions are; 1.5m, 0.5m, 1m.
Find the volume of water needed to compltetely fill it.

$V = L \times w \times h$

$V = 1.5 \times 0.5 \times 1$

$V = 0.75$

So the volume of water needed to fill the bowl is $0.75\ m^3$

Make sure of your understanding

1 Find the volume of a parallelepiped whose base length is 8cm, and its width is 4cm, and height is 4cm.

2 What is the volume of a cube whose edge length is 4.5cm?

3 A parallelepiped whose height is three times its base length. If its base length is 8cm and width is 4cm. What is its volume?

Question These questions can be solved by the same way as examples 1 and 4.

Solve the Exercises

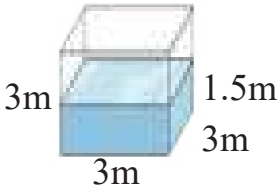
4 What is the edge length of a cube whose volume is $1000cm^3$?

5 What is the height of a parallelepiped whose volume is $48cm^3$ and base area is $12cm^2$?

6 A parallelepiped of a squared base and 10cm height. If its volume is $90cm^3$, what's the side length of its squared base?

Solve the problems

7 A cubed water tank whose edge length is 3m contains an amount of water reaching the height 1.5m. Calculate the amount of water which needs to be added for it to completely fill it.



8 Calculate the volume of the lower shadowed part of the bird house in the figure.

Think

9 Challenge: A sweets company decided to change the shape of the box from a parallelepiped with the dimensions, 8cm, 2cm, 4cm to a cubed box in a way that the box's capacity remains constant. Find the length of the edge of the cubed box.

10 Open Problem: Three cubes of edge length 5cm were put side by side. What is the resulting shape and its volume?

11 Numerical Sense: Which of the following has a better effect on the parallelepipeds volum ?
A) Doubling its base area.
B) Doubling its height.
Explain your answer with anumerical example.

Write

A general mathematical formula for the volume of the parallelepiped whose base length is (k)cm and width is half of its length and the height is three times of its base length.

[6-3] Lateral area & Total Surface area of three dimensional geometric shapes (Cube/Parallelepiped)

Idea of the lesson

Know how to find the side surface area and total surface area of the cube and the parallelepiped.

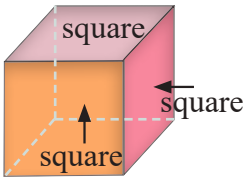
Vocabulary

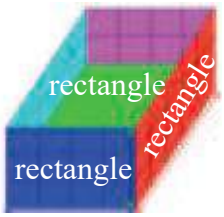
* Cube edge length
* Length
* Width
* Height.

Learn

The lateral area of a cube is the area of 4 squares. While the total area is the area of 6 squares.

The lateral area of a parallelepiped is the area of four rectangles. Each two opposite rectangles have the same area. And the total area of a parallelepiped is the area of six rectangle each two opposite rectangles have the same area. The total area is sum of lateral area and the sum of the upper base and lower base.





[6-3-1] Cube

Lateral: is the area of the four faces which are located on the sides of the geometric shape that means it is the area of four squares, so;

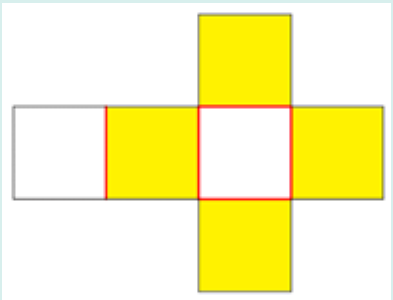
Lateral area = 4 x edge length x edge length
LA = 4 x L x L

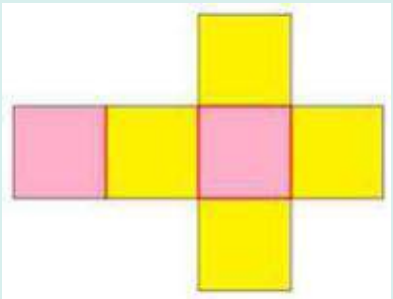
Where A is the laterl area and "L" is the cube edge length.

Total area: is the area of the six squared faces located on the surface of the geometric shape. that means it is the area of six squares, so;

Total area = 6 x edge length x edge length
TA = 6 x L x L

Where TA is the total area and "L" represents the cube edge length.



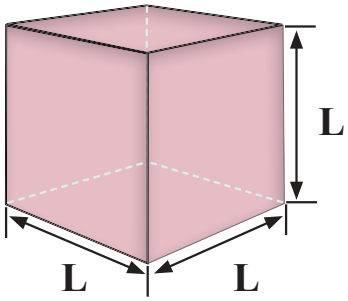


Example (1)

Find the lateral area and the total area of a cube whose edge is 12cm.

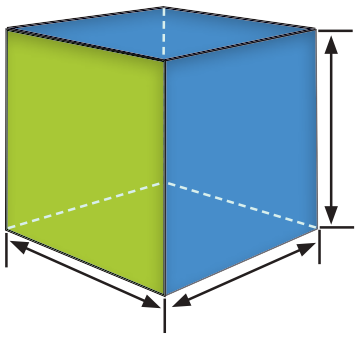
Use cube's lateral area rule by symbols
LA = 4 x L x L
Substitute and simplify
LA = 4 x 12 x 12 = 576

So the lateral area of the cube is 576cm^2
Use cube's total area rule by symbols
TA = 6 x L x L
Substitute and simplify
TA = 6 x 12 x 12 = 864
So the total area of the cube is 864cm^2



Example (2) A cube whose lateral area is $16cm^2$. Find;
1- Its edge length 2- Its volume

Write the rule of cube lateral area
LA = 4 x L x L
Substitute
16 = 4 x L x L
Use multiplication and division propety L x L = $\frac{16}{4}$
L x L = 4 simplify
L = 2
Then L(edge length) = 2cm



Write the cube's volume rule V = L x L x L
V = 2 x 2 x 2 Substitute
V =8 Simplify
V = $8cm^3$

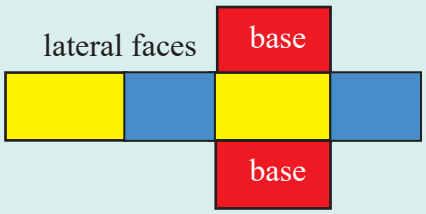
So the cube's volume is $8cm^3$

[6-3-2] Parallelepiped

Lateral Area: is the sum of areas of two couples of side rectangles.

Lateral Area = base perimeter x height
= 2 x (length + width) x height

LA = 2 x (L + W) x h



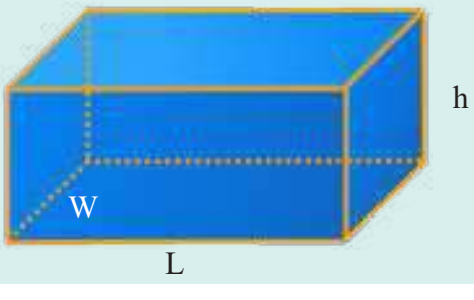
Where A represents lateral area, L is base length, W is base width and h is height.

Total Area: is the sum of areas of six rectanglar faces that represent the geometric shape surface. Or it is the sum of lateral area plus the sum of two bases' area. So;

Total Area = lateral area + two bases area

TA = [2 (L+w) x h] + [2 x L x w]

Where TA represents the total area, L is the base length, w is the base width, h is height.



Example (3) Find the lateral and total area of aparallelepiped whose dimensions are 8cm,4cm, 3cm.

lateral area rule of a parallelepiped in symbols

$LA = 2\,(L + w) \times h$

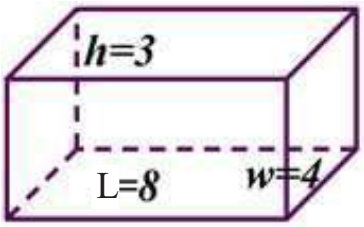
Substitute and simplify

$LA = 2\,(8 + 4) \times 3 = 2 \times 12 \times 3 = 72$

So, the lateral area of the parallelepiped is $72cm^2$

Use the total area rule of the parallelepiped in symbols;

$$T\,A = 2(L+w) \times h + 2 \times L \times w$$



Substitute and simplify

$$T\,A = 2(8+4) \times 3 + 2 \times 8 \times 4$$

$$= 2 \times 12 \times 3 + 64 = 136$$

So, the total area of the parallelepiped is 136 cm^2

Example (4) Matches box: the box is in the form of a parallelepiped whose dimensions are 5cm, 3cm, 2cm. Calculate the area of the carton board needed to make it.

$$T\,A = 2(L+w) \times h + 2 \times L \times w$$

$$T\,A = 2(5+3) \times 2 + 2 \times 5 \times 3$$

$$T\,A = 32 + 30 = 62$$

So, the area of the carton board needed to make the matches box is 62 cm^2.

Make sure of your understanding

1. A parallelepiped base length is 8cm, its width is 4cm and height is 8cm. What is its total area?
2. A cube's edge length is 2.4 cm. What is its lateral area?
3. A parallelepiped's height is three times its base length. If its base length is 8cm and width is 4cm, what is its lateral and total area?

Questions 1-2 are similar to examples 3,4

Solve the Exercises

4. A parallelepiped whose dimensions are 3cm, 5cm and 6cm. Calculate each of its lateral area and total area.
5. A parallelepiped whose base is square has edge length of 5cm. Its height is 10cm. Calculate the lateral area and total area of the parallelepiped.
6. A parallelepiped whose lateral area is $48cm^2$ and its base perimeter is 12cm. find its height.
7. A parallelepiped whose base is square has height of 10cm. If its lateral area is $280cm^2$, find the edge length of its square base.

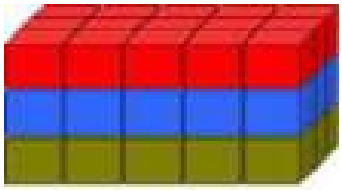
Solve the problems

8 Swimming pool: whose base dimensions are 8m, 4m and hieight is 2.5m is wanted to be paved with square pieces of ceramic with edge length 0.2m. Calculate the number of pieces needed.

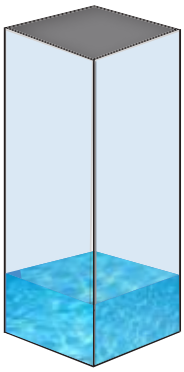
9 Furniture: A wooden locker with a frontage consisting of six drawers, rectangular and equal in area. Each drawer's dimensions are 0.5 m and 1m. If the locker's width is 2m, find its lateral and total area.

Think

10 Challenge: 45 parallelepiped wooden pieces were placed together side by side. Each parallelpiped has a square base with edge length 2cm, and height 3cm as shown in the figure. Calculate the total area of the geometric shape.



11 Open problem: Consider a parallepiped water tank with a square base and height five times of its base. If you know that the cubic volume of water inside it as $40m^3$, what is the height of the tank?



12 Numerical sense: which of the following has a greater effect on the lateral area of a parellepiped;
A- doubling its base area
B- doubling the height

Explain your answer by a numerical example.

Write

A general mathematical formula of the total area of a parallelepiped whose base length is (k) cm, its base width is a half of base length, and its height is three times of its base length.

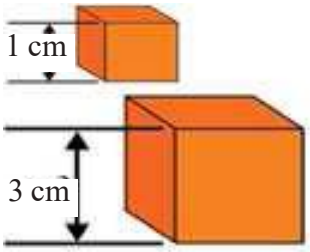
[6-4] Rate effect (scale) on the volume and surface area (Enlargement and Reduction)

Idea of the lesson
The enlargement and reduction effect of geometric shapes on their volume and surface area.

Vocabulary
* Dilation
* Dilation coefficient
* Enlargement
* Reduction

Learn

You have a cube whose edge length is 1cm and another cube whose edge length is 3cm.
- Find the volume and the surface area for both.
- Compare the volumes of both cubes then conclude the relation between them.
- Compare both areas then conclude the relation between them.



Review of concept of Extensibiliy and center of dilaation

Dilation: is the image resulting from reduction or enlargement in out a given shape. The image is smilar to the original one and has symmetrical dimensions.
The center of dilation: is one of the points in the original shape. When measuring, we fix it in order to adjust the shape measurements.
Dilation cofficient: is the ratio of the image dimensions to the original shape dimensions.

RULE 1:
If V represents the original cube volume and V´ is the new volume after magnifying the edge length by diiation coefficient k, so;
$V' = k^3 \times V = (k \cdot k \cdot k) \cdot V$

RULE 2:
If A represents the area (whether rateral or total) of the original cube (TA)´ represents the new area after magnifying the edge length by the dilation coefficient k, so;
$A' = k^2 \times A = (k.k) .A$

Example (1) We try to check these two rules using the givens in "Learn" paragraph.

Original cube volume $\Rightarrow$ $V = (L \times L \times L) = (1 \times 1 \times 1) = 1cm^3$

Total area of the original cube $\Rightarrow$ $TA = 6 \times L \times L = 6 \times 1 \times 1 = 6cm^2$

When magnifying the edge length by coefficient of dilation (3), the edge length becomes $3 \times 1 = 3$ cm $= L'$

Cube volume after dilation $\Rightarrow$ $V' = (L' \times L' \times L') \; V = (3 \times 3 \times 3) \; (1) = 27cm^3$

$(T A)' = 6 \times L' \times L' = 6 \times 3 \times 3 = 54 \; cm^2$ Total area of the cube after dilation

RULE 3 :

If V represents the original volume of the parallelepiped and V´ is the new volume of it after being magnified by dilation coefficient k, so;

$V' = k^3.V = (k.k.k) .V$

RULE 4:

If A represents the area (lateral or total) of the original parallelepiped and (A´) represents the new area after magnifying by the dilation coefficient k, so;

$A' = k^2 \times A = (k.k) .A$

Example (2) A parallelpiped of dimensions 30cm 12cm, 15cm,. A similar model was made with dilation coefficient $\left(k = \frac{1}{3} \right)$. Using the rules 3 and 4, find the volume and the lateral area of the mini model.

$V = L \times w \times h = 30 \times 12 \times 15 = 5400 cm^3$

$L A = 2 \times (L + W) \times h = 2 \times (30 + 12) \times 15 = 1260 cm^2$

$V' = K^3 .V = (k . k . k).V = (\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}) \times 5400 = \frac{5400}{27} = 200 cm^3$

$(L A)' = K^2 .(L A) = (k . k). (L A) = (\frac{1}{3} \times \frac{1}{3}) \times 1260 = \frac{1260}{9} = 140 cm^2$

Example (3) Money box: a minimized model of a money box was made in the shape of a cube whose edge length is 8cm. If greater model was wanted to be made by dilation coefficient $\frac{3}{2}$, calculate the volume and lateral area of the magnified model.

Model volume before magnifying

$V = (L \times L \times L) = (8 \times 8 \times 8) = 512 cm^3$

lateral area before magnifying

$L.A = 4 \times L \times L = 4 \times 8 \times 8 = 256 cm^2$

Volume & lateral area after magnifying

$V' = K^3 .V = (k.k.k).V = (\frac{3}{2} \times \frac{3}{2} \times \frac{3}{2}) \times 512 = 1728 cm^3$

$(L. A)' = k^2 .(L A) = (K.K). (L A) = (\frac{3}{2} \times \frac{3}{2}) \times 256 = \frac{9}{4} \times 256 = 576 cm^2$

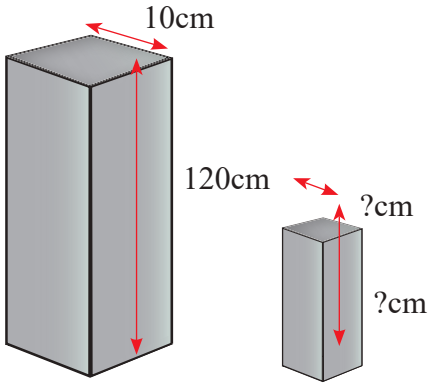
Make sure of your understanding

1 A cube whose edge length is 5cm was dilated (enlarged) by coefficient 3. Find its volume and total area after dilation.

2 A parallepiped whose dimensions are 6cm, 3cm, 9cm. Find its volume and its lateal area under the effect of dilation coefficient of $\frac{2}{3}$.

3 If you know the lateral area of a cube is 32cm^2 and that it is under the effect of reduction that its lateral area was reduced to become 8 cm^2. Find the coefficient ofdilation.

4 A piece of iron is in the shape of a parallelepiped with a suquare base which has edge length of 10cm and height of 120 cm, if reduction it by the coeffiaent $\frac{1}{10}$, find its volume after the reduction .



Questions 1-4 are similar to examples 3,4

Solve the Exercises

5 A parallelepiped with a square base of 3 cm edge length and a heigt five times greater than the edge length. Find its volume, lateral area, total area. Then find the following;

i) Its volume under the effect of dilation by coefficient 4.

ii) Its lateral area under the effect of dilation by $\frac{1}{6}$.

iii) Its total area under the effect of dilation coefficient of $\frac{1}{13}$.

6 A cube whose edge length is 1.2cm. Find its volume, lateral area and total area. Then find the following;

i) Its volume under the effect of dilation by coefficient $\frac{1}{4}$.

ii) Its lateral area under the effect of dilation by 5.

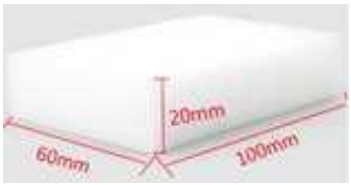
iii) Its total area under the effect of dilation coefficient of $\frac{5}{9}$.

7 If you know the total area of parallelepieped is 13cm^2 and its total area under effect of dilation (enlarging) is 52cm^2. Find the coefficient of dilation.

Solve the problems

8 A cube of ice whose edge length is 5cm melts keeping its geometrical shape under the effect of dilation coefficient $\frac{1}{5}$ in each second. Calculate the total area after the dilation.

9 The cake dough was put in a parallelepiped shaped metal mold. Its base dimensions are 30cm and 25cm. The cake dough's height was 2cm. After getting it out of the oven, its height increased by dilation coefficient 4. Calculate its volume.



10 Sponge: A piece of sponge whose bas dimensions are 100mm, 60mm,and the height is 20mm dipping into water then its dimensions are dilated by coefficient of 1.5 Calculate its total area after dilation.

Think

11 Challenge: How can you turn a cube whose edge length is 3cm to a parallelepiped with the same volume by applying two different dilation on two of its dimensions?

12 Open problem: What would the coefficient of a parallelepiped dilation be, if the exdilation effect on its dimensions was as follows;
- length with the dilation coefficient 3, width with the dilation coefficient 5, height with the dilation coefficient 7

13 Numerical sense: If we enlarge a cube under the effect of dilation coefficient of 5 then we reduced the resulting body by the dilation coefficient of $\frac{1}{3}$. What do you expect the final coefficient to be?

Write

A general mathamatical formula to find the total area of a parallelepiped. The edge length of its square base is (X)cm. Its height is three time greater than its base edge length under the effect of dilation coefficient of $\frac{1}{3}$.

[6-5] Surface area and Volume of compound three dimensional shapes

Idea of the lesson

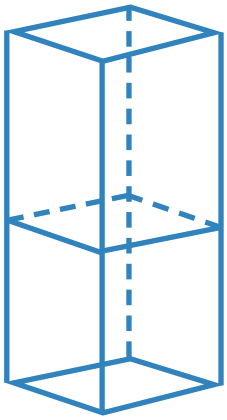
Finding the surface area and volume of compouns geometrical shapes.

Vocabulary

* Simple three dimen
*Sional shape
*Compound three dimensional shape

Learn

Two similar cubes whose each edge is 5cm were put one over the another as shown in the figure so a compound three dimensional shape was formed. It is determined. The two simple three dimensional shapes which composed it. find the surface area and the volume of the compound shape by multiplying the surface area of the compound solid and its volume.

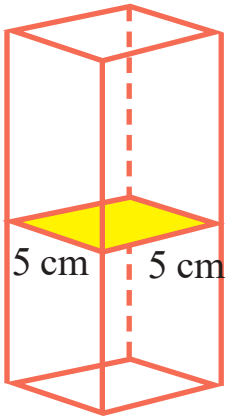


Find the volume and the surface area of a compound plane shape

Important note: When finding the surface area of a compound body. Attention must be paid to the surfaces is common between the adjacent three-dimensionals where they are counted only one.

- The compound shape is composed of two simple shapes or more. This is why we divided it to simple pieces.
- We calculate the volume and the surface area of each simple shape alone.
- We add volumes of the simple shapes get the volume of the compound.
- We add the surface areas of the simple shapes minus the common areas to get the surface area of the compound.

Example (1) We try to find the volume and the surface area of the compound shape in “leran” paragraph.



The two simple solids that form the compound are similar cubes.
The edge length of each cube is 5cm.
We find the surface area and the volume of the cube as follows;

$V = L \times L \times L = 5 \times 5 \times 5 = 125 \ cm^3$

$S A = 6 \times L \times L = 6 \times 5 \times 5 = 150 \ cm^2$

We calculate the volume of the compound shape;

$V = 125 \times 2 = 250 \ cm^3$

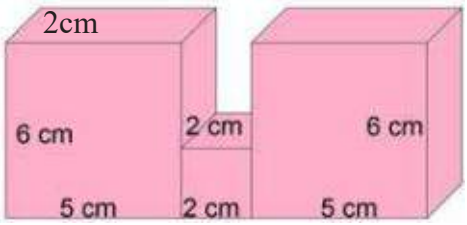
To calculate the surface area of the copmpound three dimensional shape the area of the common face must be subtracted which is the base of one of the

cubes which equals; $A = 5 \times 5 = 25 \ cm^2$
So the surface area of the compound shape is

$S A = 2 \times 150 - 2 \times 25 = 300 - 50 = 250 \ cm^2$

Example (2)

In the following figure, notice that the compound shape can be divided into three simple shap, one cube and two parallelepiped in equal dimensions.



To Callculate: The compound shape volume. We find the volume of the cube and parallelepiped volume of the cube

$V = L \times L \times L = 2 \times 2 \times 2 = 8 \ cm^3$

volume of the parallelepiped.

$V = L \times w \times h = 5 \times 2 \times 6 = 60 \ cm^3$

the total volume is = volume of the cube + 2 volume of parallelepiped

$V = 8 + 2 \times 60 = 8 + 120 = 128 \ cm^3$

Example (3)

Buildings: The building in the picture consists of 4 symmetric floors and it can be considered a compoud shape which consisting of 4 cubes placed one over on the another. If we knew the cube's edge length (which represents each floor) is equal to 2.5m .

What is the total volume and the lateral surface area of the buildings?

$V = 4 \times (L \times L \times L)$

$V = 4 \times (2.5) \times (2.5) \times (2.5) = 62.5 \ m^3$

The lateral area of the building equals (the lateral area of each floor x 4)

$LA = 4 \times (4 \times L \times L) = 4 \times (4 \times 2.5 \times 2.5) = 100 \ m^2$

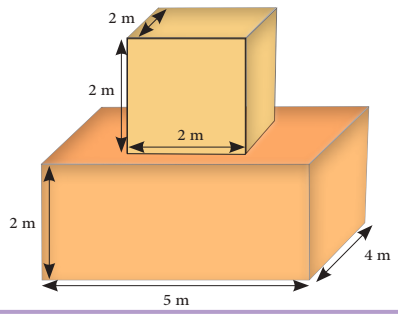
Example (4)

In near by the figure can be divided the compound solid to two simple solid shape , cube and parallelepiped

total Valume = Valume of cub + volume of parallelepiped

$= (2 \times 2 \times 2) + (2 \times 4 \times 5)$

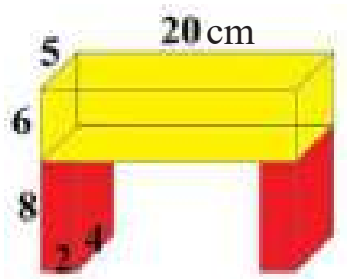
$= 8 + 40 = 48 \ cm^2$



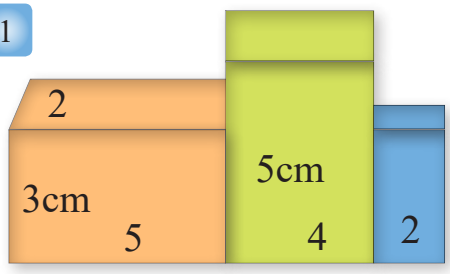
Make sure of your understanding

Find the volumes of the following compound three-dimensional shapes:

2

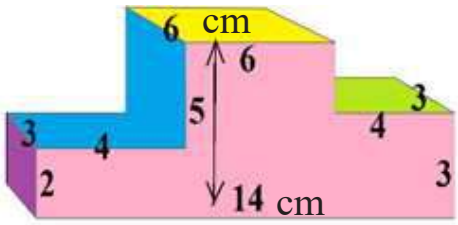


1



Questions 1-4 are similar to examples 1- 3

4



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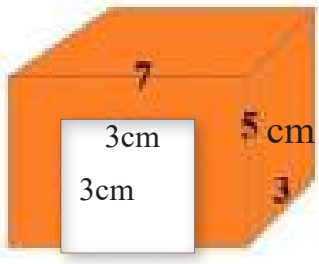
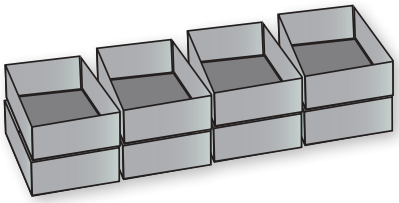


Solve the Exercises

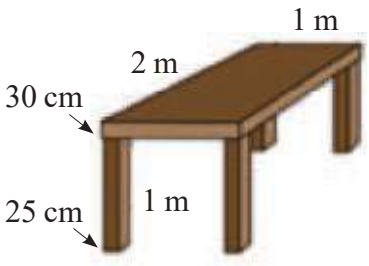
5 If you knew that the compound solid consists of 8 match boxes with the dimensions 6cm,4cm, 2cm. What is the total volume of the shape?



6 The dimensions of the upper board of the table are 1.2 m, 0.8 m, 0.1 m. The dimensions of each drawer of the six drawers are 0.8 m, 0.4 m, 0.2 m. Calculate the total volume of the table.

Solve the problems

7 A table's upper board has the dimensions 2m, 1m, 30cm. Its legs are parallelepiped. The surface of its base is squared, its edge length is 25 cm and its height is 1m.
Calculate the total volum and the surface area for the table (neglect the common areas when calculate the surface area) .



8 The following design is of a wooden table composed of theree similar wooden pieces in the shape of a parallelepiped. The dimensionss of each piece are 60cm, 40cm, 15cm. Calculate the total volume in which represents the three pieces .

Think

9 **Challenge:** Try to draw a regular compound three-dimensional shape on graph paper, composed of three parallelpiped shapes of different volumes, suppose dimensions to them of your choice, then find the volume of the shape and its surface area.

10 **Open Problem:** How can you estimate the volume of a compound three-dimensional shape of irregular simple three-dimensional shapes?

11 **Numerical Sense:** A compound theree-dimensional shape made of paving a number of wooden cubes whose each edge is 2cm. If its dimensions are 10cm, 4cm, 2cm how many cubes are there?

Write

A methematical formula for the volume of a compound theree-dimensional shape composed of k number of cubes arranged one over the other, their edge length is n cm.

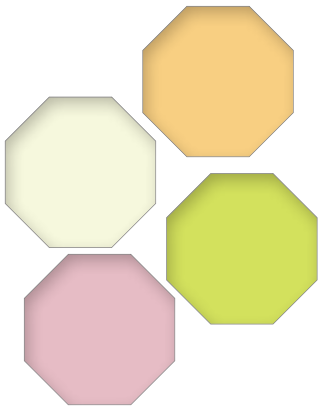
[6-6] Paving Area

Idea of the lesson
Determining which of the regular polygons can be used as a surface paving unit.

Vocabulary
* Regular polygon
* Regular polygon
*diameters
* Pentagon-hexagon, heptagon...
*Paving, Paving Area

Learn

Draw a regular octagon on pieces of colored carton and use the scissors to make a number of different colored octagons.



Try to arrange them on top of a table, all together, without leaving spaces between them. Try it again with a regular hexagon.
Think why you could arrange the pieces of the regular hexagon while you couldn't do it with the regular octagon pieces.

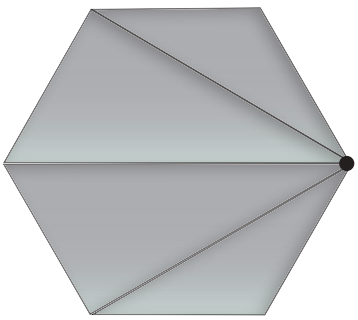
[6-6-1] Regular Polygon , Diagonals Angle Measuring

The Regular Polygon : Is a polygon whose dimensions are equal in length and has congruence angles just like the equilateral triangle and the square. The diagonals of the regular polgon are drawn a straight line linking two non - contiguous vertices (points).
Polgon Angle Measurement = (the numberof its sides -2) × 180° divided by the number of sides.

$$\theta = \frac{(n-2)\times 180^{\circ}}{n}$$

Example (1)

We try to find the measure of each angle in a hexagon as follows:
We choose one of its points and starging from it we draw all possible diagonal which are there.



We count the number of triangles formed which are four regular triangles.

Since the sum of triangle angles is 180° so the number of angles in a hexagon is 4 × 180° = 720°

We calculate the measurement of each angle by dividing the sum of a hexagon's angles by the number of angles:
720° ÷ 6 = 120°
So the measure of each angle in a hexagon is 120 degrees.

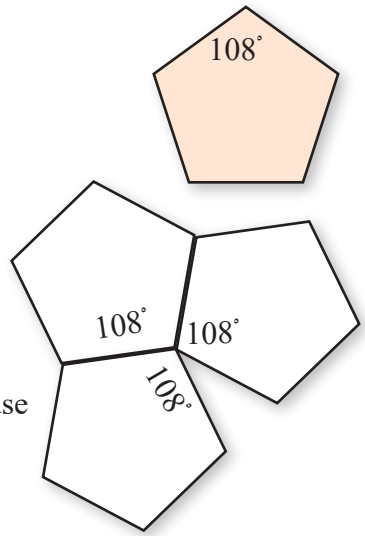
[6-6-2] Paving and Paving Area

- The process of arranging polygons side by side with a specific pattern in such a way that the whole area worked on is covered without any overlapping or left out spaces is called. (Paving)
- In order for the paving process to be done correctly the measure of the angles meeting while paving must be 360 degrees.
- In order to made a decision about whether a regular polgon is suitable or not for paving if you dive 360 degrees by the measure of the regular polgon angle, the result must be an positive integer and without a remainder.
- The number of pieces of a regular polygon basically used in paving is determined by dividing the area needed to be paved by the area of the unit used in paving. (a ceramic piece for example) Which usually has constant measurements.

Example (2) Can the floor of a room be paved by using pentagonal pieces of ceramic? Explain why.

1. First step the pentagonal angle is measured by this way:

$$\theta = \frac{(n-2) \times 180^\circ}{n} = \frac{(5-2) \times 180^\circ}{5} = \frac{540^\circ}{5} = 108^\circ$$



2. Second step divide 360° by 108°

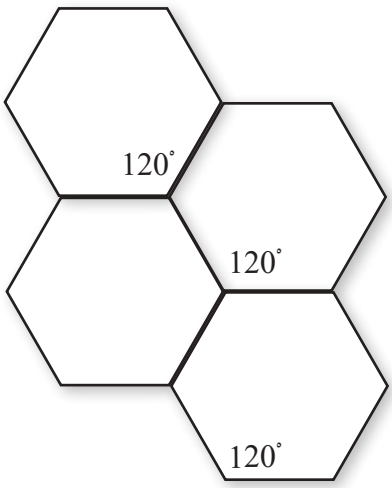
$$\frac{360^\circ}{108^\circ} = 3.3$$

Where the division result is not an integer, it is not possible to use pentagonal pieces in paving because the measure of the angles meeting in paving is less than 360 degrees.

Example (3) Can the floor of a room be paved by using hexagon pieces of ceramic? Explain why.

1. First step The hexagon angle is measured this way:

$$\theta = \frac{(n-2) \times 180^\circ}{n} = \frac{(6-2) \times 180^\circ}{6} = \frac{720^\circ}{6} = 120^\circ$$



2. Second step Dive 360° by 120°

$$\frac{360^\circ}{120^\circ} = 3$$

Where the division result is an integer, it is possible to use hexagon pieces in paving because the measure of the angles meeting in paving is equal 360 degrees.

Make sure of your understanding

Questions 1-3 are similar to examples 1- 3

1 Find the angle measurement of a regular polgon of 12 sides.

2 Can the walls of a kitchen be paved with triangular pieces of ceramic? Explain why.

3 A rectangular wall whose dimensions are 3.6 m, 3m, should be decoreted by being paved with squared pieces of mosaic with a side length of 60 cm. Calculate the number of pices needed.

4 A squared bathroom floor of side length 2m is wanted to be paved with rectangular pieces of ceramic whose dimensions are 0.5 cm, 0.25 cm. Calculate the number of pieces needed.

5 A paving worker matches 4 pieces of squared paving cobble the side length of each of them is 25 cm, as shown in the figure, If the area needed to be paved is in the shape of a rectangle with the dimensions 6 m, 8 m. Calculate the number of the needed pieces in two ways; the first is by taking the arrangement of the cobble in consider in such a way that the shape is exactly as it is in the figure. The second is without giving importance to that. What is your conclusion?

Solve the Exercises

6 Draw a regular heptagon with all of its possible diagonals. How many triangles would you have?

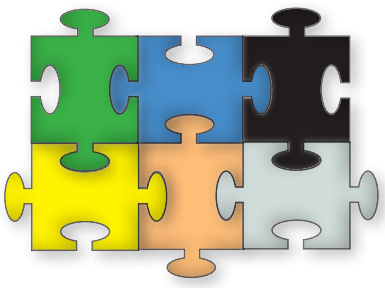
7 Find the angle measurement for each of the following regular polygons if you knew the number of their sides are:

i) 7 sides (heptagon)
ii) 8 sides (octagon)
iii) 25 sides

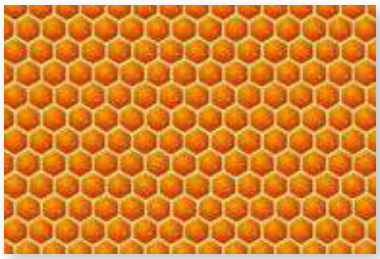
8 Can paving be acheived using the pieces of ceramic described below:

i) Regular polygon of 9 sides.
ii) Regular polgon of 10 sides.
iii) Regular polgon of 11 sides.

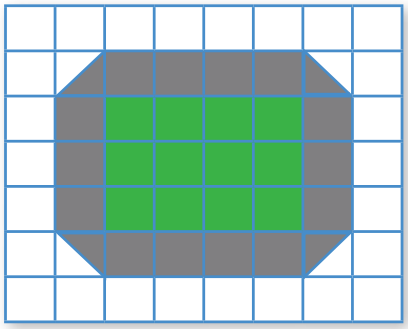
9 If the area of a coloured puzzle piece is 4 cm^2. How many pieces do we need in order to cover the surface of a rectangular table with the dimensions 30 cm, 40 cm in such a way that the extras in the permeter are cut and stuck to their suitable places in the blanks left.



Solve the problems



10 A bee cell in the form of a regular hexagon with an area of 25 cm^2. If the board that carries the cells is rectangular and its dimensions are 40 cm, 60 cm. How many cells does it carry?



11 A house owner wants to surround his rectrangular shaped garden (with the dimensions 3 m, 4 m) with squared pieces of coloured ceramic whose suface is $1m^2$ in a way that there won't be any acute edges (using a trianglular piece with an area half of that of the piece and a shape of a right triangle) as shown in the figure. It turned out that he needs 16.
How much would another house owner need if his garden's dimensions were 5 m, 6 m ?

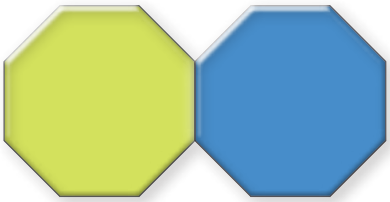
12 A rectangular wall whose dimensions are 9 m, 18 m contains two windows each in the shape of rectangle with dimensions 1 m, 0.25m, on top of it half a circle whose area is 0.5 m^2. It should be paved using pieces of hexagon mosaic, the area of each piece is 2.14 m^2. Calculate the number of mosaic pieces needed.

Think

13 Challenge: Can Ali used eqailateral triangle pieces of ceramic to cover the floor ? explain your answer.

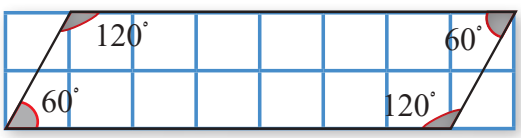
14 Open Problem: K is the number of regular polygons. Conclude a rule to find the number of diagonals of the polygon by taking four consecutive values of K.

15 Numerical Sense: Without using paper and pencil guess whether the followings in the shape of a regular octagon can be used in paving?



Write

How the parallelogram in the figure can be used in paving the floor of a room?



Chapter Test

1. Let ABCD be a rectangle whose vertices are A(-2,6) , B(2,6), C(2,-4), D(-2,-4) draw it and find its area, then draw an expansion to it where the center point is at the origing and the coefficient is $\frac{1}{2}$ and find its area as well.

2. A cube's volume is 125 cm^3, find its edge length.

3. A parallelepiped volume is 96cm^3, if its base area was 12 cm^2 what is its height?

4. A parallelepiped with a squared base, its height is 12 cm, if its volume is 768 cm^3, what's the length of its squared base side?

5. Find the volume, lateral area, and total area of a cube whose edge is 7cm.

6. Find the volume, lateral area and total area of a parallelepiped whose base dimensions are 15 cm, 10 cm, and its hight is 20 cm.

7. A cube whose edge is 4 cm. Find its original volume and its volume under the effect of dilation with coefficient $\frac{2}{3}$.

8. A cube whose side is 4cm. Find its original total area and its total area under the effect of expansion with coefficient 4.

9. If you knew that the total area of a parallepiped is 17 cm^2, and the total area under the effect of dilation (enlargement) is 153 cm^2, calculate the coefficient of adilaition.

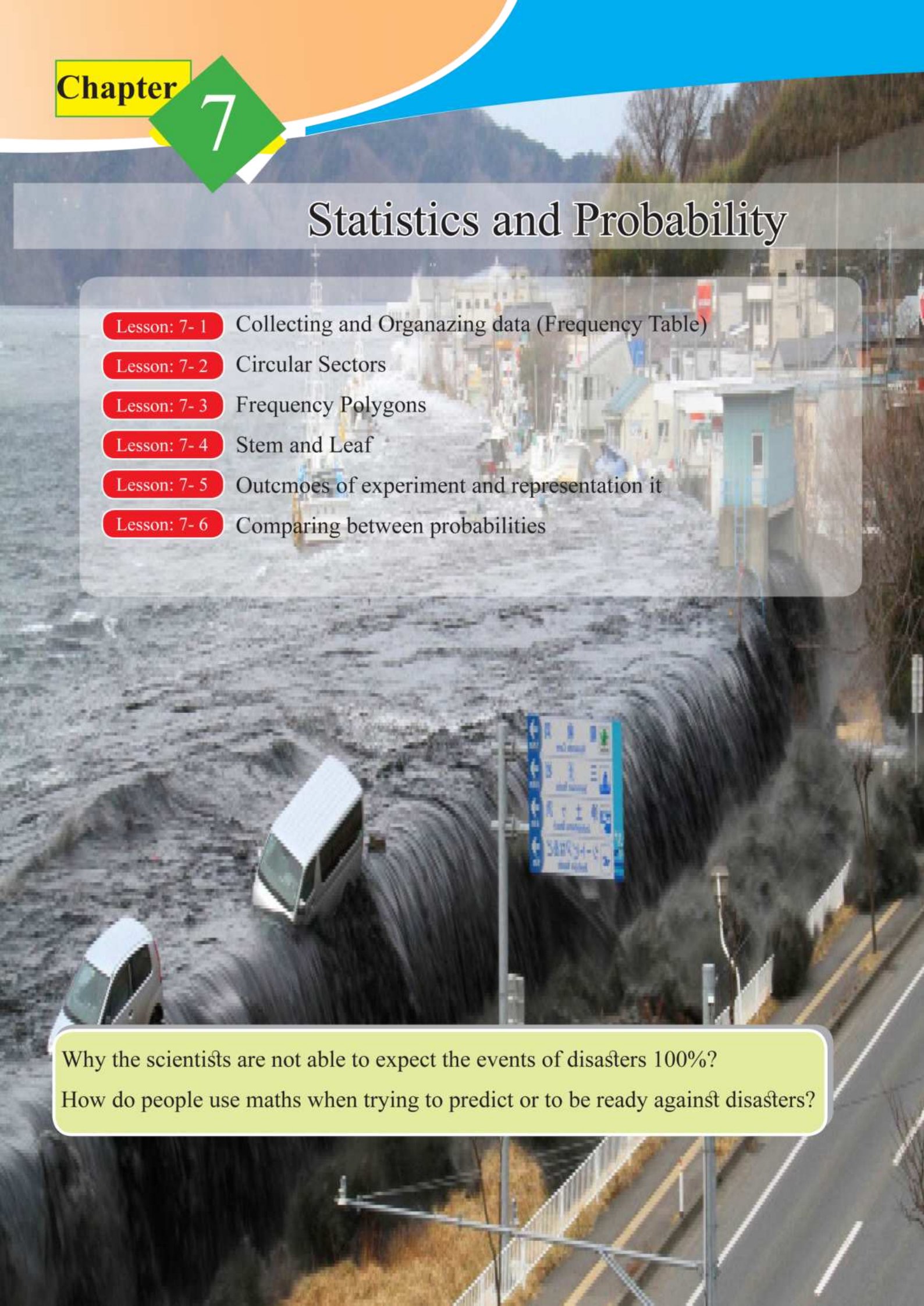
10. Can the floor of aroom be pave of by , using pieces of regular octagon cobbles? clarify that

11. A stereophonic compound composed of 8 corresponding cubes, whose each edge is 10 cm, and 4 parallelepiped of similar dimensions 6cm, 4cm, 2cm. Calculate the total volume of the stereophonic solid.

12. Abdulla wants to pave a squared corridoor whose side is 9m with a squared cobble. The area of one cobble is 0.25 m^2. Calculate the number of cobble needed to finish the paving process.

Chapter 7

Statistics and Probability



Why the scientists are not able to expect the events of disasters 100%?

How do people use maths when trying to predict or to be ready against disasters?

Pretest

1 If there were in of Muhannad farm 9 tress of apples, 13 trees of fig, 4 trees of almond and 7 trees of plam. Represent these data using signal counting in a table.

Use the data which is given in the table which represents the max speed of some animals to answer the following questions:

Animal	km/h Speed
Lion	80
Rabbit	56
Elephant	40

2 Which of the animals is the fastest?

3 Which of the animals whose speed is 40 km/h ?

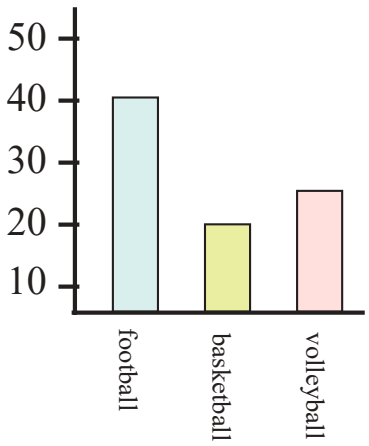
4 Which of the animals is the slowst, the lion or the rabbit ?

Write each of the following fractions as a percentage ratio:

5 $\frac{70}{100}$ 6 $\frac{3}{20}$ 7 $\frac{13}{4}$ 8 $\frac{6}{5}$

9 Arrange the following numbers in ascending order. 22 ، 15 ، 30 ، 20 ، 31 ، 11 ، 18 ، 20

Using the beside data graph which represents the sport activity of students in one of the school in aspecific year to answer the following questions:



10 Which of the activities do the students prefer ?

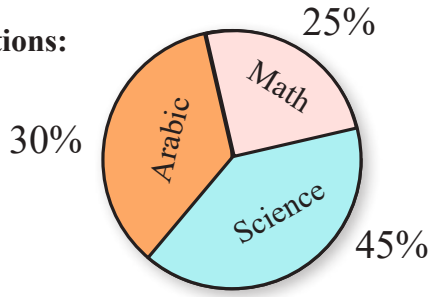
11 Arrange the prefered activities in order.

12 How many students do prefer basketball?

Write each of the following percentage ratio as a decimal form:

13 13% 14 7% 15 20%

Use the given circule graph data to answer the following questions:



16 What is the percentage ratio of Science subject?

17 What is the angle which represents the Math sector?

18 What is the sector which its persentage ratio is 30%?

[7-1] Collecting and Organizing Data (Frequency Table)

Idea of the lesson
Collect the data and tabulate into frequency table

Vocabulary
Frequency table

Learn

The teacher of Math collected data of twenty weights of students of first intermediate stage, the weihts approximaed up to kilogram as follows:

47 , 47 , 43 , 46 , 43
44 , 45 , 47 , 44 , 47
44 , 46 , 47 , 46 , 45
47 , 44 , 47 , 48 , 44

i) What is the max. weight among the weights of students?
ii) What is the min. weight among the weights of students?
iii) What is the number of students which weightt 47 kg. ?

Collecting and Organizing Data

To answer the above questions, easily, we need some time to represent them in frequency table. where each value that apears in data will indicate the number of occurence. It will help me to show data easily.

Example (1) **Arrange the data which the teacher of Math collected into a frequency table:**

Step 1:
Organize the data in an ascending order:
43, 44, 45, 46, 47, 48

Step 2:
Use the signal of counting (||) to count the recurs in every value of step 1

43 ⟹ || 44 ⟹ 𝍸 45 ⟹ ||
46 ⟹ ||| 47 ⟹ 𝍸 || 48 ⟹ |

Step 3:
Construct the frequency table.

Weights	Counting Signal	Frequency
43	||	2
44	𝍸	5
45	||	2
46	|||	3
47	𝍸 ||	7
48	|	1

Step 4:
Use the frequency table and answer the following questions:

i) The max. weight among, the weights of students is 48 kg.

ii) The min. weight among, the weights of students is 43 kg.

iii) The number of students, which weights each of them 47 kg. is 7 students.

Example (2) Construct a frequency table for the marks of a test . Using the following sets:

65 70 83 99 88 78 85 90 50 73
69 63 79 98 86 80 75 55 95 73

i) less than 70, 70-79, 80-89, 90-99.
ii) What is the number of students which they got 80-89?
iii) What is the number of students which they got less than 70?

When the data number is large or the difference between the max. and min. values is large, we construct a frequency table that contains classes to simplify the data expression.

i) The class 70-79 contains all marks of student which lies between 70,79. The number 70 is called lower limit of the class.
The number 79 is called the upper limit of the class, and so on for the rest classes.

- The class 70-79 includes any value of the following :

70, 73, 76, 77, 79 and the number of elements is 5.

- Construct a frequency table containing two columns the first contains the classes and the second contains the frequency.

ii) Number of students which have marks 80-89 is 5 students.
iii) Number of students which have marks less than 70 is 5 students.

class	frequency
less than 70	5
70-79	6
80-89	5
90-99	4

Example (3)

Weather: In one of the months of winter in Baghdad the max. tempratures were recorded for several days as follows:
35, 30, 29, 33, 30, 30, 28
34, 28, 33, 35, 30, 28, 29

i) Represent the data as a frequency table.
ii) What is the max. temparature?
iii) What is the min. temparature?
iv) How many days were the temparature 30^{0}C ?
Represent the data a frequency table of the following:
i) Arrange the data in ascending and evaluate the frequency of each value.
ii) Max temparature was 35 ^{0}C
iii) Min temparature was 28 ^{0}C
iv) The number of days which were the temparature 30^{0}C was 4 days.

max. temp. ascending	frequency
28°	3
29°	2
30°	4
33°	2
34°	1
35°	2

Make sure of your understanding

Question 1 is similar to examples 1, 3

1 Arrange the following data in a frequency table:

2, 2, 1, 6, 2, 3, 5, 5, 1, 2, 6, 5, 4, 6, 1, 3, 1

Measurement: The following represents the heights of 16 first class intermediate students centimetres as follows:

151, 137, 149, 136, 146, 148, 145, 134

149, 135, 137, 144, 136, 131, 141, 138

Construct a frequency table of height of students using the following sets:

Questions 2-4 are similar to example 2

2 Less than 140, 140-145, 146-151.

3 What is the number of students which their heights are less than 140 cm ?

4 What is the number of students which their heights are between 140,151 cm?

Solve the Exercises

5 Arrange the following data in a frequency table

2, 3, 1, 4, 3, 3, 6, 5, 1, 2, 4, 6, 1, 3, 2, 5

A scientist researched on 10 volunteers their sleeping time and concluded the outcomes:

365, 435, 380, 460, 400, 425, 440, 490, 500, 501

6 Use the results to construct the frequency table using the following sets:

Less than 400, 400-450, 451-501

7 What is the number of volunteers which is less than 400?

8 What is the number of volunteers which is within 451-501?

Solve the problems

Workers: The following data represent the ages of few workers in one of the companies:

53, 52, 45, 29, 45, 27

27, 31, 50, 32, 30, 47

9 Construct a frequency table for the given above data.

10 What is the number of the youngest age of workers and what is the number of the oldest age?

11 What is the number of workers whose each age is less than 30 years?

12 What age is recured most than others among the workers in the company?

Health: The following data represent the weights of twenty babies in kilogram

30, 16, 20, 30, 26, 22, 33, 19, 24, 15

32, 26, 18, 27, 31, 25, 32, 23, 21, 19

13 Construct a frequency table using the following sets:

15-19, 20-24, 25-29, 30-34.

14 What is the number of babies their weights are less than 30 kg. ?

15 What is the number of babies their weights are between 30-34 kg. ?

Think

16 **Challenge:** If the number of goals that been attained in football games were as follows:

4, 5, 3, 2, 2, 2, 1, 0, 1, 6, 4, 5, 2

17 Look at those data ascenging from 0-6, taken three equal times, and then construct frequency table.

18 Can we display the same data by using the frequency table and signal of counting?Explain your answer .

Write

A problem from the life fact which can be solved by frequency table.

[7-2] Circular Sectors (Pie charts)

Idea of the lesson
Representation of data by means of circular sectors and to explain them

Vocabulary
Graph circle
Sector

Learn

One of the students in college of Agriculture reconnoitered among animals breeding. in countryside homes, so he found that 75% they breed chickens, 15% breed dogs and 10% breed cats. How does the student show his conclusion of recon number.

Circle Graph (Pie chart)

Circle graph is the best choice to represent the percentage, because it shows clearly the area of the sectors and the comparison among them.

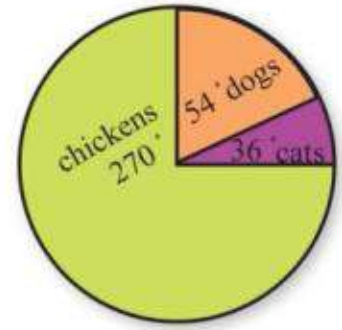
Example (1) Find the value of each angle.

Step 1:

Angle value of chickens sector: $\frac{75}{100} \times 360^\circ = 270^\circ$

Angle value of dogs sector: $\frac{15}{100} \times 360^\circ = 54^\circ$

Angle value of cats sector: $\frac{10}{100} \times 360^\circ = 36^\circ$



Step 2:

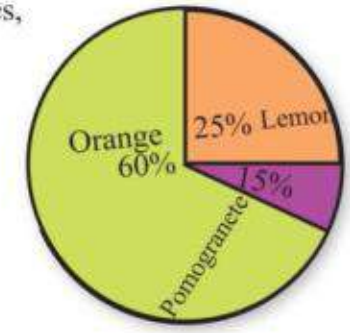
We draw the circle graph by using a compass, protractor and ruler, by starting from a certain raduis, to draw the sector of each sector.

Step 3:

Give a name to each asector and colour it

Example (2)

Agriculture: A farm contains 200 trees the given pie chart shows the percantage of each species. Find the number of each species of trees, then answer the following :



i) Which of the species of trees has a least number of trees?

ii) Which of the species of trees has a number greater than half of the whole number of trees in the farm.

iii)Which of species has a percentage 25%?

Find the number of trees for each type

Number of orange trees : $\frac{60}{100} \times 200 = 120$

Numuber of Lemon trees : $\frac{25}{100} \times 200 = 50$

Numuber of Pomegranate trees : $\frac{15}{100} \times 200 = 30$

i) The least number of trees is the trees of pomegranates (30 trees)

ii) The number of trees that is greater than one half of the whole is the trees of oranges (120>100)

iii) The trees which its percentage 25% is trees of lemon

Example (3)

The table beside shows the results of favourite colours by some students.
Draw a circle graph which represents the given data in the table.

poll subscribtion	
no. of students	favourite colour
6	blue
15	red
9	green

Step 1 : Find the sum of the number of the studentes

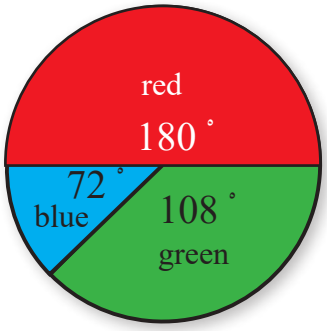
$$6 + 15 + 9 = 30$$

Step 2 : Find the angle of each sector:

sector angle value of blue coloured sector: $\frac{6}{30} \times 360^\circ = 72^\circ$

sector angle of red coloured sector: $\frac{15}{30} \times 360^\circ = 180^\circ$

sector angle of green coloured sector: $\frac{9}{30} \times 360^\circ = 108^\circ$



Step 3 : Draw the circle graph and name of each sector and colour it.

Example (4)

Survey : The following table shows the opinions of 40 persons dealing with their favourite hobbies.

favourite hobbies	
percantage rate	hobby
15%	reading
5%	computer games
55%	walking
25%	swimming

i) How many persons do they prefer walking?

ii) What is the sector angle of swimming sector?

Number of persons who prefer walking: $\frac{55}{100} \times 40 = 22$

The angle of swimming sector: $\frac{25}{100} \times 360^\circ = 90^\circ$

Make sure of your understanding

Use the given table and draw the circle graph.

Set of compact disc of muhammad	
Educational programmers	40%
language dictionary	5%
Art programes	30%
Luxury games	25%

1 Which of the discs represents an angle 90° ?

2 Which of the discs has a ratio 30% ?

If Muhammad had 20 compact disc (CD) use the table in question 1 and find the number of CD of each species and then answer the following:

Questions 3-6 are similar to examples 2-4

3 Which of the CD is the least in number?

4 Are the luxury game discs greatest in number?

5 What is the number of discs which represent the luxury games?

6 What is the value of angle which represents the luxury games sector?

Solve the Exercises

Newspaper: The given table shows the newspapers that a group of persons prefer

Prefered News	
News	Number
Sport	7
News	3
Advertisement	5
Economic	4
Other	1

7 Represent the data of the table in a circle graph, and then answer the followings:

8 Which of the newspapers has a ratio of 35% ?

9 What is the angle of the advertisement news sector ?

Time: A student spends 10 hours with his family as shown in the table below.

10 Represent the data as circle graph.

The time of which the student spends with his family	
food	35%
watching TV	25%
Conversation	15%
Sport	25%

Answer the followings:

11 Which of the times has the same percentage?

12 Which of the time has an angle of sector 54°?

13 What is the angle of sport sector?

14 How many hours does the student spend his time in conversation ?

Solve the problems

Weather: The following table shows the monthly average of temperature in one of the resorts of Iraqi Kurdistan.

15 Represent the given data as a circle graph and answer the followings:

The month average of the temp.	
Month	**Average**
February	10
March	19
April	15.5
May	22.5
June	23

16 What is the percentage of temperature in May?

17 Which of the months has an angle its sector 92^{o} ?

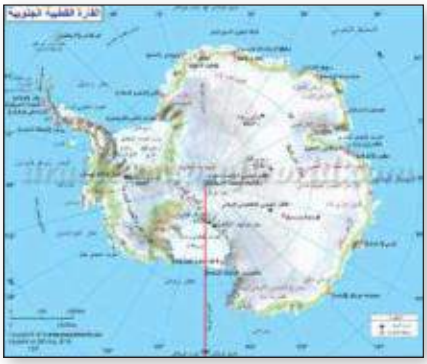
18 What is the angle of sector February ?

19 Which month has a percentage equals 25%?

Think

20 **Challenge:** Some of people which have swimming hobby, prefer walking instead of swimming. Accordingally the value of their sector angle became 216°: What is the number of those people ?
Use table in Example 4

21 The approximate area of the land of the earth is 150 million square kilometers. The area of South Pole Continent is 10% of the area of the land. Find the area of the South Pole continent approximately.



Write

Aproblem from your life fact that can be solved by using circle graph.

[7-3] Frequency Polygons

Idea of the lesson

Representing data by frequency polygons

Vocabulary

Frequency polygon
Center of class

Learn

The data below in F.T. represents the interest of one of mini-markets approximated to thousand dinars within thirty days.

Frequency	Class of interest
5	6 - 10
11	11 - 15
8	16 - 20
6	21 - 25

How can I help the dealer to extract a new information from the given original data of the table?

Frequency Polygons

Frequency Polygons: It is one of the methods to extract new informations about the original data. It is a number of segments which join the points whose components are the center of classes and the frequency.

Center of class: It is the sum of lower limit upper limit of the class divided by 2.

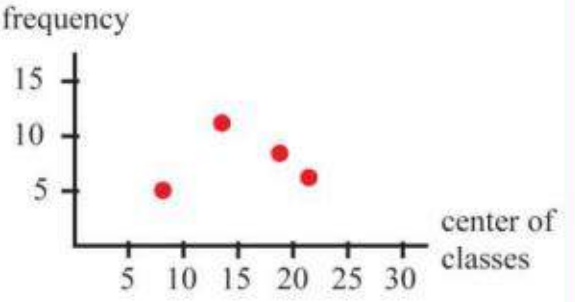
We usually join the ends of the polygon with x-axis, so we join the beginning with a certain center of classes which lies on the left of the first class and its frequency is zero, while the end of the polgon joinds the mid-mark which lies on the right of the last class on x-axis, and its frequency equals zero too.

Example (1) **Represent the data as a paragraph (learn) by frequency polygons.**

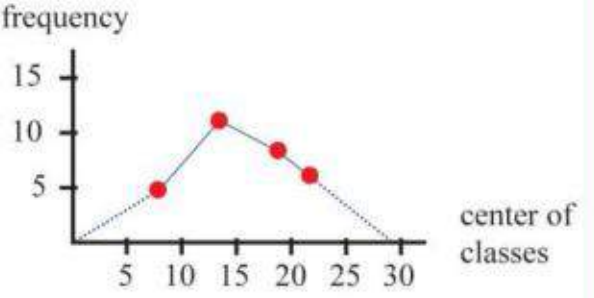
Step 1: Construct the following table:

Frequency	Class of interest	center of classes	Points
5	6 - 10	$\frac{6+10}{2} = \frac{16}{2} = 8$	(8 , 5)
11	11 - 15	$\frac{11+15}{2} = \frac{26}{2} = 13$	(13 , 11)
8	16 - 20	$\frac{16+20}{2} = \frac{36}{2} = 18$	(18 , 8)
6	21 - 25	$\frac{21+25}{2} = \frac{46}{2} = 23$	(23 , 6)

Step 2: Draw two perpendicular gradated co-ordinates which the x-axis represents center of classes and the y-axis represents the frequency, and then determine the points



Step 3: We joing those points by segtments by using a ruler, to get the given figure



Step 4: The polygon description : We see through the frequency polygon that the interest increases up to first 15 days and then it decreases after 13 days.

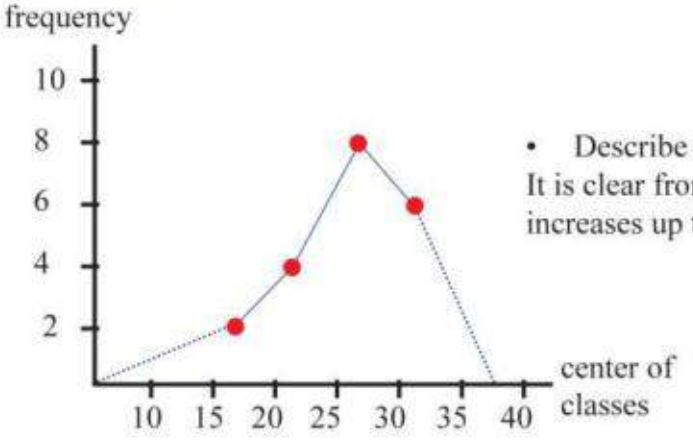
Example (2)

Represent the given data by frequency polygon and describe the changes that occur to data.

- We construct the following table using the given data in the given example:

Frequency	Classes	center of classes	Points
2	15 - 19	$\frac{15+19}{2} = \frac{34}{2} = 17$	(17 , 2)
4	20 - 24	$\frac{20+24}{2} = \frac{44}{2} = 22$	(22 , 4)
8	25 - 29	$\frac{25+29}{2} = \frac{54}{2} = 27$	(27 , 8)
6	30 - 34	$\frac{30+34}{2} = \frac{64}{2} = 32$	(32 , 6)

Frequency	Class
2	15 - 19
4	20 - 24
8	25 - 29
6	30 - 34



- Describe the data from the above table.

It is clear from the frequency polgyon that the data increases up to 25 and starts to descend.

Make sure of your understanding

1 Represent the data in frequency table by frequency polygon and describe the changes which occur to the data:

Class	5 - 9	10 - 14	15 - 19	20 - 24
Frequency	6	8	11	7

Health: The following table indicates the weights of twenty tow babies in kilograms.

Class of weights	15 - 21	22 - 28	29 - 35	36 - 42
Frequency	4	6	8	4

2 Represent these data by frequency polygons.

3 Describe the changes which occur to these data.

Questions 1-3 are similar to examples 1 -2

Solve the Exercises

Sport: The following table shows the results of eighteen sports men in high jumping game

High jumping	11 - 20	21 - 30	31 - 40	41 - 50
Frequency	3	4	7	4

4 Represnt these data by frequency polygon.

5 Describe the changes that occur to these data.

6 Represent the data of frequency table by frequency polygon and describe the changes which occur to these data.

Classes	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45
Frequency	11	16	19	14	5

Solve the problems

Learn: The following data represent the number of first class intermediate students which they memorized Surats of Kuran Karim. They are classified into classes which represent the number of surat.

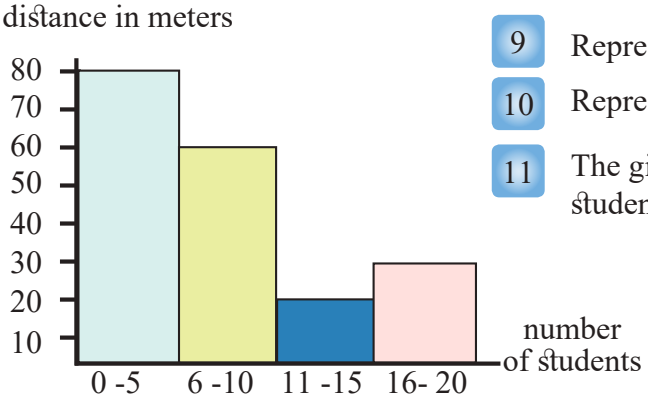
Classes	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30
Frequency	6	7	12	4	3

7 Represent these data by frequency polygon.

8 Describe the changes that occur to those data.

Think

Challenge: Number of pages of a chapter from a story is (35) pages, they are divided equally by 5 groups to read, number of elements of groups are 4, 3, 5, 2, 6 respectively.



9 Represent these data by frequency table.

10 Represent these data by frequency polygon.

11 The given bar diagram represent the distances of some students› houses from their school in meters.

12 Represent these data by frequency table.

13 Represent these data by frequency polg.

Basketball: The frequency table shows (28) sportsmen playing a basketball.

Classes	10 - 20	21 - 31	32 - 42	43 - 53	54 - 64
No. of sportsmen	3	4	4	9	8

14 Represent the data as frequency polygon.

Write

The steps of data representation by a frequency polygon.

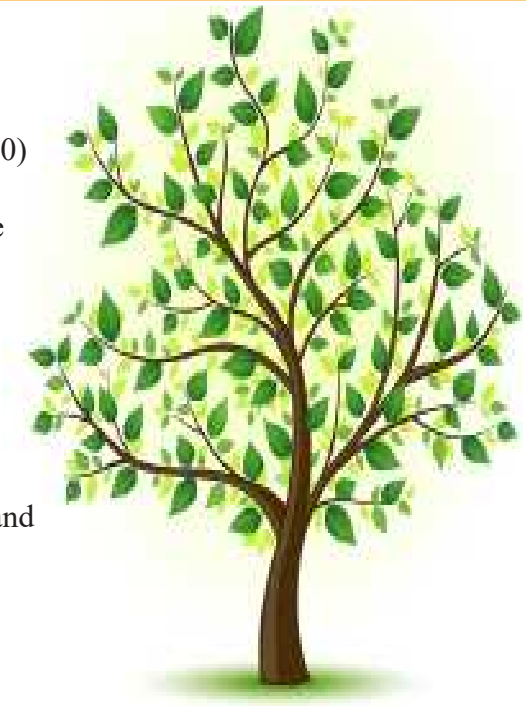
[7-4] Stem and Leaf

Idea of the lesson:
- Representing the data by stem and leaf.

Vocabulary
- Stem
- Leaf

Learn

One of the specialists studied gathering data of weights of (20) students in intermediate stage, approximated to kilogram. The results were as the following:



39 42 42 40 38 39 42 41 38 42
42 43 39 42 40 40 41 41 42 39

i) What is the maximum weight among these students, and what is the max frequency?
ii) What is number of students that weigh each 38 kg. ?

Stem and Leaf

Representation by stem and leaf, arranging the data from smallest to greatest. The leaves represent the unit which has low value, while the stem represents the digits the greatest common place value.

Example (1) **Use the representation of steam and leaves to show the data.**

Step 1: Note that the data consists of two digits, so the tens place represents the stem and the ones place represents the leaves. Choose the stems by using the number 3,4 (tens place).

Step 2: Make the following table which consists two perpendiculars, stem and leaves.

- Write the stems on their perpendicular from smallest to greatest. (tens)
- Write the leaves of every stem on the right even if they are repeated. (ones)

tens place	Leaves (ones place)
3	9 8 9 8 9 9
4	2 2 0 2 1 2 2 3 2 0 0 1 1 2

Step 3: Arrange the leaves from smallest to greatest, event if they are repeated.

Stem	Leaves
3	8 8 9 9 9 9
4	0 0 0 1 1 1 2 2 2 2 2 2 2 3

Step 4: By using the table answer the questions.

Note that the stem 4 has the most number of leaves which contains 14 leaves.
The leaf 2 in the stem repeated 7 times, so the weights 42 was the max. frequency and 43was the greatest weights.

Note the stem 3 has 5 leaves, leaf 8 in stem 3 repeated twice, therefore the number of the students which their weights 38 kg. is two only.

Example (2)

The following table shows the height of some trees in a farm in meters.

i) Use the table to represent the data by stem and leaves.

ii) What is the number of trees which their heights are less than 18 m?

iii) What is the number of trees which their each height is 20m?

Height of trees in meters				
20	8	20	9	15
11	18	25	14	10

Use the representation of stem and leaves to show the data.

- Number of trees which their heights less than 18 m is 6 trees.
- The leaf 0 in stem 2 repeated twice.
  So the number of trees which their height 20m is 2 trees.

Stem	Leaves
0	8 9
1	0 1 4 5 8
2	0 0 5

Example (3)

Speed: The below table shows the speed of cars in kilomter per hour on a road.

i) Represent the data by stem and leaf.

ii) What is the number of cars which their speed is 74 km/hr ?

iii) What is the number of cars which their speed is greater than 65 km/h?

iv) What is the min. speed among these cars?

i)

Car speed				
65	72	76	68	65
59	70	69	71	74
68	65	71	74	69

ii) Number of cars which their speed 74 km/h is 2 .

iii) Number of cars which their speed is less than 65 km/h is 1 cars .

iv) The minimum speed among the cars is 59 km/h.

Stem	Leaves
5	9
6	5 5 5 8 8 9 9
7	0 1 1 2 4 4 6

Make sure of your understanding

1 **Students:** Use the stem and leaves representation to display the data in the given table

Students' Marks			
91	96	80	91
93	79	93	80
72	80	93	72

2 What is the number of students whose marks are less than or equal 80 ?

Weather: The max temperature in ^{0}C for several days as follows:

15 13 28 32 38 30 31 13
36 35 20 24 38 32 38

Questions 1- 5 are similar to examples 2

3 Use the stem and leaves representation to display the above data.

4 Number of temperatures which are less than 30 ^{0}C.

5 How many days their temperature were greater than 32 ^{0}C?

Solve the Exercises

Books: The following table shows the prices of books

Price of books			
21	16	19	30
31	29	25	25
28	39	34	35

6 Use the stem and leaves representation to display (show) the data in above table.

7 How many books are there, where the price of each is less than 25 thousand dinars?

8 How many books are there the which the price each of them between 25 and 39 thousand dinars?

9 Use the stem and leaves representation to display data in the below table.

Number of pages of chapter			
10	9	15	21
8	18	17	10
22	20	11	12

10 How many chapters are there which their each contains number of pages greater than 18 pages?

11 How many chapters are there which their each one has 10 pages?

Solve the problems

Birds: The following data show the average weights of small birds among 12 different species in kilogram.

13 11 6 19 7 10
12 5 12 21 18 25

12 Use the stem and leaves representation to display these data.

13 Which of these birds have the lightest weight?

14 How many weights of birds are less than 12 kg?

15 Use the stem and leaves representation to show the data in the given table which represents the number of visitors of a library within a certain time.

Number of Visitors			
8	9	31	13
17	32	20	23
30	15	22	17

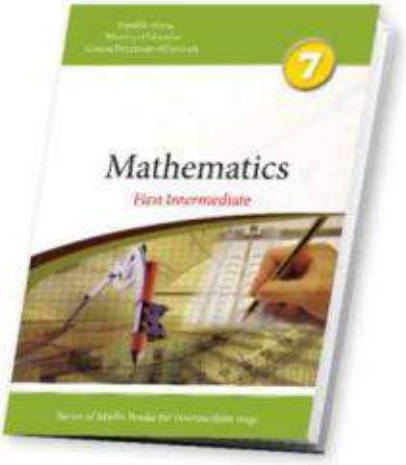
16 What is the number of visitors, each of them has more than 20 visiting?

17 How many visitors of a library each of them has visiting 17 times ?

Think

The following represents marks of the first class intermeiate students in math are brepresented by stem and leaves, as it is shown in below table:

Stem	Leaves
4	3 7
5	3 6 7 8
6	0 0 3 5 7 8



Use the table and answer the followings:

18 Which of the marks were most repeated among the marks of students?

19 How many students failed in math ?

20 How many students did get less than 60 marks ?

Sport: The following data represent the winning number that made by ten countires in bicycle racing. 1 4 10 18 36 19 12 12 11 5

21 Use stem and leaves representation to show data and answer the following:

22 How many countries that won more than 10 times?

23 How many countries that won 12 times in the race?

Write

A problem from life fact and then represent by stem and leaves.

[7-5] Outcomes of Experiment and representation it

Idea of the lesson
Determinating the outcomes of an experiment and organizing

Vocabulary
* Experiment
* Outcomes
* Table
* Tree
* Sample Space

Learn

With Ahmed a box contains different geometrical solid, cubes and paralleiepiped with, red and blue colours, of these geometrical pieces at each time what is the probability if Ahmed has drawn one ?

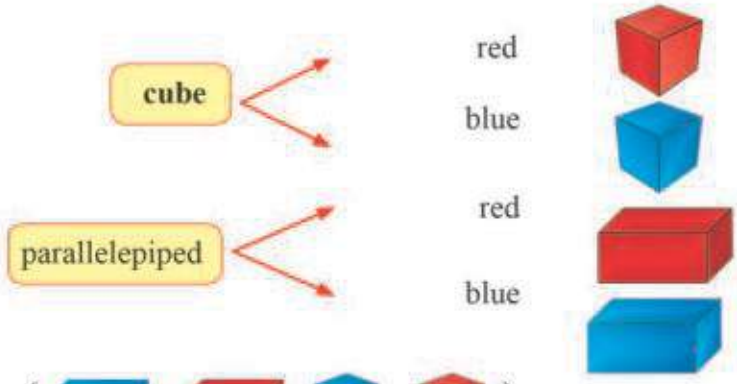
Outcomes of Experiment and Representation

Experiment: It is an action to observe the outcomes.
The outcomes can be arranged by two methods, table and tree, and these outcomes are written inside two brackets of type { }, this set is called "Sample Space".

Example (1)

First method: Tree graph

The sets can be created by a paragraph (Learn) by tree graph method.



sample space { , , , } number of prop. four

Second method: Table

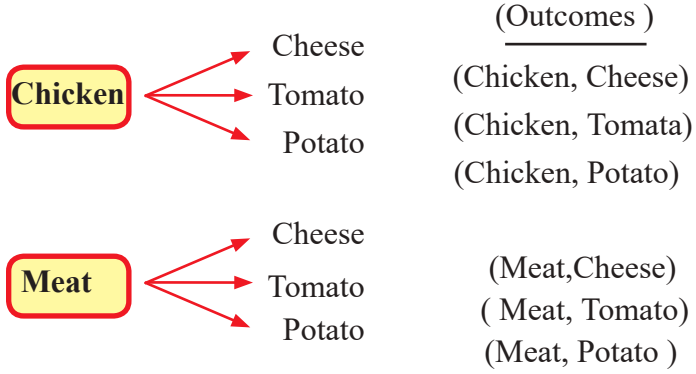
The sets can be created by a paragraph (Learn) by means of table method.

Shape	Colour	Outcome	Sample
cube	red	Red cube	
parallelepiped	blue	Blue parallelepiped	
cube	blue	Blue cube	
parallelepiped	red	Red parallelepiped	

Example (2)

Food: If you want to eat a sandwich of chicken or a sandwich of meat with cheese or tomato or potato.
Find the outcomes using:
i) Tree graph **ii)** Table

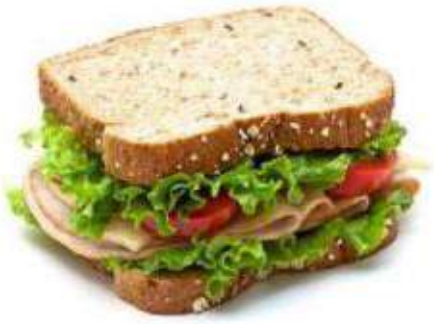
First method: Tree graph



(Outcomes)

(Chicken, Cheese)
(Chicken, Tomata)
(Chicken, Potato)

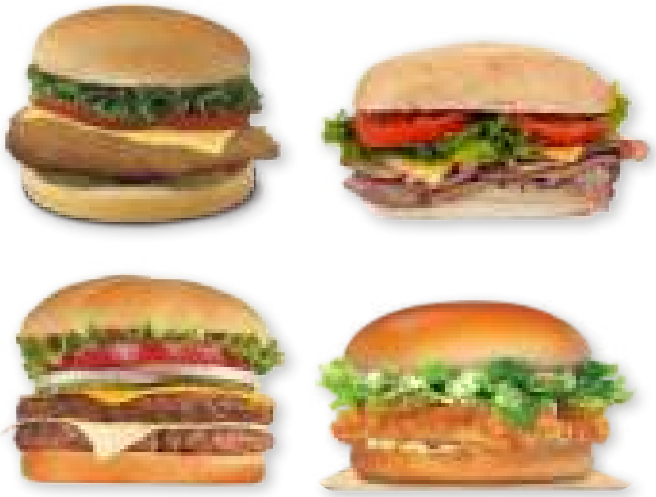
(Meat,Cheese)
(Meat, Tomato)
(Meat, Potato)



Number of probability six
Sample Space is { (Chicken,Cheese), (Chicken, Tomato), (Chicken, Potato), (Meat,Cheese), (Meat, Tomato), (Meat, Potato)}

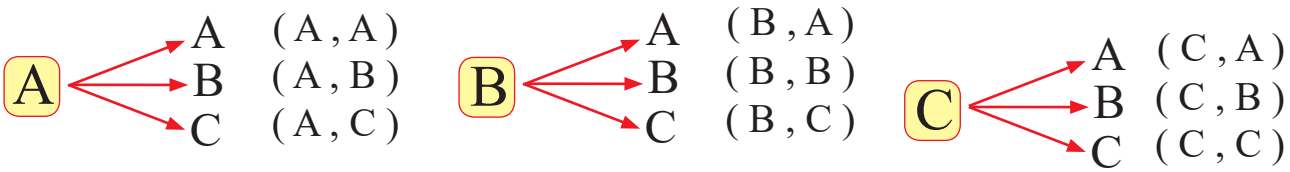
Second Method : Table

Sandwich	Species	Outcome
Chicken	Cheese	(Chicken,Cheese)
Meat	Tomato	(Meat, Tomato)
Chicken	Potato	(Chicken, Potato)
Meat	Cheese	(Meat, Cheese)
Chicken	Tomato	(Chicken, Tomato)
Meat	Potato	(Meat, Potato)

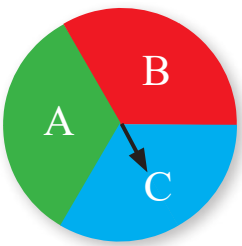


Example (3)

The spinner of the revolving dics is rotated twice. Write all the probabilities using the tree method.



Number of probabilities equals 9



Sample Space is

{ (A , A),(A , B),(A , C),(B , A),(B , B) ,(B , C),(C , A),(C , B),(C , C) }

Make sure of your understanding

1 **Games:** In a park there are a swing, jump playing and hanged-ladder palying. In how many different ways you can perfomr all of them in play ground?
Represent the outcomes using tree graph.

Questions 1-3 are similar to examples 1-2

Tossed a coin twice, answer the followings :

2 Represent all the outcomes by using a table:

3 What is the number of different sets of possible probabilities?

Solve the Exercises

Fashion: Maha has a black, white and brown shoes and black skirt and brown skirt.

4 In how many different ways she can dress?
Represent the outcomes using a table.
The below table shows the names of geometrical figures with two colors.

Figure	triangle , square , circle
Colour	blue , yellow

5 Use the tree graph to construct all possible probability sets.

6 **Letters:** Choose letters from the word “Kirkuk”, corresponded with letters of “Cat” use the tree method and write all possible probabilities.

7 **Food:** If you have four choices of main food plate and three choices of fruits and two choices of sweets. What is the number of different meals can be chosen from these choices?

8 What kind of information that tree graph can be provided you?

9 Is the tree graph beneficial to determine the outcomes of tossing a one coin ?
Explain your answer.

Solve the Exercises

10 Three different coins are tossed. Use the tree graph method to represent all possible probabilities.

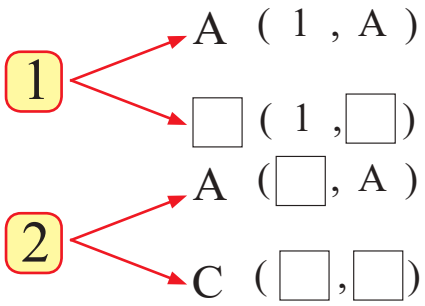
11 You have three different volume of cubes, small, medium and large with two colours red and blue. Use the table to represent all possible probabilities.

Think

12 If you have a dice and coin. By using tree graph to write all possible probabilities resulted by tossing them once together.

13 **Open problem:** If possible outcome of tossing coins once all together as follows:
(H , H , T) , (H , T , H) , (H , T , T) ,
(T , H , H) , (T , H , T) , (T , T , H) ,
(T , T , T)
How many coins ware tossed ?

14 By using the given tree representation (graph) complete the missing probabilities.



15 Number of possible probabilities equals □

16 If the number of probabilities of tree representation by certain data equals six. Choose the data which satisfy it.

Write

The steps which you follow to make tree graph that show your experiment outcomes.

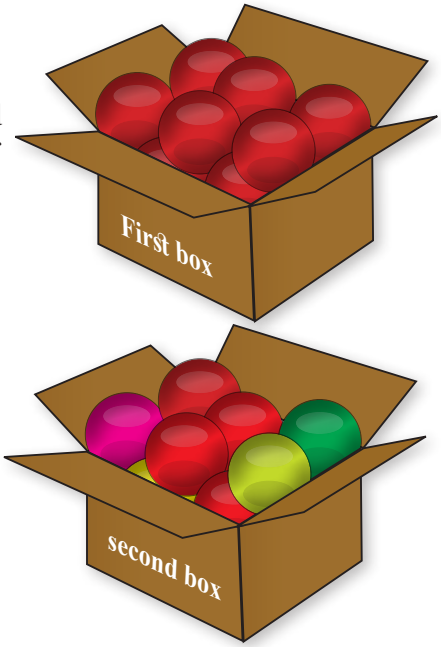
[7-6] Comparing between Probabilities

Idea of the Lesson
Comparing between Probability

Vocabulary
* Experiment
*Event
*Probability
*Certain Event
*Impossible Event
*Probable
*More likely
*Less likely

Learn

Muhannad has two boxes, first box contains all red balls and the second box contains different color balls. If Muhannad has drawn one ball from each box, what is the probability of red ball ?



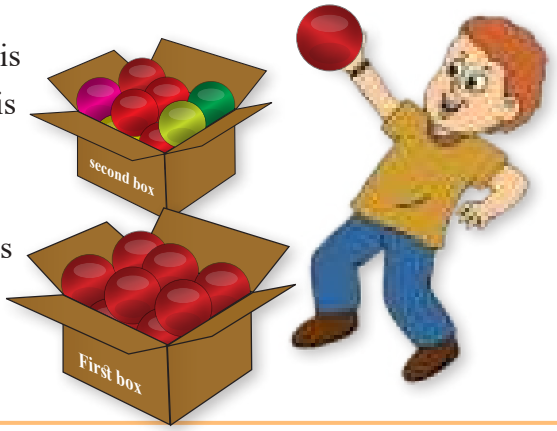
Comparing between Probabilities

Experiment: It is an action leads to number of possible outcomes each of them is called "Event", which is a set containing one outcome or more.
Event Probability: It is a measurement of eventual chance.
Certain event: The event that happens certainly.
Impossible event: The event that does not happen at all.
Probable event: The event that has a chance to happen. If it has a large chance then it is called "More likely event" and if it has a small chance then it is called "Less likely event".

Example (1)

i) The probability of drawing red ball from the first box is a certain probabiliy because all the balls in first box are red.

ii) Probability of drawing yellow ball from the first box drawn by Muhannad is an impossible probability because there is no yellow ball in the first box at all.
iii) Probability of red ball drawn from the second box is more likely probable because the number of red balls is the most among the others.
iv) Probability of green balls drawn from the second box is less likely becase the number of green balls less than the number of red balls in the box.



Example (2)

A box contains 3 cubes, 3 spheres and 5 cones.

i) Which event has greater probability drawing sphere or cone?
Since the number of cones is greater than the number of spheres, so the probability of drawing cone is greater than the probability of drawing sphere.

ii) Which event has greater probability drawing sphere or cube?
Since the number of spheres equeals the number of cubes therefore their events have equal probability.

Example (3)

The probability can be written as a percentage ratio write the probability of each event.

Write the probability of each event:
Write 0% or 50% or less than 50% or greater than 50% or 100%

i) All female students in first-class intermediate school are present today. Maryam is a student in first class.
What is the probability of Maryam being present today?

The probability is certain, therefore she is present in the school 100%.

ii) An airplane of Iraqi airways contains a number of passengers, but Muhammad was not in it after taking-off.
What is the probability that he was in the airplane after taking-off ?
The probability is impossible, there Muhammad's presence probability in the airplane is 0%.

iii) What is the probability of appearing 6 when a dice is tossed?
the probability is lees likely therefore the probability is less than 50%

iv) A sack contains 10 red balls and 10 yellow balls.
What is the probability of drawing a red ball?
The probability is likely equal, therefore the probability of drawing a red ball is 50% .

v) A box contains 7 cubes and 3 spheres. What is the probability of drawing a cube ?
the propability is more likely ,therefore the probability is greater than 50%

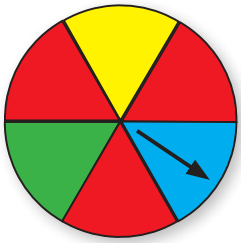
Example (4)

The spinner of a revolving disc is rotated once. Write probability for the following :

i) The spinner stops on red colour. More likely greater than 50%

ii) The spinner stops on green colour. Less likely less than 50%

iii) The spinner stops on black colour. Impossible probability, 0%.



Make sure of your understanding

Write the probability of each event: certain, impossible, probable, more likely and less likely.

Questions 1 - 7 are similar to examples 1,2

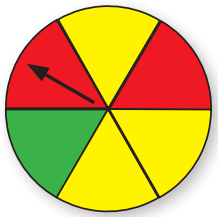
1 The number 13 is an odd number .....

2 $3 \times 6 = 18$ .....

3 $18 = 3 \times 6$ .....

4 $5^3 = 5 \times 5$ .....

The disc is rotated once, answer the following:



5 The spinner stops on green colour. .....

6 The spinner stops on yellow colour. .....

7 The spinner stops on blue colour. .....

Write the probability of every event. Write 0% or 50% or less than 50% or 100%.

8 The probability of coming Tuesday after Mondays is .....

9 The probability of drawing a yellow ball from a box containing all red balls is .....

10 The probabiliy of appearance of number 5 when tossing a dice is .....

Questions 8-11 are similar to examples 3,4

11 A committee consists of 3 men and 3 women. the probabiliy of choosing one man is .....

Solve the Exercises

Inscribed the right answer and write the suitable word (certain, impossible and probable)

12 **Weather:** The temperature of one of summer days are 2 ^{0}C , 39 ^{0}C .

13 **Numbers:** The number 0 is odd, even

14 **Gardens:** In a small garden there are 7 plants of red rose, 3 palnts of white rose. If a plant randomly chosen, what is the greatest probability of the plant that has a red colour or white colour ? Prove your answer.

write the probability of each event. Write 0% or %50 or less than or greater than 50% or 100%.

15 Number of days in a month is 30 days. .....

16 Baghdad is the capital of Iraq Republic .....

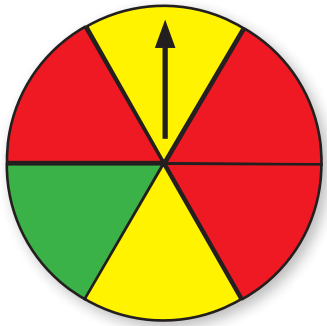
17 The number 5 is one of the factors of 12 .....

a sac contains 3 yellow balls and 3 green balls.

18 Drawing a yellow ball.....

Solve the Exercises

Play: Suppose you turned the given disc once. Describe probability of spinner stop on every colour. Write (certain, more likely, less likely, impossible)



19 Green but not red .....

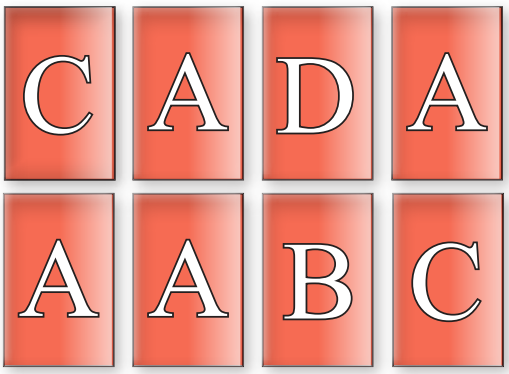
20 Blue .....

21 Red but not green .....

22 Not brown .....

write: probability of every event, write (0%, 50%, leas than 5% greater than 50% or 100%).

Cards: Khalid pull one card among the following cards randomly.



23 The letter A .....

24 The letter B .....

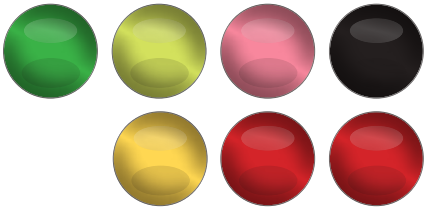
25 The letter C .....

26 The letter A or D .....

27 The letter H .....

Think

Challenge : Describe a set of 7 balls with following characteristics:



28 There are 4 different colours in the set.

29 When a ball is drawn the probability of drawing a coloured ball is greater than the probability of any other coloured ball

30 Only two among other colours have equal probable.

31 You have a cube  and parallelepiped  which event whose probability is greater than the number 3 appearance on the cube or on the para, lelpiped ? Describe your answer.

Write

A problem from life fact that can be solved by describing the probability, then solve that porblem.

Chapter Test

1 Represent the following data by frequency table.

3 , 12 , 17 , 13 , 20 , 18 , 8 , 5 , 11 , 16 , 19 , 7 , 10 , 15

18 , 14 , 9 , 14 , 10 , 20

Which of the class has the greates frequency.

2 A store contains sport needs, 35% sport shirts, 20% sport shoes and 45% other sport supplies, represent the data by circular sector .

* If the store contained 200 different needs, what is the number of shoes it contained ?
* What is the measurment of the angle that represents the ratio 35% ?

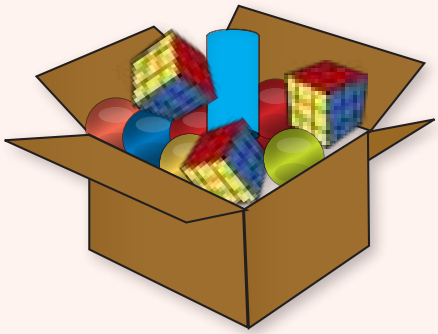
3 Represent the given data as frequency polygon and describe the changes of data.

Class	3 - 7	8 - 12	13 - 17	18 - 22
Frequency	6	2	9	8

4 Muhammad chose sock and shoes randomly, write all the probability using tree method, if he has black and white socks, and one black shoes brown shoes and white shoes.

5 A box contains 3 cubes, 7 sphers and one a cylindrical solid.

* What is the probability of drawing one spher? What is the percentage ratio?
* What is the probability of drawing a cone solid ? What is the percantage ratio ?
* What is the probability of drawing a clyindrical solid ? What is the percantage ratio ?
* What is the probability of drawing a solid ? What is the percantage ratio ?



6 Represent the given data in (1) as stem and leaf.

* What is the greates and least values ?
* What is the value which has the least frequency ?

7 The given table shows the sizes of sport trousers which are sailed within three weeks.

* Represent the data as stem and leaves.
* What is the number of sport trousers which has the size greater than 40 ?
* Which of the sizes has the greatest sailed within three weeks ?
* What is the number of trousers which are sold within three weeks of size less than 40 ?

size of trousers						
29	40	35	38	15	15	32
42	44	36	43	45	31	30
34	37	46	50	41	33	39

Chapter Exercises

[1−1] Mental Math , Powers and Scientific Notation

Choose the correct answer

Use (apply) the properties of the operations to calculate mentally

1 $3 \times (16 + 8) = \ldots\ldots\ldots$ (a) 27 (b) 66 (c) 72 (d) 73

Calculate the following

2 $10^5 = \ldots\ldots$ (a) 100 (b) 1000 (c) 10000 (d) 100000

Write the following number by using the powers

3 1000 000 =..... (a) 10^6 (b) 10^5 (c) 10^4 (d) 10^3

Write the following as a scientific notation

4 $900000000 = \ldots$ (a) 9×10^7 (b) 9×10^8 (c) 9×10^9 (d) 9×10^{10}

Write the following number by using digital notation

5 $8 \times10^4 = \ldots\ldots$ (a) 80000 (b) 8000 (c) 800 (d) 80

[1−2] Ordering of Operations on Integer Numbers and Absolute Value

Choose the correct answer

By using order of operation, find the value of each of the following

1 $64 \div 8 + 3 \times(-5) = \ldots\ldots$ (a) 7 (b) -7 (c) 8 (d) -8

2 $|-72| \div |-9| + 14 \times (-3) = \ldots\ldots$ (a) 45 (b) 34 (c) -45 (d) -34

3 $|-42| - |-40| + 22 \div (-11) = \ldots\ldots$ (a) 30 (b) 20 (c) 10 (d) 0

4 $6^2 \div 6 + 2 \times (-3) - 5 \times 10^2 = \ldots$ (a) 50 (b) -50 (c) 500 (d) -500

[1−3] Algebraic Statements

Choose the correct answer

Write an algebraic statements which represents each of the following

1 5 times L^2 plus 1

(a) $L^2 + 1$ (b) $5L^2 + 1$ (c) $5L^2 - 1$ (d) $L^2 - 1$

2 6 raised to power 3 multiply by $(L+4)$

(a) $18 \times (L+4)$ (b) $6^3 (L+4)$ (c) $3^6 (L+4)$ (d) $6 (L+4)^3$

Find the value of algebraic statement of each of the following by using the given variable

3 $3(Y - 8) - 10$, $Y = 8$: (a) -7 (b) 7 (c) -10 (d) 10

4 $(60 \div X) - 2^4(9 + |X|)$, $X = -1$ (a) 100 (b) -100 (c) 220 (d) -220

[1-4] Solving Equations by one-step

Choose the correct answer

Solve subtraction equations by using mental math

1) $13 - Z = -21$ (a) $Z = -28$ (b) $Z = 28$ (c) $Z = 34$ (d) $Z = -34$

Solve addition equation by using the relation between addition and subtraction

2) $N + 14 = |-74|$ (a) $N = -60$ (b) $N = 60$ (c) $N = 88$ (d) $N = -88$

Solve the multiplication equation by using the relation between multiplication and division

3) $8Y = -32$ (a) $Y = 4$ (b) $Y = 2$ (c) $Y = -2$ (d) $Y = -4$

[1-5] Square Root and Cubic Root

Choose the correct answer

Find the cubic and square root of the integer

1) $-\sqrt{121} = \ldots\ldots$ (a) -11 (b) -21 (c) 11 (d) 21

2) $\sqrt[3]{-729} = \ldots$ (a) -9^2 (b) 9^2 (c) -9 (d) 9

Find the value of the algebraic statement state in each of the following by using the given variable

3) $3X - \sqrt{64} + 16$, $X = 20$ (a) -68 (b) -60 (c) 68 (d) 60

4) $(Y + \sqrt[3]{27}) - 12$, $Y = 36$ (a) 24 (b) -24 (c) -8 (d) 0

[2-1] Rational Numbers

Choose the correct answer

Write the following numbers in the form of decimal fraction

1) $3\frac{4}{5} =$ (a) 3.8 (b) -3.8 (c) 3.08 (d) -3.08

2) $-9\frac{6}{11} =$ (a) $-9.\overline{45}$ (b) -9.45 (c) -9.54 (d) $-9.\overline{54}$

Write the following decimal in the form of fraction number

3) $-5.8 =$ (a) $\frac{29}{10}$ (b) $-\frac{29}{5}$ (c) $-\frac{29}{10}$ (d) $\frac{29}{5}$

Write the suitable number in black

4) $-4\frac{7}{8} < \boxed{\ldots\ldots}$ (a) $-4\frac{36}{32}$ (b) $-4\frac{9}{24}$ (c) $-5\frac{14}{16}$ (d) $-5\frac{5}{8}$

5) $5.12 = \boxed{\ldots\ldots}$ (a) $\frac{120}{25}$ (b) $\frac{128}{20}$ (c) $\frac{126}{50}$ (d) $\frac{128}{25}$

Arrange the following rational numbers from smallest to greatest

6) $\frac{8}{14}, \frac{3}{7}, -\frac{6}{21}, \frac{20}{28}$

a) $\frac{3}{7}, \frac{8}{14}, -\frac{6}{21}, \frac{20}{28}$ b) $-\frac{6}{21}, \frac{3}{7}, \frac{8}{14}, \frac{20}{28}$ c) $\frac{20}{28}, \frac{8}{14}, \frac{3}{7}, -\frac{6}{21}$ d) $-\frac{6}{21}, \frac{20}{28}, \frac{8}{14}, \frac{3}{7}$

[2-2] Operations on Rational Numbers

Choose the correct answer

Find the following result of rational numbers using addition and subtraction

1) $\frac{3}{4} + \frac{7}{5} - \frac{9}{2} = \ldots$ a) $\frac{47}{10}$ b) $\frac{47}{20}$ c) $-\frac{47}{10}$ d) $-\frac{47}{20}$

2) $4\frac{1}{6} - 1\frac{2}{3} - 6\frac{1}{12} = \ldots$ a) $3\frac{8}{12}$ b) $2\frac{8}{12}$ c) $-2\frac{7}{12}$ d) $-3\frac{7}{12}$

Find the result of following

3) $3\frac{3}{5} \times 4\frac{2}{3} \times \frac{-5}{21} = \ldots$ a) $\frac{41}{3}$ b) $\frac{-41}{3}$ c) 4 d) -4

4) $\frac{5}{7} \times \frac{21}{20} - \frac{4}{5} + \frac{16}{5} = \ldots$ a) $-\frac{1}{2}$ b) $-\frac{3}{4}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

[2-3] Percentages and Estimation

Choose the correct answer

Write the percent in the form of rational number

1) $225\ \% = \ldots$ a) $\frac{9}{4}$ b) $\frac{4}{9}$ c) $\frac{7}{4}$ d) $\frac{4}{7}$

2) $\sqrt{25}\ \% = \ldots$ a) $\frac{5}{10}$ b) $\frac{\sqrt{25}}{10}$ c) $\frac{1}{20}$ d) $\frac{1}{4}$

Write the following rational number in the from of percent

3) $\frac{12}{60} = \ldots$ a) $\frac{10}{100}$ b) $\frac{20}{100}$ c) $\frac{40}{100}$ d) $\frac{60}{100}$

Estimate the percentage for the following number

4) $2\frac{3}{19} \approx \ldots$ a) $\frac{41}{100}$ b) $\frac{205}{100}$ c) $\frac{105}{100}$ d) $\frac{410}{100}$

5) $8.09 \approx \ldots$ a) $\frac{89}{100}$ b) $\frac{809}{100}$ c) $\frac{980}{100}$ d) $\frac{810}{100}$

[2-4] Gain and Proportional Division

Choose the correct answer

Clothes shope make a sale 20 % from price . Whats the price sale in ID to each of the following price.

1 15000 (a) 1000 (b) 2000 (c) 3000 (d) 4000

2 48000 (a) 8000 (b) 9000 (c) 8600 (d) 9600

The merchant paid atax 2.5 % for aprice of goods. Find the ratio from the following price.

3 80000 (a) 1000 (b) 1500 (c) 2000 (d) 2500

4 1200000 (a) 3000 (b) 30000 (c) 4000 (d) 40000

Find the gain of the following

5 6.5% × 4000000 (a) 260000 (b) 620000 (c) 62000 (d) 62000

Find the rational division for following

6 4500000 من 1:2 (a) 1250000 (b) 3000000 (c) 125000 (d) 225000

[2-5] Direct Variation and Inverse Variation

Choose the correct answer

1 If the price piece of cloth directly variation withe number of meters and the price of meter 4000 ID. What is the price piece of clothes its length 6 meters.

(a) 12000 (b) 18000 (c) 20000 (d) 24000

2 To build a house , need 18 workers in 90 days .
How many day does it needed to build with 36 workers?

(a) 60 (b) 55 (c) 50 (d) 45

3 8 workers can unload truck of flour in 48 /h work,How many workers does the shop owner workers need to unload,the same truck in 12 /h

(a) 32 (b) 24 (c) 16 (d) 8

[2-6] Estimation of Square and cubic Roots

Choose the correct answer

Estimated the following square roots, closest to anteger

1 $\sqrt{23}$ (a) 3 (b) 4 (c) 5 (d) 6

2 $\frac{\sqrt{122}}{36}$ (a) $\frac{11}{6}$ (b) $\frac{11}{36}$ (c) $\frac{12}{6}$ (d) $\frac{12}{36}$

Estimated the following cube root, closest to anteger

3 $\frac{49}{\sqrt[3]{720}}$ (a) $\frac{7}{9}$ (b) $\frac{47}{8}$ (c) $\frac{49}{9}$ (d) $\frac{7}{8}$

[3-1] Algebraic term and similar terms

Choose the correct answer

Determine the coefficient and the symbolic part of each of the following algebraic terms

1. $\frac{15}{6}w^2$ (a) $\frac{15}{6}$, w^2 (b) w^2, $\frac{15}{6}$ (c) $\frac{15w}{6}$, w (d) $\frac{6}{15}$, w^2
2. $3\frac{ab}{c}$ (a) $\frac{3b}{c}$, a (b) $3b$, $\frac{a}{c}$ (c) 3, $\frac{ab}{c}$ (d) $\frac{c}{ab}$, 3

Determine the similar algebraic terms

3. $\sqrt[3]{27}\,x^2y$ (a) $3xy$ (b) $9x^2y$ (c) $3x^2y^2$ (d) $3xy^2$
4. $|-7|\,yz^2$ (a) $7z^2y$ (b) $-7yz^2$ (c) $7y^2z$ (d) $-7yz$

[3-2] Addition and subtraction of similar algebraic terms

Choose the correct answer

Find the following result of addition of the two terms

1. $10\frac{xy}{z}$, $-8\frac{xy}{z}$ (a) $18\frac{xy}{z}$ (b) $2\frac{yz}{x}$ (c) $-2\frac{xy}{z}$ (d) $2\frac{xy}{z}$
2. $\sqrt{16xy^3}$, $\sqrt{36xy^3}$ (a) $12xy^3$ (b) $10x^3y$ (c) $10xy^3$ (d) $-10xy^3$

Find the following result of subtract first term from second term

3. $\frac{1}{10}x^2z$, $\frac{1}{5}x^2z$ (a) $\frac{2}{5}x^2z$ (b) $\frac{1}{10}x^2z$ (c) $\frac{-2}{5}x^2z$ (d) $\frac{-1}{5}x^2z$

Find the result of the following

4. $\sqrt{-27}\,xy - |-6|xy$ (a) $9xy$ (b) $-3xy$ (c) $3xy$ (d) $-9xy$

[3-3] Multiplication of algebraic terms

Choose the correct answer

Find the result of the multiplying two algebraic terms

1. $\frac{2}{7}wy$, $\frac{2}{5}x$ (a) $\frac{2}{35}wyx$ (b) $\frac{4}{35}wyx$ (c) $\frac{-4}{35}wyx$ (d) $\frac{-2}{34}wyx$
2. $\sqrt[3]{125}\,y$, $-8z$ (a) $40yz$ (b) $-40yz$ (c) $200yz$ (d) $-200yz$

Find the result of the multiplying algebraic term by polynomial

3. $z+w-y$, $-4x$

(a) $4zx+4wy+4yx$ (b) $-4zx-xw+4yx$ (c) $4xz+4xw-4yx$ (d) $-4xz-4wx+4yx$

4. $\frac{1}{2}$, $z-y+2$

(a) $\frac{1}{2}z-y+\frac{1}{2}$ (b) $\frac{1}{2}z-\frac{1}{2}y+1$ (c) $\frac{1}{2}z+\frac{1}{2}y+1$ (d) $\frac{1}{2}z+\frac{1}{2}y-\frac{1}{4}$

[3-4] Numerical value of Polynomial

Choose the correct answer

Find the numerical value for the following expressions

1) $3^2xz - 2^3yz + 10$, $x = 5$, $y = 1$, $z = 2$

(a) -84 (b) 84 (c) -48 (d) 48

2) $\sqrt{16}\,y^3 + \sqrt[3]{-8}\,x^3 - 20$, $y = 2$, $x = 3$

(a) -42 (b) -24 (c) 42 (d) 24

3) $\frac{3}{5}zw + \frac{2z}{5} - \frac{3}{10}w$, $z = 2$, $w = 3$

(a) 7 (b) $\frac{19}{5}$ (c) $\frac{-19}{5}$ (d) -7

4) $(\frac{1}{2}xy - 9yz) + 13$, $x = 12$, $y = \frac{1}{3}$, $z = |-5|$

(a) 1 (b) -1 (c) $\frac{1}{2}$ (d) $\frac{-1}{2}$

[3-5] Functions and its Organization of the agenda in tables

Choose the correct answer

1) **Write the function rule of the following inputs and outputs:**

inputs	function rule	outputs
1	.....	1
2	.....	5
3	.....	11

(a) x^3+2x-1 (b) $x-5x^2+1$ (c) x^3+x-1 (d) $\sqrt{4}\,x^3+x+1$

2) **If the function rule is $2y+y^2+2$ write the outputs of the function**

inputs	function rule	outputs
10	$2(10)+(10)^2+2$	.....
11	$2(11)+(11)^2+2$	.....
12	$2(12)+(12)^2+2$	.....

(a) 122,154,190 (b) 122,145,190 (c) 122,145,170 (d) 212,145,170

[4-1] The Sets and Operations on Sets

Choose the correct answer

Write the elements of the following sets

1) $Z^- = \{x \in Z : x < 0\}$

(a) {-3, -2, -1, 0} (b) {0, 1, 2, 3} (c) {1, 2, 3, ...} (d) {...., -3, -2, -1}

2) $A = \{x \in Z$: x is an odd number between 4 and 10 $\}$

(a) {...., 5, 7, 9} (b) {...., 4, 5, 7, ...} (c) {5, 7, 9} (d) {5, 7, 9, ...}

Put one of these symbols in the correct ($\notin$, $\not\subseteq$, $\in$, $\subseteq$, $=$) blanks so that the statements is true

3 $\{-1, 0, 3, 4\}$ ..... $\{x \in Z : -3 < x < 5\}$

(a) $\in$ (b) $\not\subseteq$ (c) $\subseteq$ (d) $=$

4 12 ..... $\{-6, -3, 0, 3, 6, 9, \ldots\}$

(a) $\not\subseteq$ (b) $\subseteq$ (c) $\notin$ (d) $\in$

IF

$A = \{-3, -1, 0, 3, 7, 12\}$, $B = \{-4, -2, -1, 0, 2, 7, 13\}$

$C = \{-6, -2, -1, 3, 7, 13, 15\}$

Find the following set:

5 $B \cup C$ (a) $\{-2, -1, 7\}$ (b) $\emptyset$ (c) $\{-6, -4, -2, -1, 0, 2, 3, 7, 13, 15\}$ (d) $\{-2, 13\}$

6 $A \cap B \cap C$ (a) $\{-1, 7\}$ (b) $\{-1, 7, \ldots\}$ (c) $\{\ldots, -1, 7\}$ (d) $\emptyset$

[4-2] Solving Equations of Multi-Step in Z

Choose the correct answer

Solve the following equations using the relation between operations

1 $\sqrt[3]{-27}\, n \div 10^2 = -30$ (a) -1000 (b) -100 (c) 10^3 (d) 10^2

2 $\sqrt[3]{-64}\, z \div 8 = \sqrt{100}$ (a) -40 (b) 40 (c) -20 (d) 20

[4-3] Solving Equations of Multi-Step in Q

Choose the correct answer

Solve the following equations in Q

1 $\sqrt[3]{-27}\, y \div 9 = 1 - \frac{2}{9}$ (a) $\frac{7}{3}$ (b) $\frac{-3}{7}$ (c) $\frac{-7}{3}$ (d) $\frac{3}{7}$

2 $7(3y \div 15) = 6(y \div 10)$ (a) $\frac{10}{3}$ (b) $\frac{-3}{10}$ (c) $\frac{-6}{10}$ (d) 0

[4-4] Inequalities and the Properties of Inequalities

Choose the correct answer

Write an inequality for each statement

1 Must be the child's age (e) 12 years or older until it is registered in the first grade primary school

(a) $e > 6$ (b) $e < 6$ (c) $e \geq 6$ (d) $e \leq 6$

2 Must not exceed the speed of the vehicle (s) within the city for 80 k/ h

(a) $s > 80$ (b) $s < 80$ (c) $s \geq 80$ (d) $s \leq 80$

[4-5] Solving Inequalities by using Multi-Step

Choose the correct answer

Use inequality properties to solve each of the following in Q

1 $-7(z - 6) \geq 42$ (a) $z < 0$ (b) $z \leq 0$ (c) $z > 0$ (d) $z \geq 0$

2 $\sqrt[3]{-8}\,(z+3) > -3$ (a) $z > \frac{-2}{3}$ (b) $z \geq \frac{3}{2}$ (c) $z \leq \frac{-3}{2}$ (d) $z < \frac{-3}{2}$

[5-1] Regular Polygons and Interior angles , Exterior and central Angles

Choose The Correct Answer

1 The shape  is :

a Convex regular hexagon .
b Concave regular hexagon .
c Convex irregucar hexagon .
d Concave irregular hexagon .

2 Which Polygon its measures of interior angles is 900° :

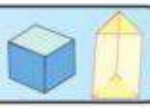
a Heptagon.
b Triangle .
c Pentagon .
d Nonagon .

3 The shape  is :

a Convex irregular palygon.
b Regular concave Poly.
c Convex regular Poly.
d Concave irregular.

[5-2] Solid Shapes and composite Solid Shapes

Choose The Correct Answer

1 The Solids in the Picture are : 

a Pyramid, Rectangular.
b Pyramid, Square.
c Pyramid .
d Cube, Ternary Prism .

2 What is the body which the has same distance between each point and his center , and has not vertices , bases, faces :

a Cylinder.
b Circle .
c Pyramid .
d Sphere .

3 The number of the pentagon prism's faces are :

a 7 Faces.
b 8 Faces .
c 5 Faces .
d 11 Faces .

[5-3] Coordinate Plane

Choose The Correct Answer

1 Which sentences is correct :

a Each X and Y coordinates for point in quadrant III are nagative.
b Y coordinates for point on Y - axis is Zero .
c X - coordinate for point in quadrant II is nagative .
d Y - coordinates for point quadrant IV is positive .

2 To represent the point A (5,-2) on a coordinate plane we move 5 units from the origin :

a **Above.** b **Right .** c **Below .** d **Left .**

3 To represent point D (0,3) on coordinate plane we move 3 units from the origin :

a **Above.** b **Right .** c **Below .** d **Left .**

[5-4] Translation and Reflection and Symmetry

Choose The Correct Answer

1 Wich figures have a harizontal line of symmetry :

a  . b  . c  . d  .

2 Suppose the point (2 , -1) is reflection image of the point (2 , 1) then reflecting line is:

a **X- and Y - axis .** b **Origin .** c **X- axis .** d **Y- axis .**

3 Translation of the point (2 , 1) 2 units abve and then 1 unit left is the point :

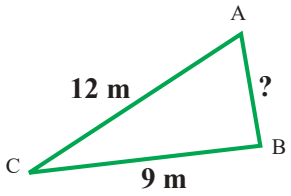
a **(1 , 3) .** b **(4 , 1) .** c **(2 , 4) .** d **(4 , 2) .**

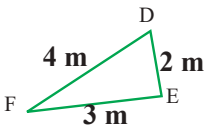
[5-5] Congruence and Similarity

Choose The Correct Answer

1 If the triangle ABC is similar to the triangle DEF , then the length of AB is :

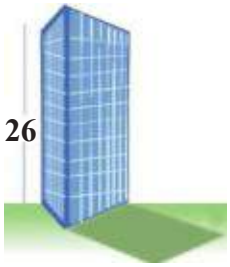
a **6 .** b **8.**
c **4 .** d **2.**

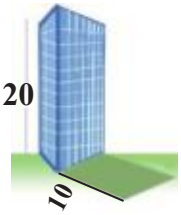




2 What is the shadaw length for building its heigh is 26 m with another building its height 20 m and its shadow length is 10 m ?

a **8 .** b **11.**
c **12 .** d **13.**





[6-1] Rate effect (scale) on the perimeter and area (Enlargment and Reduction)

Choose The Correct Answer

1 The perimeter of squar whose side length 6 cm under the effect of dilation coefficent $\frac{1}{8}$ is equal to :

a 2 cm. b 6 cm. c 4 cm. d 3 cm.

2 The Perimeter of rectangle whose sides length are 16 cm , 34 cm , under the effect of dilation coefficent 7 is equal to

a 720 cm. b 700 cm. c 650 cm. d 610 cm.

3 The Area of trapezoid whose bases length 5 cm , 9 cm and height 3 cm under effect of dilation coefficent 2 is equal to

a 84 cm^2. b 86 cm^2. c 82 cm^2. d 88 cm^2.

[6-2] Volumws of Solid shapes (cube\parallepiped)

Choose The Correct Answer

1 The parallelpiped whose dimensions are 3 cm , 5 cm , 6 cm so its volum is :

a 6 cm^3. b 60 cm^3. c 90 cm^3. d 80 cm^3.

2 The volume of parallelpiped sguared base side length 2 cm and its height three times of bases side it so its volume is :

a 12 cm^3. b 64 cm^3. c 48 cm^3. d 24 cm^3.

3 A water tank in a form of parallelpipeded whose dimensions 2 m , 3 m , 4 m ,in which is at rate the water 8m^3 \ h , the time needed to fill it is .

a 3 hours. b 5 hours. c 8 hours. d 9 hours. .

[6-3] Lateral area & total surface area of Solid shapes

Choose The Correct Answer

1 The parallelepiped of squared base length 2cm and its height five times of base side so the total area is :

a 82 cm^2. b 86 cm^2. c 88 cm^2. d 84 cm^2.

2 A parallelepiped whose lateral area 120 cm^2 , and half the peremeter of the base is 12 cm so its height equals to :

a 6 cm . b 5 cm . c 8 cm . d 12 cm.

3 A tank in a form of cube whose edge 2 m ,they need to paint the walls to the half of its height so the painted area equls to:

a 2 cm^2. b 4 cm^2. c 6 cm^2. d 8 cm^2.

[6-4] Rate effect (scale) on the volume and surface area (enlargement and reduction)

Choose The Correct Answer

1 A metallic block in the form of a parallelpiped whose its dimensions are 2 cm, 8 cm, 10 cm placed in aconvection oven then it expanded under the effect of dilation coefficent k = $\frac{5}{2}$ is, the volume after dilation is:

a 2000 cm^3. b 2250 cm^3. c 2500 cm^3. d 3000 cm^3.

2 The total area of cube whose edge 3 cm under effect of dilation cofficent k = 3 is :

a 36 cm^2 . b 108 cm^2 . c 27 cm^2 . d 144 cm^2.

3 If the volume of cube is changed form 216 cm^3 , to 8 cm^3 , then the dilation coefficent is :

a $\frac{2}{3}$. b $\frac{2}{5}$. c $\frac{1}{5}$. d $\frac{1}{3}$.

[6-5] Surface area and Volume of compound Solid shapes

Choose The Correct Answer

1 The 3 similar cubes whose each edge lenght is 2 cm were put one over the another , the total area of shape was formed is:

a 48 cm^2. b 60 cm^2. c 64 cm^2. d 84 cm^2.

2 The 7 similar parallelepipeds whose dimensions are 3 cm, 3 cm ,5 cm ,were put one over the another , the volume of shape was formed is:

a 310 cm^3. b 315 cm^3 . c 320 cm^3 . d 330 cm^3.

3 Number of similar wooden cubes whose each edge length 2 cm were arrange together, if the dimensions of the shape was formed are 10 cm , 20 cm , 30 cm , the number of cubes are:

a 500. b 600. c 750. d 650.

[6-6] Paving Area

Choose The Correct Answer

1 Abdullah wants to pave a rectangular corridoor of dimensions 12 m , 36 m, by squared cobble , the area of one cobble is 0.5 m^2 , the number of cobbles are:

a 864. b 648 . c 684. d 846.

2 Used equilateral triangle cobble whose area is 2.5 m^2 , to pave the square land whose edge length is 25 cm , the number of cobble is :

a 500 . b 250 . c 300 . d can not the pave .

3 Can the wall be paved by 10 - sides pieces of ceramic ?

a not possible . b possible .
c possible with out condition. d dependent on the wall area .

[7-1] Collecting and Organizing Data(frequency table)

Choose The Correct Answer

1 The class 20 - 30 amang is:

a Every values less than 30 . b Every values greater than 20 .
c Every values between 20 , 30 . d Every values less from 20 to 30 .

2 The best representation for large data is:

a Simple frequency table. b Signal table .
c Not these . d Class frequency table with class .

[7-2] Circular Sectors (Pie charts)

Choose The Correct Answer

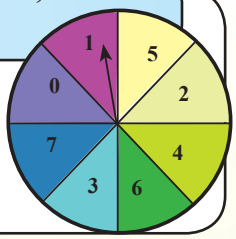
1 The percentage 25% reperesents the angle sector:

a 120° b 90° c 60° d 25°

2 On a circle graph, 35% from 200 persons prefer the red colour, how many are they ?

a 80 b 70 c 60 d 5

3 Use the pointer of the revolving disc, and chooce the correct answer, when the pointer stopped on numbers which are less than 2 .



a 25%. b greater than 50% .

c 50% . d less than 50% .

[7-3] Frequency Polygons

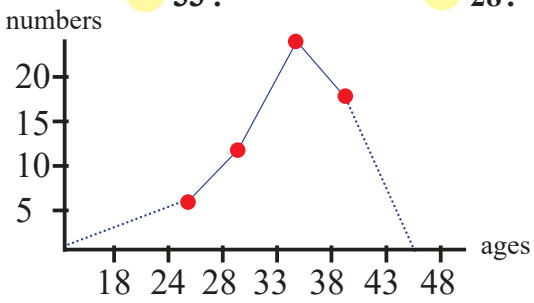
Choose The Correct Answer

1 The center of class (10 - 14) in freqancy polyag is:

a 12. b 6. c 8. d 4.

2 The following frequency polygone represents the age of the employees in one of the factories . Through the polygon we notice that the number of employees increases with the increase in age until the age reaches to :

a 43. b 33. c 28. d 20.



[7-4] Stem and Leaf

Choose The Correct Answer

1 The stem 3 leaves contation 8:

a 39. b 83. c 38. d 88.

2 Which table you can represent by stem and leaf it ?

a

26	26	30
56	46	53

b

26	46	29
56	29	53

c

26	29	26
46	53	56

d

26	26	29
56	56	53

stem	leaf
2	6 6 9
4	6
5	3 6

[7-5] Outcomes of Experiment and representation it

Choose The Correct Answer

1 Threw three coins once , the number of probabilites are:

a 10. b 8. c 6. d 4.

2 We can arrange the data in from:

a Frequency table. b Tree . c Bars graph. d Signal of counting.

3 In a public park ther is aswing , jumping game and hanging ladder so the numer of differents ways you can complete thee games are :

a 6. b 5. c 4. d 3.

[7-6] Comparing between Probabilities

Choose The Correct Answer

1 The probability of letter appearing D in Baghdad word is :

a More likely. b Impossible . c Certain. d Less likely.

2 Threw a dice once the probability of appearing No. 7 :

a Certain. b Impossible . c Likely. d Less likely.

3 Choose one red can?

a Greater then 50 % . b 100 % . c Lass than 50 %. d 50 %.