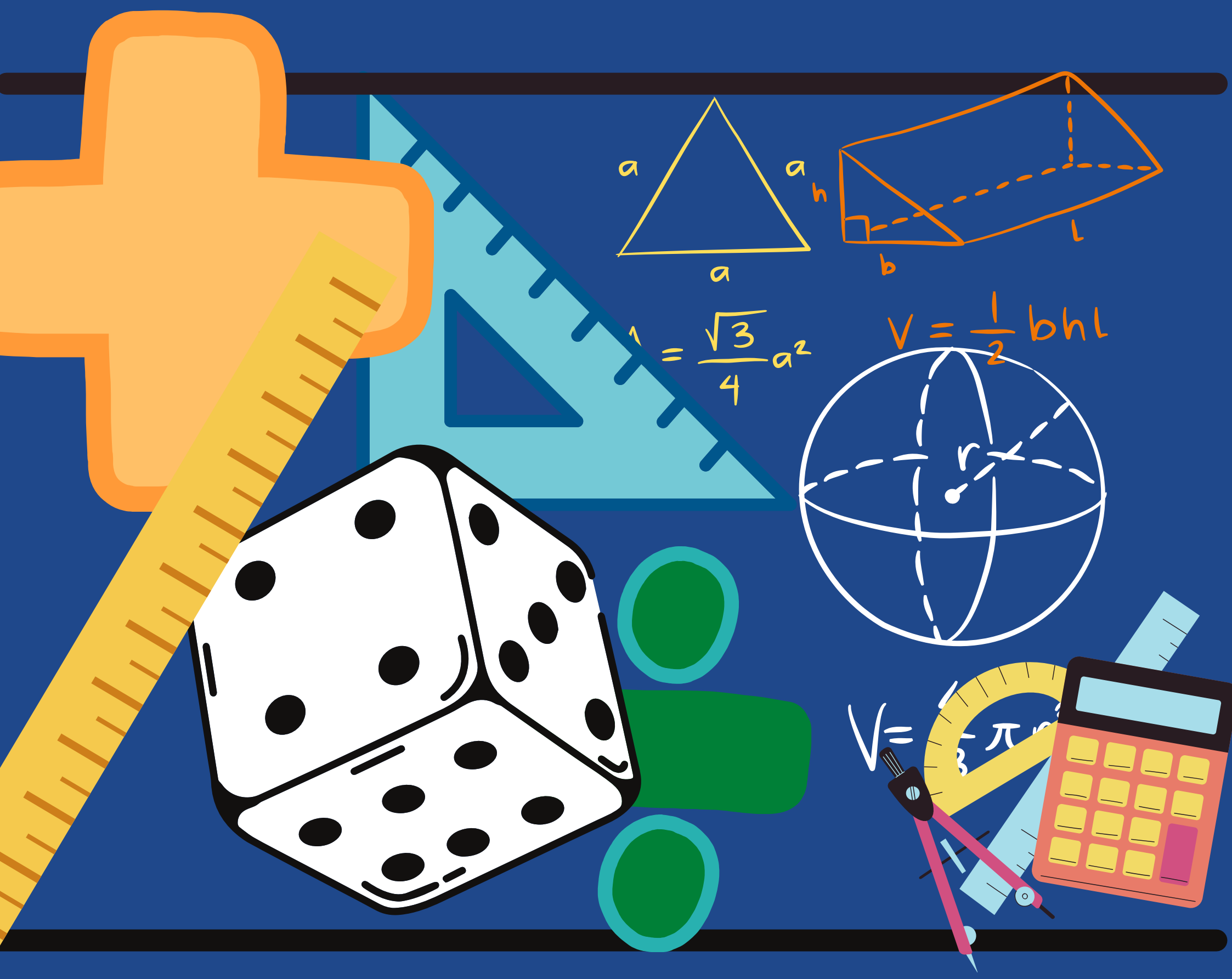
ISBN: 978-623-6963-63-0

ENGLISH FOR BASIC MATH



Hendrikus Male

ISBN: 978-623-6963-63-0

ENGLISH FOR BASIC MATH

Author: Hendrikus Male

Editor:
Jitu Halomoan Lumban Toruan

English Language Education Study Program
Universitas Kristen Indonesia
Jakarta
2021

ENGLISH FOR BASIC MATH

ISBN: 978-623-6963-63-0

Author: Hendrikus Male

Editor
Jitu Halomoan Lumban Toruan

Cover designer:
Iman Setia Harefa

Publisher:

UKI Press
Jl. Mayjen Sutoyo No.2 Cawang, Jakarta 13630
Telp. (021) 8092425. Email: ukipress@uki.ac.id

English Language Education
Universitas Kristen Indonesia
Jakarta
2021

English for Basic Math

Author: Hendrikus Male
Editor: Jitu Halomoan Lumban Toruan
Cover Design and Layout: Iman Setia Harefa

ISBN:978-623-6963-63-0

First Edition, 2021

Publisher: UKI Press
Universitas Kristen Indonesia - Jakarta
Jl. Mayjen Sutoyo No. 2 Cawang- 13630
Tel: +62 21 8092425
E-mail:ukipress@uki.ac.id
www.uki.ac.id

FOREWORD

The author would like to thank God The Almighty for His wonderful blessings so that the he is able to complete the book. Although there are many obstacles in the process of making it, he finally managed to finish it well.

The purpose of this compilation material is to meet the basic needs of students who would like to broaden the knowledge of basic Mathematics specifically students of language teaching. The preparation of this book certainly cannot be separated from the support of various parties, both in the form of material and moral support. He is indebted to Pak Jitu (Mathematics Lecturer) who has proofread and corrected the content. Thank you a million Pak. The author realizes that this book is far from being perfect and has many shortcomings so that the author welcomes positive criticism and suggestions for a betterment. Hopefully it can be useful for students and readers in general. Finally, the author thanks everyone whom he cannot mention one by one.

Jakarta, August 2021

Instructions for Students/Readers

Students are required to:

1. Read the book carefully starting from the introduction to the practice questions, then understand all the material contained.
2. Read carefully the intermediate goals to know what will be gained after studying this material.
3. Achieve your intermediate learning objectives.
4. Study the material carefully for each learning activity, if there is information that is not clear or has difficulty in learning each material, you should consult the teacher.
5. Pay attention to the steps in doing the job properly to make it easier to understand a work process.
6. Check questions to measure the extent of your knowledge.
7. Complete all the practice questions contained in each chapter so that your understanding develops properly.
8. Every time you study a sub-competency, you have to start from mastering the notions in the description of the material, carrying out tasks and doing practice questions.
9. In completing the practice questions, you are not allowed to discuss with your friends before completing the practice questions and group discussions.
10. Discuss the results of your work with classmates in the form of groups and work on group discussion questions.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1
RECTANGLE

Learning Outcomes

Students are expected to understand the basic concepts of rectangular flat shapes

A. Study Material

1. General shape of a square
2. Properties and elements of a square
3. Area and perimeter of a square
4. Solution to some problems related to square
5. Squares in daily life

B. Material Purpose

Students are able to understand the basic concepts of rectangular flat shapes

CHAPTER 1
RECTANGLE

1.1.Understanding Square

Pay attention to the objects around you! Do the objects around you have a square shape? Yes, of course! Look at ceramics, billboards, origami paper and many others. So, what is a square? Rectangle is a two-dimensional flat building formed by four equal sides and the same length and the measure of the angles is the same which is 900. The following figure is used to be called a square.

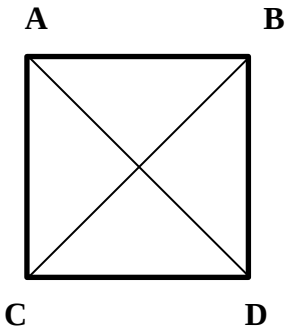


Figure 1. Square

Properties of Square

Rectangle has four sides that are the same length and opposite sides are parallel. The four angles are right angles that are equal in measure, i.e. 900. A square also has diagonals that are the same length and are perpendicular. form a right angle. Diagonal-diagonal they intersect at the middle of the base build.

Rectangle has four axes of symmetry. Occupy the frame in 8 ways. This is explained through Figure 2.

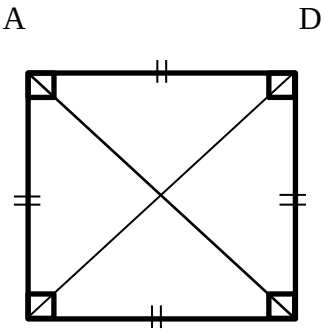


Figure 1.2. Square **A B C D**

1. The four sides of the square ABCD are the same length (AB=CD=BC=AD).
2. In the square ABCD, the opposite sides are parallel (AB//CD and AD//BC).
3. The four angles formed are right angles (<A=<B=<C=<D=900).
4. In square ABCD, the diagonals bisect each other.
5. The two diagonals of the square ABCD intersect in the middle and are perpendicular to each other (AC and BD intersect, AC is perpendicular to BD).
6. The two diagonals of the square ABCD are the same length (AC=BD

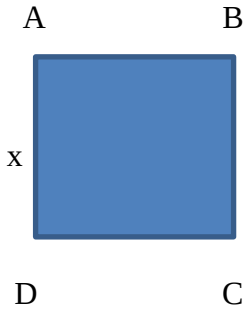


Fig. 1.3. Elements of a square

a). AB, BC, CD and AD are the sides of the same square ABCD and is denoted by the symbol = S

b). <A,<B,<C, and <D

are the angles of the square ABCD,

which are right angles (90°).

Circumference of the Square

Around A square is the sum total of all the sides that a flat shape has. Here is the formula for calculating the perimeter of a square.

ROUND OF A SQUARE:

Circumference= side + side + side + side = $k = 4s$

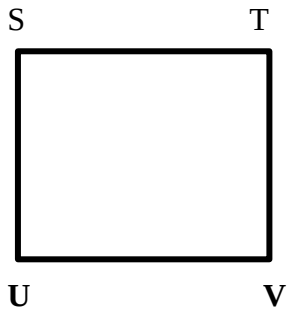


Figure 1.4. Square Area

Area is a quantity that expresses the two-dimensional size of a clearly delimited part of the surface, and usually, the area is bounded by a closed curve. The area of a flat shape is the number of squares with the same side length and covers the entire flat shape. The following is the formula for calculating the area of a square.

> Wide = side × side L = $S^{2.}$ In addition to the formula above, to calculate the area of a square, you can use the formula for the relationship between the area of a square and its circumference as follows. Area = $\frac{K^2}{16}$

Area and perimeter of a square if diagonals are known

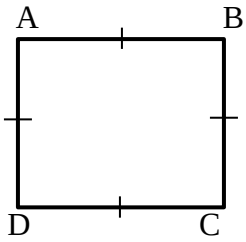


Figure 1.5 Area and perimeter of a square if the dialogue is known.

Actually, the formula for finding the area and perimeter of a square if you know the length diagonal alone is very easy, as long as we know, understand, and master the basic formulas of a square (the formula for the area and perimeter of the figure) and the Pythagorean theorem. If we master these two things then we can easily calculate the area and perimeter of a square if only the length of the diagonal is known. The following is a complete explanation of how to find the area and perimeter of a square if you know the length of the diagonal along with an example of the problem below: Find the formula for the area and perimeter of a square if you know the length

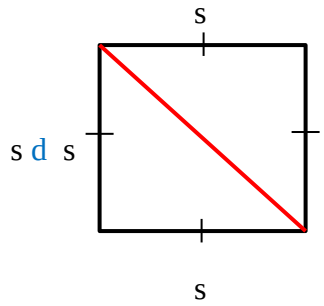


Figure 1.6. Formulas for area and perimeter if the diagonals are known

To find length diagonally we can use the Pythagorean theorem until we get the formula $s^2+ =$. After that, we will repeat the formulas for finding the area of a square, namely side × side or L= $.s^2d^2s^2$

The formula for finding the length of the diagonal is:

$$\mathbf{s^2 + = s^2d^2}$$

The formula for finding the area of a square is:

Try to pay attention to the two formulas above, it turns out that the two formulas form a relationship or relationship with each other. So we can get a new formula for finding the area of a square. For more details, see the following formula.

Formula for Finding the Length of a Side of a Square If you know the diagonal
$s = \sqrt{\frac{1}{2}d^2}$

Formula for Finding Area of a Square If you know the diagonal
$L = s^2 = \frac{d^2}{2}$ then: $L = \frac{d^2}{2}$

The formula for finding the circumference Rectangle If you know the diagonal
$K = 4 \times s$ $K = 4 \times \sqrt{\frac{1}{2}d^2}$

$$s^2 + s^2 = d^2$$
$$2s^2 = d^2$$
$$s^2 = \frac{d^2}{2}$$
$$s = \sqrt{\frac{1}{2}d^2}$$

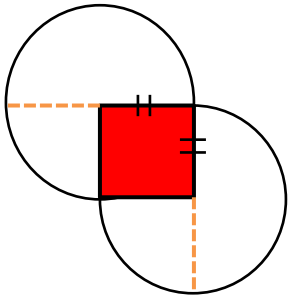


Figure 1.7. The formula for the area of a square flanked by two $\frac{3}{4}$ circle

It is known that the sides of a rectangle are equal with the radius of the circle. Then suppose that s = r. then there are two$\frac{3}{4}$ circle, then we can simplify to = $2\frac{3}{4}\frac{3}{2}$.

Total Area = Square Area + Circle Area$\frac{3}{2}$

Total area =r^2 + ..$\frac{3}{2}\pi\ r^2$

Total area = + . .$r^2\frac{3}{2}\frac{22}{7}r^2$

Total area = +$r^2\frac{33}{7}$. r^2

Total area =$\frac{7}{7}$. +$r^2\frac{33}{7}$. (equalize the denominator between and . $r^2 r^2\frac{33}{7}r^2$)

Total area = .$\frac{40}{7}r^2$

So, the formula for finding the area of a square enclosed by two circles is total area = $\frac{3}{4}\ \frac{40}{7}$. r^2

1.2. Area of the shaded square

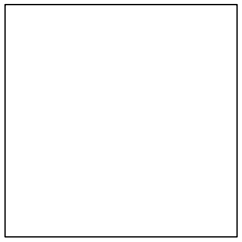
The formula for finding the area of a shaded square actually doesn't have a fixed formula because the formula used depends on the problem ordered by the problem. but we can find the area of the shaded flat shape in the following way:

Shaded area = area of the figure 1 – area of the shape

Application of squares in daily life
In our daily life, we encounter a lot of objects in the form of a square or a square such as a chessboard, ceramics, origami paper, and so on.

Usually, there are also a lot of story questions that look for the area and perimeter of rectangular objects.

Example 1:



Calculate the perimeter of the rectangle on the side!

8 cm

Discussion :

Given: s = 8 cm

Asked: around?

Solution:

K= 4s

= 4 × 8 cm

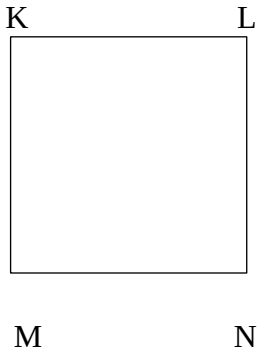
= 32 cm2

When long the side of the square is unknown but the perimeter is known, then the formula for finding the length of the side of a square is as follows.

$s = \frac{K}{4}$

Example 2:

Count the length of the side of the KLMN square below if the perimeter is 64 cm!



Discussion :

Given: circumference of KLMN: 64 cm

Asked: long side of square KLMN ?

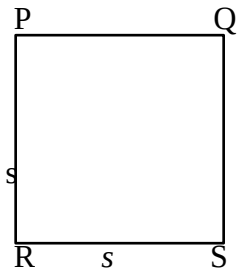
Solution:

$s = \frac{K}{4}$

$= \frac{64}{4}$

= 16 cm

Example 3:

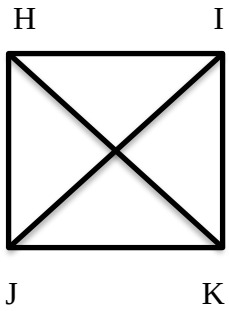


A poster rectangular in shape and long side 35m. Calculate the area of the poster!

Discussion :
Given: s = 35 m
Asked: Area?
Solution:
Wide $= s^2$
$= (35)2$
$= 1225\ m^2$
So, the area of the poster is $1225m^2$

When long the side of the square is unknown but the area is known, then the formula to find the length of the side of a square is as follows.
$s = \sqrt{L}$

Example 4:
The area of a square is 81 m^2. Calculate the sides of the square.
Discussion :
Given: $L = 81m^2$
Asked : s ?
Solution:
$s = \sqrt{L}$
$s = \sqrt{81}$
s = 9 m
So, the side of the square is 9 m .
Example 5:



A square has length diagonal $10\sqrt{2}$ cm, what is the side length, area and perimeter of the square?

Discussion :

Given : d =$10\sqrt{2}$

Asked:

a) s ?
b) L ?
c) K ?

Solution:

a) $s = \sqrt{\frac{1}{2}d^2}$

$s = \sqrt{\frac{1}{2}(10\sqrt{2})^2}$

$s = \sqrt{\frac{1}{2}(200)}$

$s = \sqrt{100}$

$s = 10$ cm

b) $L = \frac{d^2}{2}$

$L = \frac{(10\sqrt{2})^2}{2}$

$L = \frac{200}{2}$

$L = 100\ cm^2$

c) $K = 4 \times \sqrt{\frac{1}{2}d^2}$

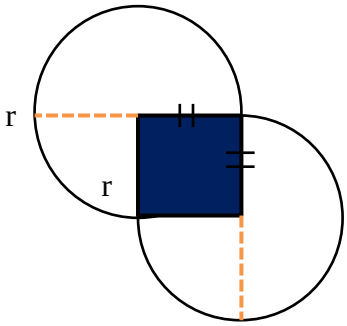
$K = 4 \times \sqrt{\frac{1}{2}(10\sqrt{2})^2}$

$K = 4 \times \sqrt{\frac{1}{2}(200)}$

$K = 4 \times \sqrt{100}$

$K = 40$ cm

Example 6:



if the total area of the figure on the side is $720cm^2$, then the area of the shaded square is…( )$\pi = \frac{22}{7}$

Discussion :

Given: total area of the figure = $360cm^2$

Asked: the total area?

Solution:

Total area = $.\frac{40}{7}r^2$

$360 = \frac{40}{7}. r^2$

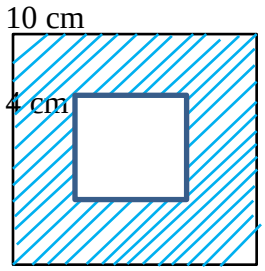
$360.7 = 40 . r^2$

$2520 = 40r^2$

$63 = r^2$

So the area of the shaded square if the total area of the figure is above 360 is 63 $.cm^2cm^2$

Example 7 :

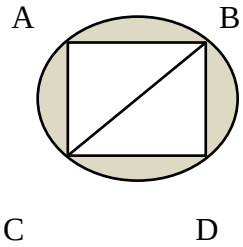


What is the area of the shaded square in the left figure?

Discussion :
Known: long side of shape I = 10 cm
Length of side of shape II = 4 cm
Wanted: area of shaded?
Solution:
Area of the shape I = s × s
Area of the shape I = 10 × 10
Building area I = 100cm ^{2}
Building area II =s × s
Building area II =4×4
Building area II = 16cm ^{2}

The area of the shaded area = L shape I - L shape II
Area of shaded area = 100 cm ^{2} - 16 = 84 .cm ^{2}cm ^{2}

Example 8:



A circle is exactly inside a square. If the side of the square is 14 cm, find the area of the square, the area of the circle, and the area of the shaded area.

Discussion :
Given: square edge = 14 cm
Wanted : a) area of square
b) area of circle
c) the area of the shaded area
solution:
To find the area of a square, we use the formula for the area of a square:

a) Area of square = s^2

Area of square = $(14\ cm)^2$
Area of a square = $196\ cm^2$

To find the area of a circle, we use the formula for the area of a circle:

b) Area of circle = πr^2

Area of circle = $7\ \frac{22}{7} \times cm^2$
Area of circle = $154\ cm^2$

The area of the shaded area is the area of the square minus the area of the circle, namely:

c) Shaded area = Square area – Circle Area

Shaded area = $196 - 154\ cm^2\ cm^2$
Shaded area = $42\ cm^2$

Example 9:
A square handkerchief has an area of 625 cm^2. What is the circumference of the handkerchief?

Discussion :

Given: L = $625\ cm^2$

Asked: K = ….?

Solution:

$L = s^2$

$625 = s^2$

$s = 25\ cm$

Then the circumference:

K= 4 × s

= 4× 25

= 100 cm

Example 10:

Mr. Kasa is a businessman, he buys land in an area the price per square meter of land is sold for IDR 10,000,000. If the land to be purchased is a square with length 9×9m. How much money does Mr. Kasa have to provide to buy the land?

Discussion :

Given: a) length = 9 m

b) width = 9 m

c) price/ = Rp.10. 000000,-m^2

Asked: How much rupiah should Mr. Kasa provide?

Solution:

Area = s × s = 9 × 9

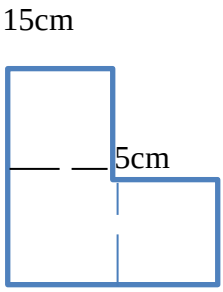
= 81 m^2

Price = 81 × 10,000,000

= 810,000,000,00

So, Mr. Kasa must provide Rp. 810,0002,000,-

Example 11 :



The area and perimeter of the figure above are...

Discussion :

Given: side = 15 cm

Asked: a) the area of the flat shape

b) the perimeter of the flat figure

Solution:

a) Area = Side x Side

Area = 15 cm x 15 cm

Area = 225 cm2

Building area = 3 x 225 cm2

= 675 cm^2

b) Around = 8 x Sides
Around = 8 x 15 cm
Around = 120 cm

So the area and perimeter of the rectangle above are 675 cm2 and 120 cm

Example 12:

A square shaped fence. The length of the side of the yard is 68 m. Around the yard, mango trees will be planted with a distance of 4 m among trees. the number of mango trees needed is.... trees

Discussion :

Known: long side = 68 m

Tree distance = 4 m

Asked: how many mango trees are needed

Solution:

Around = 4 x Sides
Around = 4 x 68 m
Around = 272 m
Mango tree needed = $\frac{\text{circumference of the yard}}{\text{Tree distance}}$

Mango tree needed = $\frac{272}{4}$ = 68 trees

Example 13 :

Uncle's field is rectangular in shape a side of 65 meters. A fence will be installed around the field at a cost of Rp. 100,000.00 per meter. The cost required to install the fence is

Discussion:

Given: Length of side = 65 m

Cost of fence per meter = 100,000.00

Wanted: Cost required

Solution:

Around = 4 x Sides

Around field = 4 x 65 m

= 260 m

Cost of fence = Perimeter garden x fence cost per meter

Cost of fence = 260 x 100,000.00

= 26,000,000.00

Summary

The definition of a square is a quadrilateral whose sides are the same length and the measure of the angle is 900. Build flat square formerly often referred to as a square and also often referred to as a quadrilateral because it has four sides of the same length. The square formula or the formula for the flat shape is divided into three formulas for the area of a square, the formula for the perimeter of a square or the formula for the sides of a square.

Around Flat figure is the total number of sides that a flat shape has.

The formula for calculating the area of a square:

Area = side × side , or Area = S2

The formula for calculating the perimeter of a square:

Around = 4 × Side, or perimeter = 4.S

The formula for calculating the sides of a square:

Side = , or S = $\frac{Perimeter}{4}\frac{p}{4}$

Group Discussion Questions

1. Calculate the perimeter of the KLMN square below

K L

M 25 cm N

Discussion :

Known ...

Asked: around?

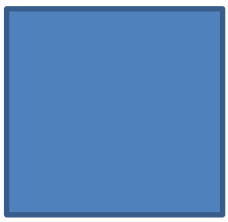
Solution:

P = 4s

P = …

P = 100 cm

2. Calculate the length The side of the UVWX square below if the perimeter is 48cm!



Discussion :
Known : ... ?
Asked: …?

Solution:

$S = \frac{\cdots}{\cdots}$

$S = \frac{\cdots}{\cdots}$

S = 12 cm

2. A billboard is square in shape and has lengthside 38 m. Calculate the area of the billboar

Discussion :
Known : …?
Asked : ... ?
Wide = …
Area = …
Area =
The area of the billboard is… m^2

4. The area of a square PQRS is 1296 $.m^2$. Calculate the sides of the square.

Discussion :
Given: L = ...? m^2
Asked : s ?
Solution:

$s = \sqrt{...}$

$s = \sqrt{...}$

s = 36 m

5. An origami paper in the shape of a square has a length of diagonal $5\sqrt{2}$ cm, calculate the side length, area, and perimeter of the origami paper?

Discussion :

Given : d =$5\sqrt{2}$

Asked:

a) s ?
b) L ?
c) K ?

Solution:

a) $s = \sqrt{...}$

$s = \sqrt{...}$

$s = \sqrt{...}$

$s = \sqrt{...}$

$s = 5$ cm

b) $L = \frac{...}{...}$

$L = \frac{...}{...}$

$L = \frac{...}{...}$

$L = 25\ cm^2$

c) $K = 4 \times \sqrt{...}$

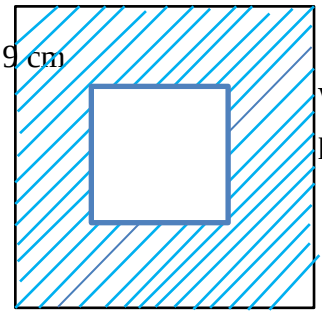
$K = 4 \times \sqrt{...}$

$K = 4 \times \sqrt{...}$

$K = 4 \times \sqrt{...}$

$K = 20$ cm

6. 36cm



What is the area of the shaded square in the left picture?

Discussion :

Known: long side of shape I = … cm

Length of side of shape II = … cm

Wanted : area of shaded ?

Solution:

a. Area of the shape I = s × s

Area of the shape I = … × …

Area of building I = … cm^2

b. Building area II =… × …

Building area II = … × …

Building area II = 81 cm^2

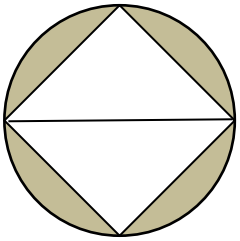
c. Area of shaded area = … – …

Area of shaded area = … cm^2 - … cm^2

The area of the shaded area = 1215 .cm^2

7. Look at the picture below. A square lies directly inside the circle. If the size of the square is 28 cm, find the area of the square, the area of the circle, and the area of the shaded area.

D



B Air conditioning

Discussion :

Given: square edge = ... cm

Wanted : a) area of square

b) area of circle

c) the area of the shaded area

solution:

To find the area of a square, we use the formula for the area of a square:

Area of square = S2

Area of a square = (...cm)2

Area of a square = 784 cm2

To find the area of a circle, we use the formula for the area of a circle:

Area of circle = r^2

Area of circle = × ... cm2─

Area of circle = 44 cm2

The area of the shaded area is the area of the square minus the area of the circle, namely:

Shaded area = Square area – Circle Area

Shaded area = ... cm2 - ... cm2

Shaded area = cm2

8. A living room is square with lengthside 6 m. The living room floor will be fitted with square tiles measuring 40 cm × 40 cm. How many tiles are needed to cover the floor?

Discussion :

Given: a) side of the floor = 60 m = 600 cm

b) tile side = 40 cm

Q: How many tiles are needed to cover the floor?

Solution:

a. Floor area = … × …

Floor area = 360,000 cm^2

b. Area of tile = … × …

= … × …

= … cm^2

So the number of tiles needed for the floor is

= floor area : tile area

= ... : ...

= 225 pieces

9. A garden is square in shape. The length of the side of the garden is 63 m. around the garden will be planted with orchids with a distance of 3 m between the flowers. How many orchids that are needed in the garden?

Discussion :

Given: The length of the side of the garden = 63 m

Distance between flowers = 3 m

Wanted : How many orchids are needed

Solution:

Perimeter = ... x ...

Perimeter = ... x ...

Perimeter = 252 m

Orchid flower needed = Perimeter garden

Flower distance

= ..... = 84 flowers

.....

So, the number of orchids needed is 84 flowers

10. Uncle's field is rectangular in shape. The side is 28 meters. A fence will be installed around the field at a cost of Rp. 150,000.00 per meter. How much is the cost required to install the fence?

Discussion:

Given: Length of side = 28 m

Cost of fence per meter = 150.000,00

Wanted: Cost required

Solution:

Perimeter = 4 x Sides

Around field = 4 x ... m

= ... m

Cost of fence = Perimeter garden x fence cost per meter

Cost of fence = ... x ...

So, the required cost is Rp. 16,800,000.00

11. There is a shophouse that is square in shape and has a circumference of 80 m. What is the area of the shophouse?...

Discussion :

Known: Around = 80 m

Asked: ...?

Solution:

First find the length side of the shop.

S = K : 4

S = ... : 4

S = ...

After we have gotten long side, then we can calculate the area.

L = S × S

L = ... × ...

L = 400 m2

So, the area of the shop is 400 m2

12. If a square field has an area of 169 m2 . then what is the perimeter and side of the field?

Discussion :

Given: area of square 169 m2

Asked: what is the perimeter and side?

Solution:

Firstly, find the side of the field.

Area = S2

... = S2

S= $\sqrt{...}$

S = 13 m2

K = ...×...

K = 52 m

13.A square garden has a side of 9 cm. Calculate the area of the garden.

Discussion :

Known: Sides

Asked: ...?

Solution:

Area of garden area = Side × Side

= ...×....

= 81 cm2

14. A square window with sides 12 cm. Calculate the area of the window.

Discussion :

Known: Sides

Asked: ...?

Solution:

Area of garden area = Side × Side

= ...×....

= 144 cm2

15. Two farms are square with sides of 5 m. Find the two areas of the garden.

Discussion :

Known: Sides

Asked: ...?

Solution:

Area of garden area I = Side × Side

= ...×....

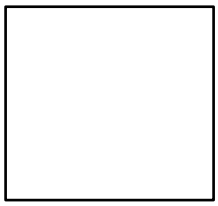
= 25 m2

Area of garden II = Side × Side

= ...×....

1.3. Independent Questions

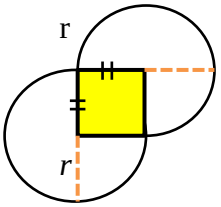
2. Write down the meaning of square!
3. Write down the properties of a square!
4. Write down the formulas for finding the perimeter and area of a square.
5. If a square has a perimeter of 124 cm, what is the side of the square?
6. If a square has a side of 50 cm, what is the perimeter of the square?
7. Given that the area of a square is 121 cm^2, then length of the sides of the square are...
8. Mr. Roy plans to install ceramics on the floor which has an area of 32 $m^2$with a ceramic size of 40 cm × 40 cm. how many pieces of ceramic are needed and if the price of 1 ceramic is 8,000. How much money should Mr. Roy spend?
9. A square-shaped playground. The length of the side of the playground is 45 m. Around the playground, swings will be made with a distance between the games of 5 m. How many swings are needed in the playground?
10. A D



B C

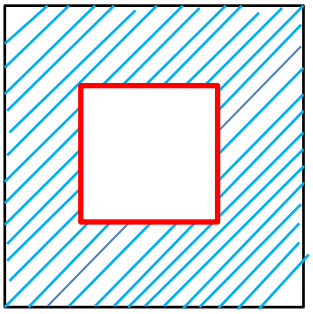
It is known that the long squareside 12 cm. Calculate the area of the square!

11. If the total area of the figure below is 560 cm2, then the area of the shaded square is… ($\pi = \frac{22}{7}$)



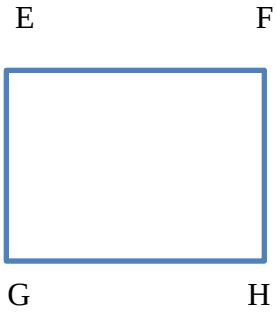
12. 21 cm

7 cm

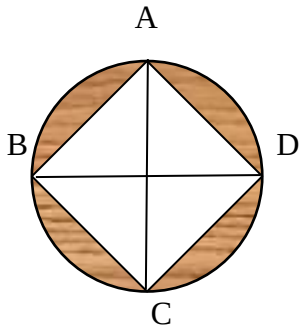


What is the area of the shaded square in the left figure?

13. Pak Anto is a farmer, he plans to buy a plot of rice fields in an area. The price per square meter of rice fields is sold for IDR 2,000,000. If the field to be purchased is a square with length 34m × 34m. How much money should Pak. Anto provide to buy the field?
14. A rectangular floor with length side 8 m. the floor will be tiled with square tiles measuring 50 cm × 50 cm. How many tiles that are needed to cover the floor?
15. A square mattress. If you know the area is 1024 cm2. What is the circumference of the bed?



16. Look at the image below! A square lies directly inside the circle. If the perimeter of the square is 136 cm, find the area of the square, the area of the circle, and the area of the shaded area!



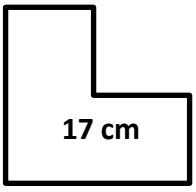
17. A fish pond is in the shape of a square with length side 16 m. The fish pond will be surrounded by a three-level wire fence. How many meters of wire are needed?

18. Uncle Tom's garden is rectangular in shape 85 meters side will be made of bamboo fence. Each meter requires three bamboos, how many bamboos are needed to make uncle's garden fence?

19. A square yard. The length of the side of the yard is 86 meters. Around the yard, papaya trees will be planted with a distance of 2 meters between trees. How many papaya trees are needed? They are … trees.

20. What is the total rotational symmetry and folding symmetry of the square?

21. 17 cm



What is the area and perimeter of the side plane?

CHAPTER 2
PARALLELOGRAM

A. Learning Outcomes

Students are expected to be able to understand and calculate parallelogram shapes

B. Study Material

1. Definition of Parallelogram
2. Parallelogram Area
3. Circumference of Parallelogram
4. Parallelogram Diagonal Length

CHAPTER 2
PARALLELOGRAM

2.1 Definition of Parallelogram

A parallelogram is a flat shape two-dimensional formed by two pairs lateral which is each the same length and parallels with a partner, and have two pairs corner each of which is equal to the angle opposite it.

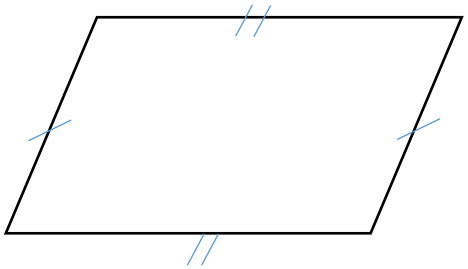


Figure 2. A parallelogram

In order to understand the meaning of a parallelogram, try to make an arbitrary triangle, for example ABD. The midpoint of the side BD is named point O. Then at point O, rotate ABD by half a turn (1800), so that ABCD is formed as shown below.

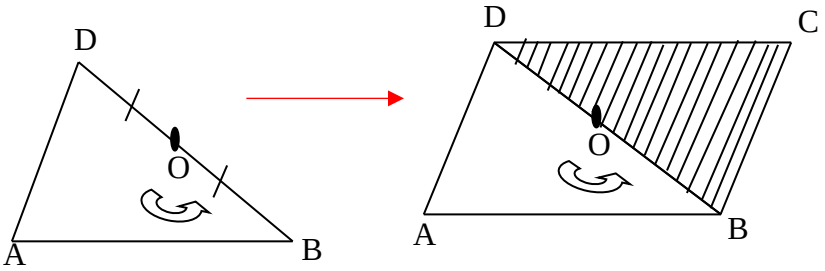
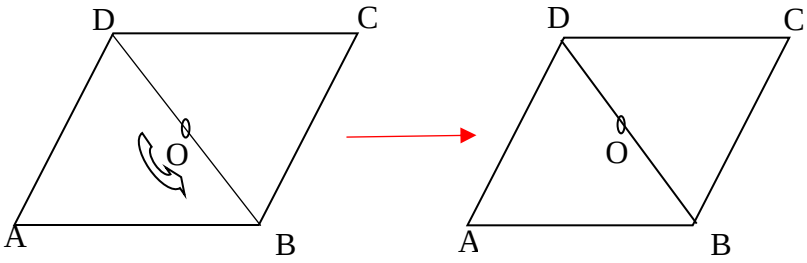


Figure 2.1 and 2.2. triangle to parallelogram

Build a BCD as an image of ABD. Build a triangle and shadow! What is formed is what is called a parallelogram.
So, a parallelogram is a quadrilateral with opposite sides of the same length or parallel which is formed from a triangle and its image is rotated 1800 at the midpoint of one of its sides.

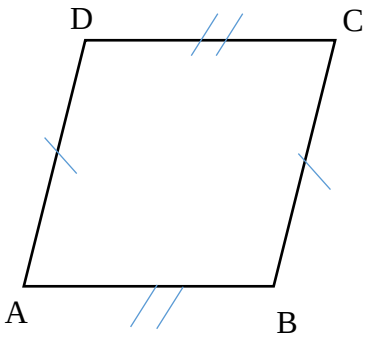


The figure shows the parallelogram ABCD. Rotate ABD is 1800 at point O, so that we get AB to be DC and AD to be BC. Consequently, AB = DC and AD = BC. So in this case:
Opposite sides are equal and parallel.

In the parallelogram picture above, try to pay attention to the corners. If the parallelogram is rotated 1800 then we get$\angle A$ Becomes , $\angle C\angle ABD$ to be, and to be. $\angle BDC\angle ADB\ \angle CBD$

As a result, $\angle A$=, and
=,$\angle C\angle ABD\angle BDC\angle ADB\angle CBD$. So =, = + , and
= + .$\angle A\angle C\angle B\angle ABD\angle CBD\angle D\angle ADB\angle BDC$
So therefore :
Opposite angles are equal.

Look at the image below.



In the parallelogram ABCD, AB//DC and AD//BC. Based on the properties of parallel lines, because AB//DC, we get:

a. angle A is on the same side as angle D, so angle A + angle D = 180°.
b. angle B in one-sided angle C, then angle B + angle C = 180°.

Likewise, because AD // BC, then we get:

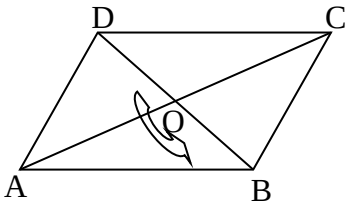
a. angle A is on the same side as angle B, so angle A + angle B = 180°.
b. angle D is on the same side as angle C, so angle C + angle D = 180°.

This can be written as follows.

- ∠A+ ∠D = ∠A+ ∠B = 1800
- ∠C+ ∠B = ∠C+ ∠D = 1800

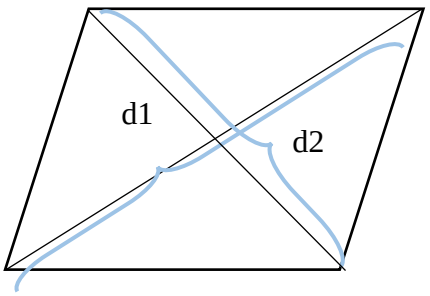
So therefore :
The number of pairs of adjacent angles is 1800

Look at the picture on the side!
If ABD is rotated 180° at point O, so that OA becomes OC and OB becomes OD.
This shows that OA = OC and OB = OD.
Whereas OA + OC = AC and OB + OD = BD.



So, therefore :
The two diagonals bisect each other

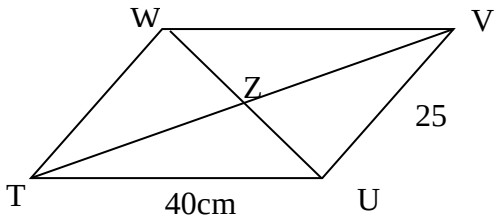
Look at the following parallelogram image.



It has 2 diagonals of different lengths.

Problems example:

1. Look at the following figure!



In the TUVW parallelogram above, the diagonal-the diagonals intersect at point Z. If the length of TU = 40 cm, UV = 25 cm, $\angle TUV =$. Determine it: 120^0

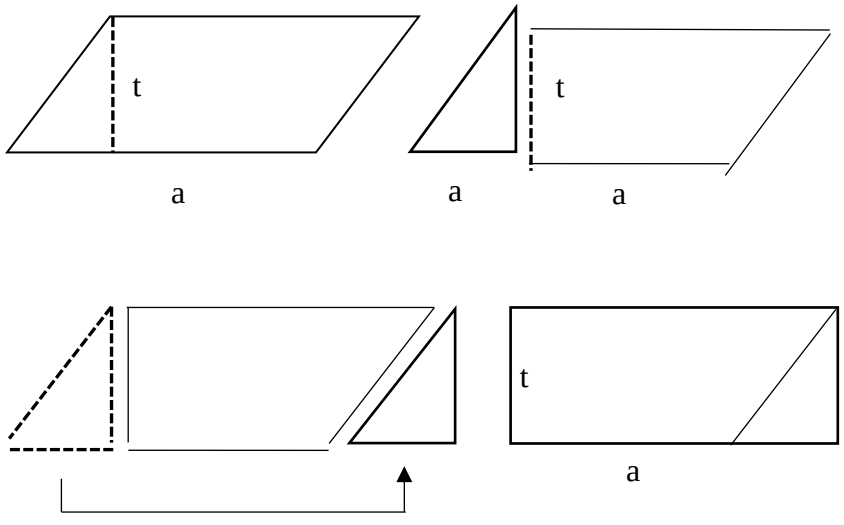
a. VW length
b. TW length
c. Big $\angle TWV$
d. Big $\angle UVW$

Solution:

a. The length of TU // VW, then the length of VW is 40 cm
b. UV length // TW, then TW length is 25 cm
c. Big // then big is 1200$\angle TUV$ $\angle TWV\angle TWV$
d. Big $\angle UVW$:
   $\angle TUV$ + = 1800 $\angle UVW$
   1200 + = 1800$\angle UVW$
   $\angle UVW$ = 1800 - 1200
   $\angle UVW$ = 600

Calculating the area of a parallelogram is the same as calculating the area of a rectangle. Why is that?

Look at the picture below carefully, after the left part of the parallelogram is cut and then combined with the part on the right it will form a flat rectangular shape.

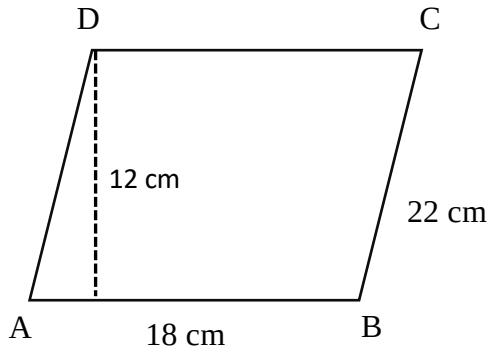


The difference is in the parallelogram the length becomes the base (a) and the width becomes the height (t).

Therefore, it can be obtained area parallelogram :
L = base (a) x height (t)

Problems example:

1. Look at the parallelogram image below!



Find the area of the parallelogram ABCD

Solution:

L = axt

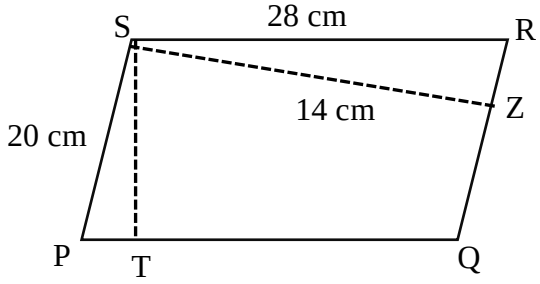
L = 18cm 12cm ×

L = 216 cm2

2. Daniel painted a parallelogram-shaped wall with an area of 85 m2 and a length of 17 m. How high is the wall that Daniel painted?

Solution:

L = 85 m2 , a = 17 m
L = at×
85 m2 = 17 mt×
t = $\frac{85}{17}$
t = 5 m
So, the height of the wall that Dodi painted is 5 meters.



Find the area of the parallelogram PQRS and the length SZ!

Solution:

L = axt
L = 20cm 14cm×
L = 280 cm2

SZ Length:
L = PQ ST×
280 cm = 28 cm SX×
SX = $\frac{280}{28}$ = 10 cm

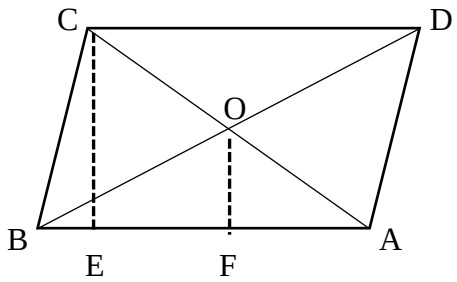
3. In a parallelogram, the area is 300 cm2. If the length of the base of the parallelogram is 6x and the height is 2x, find the value of x, the length and height of the parallelogram....

Solution:

L = a × t
300 cm2 = 6x× 2x
300 cm2 = 12x2
$x^2 = \frac{300}{12}$
x^2 = 25
x = 5
after finding the value of x, then the length of the base of the parallelogram:
Base length = 5x

Base length = 5 × 5
Base length = 25

In the same way, the height of the parallelogram:
Length high = 2x
Length high = 2 5×
Length high = 10



4. Look at the picture above!
   Length AB = 15 cm, area AOB = 45 cm2, ratio OF: DE = 2: 4. Find the area of parallelogram ABCD!

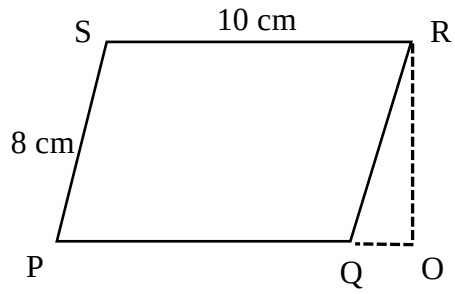
   Solution:

   To find the length of OF, then we use the triangle formula:

   Area AOB = $\frac{a\ x\ t}{2}$
   45 cm2 = $\frac{15\ x\ OF}{2}$
   90 cm2 = 15 cm OF×
   OF = 6 cm

   After meeting the length OF, the length of DE can be found using the concept of comparison, namely:

   OF : DE = 2 : 4.
   6 cm : DE = 2: 4
   DE = $\frac{4}{2}$ 6 ×
   DE = 12 cm



a. calculate the area of PQRS
b. RO length

Solution:

a. Area of PQRS = a × t
   Area of PQRS = 10 cm 8 cm×
   Area of PQRS = 80 cm2
b. To find the length of RO, we can get the formula for the area of a parallelogram as well, namely:
   Area of PQRS = at×
   80 cm2 = 10 cm RO×
   RO = $\frac{80}{10}$
   RO = 8 cm

5. It is known that the parallelogram EFGH with length EF = 24 cm with the ratio EF : FG = 4: 3. If height = 12 cm, calculate the area of the parallelogram!

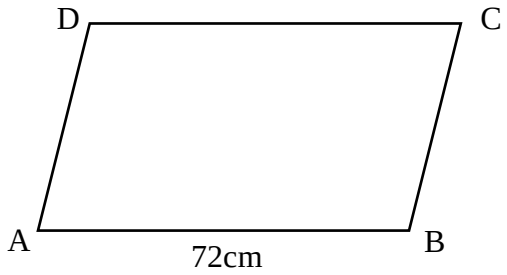
Solution:

EF : FG = 4: 3
24 : FG = 4: 3
FG = 24 $\frac{3}{4}$ ×
FG = 18 cm

Area of parallelogram EFGH:
L = at ×

L = 24cm 12cm×
L = 288 cm2

6. If you know a parallelogram with an area of 864 cm2, then the height of the parallelogram is….



Solution:

L = a × t

800 cm2 = 72 cm t×

t = $\frac{800}{72}$ cm

t = 12 cm

7. Lily made a craft in the form of a parallelogram with a base length of 88 cm and a height of 78 cm. The crafts are coated with oil paint. Each 858 requires 1 small can of paint. How much paint does Lily need to paint the craft?cm^2

Solution:

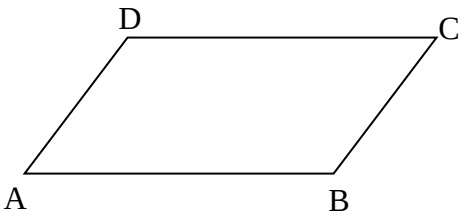
L = at ×
L = 88cm 78cm ×
L = 6864 cm2

Paint needed = L : 858 /cancm^2
Paint needed = 6864 : 858$cm^2 cm^2$
Paint needed = 8 cans

8. A parallelogram is known to have an area of 250 cm2, with a base of 15 cm. determine the height of the parallelogram!

   Solution:
   L = at×
   225 = 15 t×
   t = = 16 cm$\frac{240}{15}$

Look at the following picture.



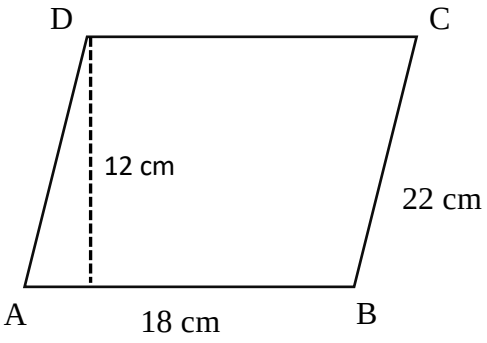
Around parallelogram ABCD is the sum of each side. So we get the formula:
K = AB + BC + CD + DA

Because AB = CD and AD = BC, then the formula for the perimeter of the parallelogram is obtained:

K = 2 (AB + BC)

Problems example:

1. Look at the parallelogram figure below!



   Find the perimeter of the parallelogram ABCD

Solution:

K = 2 (AB + BC)

K = 2 (18cm +22cm)

K = 2 (40 cm)

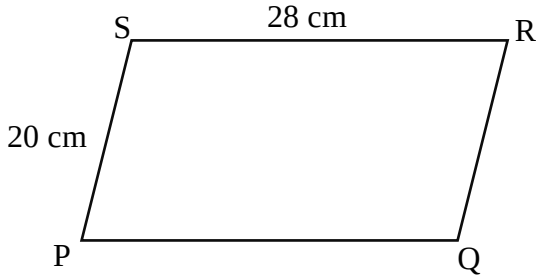
K = 80 cm

2. Given a parallelogram EFGH with length EH 9 cm. If the parallelogram has a perimeter of 36 cm, what is the length of EF?

   Solution:

   K = 2 (EF + EH)
   36cm = 2 (EF + 9cm)
   36 cm = 2 EF + 18 cm
   2 EF = 36 cm – 18 cm
   EF = $\frac{18\ cm}{2}$
   EF = 9 cm

3. Look at the following picture.



   Find the perimeter of the parallelogram PQRS!

   K = 2 (PS + SR)
   K = 2 (20cm + 28cm)
   K = 2 (48 cm)
   K = 96 cm

4. During running, Ali surrounds a parallelogram-shaped field with a base length of 25 meters and a side width of 20 meters. Ali ran 5 laps. How long is Ali's running track?

   Solution:

   K = 2 (a + t)
   K = 2 (25 m 20 m) +
   K = 2 (45 m)
   K = 90 m
   Ali ran 5 laps, so:
   5 × 90 m = 450 m

   Then the length of Ali's running track is 450 meters.

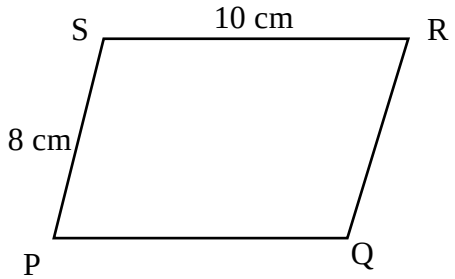
5. The garden in front of Dodi's house is in the form of a parallelogram. The lengths of the different sides are 18 meters and 12 meters. There are lights around the park every 5 meters. How many lights are installed?

   Solution:

   K = 2 (18m + 12m)
   K = 2 (30m)
   K = 60 m

   If a 5 meter lamp is installed, then a lot of lamps:
   60 : 5 = 12 lights

6. Look at the following figure!



Calculate the perimeter of PQRS!
Solution:
K = 2 (PQ + SP)
K = 2 (10 + 8)
K = 2 (18)
K = 36 cm

7. It is known that the parallelogram EFGH with length EF = 24 cm with the ratio EF : FG = 4: 3. If height = 12 cm, calculate the perimeter and area of the parallelogram!
   Solution:
   EF : FG = 4: 3
   24 : FG = 4: 3
   FG = $24\frac{3}{4}\times$
   FG = 18 cm
   Perimeter of the parallelogram EFGH:
   K = 2 (EF + FG)
   K = 2 (24cm + 18cm)
   K = 2 (42 cm)
   K = 84 cm
8. It is known that a parallelogram has side A = 37 cm and side B = 32 cm. Find the perimeter of the parallelogram?

   K = 2 (a + b)
   K = 2 (37cm + 32cm)
   K = 2 (69 cm)
   K = 138 cm

9. The perimeter of the parallelogram is 100 cm and the length of the base is 25 cm. Calculate the length and height of the parallelogram!

   K = 2 (a + t)
   100cm = 2 (25cm + h)
   100cm = 50cm + 2a
   2t = 100 cm – 50 cm
   2t = 50cm
   t = 25 cm

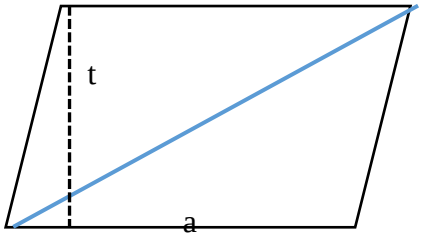
10. Harry 's garden is a parallelogram with a side length of 57 cm. And the length of the other side is 35 cm. The garden will be made a fence at a cost of Rp. 35,000/meter. The cost that Harry needs is…

    Solution:

    K = 2 (a + t)
    K = 2 (57 + 35)
    K = 2 (92)
    K = 184 cm

    Hani's costs are:
    K fence cost/meter = 184 35,000 = 644,000

A parallelogram has two different diagonals, here are the diagonal formulas.



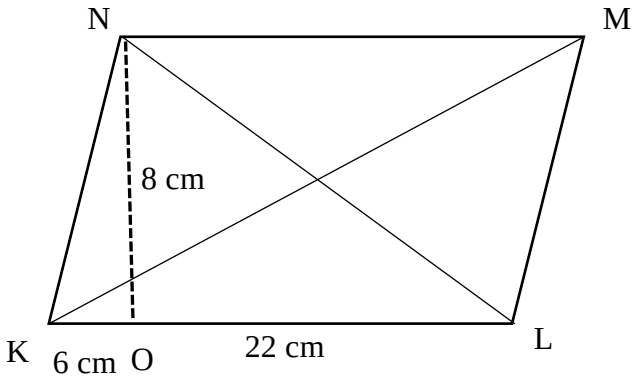
Diagonal1 =$\sqrt{{a_1}^2 + t^2}$

Note:

Diagonal1 = Blue line

Problems example:

1. Look at the following figure!

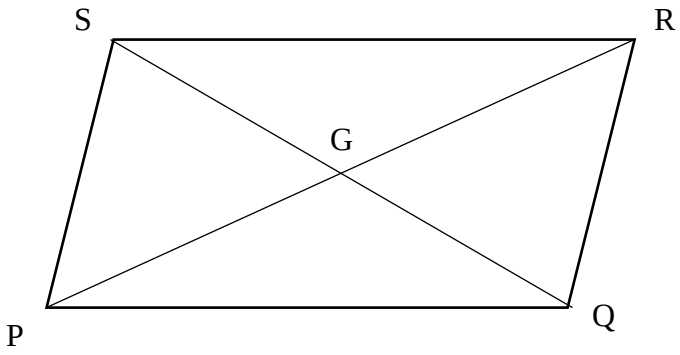


In the figure above, it is known that a parallelogram has 2 diagonals of unequal length, then:

a. Find the length of the diagonal KN
b. Find the length of the diagonal NL

Solution:

a. KN diagonal length:
   a = 22 + 6
   a = 28 cm
   t = 8 cm
   diagonal KN = $\sqrt{a^2 \times t^2}$
   diagonal KN = $\sqrt{28^2 + 8^2}$
   diagonal KN = $\sqrt{784 + 64}$
   diagonal KN = $\sqrt{848}$
   diagonal KN = $4\sqrt{53}$
b. NL diagonal length:
   a = 22 – 6 – 6
   a = 10 cm
   t = 8 cm
   diagonal NL = $\sqrt{a^2 + t^2}$
   diagonal NL = $\sqrt{10^2 + 8^2}$
   diagonal NL = $\sqrt{100 + 64}$
   diagonal NL = $\sqrt{164}$
   diagonal NL = $2\sqrt{41}$ cm



2. Given that PQRS is a parallelogram with a diagonal Intersecting PR and SQ at point G. If PG = 8a + 4, PR = 24a, and GQ = 4a + 5, then SG….

   PG = GR

   8a + 4 = GR

   QG = SG

   4a + 5 = SG

   PR = PG + GR

   24a = 8a + 4 + 8a + 4

   24a = 16a + 8

   8a = 8

   a = 1

   SG Length:

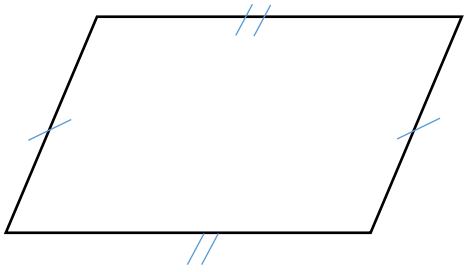
   SG = 4(1) + 5

   SG = 9

Summary

A. Definition of Parallelogram

A parallelogram is a flat shape two dimensional formed by two pairs lateral which are each the same length and parallel with a partner, and have two pairs corners each of which is equal to the angle opposite it.



B. Traits of Parallelograms

1. The opposite sides are equal and parallel.
2. Opposite angles are equal.
3. The number of pairs of adjacent angles is 1800
4. The two diagonals bisect each other.
5. Has 2 diagonals of different lengths.

C. Area of Parallelogram

L = base (a) x height (t)

D. Perimeter of Parallelogram

K = 2 (AB + BC)

E. The formula for the length of the diagonals of a parallelogram

Diagonal1 = $\sqrt{a_1{}^2 + t^2}$

Group Discussion Questions

1. It is known that a parallelogram has an area of 280 cm2 and a base = 40 cm. Calculate the height of the parallelogram!

   Solution:
   L = at ×
   … = … × t
   t = cm $\frac{\cdots}{\cdots}$
   t = … cm

2. Look at the following figure!

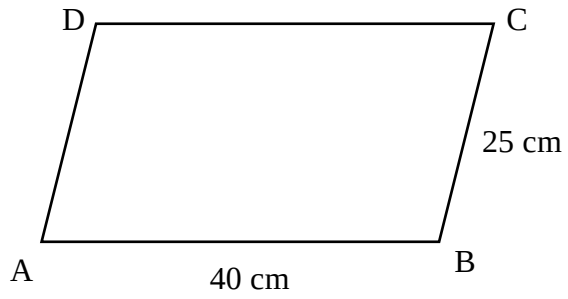


Figure 2.6.1

It is known that a parallelogram has a base = 40 m and a height = 25 m. Find the area and perimeter of the parallelogram!

Solution:

L = at ×

L = … × …

L = … m2

K = 2 (a + t)

K = 2 (… + …)

K = 2 (…)

K = … m

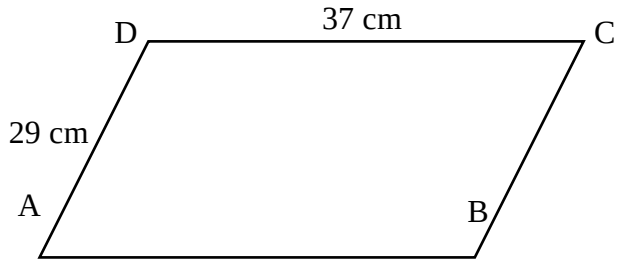
3. A garden is in the form of a parallelogram with an area = 500 m2 and the length of one side is 25 m. There are lights around the garden every 10 meters. Count the number of lights installed!
Solution:
L = a × t
… = … × t
t = m $\frac{\cdots}{\cdots}$
K = 2 (a + t)
K = 2 (… + …)
K = 2 (…)

K = … m

So, the number of lights installed is:

… : … = … lamp

4. Look at the following figure!



It is known that a parallelogram has a base = 37 cm and a height of 29 cm. Define:

a. Circumference of ABCD
b. Area ABCD

Solution:

a. K = 2 (a + t)
   K = 2 (…+…)
   K = 2 (…)
   K = … cm

b. L = a × t
   L = … × …
   L = … cm2

5. It is known that a parallelogram has a perimeter of 120 cm and a base of 36 cm. Calculate the height of the parallelogram!

Solution:

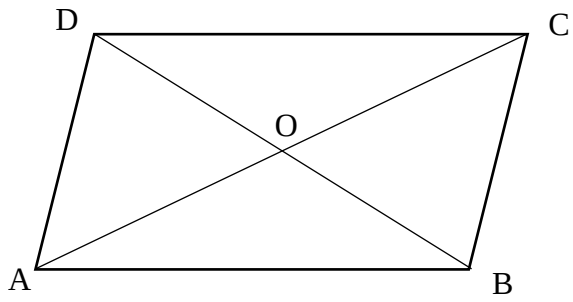
K = 2 (a + t)
… = 2 (… + t)
… = … + 2t
… = 2t
… = t

6. A parallelogram has an area of 128 cm2. If the length of the base is 4x and the height is 2x. Determine the value of x, the length of the base and the height of the parallelogram!

   Solution:

   L = at ×
   … = … × …
   … = …
   … = …x2
   … = x
   Base length:
   4x = 4 … = …×
   high length:
   2x = 2 … = …×

7. Look at the following figure!



   Given that ABCD is a parallelogram with a diagonal The intersecting AC and BD at point O. If AO = 4a + 6, AC = 32a, and BO = 2a + 8. Find the lengths of AO and OD….

   Solution:

   AO = OC

   4a + 6 = OC

   BO = OD

   2a + 8 = OD

AC = AO + OC

… = … + … + … + …

… = … + …

… = …

…a = …

a = …

AO Length:

AO = 4… + 6

AO = … cm

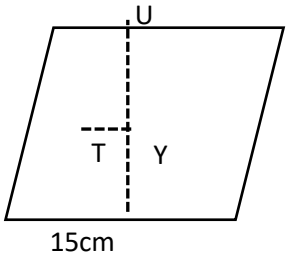
OD Length:

OD = 2… + 8

OD = … cm

8. Ibu Lia's garden is in the form of a parallelogram with a side length of 25 m and a side length of 35 m, the rice field will be made a fence at a cost of 60,000/meter. The cost needed by Mrs. Lia is…
   Solution:
   K = 2 (a + t)
   K = 2 (… + …)
   K = 2 (…)
   K = … m
   Cost required = K fence cost/meter ×
   Cost required = … 60,000/meter ×
   Cost required = …

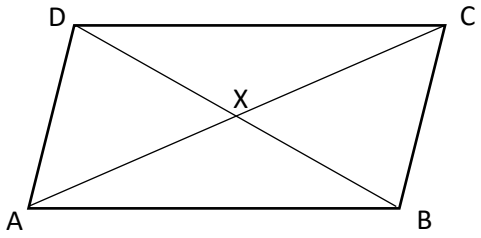
9. Look at the following figure!
   a. Calculate the area of
   b. UY le
   c. Calculate the circumference of STUV



Solution:

a. L = at ×
   L = … … ×
   L = … cm2
b. To find the length of UY we can also use the formula for the area of a parallelogram, namely:
   STUV area = at×
   …cm2 = …cm UY×
   UY = ⋯/⋯
   UY = … cm
   K = 2 (a + t)
   K = 2 (… + …)
   K = 2 (…)
   K = …cm

10.



In the parallelogram ABCD above, the diagonal-the diagonals intersect at point X. If the length of CD = 15 cm, BC = 8 cm, $\angle ADC$ = 1350. Determine:

a. Length AB
b. AD length
c. Big $\angle ABC$
d. Big $\angle CBA$

Solution:

a. The length of CD // AB, then the length of AB is … cm
b. The length of BC // AD, then the length of AD is … cm
c. Large // , then length is …0$\angle ADC\angle ABC\angle ABC$
d. Big = $\angle CBA$
   $\angle ADC$ + = 1800 $\angle CBA$
   …0 + = 1800$\angle CBA$
   $\angle CBA$ = …0 + …0

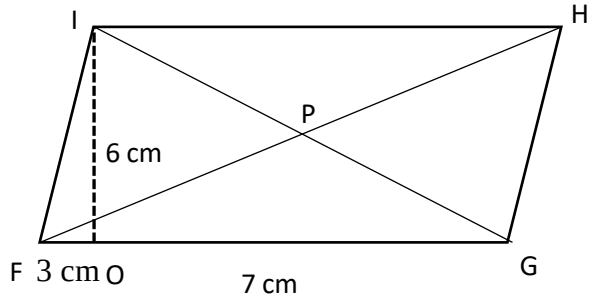
$\angle UVW$ = …0

11. During running, Lala surrounds a parallelogram-shaped field with a base length of 45 meters and a side width of 38 meters. Tasya ran 3 laps. How long is Lala's running track?
    Solution:

    K = 2 (a + t)
    K = 2 (… + …)
    K = 2 (…)
    K = … m
    Lala's running track length:
    K × 3 = … m
12. Around the parallelogram is 396 cm. The length of the base is 22 cm. What is the length of the other side?

13. Solution:
    K = 2 (a × t)
    … = 2 (…× t)
    … = … × 2t
    … = 2t
    … cm = t

14. Look at the following picture!



    In the figure above, it is known that a parallelogram has 2 diagonals of unequal length, then:

    a. Find the length of the diagonal FH
    b. Find the length of the diagonal IG

Solution:

a. FH diagonal length:

a = … + …

a = … cm

t = … cm

diagonal FH = $\sqrt{a^2 \times t^2}$

diagonal FH = $\sqrt{\ldots^2 + \ldots^2}$

diagonal FH = $\sqrt{\ldots + \ldots}$

diagonal FH = $\sqrt{\ldots}$

diagonal FH = $\sqrt{\ldots}$

c. IG diagonal length:

a = … – … – …

a = … cm

t = … cm

diagonal IG = $\sqrt{a^2 + t^2}$

diagonal IG = $\sqrt{\ldots^2 + \ldots^2}$

diagonal IG = $\sqrt{\ldots + \ldots}$

diagonal IG = $\sqrt{\ldots}$

diagonal IG = $\sqrt{\ldots}$ cm

15. It is known that a parallelogram has a base of 33 cm and a height of 27 cm. Find the area and perimeter of the parallelogram!

Solution:

L = at ×

L = … … ×

L = … cm2

K = 2 (a + t)

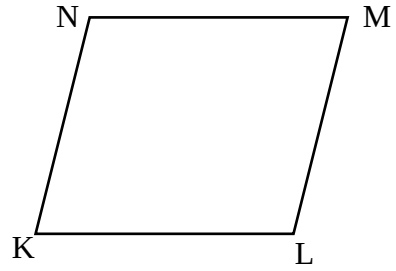
K = 2 (… + …)

K = 2 (…)

K = … cm

16. A parallelogram KLMN has side length KL = 96 cm. If side KL : LM = 4: 3. Find the length of LM, perimeter, and area the KLMN parallelogram!

Solution:



KL : LM = 4: 3
LM = KL $\frac{\ldots}{\ldots}$
LM = … $\frac{\ldots}{\ldots}$ ×
LM = … cm

K = 2 (KL + LM)
K = 2 (… + …)
K = 2 (…)
K = … cm

L = axt
L = … x …
L = …cm^2

2.2. Independent Questions

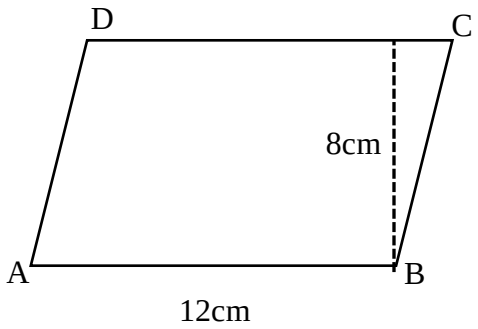
1) A parallelogram PQRS is known to have side AB 76 cm and side BC 58 cm. Around The parallelogram is…

2) Around the parallelogram is 2408 cm. The length of the base is 14 cm. What is the length of the other side?

3) There is a parallelogram whose hypotenuse is 16 m long, its base is 35 m and its height is 18 m. So what is the perimeter and area of the parallelogram?

4) A parallelogram has an area of 1152 cm². If the base of the parallelogram is 8x and the height is 4x. What is the value of x, the base and the height of the parallelogram?

5) Below is a parallelogram ABCD with a length of AB = 12 cm, and the value of AB: BC = 6: 4. If the height of the parallelogram is 8 cm. What is the perimeter and area of parallelogram ABCD?



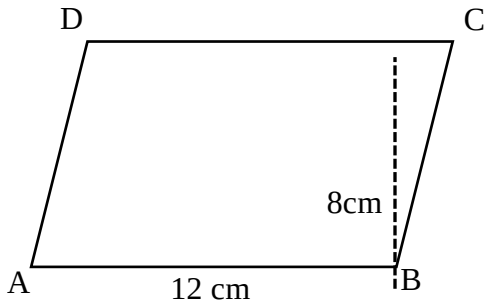
6) Tamy is making crafts from cardboard in the form of a parallelogram with a side length of 75 cm and the other side 55 cm. On the cardboard will be affixed beads with a distance of 5 cm. The number of beads Talita needs is.... fruit

7) A fish pond is in the shape of a parallelogram with sides 18 meters and 16 meters long. The fish pond will be surrounded by a 5-level wire fence. How many meters of wire do you need?

8) Thomas makes a craft in the form of a parallelogram with a base length of 100 cm and a height of 50 cm. The crafts are coated with oil paint. Every 625 cm^2 requires 1 small can of paint. How much paint does Farhan use to paint his craft?

9) A garden in the shape of a parallelogram. The length of the sides is 16 meters and 14 meters. Around the park, garden lights are installed every 3 meters. How many lights are installed?

10) Below is a parallelogram ABCD with a length of AB = 12 cm, and the value of AB: BC = 6: 4. If the height of the parallelogram is 8 cm. What is the perimeter and area of parallelogram ABCD?



11) The garden in front of Mr. Anton's house is a parallelogram. The lengths of the different sides are 8 meters and 14 meters. Around the park, garden lights are installed every 4 meters. How many lights are installed?

12) A parallelogram has an area of 1696 dm2 and a length of 53 dm. The height of the parallelogram is … cm.

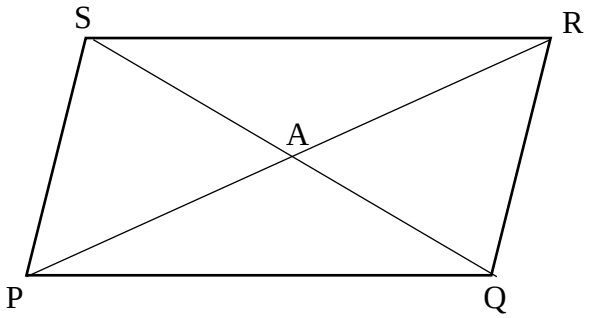
13) During running, Tasya walks around a parallelogram-shaped field with a base length of 26 meters and a side width of 18 meters. Tasya ran 5 laps. How long is Tasya's running track?

14) Tamy is making crafts from cardboard in the form of a parallelogram with a side length of 75 cm and the other side 55 cm. On the cardboard will be affixed beads with a distance of 5 cm. The number of beads Talita needs is.... fruit

15) A fish pond is in the shape of a parallelogram with sides 18 meters and 16 meters long. The fish pond will be surrounded by a 5-level wire fence. How many meters of wire do you need?

16) Thomas makes a craft in the form of a parallelogram with a base length of 100 cm and a height of 50 cm. The crafts are coated with oil paint. Every 625 cm^2 requires 1 small can of paint. How much paint does Farhan use to paint his craft?

17) Look at the image below.



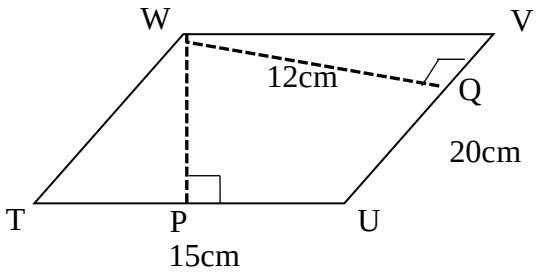
In the parallelogram PQRS above, the diagonal-the diagonals intersect at point A. If you know the length of KL = 31 cm, LM = 213 cm, $\angle KLM = 135^0$. Determine it:

a. RS length
b. SP length
c. Big $\angle PSR$
a. Big $\angle QPS$

18) A parallelogram ABCD is known to have side AB 87 cm and side BC 69 cm. The perimeter of the parallelogram is .... cm

19) Uncle's garden is in the form of a parallelogram with a side length of 75 m. and the length of the other side is 65 m. The garden will be made a fence at a cost of Rp. 75,000.00/meter. The cost required is....

20) Look at the parallelogram figure below.



Define:

a. Perimeter of the TUVW parallelogram
b. Area of a parallelogram TUVW
c. length WP

CHAPTER 3
TRAPEZIUM

A. Learning Outcomes

Students are able to understand the concept of trapezoidal concepts and terminology, and apply them in everyday life

B. Study Material

1. Definition of Trapezoid
2. Properties of the Trapezoid
3. Types of Trapezoid
4. Trapezoidal formula
5. Congruence in the trapezium

CHAPTER 3
TRAPEZIUM

3.1 Understanding Trapezoid

Did you know that before the trapezoid was known in mathematics lessons in elementary school, it turned out that the trapezoid had been used as a roof by our ancestors in the form of a trapezoid?

DEFINITION:

A trapezoid is a rectangular shape formed by four sides where two of them are opposite each other of different lengths

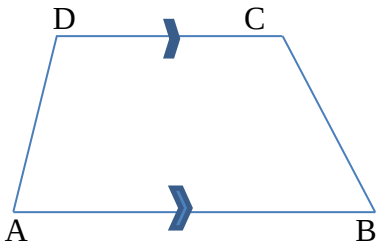


Figure 3. 1. Trapezoidal Properties

Trapezoidal Properties

In general, a trapezoid has the following properties:

1. It is a two-dimensional flat shape
2. Has only one rotational symmetry and no folding symmetry (except isosceles trapezium)
3. It has four vertices, namely the vertices A, B, C, and D
4. It has four sides, namely AB, BC, CD, and DA
5. Has a pair of parallel sides i.e. AB is parallel to DC
6. The sum of the adjacent angles between parallel sides (one-sided interior angles) is 180o .

$\angle BAD + \angle ADC = 180^o$ (one-sided inner corner)

$\angle BCD + \angle CDA = 180^o$ (one-sided inner corner)

7. Have diagonals of different lengths (except isosceles trapezium)

a. Isosceles Trapezoid

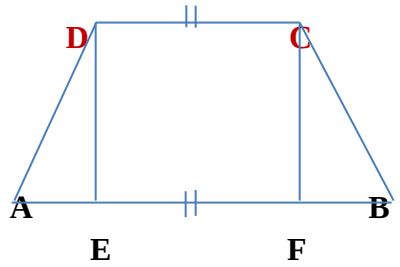


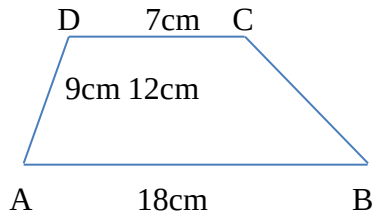
Figure 3.2. Isosceles Trapezoid

An isosceles trapezoid is a trapezoid that has a pair of equal sides, in addition to having a pair of parallel sides

The properties of an isosceles trapezium are:

- It has two equal-length edges and two parallel edges of different lengths. (AD = DC and AB // DC)
- Has two diagonals of the same length (AC = BD)
- Has two adjacent angles that are equal in size.
- The sum of the four angles is 360o
- Has one folding symmetry and one rotating symmetry

It is known that a trapezoid ABCD is drawn as follows:



Find the perimeter (P) of the trapezoid above!

Discussion:

To determine the perimeter of a trapezoid

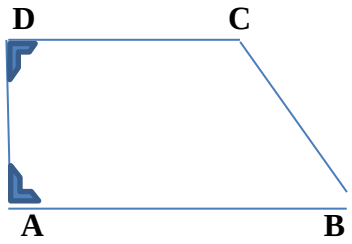
the following formula is used:

P=AB+BC+CD+AD

=18+12+7+9=46

So, the perimeter of trapezoid ABCD is 46 cm.

b. Trapezoid Right



The properties of a right-angled trapezium are:

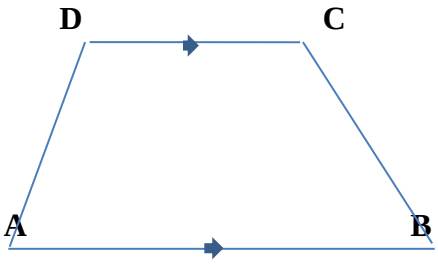
- Has a pair of parallel edges of different lengths (AB // DC)
- A trapezoid whose sum of the four angles is 360°
- Have two diagonals of different lengths
- It has two angles that are 90o each. = 90o and$\angle BAD\ \angle ADC$ =90

Definition:

A right angled trapezoid is a trapezoid in which one angle is90°

C. Any Trapezoid

A trapezoid whose legs are not the same length, and also whose legs are not perpendicular to the parallel sides.



DEFINITION:

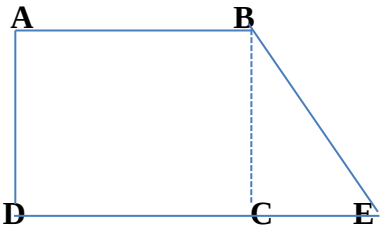
An arbitrary trapezoid is a trapezoid that has no special terms and properties

The properties of any trapezium are:

- Has four sides that are not the same length but have a pair of parallel sides (AB = DC)
- Have two diagonals of different lengths
- Each angle is different
- Has only one rotational symmetry

Trapezoidal Formula

a. Perimeter of Trapezoid



Perimeter trapezoid is determined in the same way as determining the perimeter of other flat shapes, namely by adding up the lengths of the sides that limit the trapezoid.

FORMULA:

Perimeter = AB + BC + CD + DA

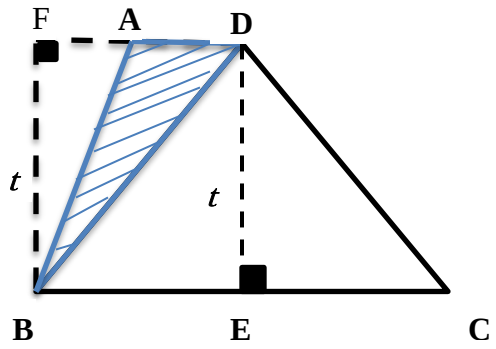
Problems example:
If a trapezoid has sides AB = 27 cm, BC = 56 cm, CD = 69 cm, DA = 33 cm. find and calculate the perimeter of the trapezoid!
Solution:
Known :
Side AB = 27 cm
Side BC = 56 cm
CD side = 69 cm
Side DA = 33 cm

Asked: P =…..?
Solution:

P = AB + BC + CD + DA
W = 27cm + 56cm + 69cm +33cm
W = 185 cm

So, the perimeter of the trapezoid is 185 cm

Area of Trapezoid



The figure above shows that the trapezium ABCD is cut according to the diagonal BD, so it appears that the trapezium ABCD is formed from Δ ABD and BCD with bases AD and BC and height t (DE).Δ

Area of trapezium ABCD = Area Δ ABD + Area BCDΔ = $\frac{1}{2}$ x AD x FB + x BC x DE$\frac{1}{2}$ = $\frac{1}{2}$ x AD xt + x BC xt$\frac{1}{2}$ = $\frac{1}{2}$ xtx (AD+BC)

Based on the description above, it can be concluded as follows:

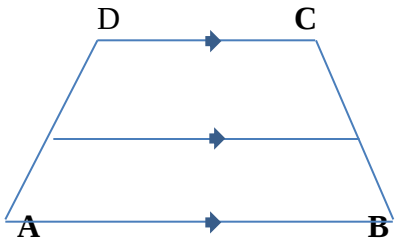
Area of trapezoid=$\frac{1}{2} \times$ *jumlah sisi sejajar* $\times$ *tinggi*

$$\frac{1}{2} \times (AB + CD) \times t$$

Similarity formula in trapezium

Form 1:

The trick that can do this trapezoidal similarity quickly for the first shape is to use the following formula



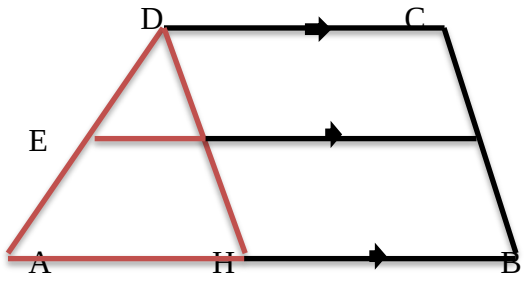
$$x = \frac{(DC.AE) + (AB.DE)}{AE + DE}$$

Or it can also be used as follows:

$$x = \frac{(DC.BF) + (AB.CF)}{CF + BF}$$

The proof is as follows:

First make a triangle and a parallelogram from the trapezoid above. The result looks like the following image,



Information:

DC = GF = HB. $\Delta EDG \sim \Delta ADH$.Note that based on the principle of similarity, the following equation will be obtained,$\Delta EDG \; dan \; \Delta ADH$

$$\frac{EG}{AH} = \frac{DE}{DA}$$

$$EG = \frac{DE.AH}{DA}$$

Note that EF = EG + GF, so that

$$EF = EG + GF$$

$$EF = + GF\frac{DE.AH}{DA}$$

$$EF = +\frac{DE.AH}{DA}\frac{GF.DA}{DA}$$

The value of AH = AB –HB, then

$$EF = +\frac{DE.(AB-HB)}{DA}\frac{GF.DA}{DA}$$

$$EF = +\frac{DE.AB-DE.HB}{DA}\frac{GF.DA}{DA}$$

Since GF = HB = DC and DA = AE + DE, then

$$EF = +\frac{DE.AB - DE.DC}{DA}\ \frac{DC.(AE)}{DA}$$

$$EF = \frac{DE.AB - DE.DC + DC.AE + DC}{AE + DE}$$

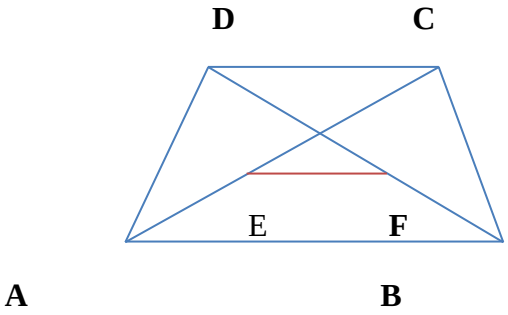
$$EF = \frac{DE.AB + DC.AE}{AE + DE}$$

So it proves a quick formula to find the value of EF

Examples of Trapezoidal Problems

Shape 2.

The following is a trapezoidal similarity formula for the second form. Consider the following trapezoid!

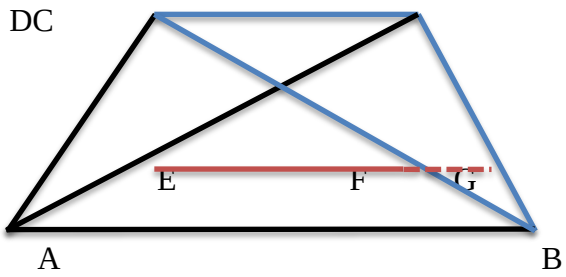


Note: points E and F are the midpoints of lines AC and BD, respectively. So, AE : AC = BF : BD = 1: 2

$$EF = \frac{1}{2}(AB - CD)$$

Proof:

Create an extend line EF in G as shown in the following image,



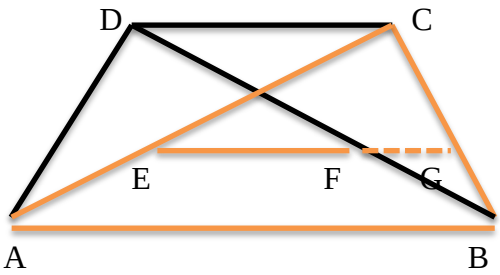
Take note$\Delta BCD\ dan\ \Delta BGF$

Based on $\Delta BCD\ dan\ \Delta BGF\ dapat\ diperoleh\ persamaan\ berikut$:

$= \frac{GF}{CD}\frac{BF}{BD}$

$GF = \frac{BF \times CD}{BD}$

We save the above equation as equation 1, then consider $\Delta ABC\ dan\ \Delta EGC$



The following equation will be obtained:

$\frac{EG}{AB} = \frac{EC}{AC}$

$EG = \frac{EC\ \times AB}{AC}$

We save the above equation as equation 2

The line EG = EF + FG

Then EF = EG – GF

Based on equations 1 and 2, the following equation will be obtained:

EF = EG – GF

EF = $\frac{EC \times AB}{AC} - \frac{BF \times CD}{BD}$

The value of BD = AC, so that the following equation can be obtained

EF = $\frac{EC \times AB - BF \times CD}{AC}$

Before it is known that AE : AC = 1: 2 (E and F are the midpoints of the lines AC and BD), then AC = 2 AE and BF = FD = EC = AE.

EF = $\frac{AE \times AB - AE \times CD}{2AE}$

EF = $\frac{AE\ (\ AB - CD\ )}{2AE}$

EF = $\frac{AB - CD}{2}$

EF = (AB $\frac{1}{2}$ – CD)

So it proves a quick formula to find the EF value:

$$EF = \frac{1}{2}(AB - AC)$$

3.2. Group Discussion Questions

1. A trapezoid has parallel sides 12 cm and 14 cm respectively and the height is 10 cm. What is the area of the following trapezium?

   Solution:

   Known : Parallel side = 14 cm and 16cm

   Height = 12 cm

   Asked: Area?

   Answer :

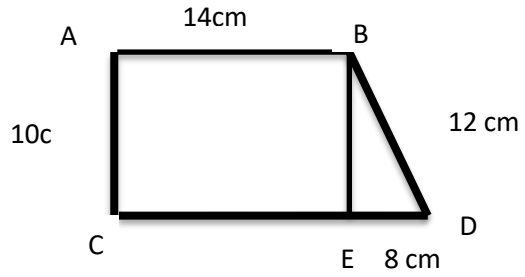
   Wide $= \frac{1}{2}$ x number of parallel edges x height

   $= \frac{1}{2}$ x (14 + 16) x 12

   $= \frac{1}{2}$ x 30x 12

   = <u>180cm2</u>

2. Look at the following picture!



The area and perimeter of the trapezium above are...

Solution:

Before finding the area and perimeter, first find the length from point C to D.

CD Length = Length AB + Length ED

= 14 + 8

= 22 cm

Wide $= \frac{1}{2}$ x (AB + CD) xt

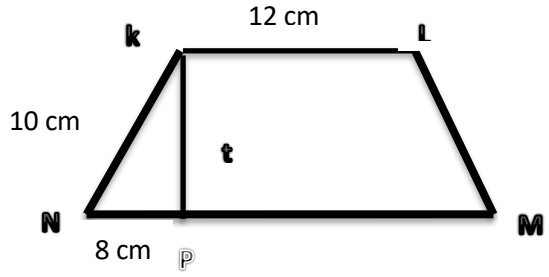
$= \frac{1}{2}$ x (14 + 8) x 10

$= \frac{1}{2}$ x 220x 10

= <u>110 cm2</u>

- Circumference= AB + BD + DC + CA
  = 14 + 12 + 8 + 10
  = <u>44 cm</u>

3. Look at the following picture!



Find the area and perimeter of the isosceles trapezium above!
Solution:

Because the KLMN trapezoid above is an isosceles trapezoid, the length of KN = LM = 8 cm.
So the circumference:

Circumference = KL + LM + MN + KN
= 12 + 10 + 20 + 10
= <u>52 cm</u>

Before finding the area, first find the height of the trapezium by using the Pythagorean formula .

Height (KP) $= \sqrt{(KN)^2 - (NP)^2}$

$= \sqrt{10^2 - 8^2}$

$= \sqrt{100 - 64}$

$= \sqrt{36}$ = 6 cm

Wide $= \frac{1}{2}$ x (KL + MN) xt

$= \frac{1}{2}$ x (12 + 20) x 6

$= \frac{1}{2}$ x 32 x 6

= <u>96 cm2</u>

4. If the area of a trapezium is known to be 640 cm2 and also the height of the trapezium is 16 cm and one of the parallel sides is 28 cm. What is the length of one side of the trapezium?
   Solution:

zKnown: Area = 640 cm^2

Height = 16 cm^2

One parallel side (b) = 28 cm^2

Asked : The length of one of the parallel sides (b) ?

Answer :

Wide $= \frac{1}{2}$ x (a + b) xt

640 $= \frac{1}{2}$ x (a + 28) x 16

640 = 8 (a + 28)

$\frac{640}{8}$ = a + 28

80 = a + 28

a = 80 − 28

a = <u>52 cm</u>

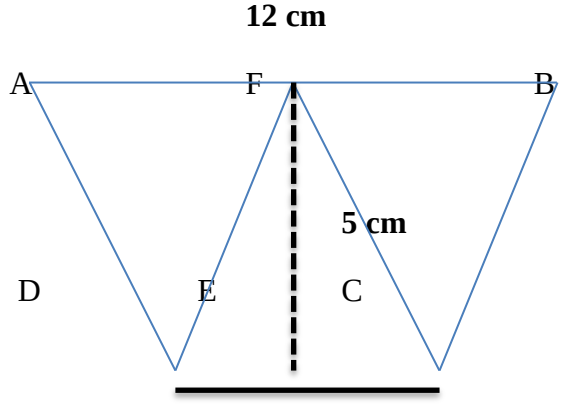
So, the length of one side of the trapezium is 52 cm

5. An object is in the shape of a trapezoid whose parallel sides are 15 cm and 10 cm and the height of the trapezium is 8 cm. Find the area of the trapezium!

Solution:

Known : parallel sides = 15 cm and 10 cm
Tall = 8 cm
Asked : Area of trapezoid ?
Answer :
Wide = $\frac{1}{2}$ x number of parallel sides x height
= $\frac{1}{2}$ x (15 + 10) x 8
= 4 (25)
= <u>100 cm2</u>
So, the area of the trapezium is 100 cm2

6. Calculate the area of the shaded blue area as shown below! If it is known that the length of AB is 12 cm, the length of EF is 4 cm and the length of CF is 5 cm.



Answer:

- First, find the base of the right triangle CEF using the Pythagorean formula.
  CE = $\sqrt{(CF)^2 - (EF)^2}$
  = $\sqrt{5^2 - 4^2}$ =$\sqrt{25 - 16}$
  = $\sqrt{9}$
  = 3 cm
  So, the length of one of the parallel sides = CD = 3 + 3 = 6 cm
- Find the area of a colorless isosceles triangle

Wide $= \frac{1}{2}$ x base x height

$= \frac{1}{2}$ x 6 x 4

= 12 cm2

- Finding the area of the trapezium

  Wide $= \frac{1}{2}$ x number of parallel sides x height

  $= \frac{1}{2}$ x (12 + 6) x 4

  = 2 (18)

  = 36 cm2

- Looking for the shaded area

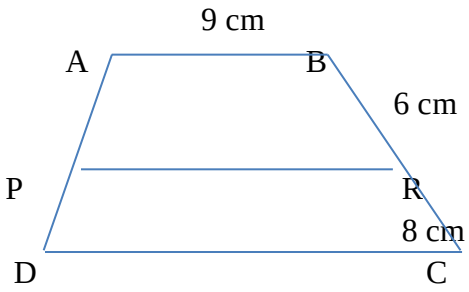
  Shading area = area of trapezium – area of isosceles triangle colorless

  = 36 cm^2 – 12 cm2

  = 24 cm2

  So, the area of the shaded blue area is 24 cm2.

7. The trapezoid ABRP is congruent to PRCD. Calculate the length of the CD ?



Answer :

First find the length of PR by using the comparison method.

$$\frac{AB}{PR} = \frac{BR}{RC}$$

$$\frac{9}{PR} = \frac{6}{8}$$

$9 \times 8 = PR \times 6$

$72 = PR \times 6$

$PR = \frac{72}{6}$

$PR = 12$

Next, find the length of the CD.

$$\frac{AB}{PR} = \frac{PR}{CD}$$

$$\frac{9}{12} = \frac{12}{CD}$$

$9 \times CD = 12 \times 12$

$9 \times CD = 144$

$CD = \frac{144}{9}$

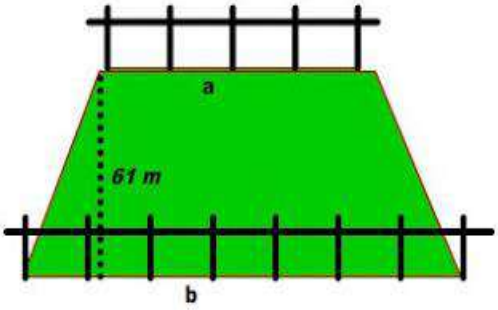
$CD = 16$

So, the length of CD in the trapezium is 16 cm.

8. Pak Ahmad fenced his garden which was in the form of a trapezoid. The distance between two parallel fences is 61 m. If the total length of the fenced garden is 190 m, what is the area of Pak Ahmad's garden?

Solution: For example:
the distance between two parallel fences is the height of the trapezoid (t = 61m)
The sum of the lengths of the gardens that are fenced in parallel is the sum of the two sides
parallel to the trapezium (a + b = 190 m).

For more details, see the following figure:



Answer :

L $= \frac{1}{2}$ x (a + b) xt

$= \frac{1}{2}$ x 190 m x 61 m

$= \frac{1}{2}$ x 11590 m2

= 5,795 m^2

So, the area of Mr. Ahmad's garden is 5,795 m^2.

9. In the trapezium ABCD below, it is known that $\overline{AD}$= . o, length = 18 cm and = 10 cm.$\overline{BC} \angle A = 45 \overline{AB\ CD}$

Determine:

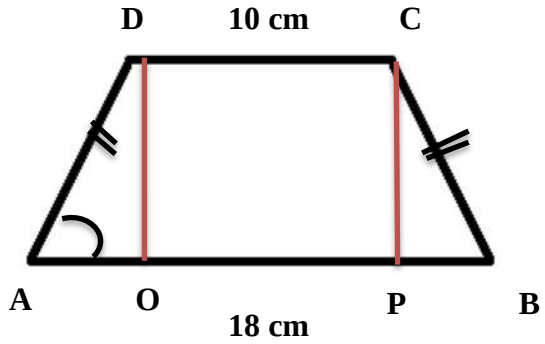
a. trapezoidal height
b. Area of trapezoid

Solution:

a. trapezoidal height:

To find the height of the trapezium, you can use the Pythagorean formula.

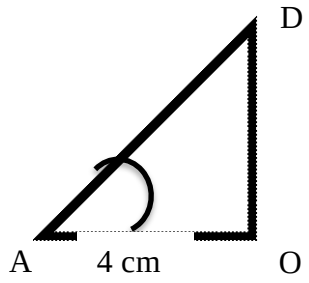
First, we draw a perpendicular line from point D to line AB and draw a perpendicular line from point C to line AB.



In the trapezium, the length of the line OP = CD and the length of the line AO = PB, so:

$$\begin{aligned}
\overline{AB} &= \overline{AO} + + \overline{OPPB} \\
\overline{AB} &= \overline{AO} + + \overline{CD\ AO} \\
18 &= 2\,\overline{AO} + 10 \\
2\,\overline{AO} &= 18 - 10 \\
2\,\overline{AO} &= 8 \\
\overline{AO} &= \frac{8}{2} \\
&= 4 \text{ cm}
\end{aligned}$$

Then the triangle AOD is formed, where angle A is 45^{o}and the base is 4 cm. So we can use the Pythagorean formula to find the height of the trapezoid.



Tan A $= \frac{DO}{AO}$

Tan 45o $= \frac{DO}{4}$

1 $= \frac{DO}{4}$

DO = 1 x 4

= 4 cm

So, the DO line is the height of the trapezium so it is 4 cm.

b. Area of trapezoid

L $= \frac{1}{2}$ x number of parallel sides x height

$= \frac{1}{2}$ x (10 + 18) x 4

= 2 x 28

= 56 cm2

3.3. Trapezoid Problem Practice

1. A trapezium has parallel sides 15 cm and 10 cm and the height of the trapezium is 8 cm. What is the area of the following trapezium?
   Solution:

   Known : Length of parallel sides = … cm and … cm
   Tall = … cm
   Asked : Area of trapezoid?

Answer :

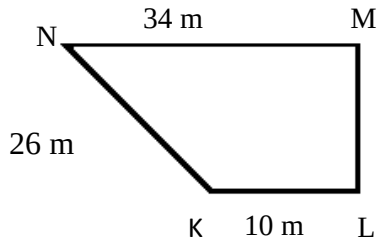
Wide $= \frac{1}{2}$ x number of parallel sides x height

= … x (…+…) x …

= … x …

= <u>90 cm2</u>

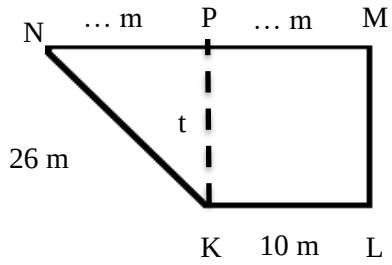
2. Mr. Damar bought a plot of land with the shape and size as shown below.



If the land price is IDR 45,000.00/m2, then How much does Mr. Damar have to pay?

Solution:

To find the height, we use the Pythagorean theorem right triangle.



t $= \sqrt{(KN)^2 - (NP)^2}$

$= \sqrt{\ldots - \cdots}$

$= \sqrt{\ldots - \cdots}$

$= \sqrt{\ldots}$

= 10 m

The area of the land in the form of a trapezoid:

Wide = $\frac{1}{2}$ x number of parallel sides x height

= … x (… + …) x …

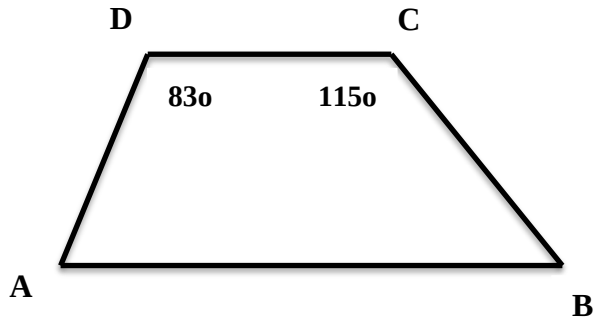
= … x …

= 220 m^2

So, Mr. Damar has to pay the amount = … x Rp….

= <u>IDR 9,000,000.00</u>

3. Calculate the measure of the other angles in the trapezoid in the figure below!



Solution

Known :$\angle ADC = \cdots$

$\angle BCD = \cdots$

Asked: what is the other angle?

Answer :

- $\angle BAD + \angle ADC$ = 180°

  $\angle BAD$ + … = 180°

  $\angle BAD$ = … − …

  $\angle BAD$ = <u>97o</u>

- $\angle DCB + \angle CBA$ = 180°

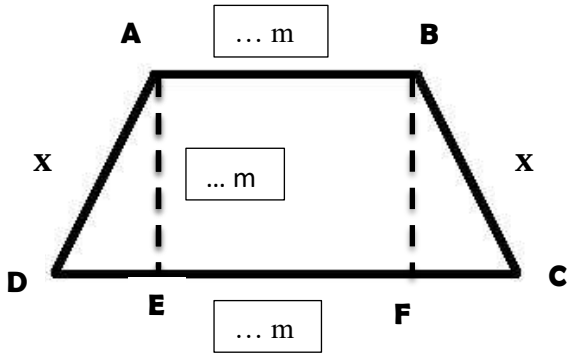
  ... + $\angle CBA$ = 180°

  $\angle CBA$ = … − …

  $\angle CBA$ = <u>65o</u>

4. Andi circled the isosceles trapezoidal court 10 times. The height of the trapezoid is 120 m and its two parallel sides are 250 m and 150 m long. Andi's distance is...
   Solution:

   Known : Height of trapezoid = … m
   Two parallel sides = … m and … m
   Asked: The distance traveled by Andi?
   Answer :
   The distance that Andi travels around the field is the same as the circumference of the field.



   From the figure that the length of DE = length of FC, where DC = 250 m, then

   Length DE = $\frac{1}{2}$ x (DC – AB)
   = $\frac{1}{2}$ (… - …)
   = $\frac{1}{2}$ (…)
   = 50 m

   Then we find the hypotenuse of the trapezoid.

$$AD = \sqrt{(AE)^2 + (DE)^2}$$
$$= \sqrt{(\ldots)^2 + (\ldots)^2}$$
$$AD = \sqrt{\ldots + \ldots}$$
$$= \sqrt{\ldots}$$
$$= 130\,m$$
$$Jadi, nilai\ x = AD = BC = 130\,m$$

So that the perimeter of the trapezium can be calculated

K = AB + BC + CD + DE

= … + … + … + …

= 660 m

Andi's distance = 10 x circumference of trapezium

= 10 x (…)

= … meters

= … meters x … km

= 6.6 km

So, the distance covered by Andi is 6.6 km

5. An object is in the shape of a right-angled trapezoid with parallel sides 25 cm and 40 cm long and 20 cm high. What is the perimeter of the trapezium and the area of the trapezoid?

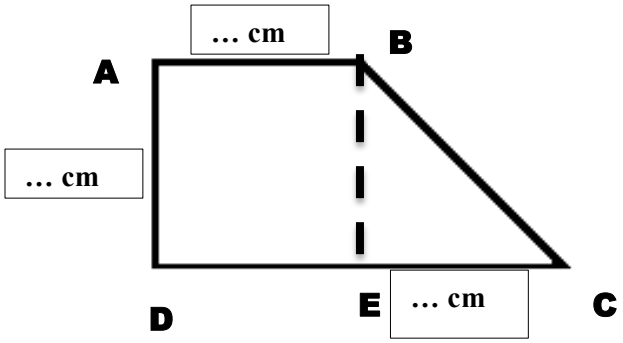
Solution:

Known : Length of parallel sides = … cm and … cm

Height of trapezium = … cm

Asked : Around and Area of trapezium ??

Answer :



To find the perimeter of a trapezium, first find all the side lengths outside the trapezium. Then we find the length of BC by using the Pythagorean formula.

EC Length = DE – AB

= … - …

= 15 cm

Height of trapezium (AD) = BE = … cm

hypotenuse (BC) $= \sqrt{(BE)^2 + (EC)^2}$

$= \sqrt{(\ldots)^2 + (\ldots)^2}$

$= \sqrt{\ldots + \ldots}$

$= \sqrt{\ldots}$

= 25 cm

Then find the perimeter of the trapezoid.

K = AB + BC + CD + DA

= … + … + … + …

= <u>110cm</u>

Then find the area of the trapezoid.

L $= \frac{1}{2}$ x (AB + DC) x height

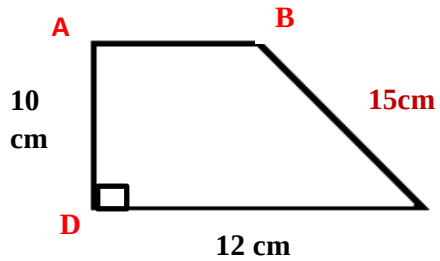
= … (… + …) x …

= … (…) x …

= <u>650 cm2</u>

So, the perimeter and area of the trapezium are … cm and … cm2.

6. It is known that trapezium ABCD and trapezium PQRS are congruent as shown in the following figure. Determine the length of CD and PQ ?



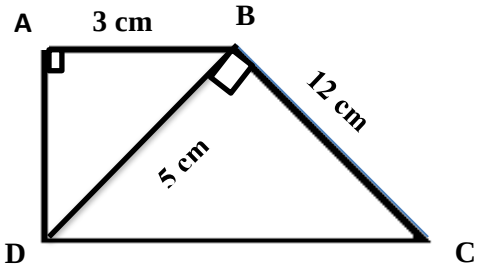
Solution:

It is known that trapezium ABCD is congruent with trapezium PQRS so that:

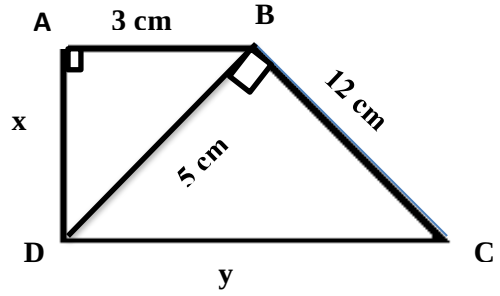
$$\frac{AD}{PS} = \frac{CD}{RS} = \frac{AB}{PQ}$$

• $\frac{AD}{PS} = \frac{CD}{RS}$ $\frac{\dots}{\dots} = \frac{CD}{\dots}$ … x … = … x CD … = … x CD CD = $\frac{\dots}{\dots}$ = 6 cm	• $\frac{AD}{PS} = \frac{AB}{PQ}$ $\frac{\dots}{\dots} = \frac{\dots}{PQ}$ … x … cm

7. What is the area of the shape ABCD?



Solution:



AD(x)= $\sqrt{(BD)^2 - (AB)^2}$

= $\sqrt{(\ldots)^2 - (\ldots)^2}$

= $\sqrt{\ldots - \ldots}$

= $\sqrt{\ldots}$ = 4 cm

CD(y)= $\sqrt{(BC)^2 + (BD)^2}$

= $\sqrt{(\ldots)^2 + (\ldots)^2}$

= $\sqrt{\ldots + \ldots}$

= $\sqrt{\ldots}$

= 13 cm

After finding one of the parallel sides and the height of the trapezium, then find the area of the trapezium.

L = $\frac{1}{2}$ x (AB + CD) x AD

= … x (… + …) x …

= … x (…) x …

= <u>32 cm2</u>

So, the area of the trapezium is … cm2.

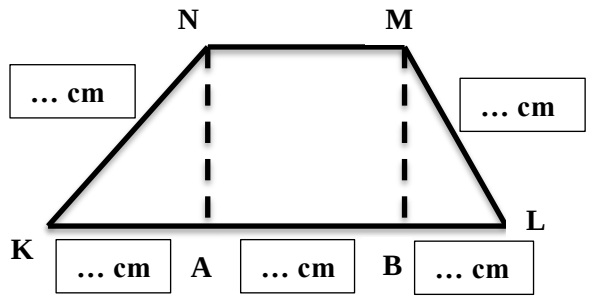
8. A KLMN trapezoid where MNAB is a square with length AB = 8 cm. If KA = 6 cm, KN = 10 cm, BL = 2 cm, and ML = $2.\sqrt{17}$

   Determine: a. MN length?

   b. Around KLMN trapezoid?

Solution:

Known:



Asked: a. MN length?

b. Around KLMN trapezoid?

Answer :

a. Length MN = AB = … cm.

b. Base = KL = KA+ AB + BL

= … + … + …

= 16 cm

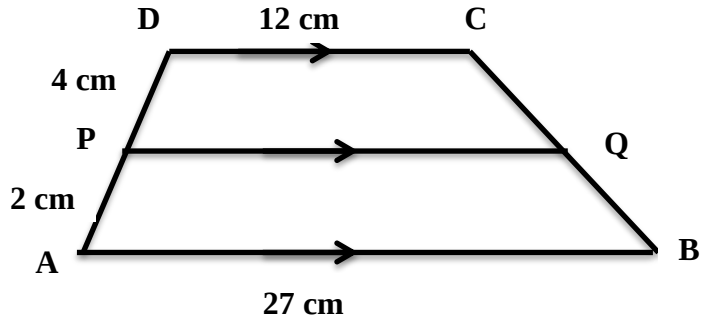
Around trapezoid = KL + ML + MN + NK

= … + … + … + …

= $\underline{(34 + 2)\ \text{cm}\sqrt{17}}$

So, the perimeter of the trapezium is … cm.

9. Look at the ABCD trapezium in the figure below!



Then the length of PQ is...

Solution:

PQ $= \frac{(CD\ x\ AP) + (8\ AB\ x\ DP)}{AP+DP}$

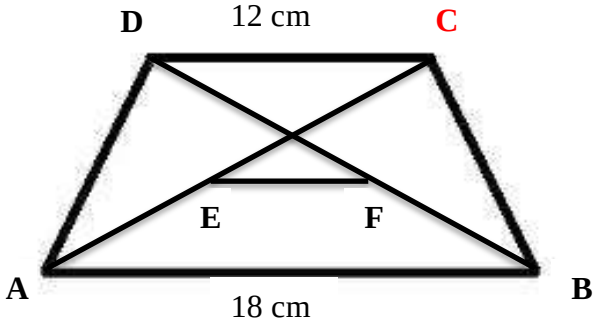
$= \frac{(\ldots x \ldots) + (\ldots x \ldots)}{\ldots + \ldots}$

$= \frac{\ldots + \ldots}{\ldots}$

$= \frac{\ldots}{\ldots}$

= 22 cm

10. Look at the following figure!



E and F are the midpoints of line AC and line BD. Then the length of EF is...

Solution:

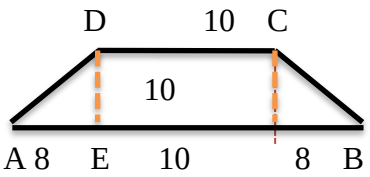
EF $= \frac{1}{2}$ (A B C D)

= … (… - …)

= … (…)

= 3 cm

11. A plot of land is in the form of an isosceles trapezoid with a perimeter of 80 m and two parallel sides of length 10 m and 26 m. How much is price of the land?



Discussion:

$$DE^2 = AD^2 - AE^2$$

$$= \quad -$$

$$=$$

$$= \sqrt{\quad} =$$

Wide$= - \times (\quad) \times t$

Wide$= \frac{1}{2} \times (\quad) \times$

Wide$\ldots = \cdots \times$

Wide$=$ ^{2}

The land price$= \cdots \times 75.000{,}00$

The land price$= \cdots$

So the price of the whole land is $R_{p=\ldots}$

12. If the area of a trapezoid is known, it is 640 cm2. The height of the trapezoid is 16 cm and the length of one of the parallel sides is 28 cm. what is the length of the other parallel side?

Discussion

Suppose the two parallel combs with symbols a and b, then their area is:

Area = (a + b) $\frac{\cdots}{\ldots} \times \times t$

640 = $\frac{\cdots}{\ldots} \times (a + 28) \times 16$

640 = … (a + …)×

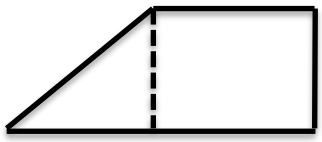
8a = …+ …

8a = … - …

a = = … cm$\frac{\ldots}{\ldots}$

so the length of the other parallel side is … cm

13. A trapezoid ABCDE as shown in the figure below where BC = CD = 8 cm, AD = 10 cm and EB = 14 cm. what is the area of the trapezoid?



Discussion

What is not known from the picture above is another parallel side, namely side AB:

AE2 = AD2 – DE2

AE2 = …2 - …2

AE2 =... - …

AE2 = …

AE2 =$\sqrt{\ldots}$

AE2 =…

Thus, the parallel sides AB are:

AB = AE + EB

AB = … + …

AB = …cm

The next step, can only be searched broadly:

Area = (CD + AB) $\frac{1}{2}$ ×× t

Area = (… + …) …$\frac{1}{2}$ × ×

Area = …cm2

14. An area of a trapezoid is 104 cm2, the lengths of its parallel sides are 15 cm and 11 cm. calculate the height of the trapezoid!

Solution:

Known:

a = 15 cm

b = 11 cm

L = 104 cm2

Asked: t = …?

Answer:

t = 2L : (a + b)

t = 2 … : (… + …)×

t = … : …

t = … cm2

15. A trapezoid has parallel sides measuring 8 cm and 15 cm respectively and has a height of 10 cm. what is the area of the trapezoid?

Solution:

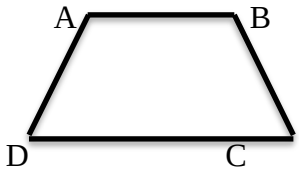
Wide = $\frac{parallel\ sides \times height}{2}$

Area = $\frac{(8\ cm + 15\ cm) \times 10}{2}$

Wide $= \frac{\ldots cm \times \ldots cm}{\ldots}$

Area = $\frac{\ldots . cm}{\ldots}$

Area = … cm

16. 

Look at the trapezoid picture above! If < BAD = 7x, <BCD = z, and <ADC = 400, then determine the values of x, y, and z!

Solution:

Known : big < BAD = 7 x large < BCD = z

Large < ABC = 4y big< ADC=40^0

Asked: the value of x, y, and z = …..?

Solution:

The sum of the adjacent angles between two parallel sides is 1800.

400 + 7x = 1800

7x = 1800 - …

7x = …

x = $\frac{\ldots}{\ldots}$

x = …

base angle equal

z = 400

The sum of the adjacent angles between two parallel sides is 1800 .

$z + 4y = \ldots$

$\ldots + 4y = \ldots$

$4y = \ldots - \ldots$

$4y = \ldots$

$y = = \ldots \frac{\ldots}{\ldots}$

17. B 10 C

5 cm

A 3 E 12 D

Find the area of the perimeter, if the length of AB = 5 cm?

Discussion:

Given: BC = 10 cm

AD = AE + ED = 3 + 12 = 15 cm

AB = 5 cm

Wanted: area and perimeter = …. ?

Answer:

To find the area we must calculate the length of BE using the Pythagorean formula

$BE2 = AB2 – AE2$

$BE2 = 52 - 32$

$BE = \ldots - \ldots$

$BE2 = \ldots$

$BE = \sqrt{\ldots}$

BE = …

Area = (BC + AD) × $^{t}/_{2}$

Area = (… +…) × $^{4}/_{2}$

Area = … …×

Area = … cm2

Perimeter = AB + BC + CD + DA

= … + … + … + …

= … cm

18. A trapezoid has parallel sides 14 cm and 18 cm respectively and a height of 10 cm, what is the area of the trapezoid?

Answer :

Area of trapezoid = number of parallel sides × $^{t}/_{2}$

Area of trapezoid = (… + …) $\frac{\cdots}{2}$

Area of trapezoid = … …×

Area of trapezoid = …cm2

So the area of the trapezoid is … cm2

19.Find the area of a trapezoid which has and height $!p_1 = 8cm, p_2 = 13cm6cm$

Discussion:

$$l = \frac{1}{2}.t.(p_1 + p_2)$$

$$= \frac{1}{2}.(\ldots)(\ldots + \cdots)$$

$$= \cdots cm^2$$

20. If it is known that a trapezoid has side lengths, then calculate the perimeter (P) of the trapezoid $EF = 5cm, FG = 3cm, GI = 7cm, IJ = 10cm$.

Discussion:

Known:

Side EF=5cm

Side FG=3cm

Side GH=7cm

Side HI = 10cm

Asked :P= ⋯ ?

$P = EF + FG + GH + HI$

$L = 5cm + 3cm + 7cm + 10cm$

$L = 25\ cm$

So, the circumference is= $25\ c$

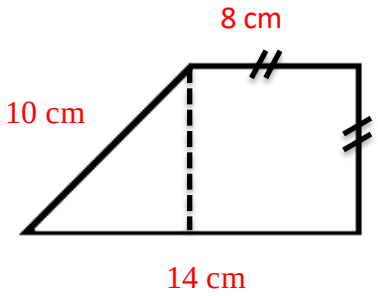
Independent Questions

1. Find the area of a trapezium whose parallel sides are 15 cm and 9 cm long and 6 cm high?

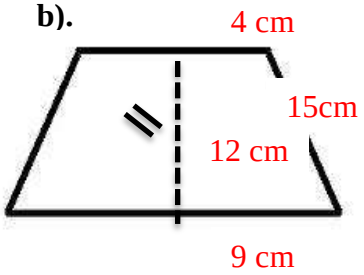
2. A right-angled trapezium has parallel sides 12 cm and 24 cm. If high trapezium 16 cm, find the length of the hypotenuse and the area of the trapezium?

3. Find the perimeter and area of the following trapezium.

a).



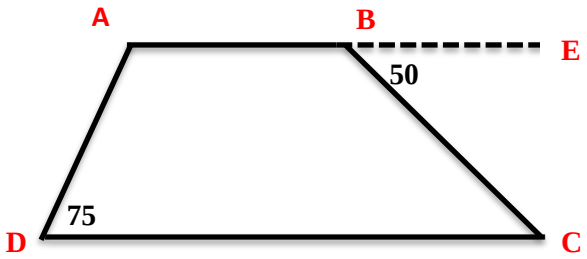
b).



4. The area of an isosceles trapezium is 112 cm2. If the lengths of the parallel sides are 8 cm and 12 cm, find the length of the legs of the trapezium and the height of the trapezium?

5. An isosceles trapezium has legs 40 cm long and its parallel sides are 14 cm and 38 cm. what is the height and area of the trapezium?

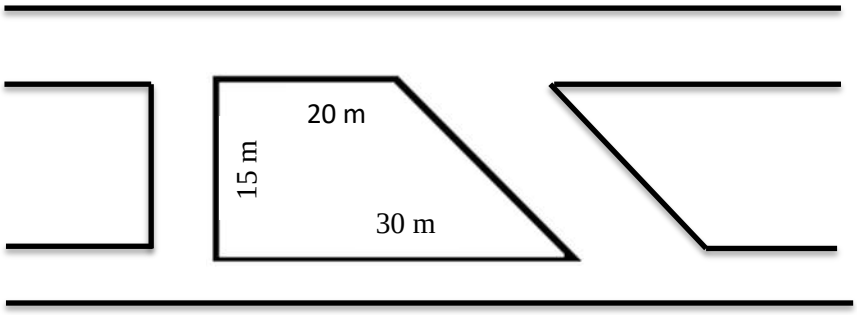
6. Take a look at the following ABCD trapezoid figure!



Measure 0 and 0. What is the measure of the other angle?$\angle EBC = 50 \angle ADC = 75$

7. The ratio of the lengths of the parallel sides of a trapezium is 4: 6. If the height of the trapezium is 12 cm and the area is 120 cm2, the length of the parallel sides is...

8. The following picture shows a garden in the form of a right-angled trapezoid surrounded by a road. Around the park, trees are planted with a distance of 1 m each, starting from the four corners of the garden.

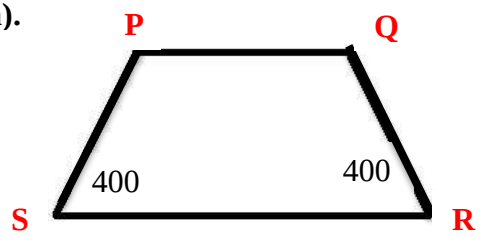


If the cost of maintaining the garden for each month is Rp. 750.00/m2, how much is the maintenance of the garden for each month?

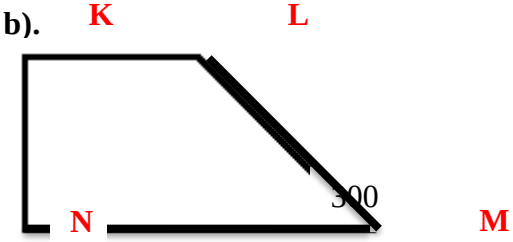
9. Mrs. Nita owns a plot of land in the form of a trapezoid with a pair of parallel sides which are 35 m and 45 m long, respectively. If the distance between the two parallel sides is 20 m, what is the area of Mrs. Nita's land?

10. Find the measure of all the unknown angles of the following trapezium.

a).

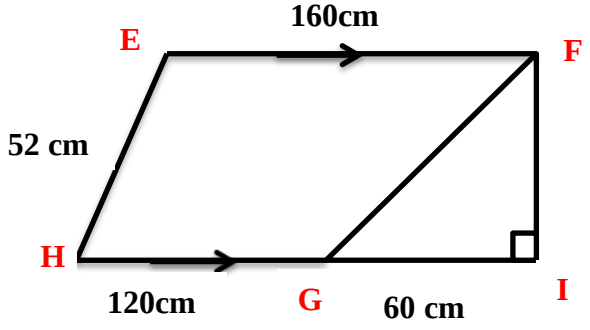


b).



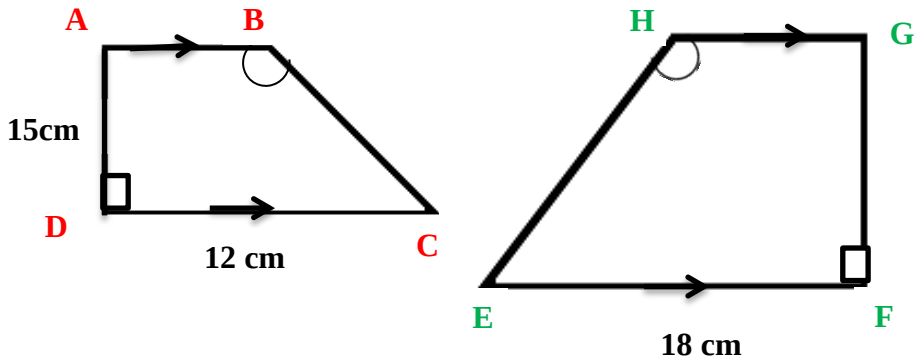
11. A trapezium ABCD, and with an area of 420 cm2. If the length is cm and = 20 cm, what is the length?$\overline{AB}//\overline{CDBE} \perp \overline{CDAB} = 27\,\overline{CDBE}$

12. Look at the following figure!



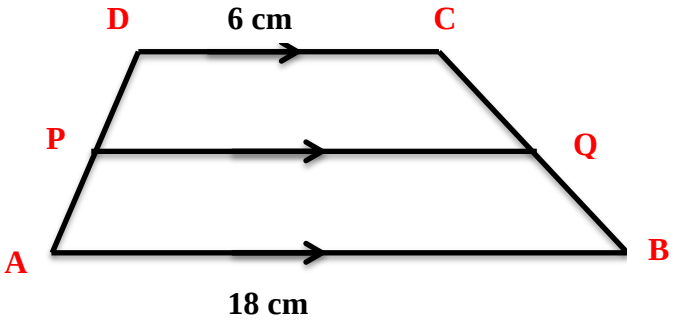
a. What are the parallel sides and the height of the trapezium EFGH?
b. What is the area of EFGH?
c. What is the circumference of EFIH?

13. It is known that trapezium ABCD and trapezium EFGH are congruent as shown below. Determine the length of FG?



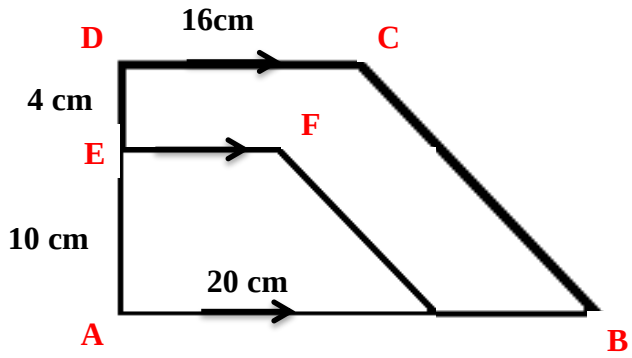
14. The quadrilateral PQRS is a trapezoid with parallel sides PS and QR, PQ = SR, size 0 and size 0. What is the size of $?\angle SPQ = 120 \angle SPR = 20 \angle PSQ$

15. Watch the following figure!



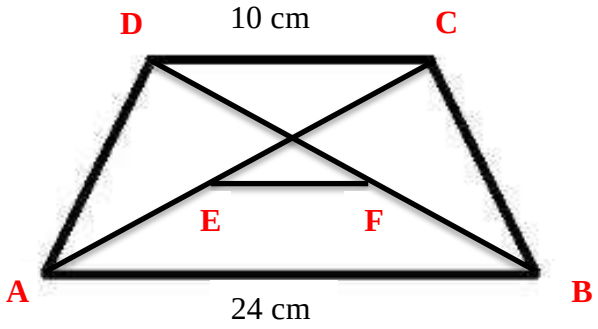
If DP : PA = 1: 2 , then the length of PQ is …

16. Look at the following figure!



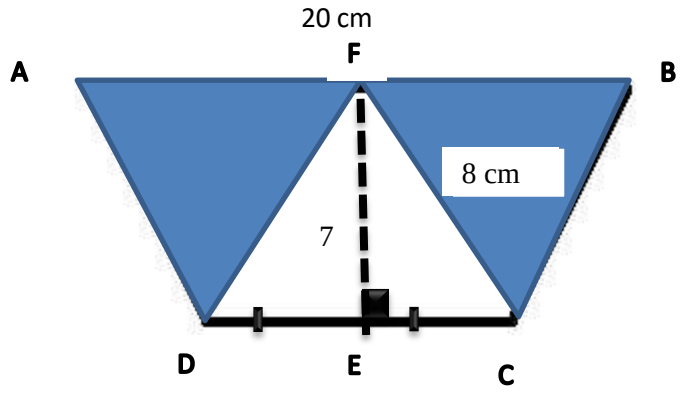
The quadrilateral AGFE is congruent to the quadrilateral ABCD. Find the area of quadrilateral ABCD!

17. Look at the following picture!

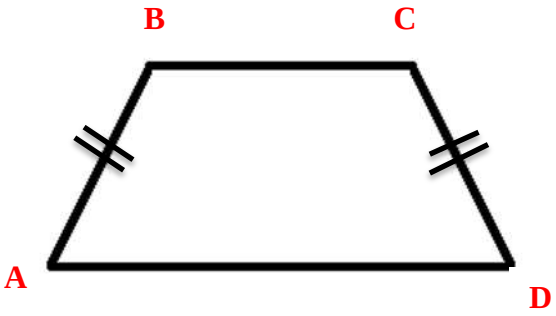


E and F are the midpoints of AC and BD. The length of EF is…

18. Calculate the area of the shaded area as shown below. If it is known that the length of AB is 20 cm, the length of EF is 7 cm, and the length of CF is 8 cm.



19. In the trapezium ABCD below, it is known that $\overline{AB}$= . o, length = 32 cm and = 20 cm.$\overline{BC}\angle A = 45\overline{AD\ BC}$



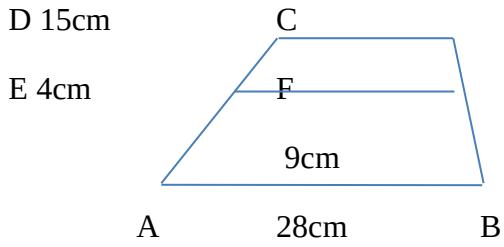
a. Trapezoid height
b. Area of the trapezoid

20. A sheet of cardboard in the shape of a trapezoid with parallel sides measuring 48 cm and 32 cm. The area of the trapezoid is 800 cm2. The height of the trapezoid is…

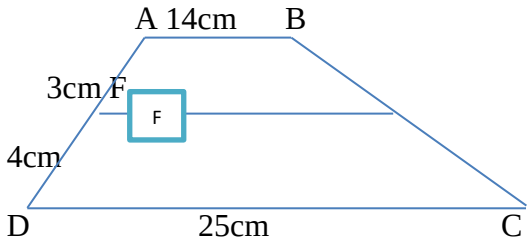
21. A trapezoid whose area is$560\ cm^2$ and height, then the length of the base (a) and the length of the top side (b) in a trapezoid are... $20cm$.

22. It is known that the lengths of the two parallel sides of the trapezoid are $28cm\ dan\ 32cm$. If the area of the trapezoid is then the height of the trapezoid is...cm$750cm^2$,

23. Determine the length EF of the trapezoid below

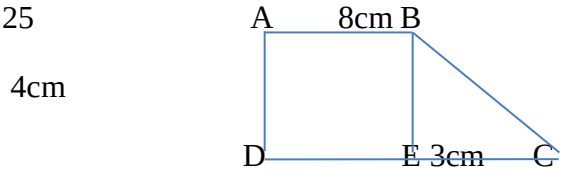


24.



The length of EF is….?

25



What is the perimeter of the trapezoid above?

CHAPTER 4
RECTANGULAR

A. Learning Outcomes

Students are able to understand and master rectangular material in various ways and to use methods appropriately.

B. Study Material

1. Definition of Rectangle
2. Area and Perimeter of Rectangle
3. Axis of Symmetry, Rotary Symmetry and Rectangle Diagonals
4. Solving each rectangular problem
5. Rectangle problem solving
6. Solving problems using the image/figure sharing method

CHAPTER 4
RECTANGULAR

4.1. Understanding Rectangles

Look around you! Is there anything rectangular? Of course, a lot! There are notebooks, desks, blackboards, and even rectangular cupboards. So, what is a rectangle?

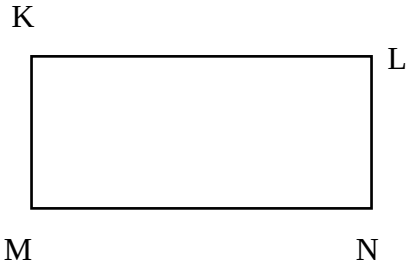
A rectangle is a quadrilateral whose four angles are right angles and a side-opposite sides are the same length.

Figure 4.Rectangle

Properties of Rectangles

The properties of a rectangle in terms of side, diagonal and angle. Here's how to prove the properties of rectangles:

1. In everyday life you often see things around you such as: blackboards, table surfaces, house doors, etc
    a. From these objects, what can you conclude about rectangles?
    Answer:
    Rectangular is a flat shape that
2. Look at the KLMN rectangular figure below and write down your observations!



Based on the KLMN rectangular figure, there are several things that can be obtained, including:

a. sides KLMN rectangles are , ... , , and ...$\overline{KLMN}$
b. The opposite sides are parallel and the same length is$\overline{KL}$ with ..... ; with .....$\overline{KM}$
c. angles a KLMN rectangle measuring ....^{o} has ... , i.e. ... , ... , <NMK, and ...
d. Diagonal rectangle ABCD is ... and BD
e. Intersection angle with a diagonal line size 90˚? (Yes No)

From the two problems, that the properties of a rectangle:

1. Has four sides and the four corner points
2. Has two pairs of sides parallel opposite and the same length
3. Every corner the magnitude is 90^{o} and the sum of all angles is 360^{o}
4. Has two diagonals which is the same length and divides into 2 equal triangles
5. The angle formed by the intersection diagonal not 90˚

The width of a plane figure is the size of the area bounded by the plane figure. The area of a rectangle is the product of 2 sides which are perpendicular to each other.

Area Formula Rectangular (L) :

L = Length is Width

x Height

$W = l\ x\ h$

Example 1

A rectangle has a length of 9 cm and a width of 6 cm. Find the area of the rectangle!

Known: Long = 9 cm

Wide = 6 cm

Asked : Width of rectangular

Answer : $\boldsymbol{W = l \times h}$

$= 9cm \times 6cm$

$= 54\ cm^2$

So, the area of the rectangle is $54\ \text{cm}^2$.

Example 2

A rectangular pool has a width of 4 m and an area of $24\ \text{m}^2$, then the length is...

Known: Wide = 24 m2

Wide = 4 m

Asked : Long pool

Answer : $\mathbf{W = l \times h}$

$\text{L} = \frac{\text{w}}{h}$

$L = \frac{24\ \text{m}^2}{4\ \text{m}}$

L = 6 m

So, the length of the pool is 6 m

Example 3

A door is 200 cm long and its area is 1 m^2. Determine the width of the door!

Known: Long = 200 cm

Wide = 1 m^2 = 10000 cm2

Asked : wide door

Answer **: W = l × h**

$$W = \frac{L}{H}$$

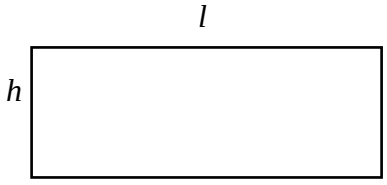
$$W = \frac{10.000}{200}$$

$$W = 50\ cm$$

So, the width of the door is 50 cm.

Circumference of the Rectangle

The circumference of a plane figure is the sum of all the side lengths-the side. The perimeter of a rectangle is the sum of the sides of the rectangle or the sum of the lengths of the four sides.



Circumference (C)Formula Rectangular:

$$C = 2\ (l + h)$$

$$C = 2l + 2p$$

Example 4

Pak Soni's garden is rectangular with a length of 65 m and a width of 48 m. How many meters is the circumference of Pak Soni's garden?

Known: Long = 65 m

Wide = 48 m

Asked : Around garden

Answer $\mathbf{:C = 2\ (l + h)}$

$$C = 2(65\text{m} + 48\text{m})$$

$$C = 2(113\text{m})$$

$$C = 226\text{ m}$$

So, the perimeter of the garden is 226 m.

Example 5

A garden has a perimeter of 360 m and a length of 120 m. How many meters wide is the garden?

Known: Around = 360 m

Long = 120 m

Asked : Wide garden

Answer $\mathbf{: W = 2\ (l + h}$

$$360 = 2(120\text{m} + l)$$

$$360 = 240\text{m} + 2l$$

$$120 = 2l$$

$$W = 60\text{m}$$

So, the width of the garden is 60 m.

Example 6

A rectangle has area 60 cm^2 with a width of 6 cm, find the perimeter of the rectangle.

Known: width = 6 cm

Wide = 60 cm^2

Asked : perimeter of a rectangular

Answer $: W = l \times h$

$$W = \frac{L}{h}$$

$$l = \frac{60\ cm^2}{6\ \text{cm}} = 10\ \text{cm}$$

$$W = 2(l + h)$$

$$W = 2(10 + 6)$$

$$W = 2(16)$$

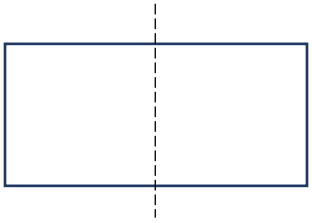
$$W = 32\ cm$$

So, the perimeter of the rectangle is 32 cm.

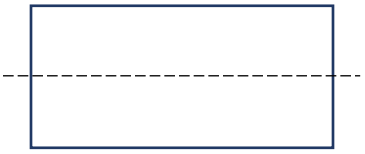
Axis of Symmetry Rectangle

Axis symmetry is a straight line that divides the plane into two equal parts. There are two axes of symmetry in a rectangle. If the quotient is not the same and when folded on the axis of symmetry the sides do not cover each other otherwise, the line is not an axis of symmetry.

Axis First Symmetry :

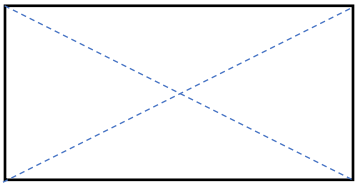


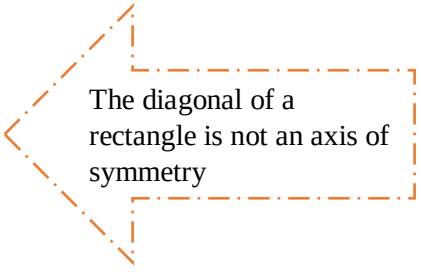
Second Axis of Symmetry :



How about diagonal rectangular?

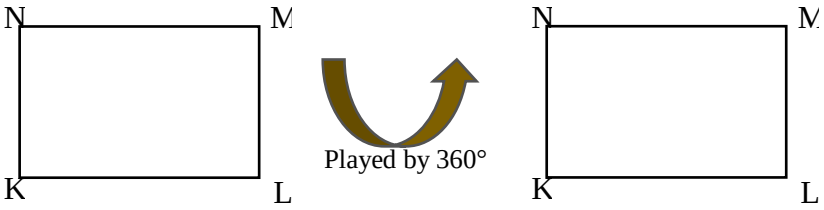
Diagonal rectangle bisects the rectangle, but not an axis of symmetry. This proved by folding the two halves of the rectangular flat shape, and the results of the folds do not cover each other with the sides another.





Rectangle Rotate Symmetry

Rotary symmetry is round in a flat shape up to one complete rotation at the center symmetry so back to the frame as before. On A rectangle has 2 symmetries, namely a circle with an angle Rotate 180° and 360°.



Pythagorean Theorem. This is because a diagonal divides the rectangle into two right triangles-elbow.

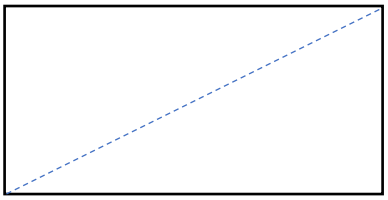
Determining the Diagonal KM

$$KM^2 = KL^2 + LM^2$$

$$KM = \sqrt{KL^2 + LM^2}$$

$$KM^2 = KN^2 + NM^2$$

$$KM = \sqrt{KN^2 + NM^2}$$



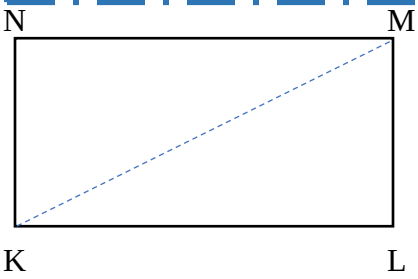
Diagonal Formula (d) : $d = \sqrt{p^2 + l^2}$

Long Formula (l) : $l = \sqrt{d^2 - l^2}$

Width Formula (w) : $w = \sqrt{d^2 - p^2}$

Formula to find area divided by diagonal :.

Determine the area of KLM: KLM $= \frac{KL \times LM}{2}$ KLM = KNM



Example 7

A rectangle has side length8 cm long and 6 cm wide. Calculate the length of the diagonal of the rectangle?

Known: Long = 8 cm

Wide = 6 cm

Asked : Long Diagonal

Answer : $\boldsymbol{d = \sqrt{l^2 + w^2}}$

$d = \sqrt{8^2 + 6^2}$

$d = \sqrt{64 + 36}$

$d = \sqrt{100}$

$d = 10$

So, diagonal of the rectangle is 10 cm.

Example 8

A cardboard is known to have a width of 7 cm and a diagonal of 25 cm. What is the length of the cardboard?

Known: diagonal = 25 cm

width = 7 cm

Asked : l = cardboard box

Answer : $l = \sqrt{\mathrm{d}^2 - l^2}$

$$l = \sqrt{25^2 - 7^2}$$

$$l = \sqrt{625 - 49}$$

$$l = \sqrt{576} = 24cm$$

So, the length of the cardboard is 24 cm.

Example 9

A piece of paper is known to have a length of 4 cm and a diagonal of 5 cm. What is the width of the paper?

Known: Long = 4 cm

Diagonal = 5 cm

Asked : Wide paper

Answer : $l = \sqrt{d^2 - p^2}$

$$l = \sqrt{5^2 - 4^2}$$

$$l = \sqrt{25 - 16}$$

$$l = \sqrt{9} = 3cm$$

So, wide the paper is 3 cm

Example 10

Two right triangles- the same size angles form a rectangle. The base of the triangle is 8 cm and the area of the triangle is 60 cm^2. What is the diagonal the rectangle?

Known: Base of triangle = length =8 cm

Wide triangle = 60 cm^2

Asked : Diagonal rectangular

Answer :

The first step to look for is the height of the triangle or the width of the rectangle.

Wide = $\frac{\text{base} \times \text{high}}{2}$

$60cm^2 = \frac{8cm \times high}{2}$

$120cm^2 = 8 \times high$

$tinggi = \frac{120\ cm^2}{8\ cm} = 15\ cm$

After knowing the length is 8 cm and the width is 15 cm, then the next step is to find the diagonal using the formula as in the previous example.

$d = \sqrt{p^2 + l^2}$

$= \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225}$

$= \sqrt{289}$ = 17 cm

So, diagonal The rectangle is 17 cm

Summary

A rectangle is a quadrilateral whose four angles are right angles and a side-opposite sides are the same length.

1. Properties of Rectangles :
   a. Has four sides and the four corner points
   b. Has two pairs of sides parallel opposite and the same length

   L = Length × Width

   $L = w \times h$

   c. Every corner the magnitude is 90º and the sum of all angles is 360º
   d. Has two diagonals which is the same length and divides into 2 equal triangles
   e. The angle formed by the intersection diagonal not 90˚

2. Wide rectangle is the product of 2 sides which are perpendicular to each other.

3. the perimeter (p) of a rectangle is the number of sides-the sides of a rectangle or the sum of the lengths of the four sides

   $p = 2\ (p + l)$

   $p = 2p + 2l$

4. Axis symmetry is a straight line that divides the plane into two equal parts. In a rectangle, there are two axes of symmetry

5. Rotary symmetry is round in a flat shape up to one complete rotation at the center symmetry so back to the frame as before. Rectangle has 2 symmetries, namely a circle with an angle Rotate 180° and 360°.

6. Diagonal is a straight line joining two angles opposite. A rectangle has two diagonals the same length. The value of the diagonal of this rectangle can be determined using the Pythagorean Theorem.

   d = $\sqrt{p^2 + l^2}$

4.2. Group Discussion Questions

1) A playing field is 64 m long and 32 m wide. How big is the field?
   Known : Long = ... m
   Wide = ... m
   Asked : Wide
   Answer **: L** =... × ...
   L =..... m
   So, The area of the playing field is .... m

2) Widerectangle is 128 cm2. If the length is 16 cm, then the width of the rectangle is...
   Known : Wide = ... cm2
   Long = 16 cm
   Asked : Wide
   Answer **:** $l = \frac{\dots}{\dots}$
   ... cm$l$ =
   So, the width of the rectangle is .... cm

3) A long cash book measures 15 cm with an area of 90 cm2. How wide is the book?
   Known : width = 6 cm
   Wide = 90 cm2
   Asked : Long
   Answer **:** $p = \frac{\dots}{\dots}$
   p = ... cm

4) Budi made a rectangular piece of paper. The length is 8 cm and the width is 5 cm. How many cm is the circumference? How many cm2 is the area?
   Known : Long = ... cm
   Wide = ... cm
   Asked : Around and Area
   Answer **:** $K = 2(\dots+\dots)$
   K =... cm
   L =...× ...
   ... cm2L =

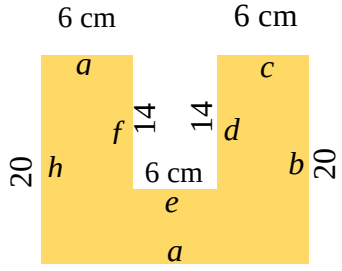
5) Rina's handkerchief is 30 cm long and 28 cm wide. How many cm is the circumference of Rina's handkerchief?

Known : Long = ... cm
Wide = ... cm
Asked : Around
Answer : $K = 2(... + ...)$
K = ... cm

6) A blackboard is 12 cm long and has a circumference of 40 cm. How wide is the blackboard?

Known : Long = 12 cm
Around = 40 cm
Asked : Wide
Answer : $K = 2(p + l)$
$... = 2(... + l)$
l = ... cm

7) Take a look at the combination of several rectangular flat shapes below!



Find the perimeter (P) of the rectangle!

Answer : P = a + b + c + d + e + f + g + h
P = ... + ... + ... + ... + ... + ... + ... + ...
P = ... cm

8) A rectangular plot of land with a perimeter of 130 m and a width of 29 m. If per land the price is Rp. 750.000,-, then how much will the land cost if it is sold?m^2

Known : circumference = ... m
Wide = ... m
Selling price of land per = Rp .....m^2

Asked : selling price of land?

Answer : K = 2 (p + l)

... m = 2 (p + ...)

... m = 2p + ...

2p = ... - .....

2p = ... m

p = ... m

Wide land = ... × ..... = ... m^2

Selling price of land = ... × Rp .....= Rp .....m^2

So, the selling price of the land is Rp.....

9) A rectangular painting measuring 30 cm × 40 cm is mounted on a rectangular frame with a length of70 cm. Find the area of the area that is not covered by the painting!

(image source:harrypottefanzone.com)

Answer: area frame = ... × ..... = ... cm^2

Wide painting = ... × ..... = ... cm^2

So, the area that is not covered by the painting is= . . . −. ..

=. . . cm^2

10) A rectangular garden is 30 m long and 20 m wide. If at the edge of the park planted with fir trees with a distance between the trees 5 m. The price of the tree is Rp. 40,000,-. How much does it cost to buy the fir tree?

Given: length = ... cm

width = ... cm

price of 1 tree = Rp. 40,000,-

Wanted: the cost of buying a tree

Answer: the edge of the park in question is the circumference of the garden. So, we use the perimeter formula to determine the length of the edge of the garden.

$K = 2(p + l)$

$K = \ldots (\ldots + \ldots)$

$K = \ldots (\ldots)$

$K = 100\ m$

At the edge of the pond planted with trees at a distance of 5 m from one another. After that we determine the number of trees purchased, namely:

Number of trees = = 20 trees$\frac{\ldots \text{ cm}}{5 \text{ m}}$

The price of 1 tree is Rp .....,-

Means the cost of installing 20 trees = 20 × Rp .., - = Rp ..., -

So, the cost needed to buy a tree on the edge of the park is Rp. ..., -.

11) Given the rectangle KLMN, the width is 4 cm less than the length. If the perimeter is 40 cm, what is the length and width of the rectangle?
Known : $l = p - 4$
$K = 40\ cm$

Wanted: the length of the rectangle

Answer : $K = 2(p + l)$

$40 = \ldots (\ldots + \ldots - \ldots)$

$40 = \ldots - \ldots$

$48 = 4p$

$p = \ldots cm$

So, the length of the rectangle is ... cm2

12) A rectangle has a length of 12 cm and a width of 7 cm, then the area and perimeter of the rectangle are ... and ... cm.cm^2

Known : $p = \ldots cm$

$l = \ldots cm$

Wanted : area and perimeter of rectangle

Answer : $L = p \times l$

$L = \ldots \times \ldots$

$L = \ldots \text{cm}^2$

To find the circumference: $K = 2(p + l)$

$K = 2(\ldots + \ldots)$

$K = 2(\ldots)$

$K = \ldots cm$

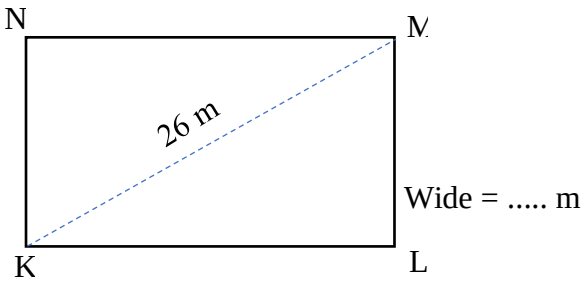
13) A rectangular shape KLMN has a diagonal KM 26 m long. If the width is 10 m, then the area of the rectangle is...m^2

Known : $d = \ldots m$

$l = \ldots m$

Wanted: Area rectangular

Answer :



Find the length of KL = $\sqrt{\text{KM}^2 - \text{LM}^2}$

KL = $\sqrt{\ldots^2 - \ldots^2}$

KL = $\sqrt{\ldots - \ldots}$

KL = $\sqrt{\ldots}$

KL = ... m

Wide KLMN =$\ldots m \times \ldots m$

= ... m^2

So, the area of the rectangle KLMN is... m^2.

14) A rectangular table has a perimeter of 28 cm. If the width is 8 cm, then what is the length of the diagonal?

Known : $K = 28\ cm$

$l = \ldots cm$

Asked : diagonal rectangular

Answer : $K = 2(p + l)$

$\ldots = 2(p + \ldots)$

$\ldots = 2p + \ldots$

$2p = \ldots$

$p = \frac{\ldots}{\ldots} = \ldots cm$

d = $\sqrt{p^2 + l^2}$

d = $\sqrt{\ldots^2 + \ldots^2}$

d = $\sqrt{\ldots + \ldots}$

d = = ... cm$\sqrt{\ldots}$

So, diagonal the table is ..... cm.

15. A diagonala rectangular area is and its length is . Determine the width of the rectangle!$130\ cm 9\ cm$

Known : $d = 130\ cm$

$p = \ldots cm$

Wanted : width of rectangle

Answer : $\boldsymbol{d = \sqrt{p^2 + l^2}}$

$$130 = \sqrt{\ldots^2 + l^2}$$

$$l^2 = 130 - \ldots$$

$$l = \sqrt{\ldots}\ cm = \ldots cm$$

4.3. Independent Question Practice

1. The hall in the school is rectangular. The length is 23 m and the width is 12 m. How many m2 is the area of the hall?

2. A perimeter of a rectangle is 80 cm and the width is 12 cm less than the length. So the length and breadth of the rectangle are...

3. Uncle Tom's rectangular garden with a length of 50 meters and a width of 30 meters will be made a fence. Each meter requires 5 bamboo. The amount of bamboo needed to make a garden fence is…

4. Write down the meaning and properties of rectangles!

5. Write the formulas for perimeter, area, and diagonal on the rectangle!

6. A rectangular sheet of cloth has a length and width ratio of 3: 2. If the cross-sectional area of the cloth is 54. Determine the length and width of the cloth!m^2

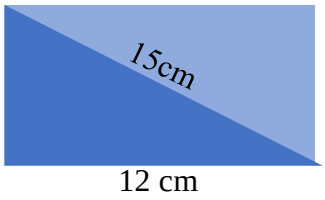
7. Mr. Rudi's terrace has an area of 18, which will be installed with tiles measuring 25 cm × 20 cm. The number of tiles needed is ... tiles.m^2

8. A rectangular swimming pool has a length of 40 meters and a width of 20 meters. The swimming pool is surrounded by a 1 meter wide walkway. Wide the path is .... m^2

9. Adit's yard is rectangular with a length of 50 meters and a width of 25 meters. A fence will be installed around the garden at a cost of Rp. 120,000.00 per meter. The cost required for the installation of the fence is.
10. The floor is rectangular with a length of 8 m and a width of 6 m. If the floor will be fitted with right-angled ceramic tiles- elbow with 6 cm base and sides tilted 10 cm. How many tiles are needed?

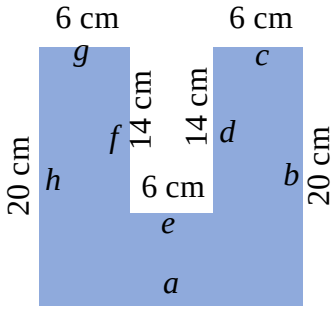
11. Uncle made a board measuring 150 cm x 120 cm. The board requires 5 cans of paint for each m. The paint that dad needs to paint the board is .... a can

12. A picture book is lined diagonally15 cm long. If the perimeter of the triangle bounded by the diagonal is 36 cm and the base is 12 cm as shown below, then what is the area of the triangle bounded by the diagonal and what is the area of the rectangle?

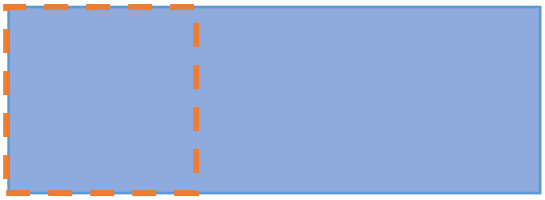


13. Take a look at the combination of several rectangular flat shapes below!

    Find the area of the rectangle!



14. Look at the following figure!



If the area of the square is 144 , then what is the perimeter of the rectangle if the length of the rectangle is 3 times the width of the rectangle?cm^2

15. A rectangle has length (3x + 4) cm and width (x + 6) cm. If the area of the rectangle is 392 cm2. What is the length and width of the rectangle?

16. A perimeter of a rectangle is 72 cm and its width is 8 cm less than its length. Calculate the length and width!

17. Bu Laras' garden is rectangular with a length of 45 m and a width of 30 m. What is the area and perimeter of Mrs. Laras' garden?

18. A rectangular garden is measured diagonally to create a boundary between the mango and orange trees to be planted. The perimeter of the garden is 150 cm and the width is 25 cm. Determine the diagonal which is measured for tree area boundaries and garden area!

19. John will make a large pool. If the length of the pool is 10 cm, then what is the width of the pool? $150\ cm^2$

20. The length of Maria's fish pond is 45 m long and 27 m wide. What is the circumference of the pond?

CHAPTER 5
KITE

A. Learning Outcomes

Students are expected to be able to define and understand the concept of a kite

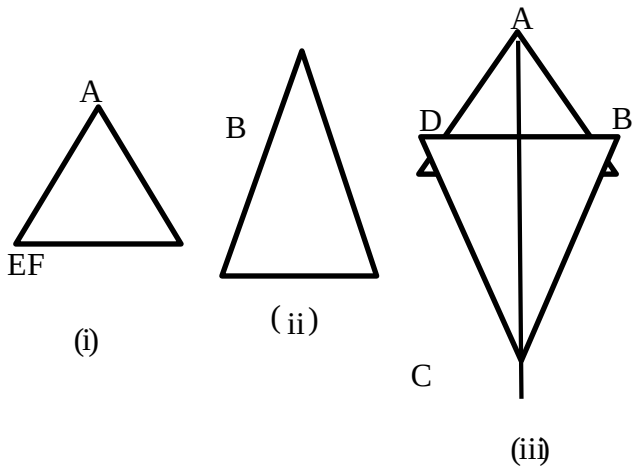
B. Study Material

1. Definition of kite
2. Kite elements
3. The properties of the kite
4. Circumference and area of the kite

CHAPTER 5
KITE

5.1 Understanding Kites

- A kite is a two-dimensional flat shape formed by two pairs of ribs, each of which is the same length and forms an angle to each other.
- A kite is a quadrilateral which has two pairs of equal sides and its diagonals are perpendicular to each other.



The elements contained in the kite are:

AB = BC

AD = CD

AC and BD . diagonals

The angles A, B, C, and D

Two opposite and congruent angles are B and D

The properties of kites include:

1. It has two pairs of sides that are the same length.
2. Has a pair of opposite angles that are equal.
3. One of the diagonals is the axis of symmetry.
4. One of the diagonals of the kite divides the other diagonal into two equal parts.
5. The two diagonals intersect perpendicularly.

Kite Touring

A kite has sides AB, BC, CD and AD. The perimeter of a kite ABCD is the sum of the lengths of all its sides, i.e. AB+CD+AD+BC.

Since AB = AD and DC = BC, the formula for the kite's circumference is:

K = AB + BC + CD + AD or K = 2 X (AB + BC)

Example 1

If it is known that a kite has adjacent sides that are 8 cm and 13 cm, respectively. Calculate the circumference of the kite! Solution: K = $2(BC + CD)$

K = 2 $(13 + 8)$

K = $2(21)$

K = cm42

So the perimeter of the kite is cm.42

Example 2

It is known that a kite has side AB = 12 cm and side CD = 14 cm. So what is the perimeter of the kite ABCD?

Discussion :

Dick :

AB = AD = 12 cm

CD = CB = 14 cm

So :

K = $AB + BC + CD + DA$

K = $12 + 14 + 14 + 12$

K = 52

So the perimeter of the kite is cm.52

Example 3

If it is known that a kite has sides AB = 10 cm and side CD = 14 cm. So what is the perimeter of the kite ABCD?

Discussion:

AB = AD = 10 cm
CD= CB = 14 cm
Then K = $AB + BC + CD + DA$
K = $10 + 14 + 14 + 10$
K = cm48
So, the circumference of the kite is cm. 48

1. Kite Area

The kite has diagonals AC and BD. If the length of the diagonal AC = d1 and the diagonal BD = d2, then the formula for the area of the kite is as follows:

$$L = \frac{1}{2} X\ AC\ X\ BD \text{ or } L = \frac{1}{2}\ .d1.d2$$

Information : d1 = diagonal first

d_2 = diagonal second

Example 1

A kite has a horizontal diagonal of 10 cm (d2) and a vertical diagonal of 22 cm (d1). How wide is the kite?

Discussion :

Area = $\frac{1}{2} \times (d1 \times d2)$

Area = $\times \frac{1}{2}(22\ \times 10)$
Area = 110 cm2.

Example 2
A kite has an area of 300 cm2 and the length of its vertical diagonal is 50 cm. what is the length of the other diagonal (the horizontal diagonal)? Discussion: Suppose ***d1*** is the vertical diagonal ***d2*** is the horizontal diagonal then the area is:

area = $\frac{1}{2} \times (d1 \times d2)$

$300 = \times \frac{1}{2}(50 \times d2)$
$300 =$ d225

d2 = $\frac{300}{25}$
d2 = cm12
So, the length of the horizontal diagonal is cm.12

Example 3
If it is known that a kite has a diagonal length horizontal l5 cm and a vertical diagonal of 10 cm. calculate the area of the kite.
Answer:
Horizontal diagonal =d1=5 cm
Vertical diagonal=d2=10 cm
L=$\times\frac{1}{2}(d1 \times d2)$
= cm$\frac{1}{2}(5 \times 10)25$

In everyday life in the community, many are found related to flat wake lessons, for example: children playing kites, this child's kite frame is in the form of a flat wake which is usually studied in school. But these children do not realize that they are applying mathematics.

Summary

1. Definition of kite
   A kite is a two-dimensional flat shape formed by two pairs of ribs, each of which is the same length and forms an angle to each other.

2. The properties of the kite
   1. Has two pairs of equal sides
   2. Has a pair of opposite angles that are equal
   3. One of the diagonals is the axis of symmetry
   4. One of the diagonals of the kite divides the other diagonal into two equal parts

5. The two diagonals intersect perpendicularly.

3. The formula for the perimeter and area of a kite Kite circumference:

$$K = AB + BC + CD + AD$$
or
$$K = 2 \times (AB + BC)$$

Kite area:

$$L = \frac{1}{2} \times AC \times BD \; atau \; L = \frac{1}{2} \times d1 \times d2$$

5.2. Group Discussion Questions

1. A plot of land is in the shape of a kite with adjacent sides of 30 m and 45 m long, respectively. If the selling price of the land is Rp. 345,000/m calculate:
   a. around the land
   b. the total selling price of the land
   solution:
   Known: AB=30 m ; BC=45 m

Asked: a. the circumference of the land and the total selling price of the land? b. price total sale of the land Answer:

a. $k=2(... + \cdots)$

$=2(... + \cdots)$

$=2(...)$

$= m150$

b. total selling price of land $=... \times 150$ $= ...$

So the total selling price of the land is ...

2. On the wall of the school garden there is a decoration of a kite. The area of the decoration of the kite is 100 cm. What is the length of the diagonal? another?

Is known;

L= cm25700

D1= cm100

Answer : d2 =2(l): 100 d2 =2(...): d2 = …:… d2 = cm114

3. Diagonal length a kite is 10 cm. if the area of the kite is 40 cm, what is the length of the other diagonal? solution: brother: L=cm40 d1=cm10 dit : d2….? answer: d2= 2L: d1 d2= 2 × ... : ... d2= cm8

4. A kite whose diagonals are the same length has an area of 18 cm2 what is the length of the diagonal?- the diagonal? how to solve it:

   is known:

   L= 18 cm asked: length of the diagonal=…….?

   D2= 2L

   D2=2 × ...

   d=√‾

   d= 6 cm

5. If you know a kite with diagonals) cm and cm. what is the area of the kite?(8 + 8(16 + 6) solution: is known: d1= (8 + 8) d2= (16 + 6) asked: L=…..? answer:
   L= $\times\frac{1}{2}(\ldots+\cdots)\ \times\ (\ldots+\cdots)$

   L=$\times\frac{1}{2}(\ldots\times\ldots)$

   L=$\frac{1}{2}\times\ldots$

   = cm2176

6. Nanda wants to make a kite with a diagonal size what you want to make are 40cm and 30cm. If you want to make 4 kites, how many

cm2 of paper do you need to make the kites? solution way: brother: d1 = cm40 d2= cm30 dit: L=….

Answer:

L=$\frac{1}{2} \times (d1 \times d2)$

L=$\frac{1}{2} \times (... \times ...)$

L=$\frac{1}{2} \times ...$

L=...

L= cm22400

7. Calculate the area of a kite whose diagonals are as follows.

   a.10cm and 14cm

   b.16 cm and 21 cm.
   solution:

   a) Use the formula for the area of a kite:

   L=$\frac{1}{2} \times (d1 \times d2)$

   L= $\frac{1}{2} \times (... \times ...)$

   L= cm2 ...

   b. Use the formula for the area of a kite:

   L= $\frac{1}{2} \times (d1 \times d2)$

   L=$\frac{1}{2} \times (... \times ...)$

   L= cm2...

8. Rizki wants to make a kite. the two bamboo sticks that Rizki made are 38cm and 34cm in size. If the kite is ready, what is its area? solution way: sis: d1 =…..cm d2=…..cm dit : L=….? answer:

L=... × ... × ...

L=... × ... × ...

L=... × ...

= cm2646

So, the area of Aditia's kite is 646 cm2

9. Arif has a kite-shaped wall hanging with a diagonal length 22 cm and 18 cm, what is the area of the wall decoration? solution: iknown: d122 cm d2=18 cm dit: L=…..? answer:
   L= ... × ...

   L=... × ...

   L=... × ...

   L= cm2198

   So, the area of the wise wall decoration is 198 cm2

10. If it is known that a kite has a diagonal length horizontal 20cm and the vertical diagonal is 60cm find the area of the kite. answer:

    diagonal horizontal= d1=30cm
    diagonal vertical = d2=70 cm

    L= $\frac{1}{2}$ × ... × ...

    = $\frac{1}{2}$ × ... ×. .

    = $\frac{1}{2}$ × ....

    = $\frac{\ldots}{\ldots}$

    so the area of the kite is...

11. A kite has an area of 180cm2, the length of one of its diagonals is 18cm. Determine the length of the diagonal another. answer:

L=180 cm2

D1=18 cm

L= $\frac{1}{2}$ × ... × ...

…= $\frac{1}{2}$ × ... × ...

D2=$\frac{\cdots}{\cdots}$

D2=cm...

12. Given the length of the diagonalThe diagonal of the kite is d1 = 12dm and d2=11dm, determine the area of the kite. solution: dik:d1=12dm d2=11dm ditL:L=…? answer:

L= $\frac{1}{2}$ × ... × ...

L= $\frac{1}{2}$ ×…× ...

L= dm2$_{66}$

so the area of the kite is 66dm2

13. A kite has an area of 375 cm and its vertical diagonal is 50 cm what is the length of the diagonal? one more (horizontal diagonal)? solution: eg: d1 is the diagonal vertical d2 is the diagonalhorizontal then the area is

area= $\frac{}{}$ × (... × ...)

...= $\frac{}{}$ × (... × ...)

...=...

... =

$\frac{}{}$

so the length of the other diagonal is …cm

14. A kite has a perimeter of 24 cm. If one of the longest sides is 6 cm, what is the shortest side? Solution: eg:

    the longest side is denoted by the
    symbol “s1” the shortest side is denoted
    by the symbol “s2” then the
    circumference is: perimeter of kite
    =2s1+2s2

    …= (... + ⋯) + ⋯

    So, the shortest side is … cm

15. Diagonal length a kite is 14cm and 10cm ind the area of the kite. is known: d1=14cm d2=0cm asked: L=…..? answer:

    L= ⎯ × ... × ...
    L= ⎯ × ... × ...

    L= ⎯ × ...

    L= cm70

    So, the area of the kite is 70 cm

16. a kite, its diagonals are 38 and 16cm, what is the area of the kitd1=……cm d2=……cm? dit :

    L= ⎯ × ....× ...

L= ⎯ × ... × ...

    = 304 cm

    So, the area of the kite is 304 cm

17. diagonal length a kite is 28cm and 54cm, find the area of the kite. Is nownD

D2=54cm

Dit: L=…..?

Answer:

L= _ × ... × ...

L= _ × ... .× ...
L= _ × ...

L=cm...

So, the area of the kite is….cm

18. a kite, its diagonals are 22cm and 30cm ., respectively calculate the area of the kite.

    Solution:

    For example: area of kite = ……? The diagonal d1=…cm
    d2 =…cm

    L = _ ×. . .× ...

    = _ ×. . .× ...

    =cm...

    So the area of the kite is….cm

19. Given a kite whose adjacent sides are 13 cm and 22 cm, respectively.

    Calculate the circumference of the kite!

    Solution:

    The perimeter of the kite can be found by adding up all the sides of the kite.

K = ... (... + ⋯)

K = ... (... + ⋯)

K = ... (...)

K = cm...

So, the perimeter of the kite is….cm2

15. Given a kite whose adjacent sides are 38 cm and 46 cm, respectively. calculate the circumference of the kite!

Solution:

The perimeter of the kite can be found by adding up all the sides of the kite.

K =... (... + ⋯)

K =... (... + ⋯)

K =... (...)

K = cm...

So, the perimeter of the kite is….cm2

21. Given a kite whose adjacent sides are 62 cm and 71 cm, respectively. calculate the circumference of the kite!

Solution:

The perimeter of the kite can be found by adding up all the sides of the kite.

K=... (... + ⋯)

K=... (... + ...)

K=... (...)

K=cm...

22. It is known that a kite has a diagonal d1 = 8 cm and d2 = 14 cm find the area of the kite.

    Solution:

    L=_ × ... × ....

    L=_ × ... × ...

    L=_

    = … cm
    So, the area of the kite is…cm

23. It is known that a kite has the lengths of the adjacent sides 8cm and 18cm, respectively. calculate the circumference of the kite.

    Solution:

    K =... (... × ...)

    K =... (... × ...)

    K =... .× (...)

    K=...

    So the circumference of the kite is…cm

24. It is known that a kite has a diagonal d1 = 42 cm and d2 = 10 cm find the area of the kite.

    Solution:

    L=_ × ... × ...

    L=_ × ... × ...

    L=_

= cm210

So, the area of the kite is 210 cm

25. It is known that a kite has a diagonal d1 = 54 cm and d2 = 12 cm find the area of the kite.

Solution:

L=_ × ... × ...

L=_ × ... × ...

L=_

= 324 cm
So, the area of the kite is 324cm

26. It is known that a kite has a diagonal d1 = 24 cm and d2 = 62 cm find the area of the kite.

Solution:

L_

So, the area of the kite is 744 cm

27. It is known that a kite has the lengths of adjacent sides 8 cm and 12 cm, respectively. calculate the circumference of the kite!

Solution:

K = 2$(BC + CD)$

K = 2(... + ⋯)

K = 2 (...)

K=40

28. A kite has diagonals which are 22 cm and 34 cm respectively. The area of the kite is...

    Solution:

    Area $= \frac{1}{2} \times (d1 \times d2)$

    Area $= \frac{1}{2} \times (\ldots \times \ldots)$

    Area = cm2374

29. If we know that a kite has side AB = 9 cm and side CD = 11 cm. so what is the circumference of the kite?

    Solution:
    K = $AB + BC + CD + DA$

    K = $\ldots + \ldots + \cdots + \ldots$

    K = cm40

30. A kite has a perimeter of 24 cm. If one of the longest sides is 8 cm, what is the shortest side?

    Solution:

    Perimeter of the kite = 2s1 + 2s2

    24 =+2s2$(\ldots \times \ldots)$

    24 =…+ 2s2

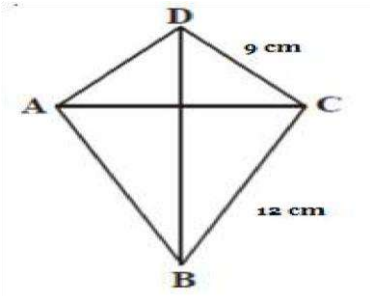
    2s2 = …+ ⋯

    2s2 = …

    S2 = 4 cm

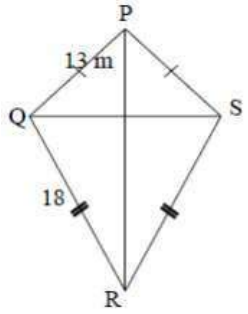
5.3. Independent Practice Questions

1. a kite whose adjacent sides are 7cm and 10cm respectively. Find the perimeter of the kite.
2. Adit makes a kite from a thread, a piece of paper, and two thin sticks of length 18cm and 11cm. What area of paper is needed to make the kite?
3. Ariz builds a kite with one of its diagonals 22 cm. If the area of the kite is 192 cm, find the length of the diagonal. another.
4. Look at the picture below!



The picture above is a kite with the lengths of the adjacent sides being 9 cm and 12 cm, respectively. Calculate the circumference of the kite!

5. Take a look at the picture of the PQRS kite below!

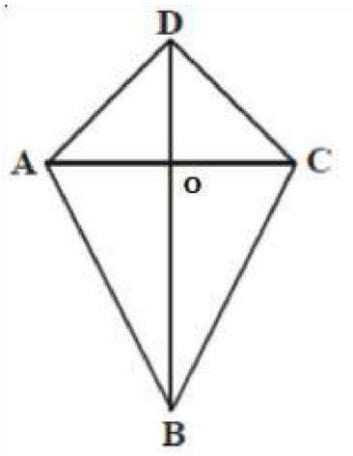


If PQR right-angled, calculate the area of the kite PQRS.
Solution:
Because PQR is right, then the area of the kite can be found using the formula area of a triangle, with base = QR = 18 m and height = PQ = 13 m. From the shape of the PQRS kite, there are two right triangles, namely PQR and PRS with the same area, then the area of the kite can be found by adding up the two areas of the right triangle, namely:

Area PQRS = Area PQR + Area PRS
Area PQRS = 2 x Area PQR
Area PQRS = 2 x x QR x PQ
Area PQRS = 2 x x 18 mx 13 m
Area PQRS = 234 m2
Find the area of the kite whose diagonal is longThe diagonals are as follows.

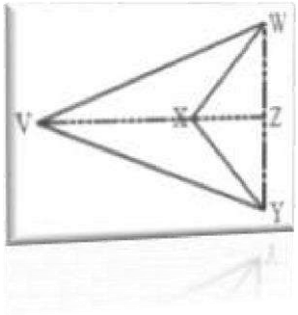
a. 8cm and 12cm
b. 9cm and 16cm
c. 15cm and 18cm
d. 13cm and 21cm

6. Look at the ABCD kite below.



If the length of AC = 24 cm, the length of BC = 20 cm and the area of ABCD = 300 cm2, then find the length of AD and the perimeter of the kite
ABCD.

7. Look at the figure below.



If you know XZ = 9 cm, WZ = 9 cm, and VZ = 24 cm. Calculate the area of the kite VWXY.

Solution:

From the picture, we get the length WY = 2 x WZ = 18 cm

Area VWXY = Area VWY – Area WXY

Area VWXY = x WY x VZ – x WY x XZ$\frac{1}{2}\frac{1}{2}$

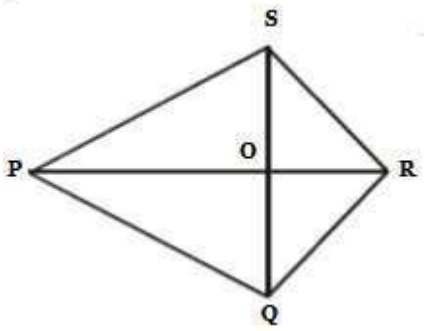
VWXY = x WY (VZ – XZ)$\frac{1}{2}$

Area VWXY = x 18 cm (24 cm – 9 cm)$\frac{1}{2}$

Area VWXY = 135 cm2

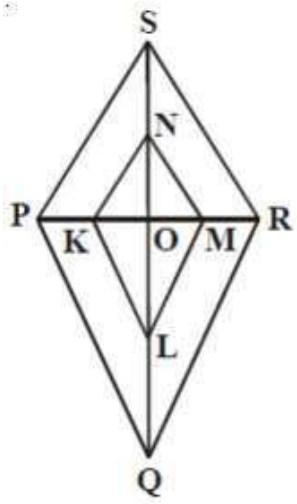
It is known that the area of a kite is 192 cm2. If diagonal d1 and d2 have a ratio of d1 : d2 = 2: 3, determine the length of the diagonals d1 and d2.

8. Look at the figure below.



The picture above is a PQRS kite. If it is known that the length of PR = 16 cm, QS = (x + 3) cm, and area of PQRS = 112 cm2. Determine the length of QS.

9. Look at the figure below.

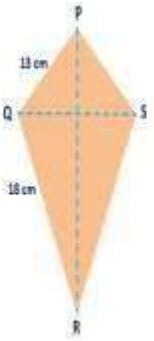


It is known that the points K, L, M, and N are the midpoints of PQ, , RO, and SO, respectively. If the length of 2QS = 3PR and the area of the kite PQRS is 60 cm2. Determine the ratio of the area of PQRS to KLMN.

10. A kite has a diagonal length horizontal10 cm (d1) and a vertical diagonal of 22 cm (d2). What is the area of the kite?

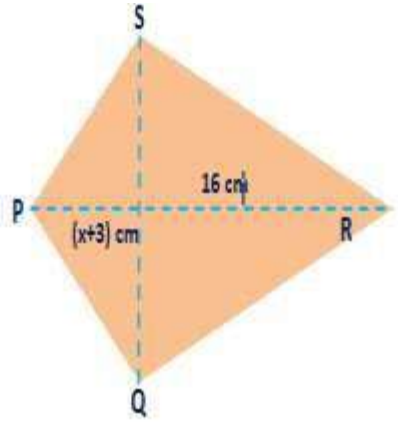
11. A kite has an area of 325 $cm^2$and the length of the vertical diagonal is 50 cm. What is the length of the diagonal one more (horizontal diagonal) ?

12. If we have a PQRS kite as shown below:



The picture of the PQRS kite above has a side length of PQ = 13 cm and QR = 18 cm. IfPQR right-angled, calculate the area of the kite PQRS.

13. Take a look at the figure:



The above PQRS kite has length PR = 16 cm and QS = (x + 3)cm, and area PQRS = 112 cm2. Determine the length of QS.?

14. On the walls of the kindergarten school there is a decoration in the form of a kite. The area of the kite decoration is 5700 cm2 and the length of one of its diagonals is 100 cm. What is the length of the diagonal another?

15. Diagonal length of a kite is 14 cm. If the area of the kite is 44 cm2, what is the length of the other diagonal?

16. A kite with the same diagonals has an area of 34 cm2. What is the length of the diagonal- the diagonal?

17. If you know a kite with diagonals (12 + 12) cm and (18 + 8) cm. What is the area of the kite?

18. Tom wants to make a kite. Diagonal size what he wants to make is 40 cm and 30 cm. If he wants to make 4 kites, how many cm2 of paper does he need to make the kites?

19. Darman wants to make a kite. Two bamboo sticks made by Adit are 38 cm and 34 cm. If the kite is finished, how big is it?

20. Easter has a room where the walls of the room are decorated in the form of a kite with a diagonal length 22cm and 18cm.

21. Radit made a kite with a frame of bamboo and covered with paper. The two bamboos used for the framework are the same length. If the paper needed by Radit is 600 cm2, what is the length of the two frames of Akbar's kite?

22. Budi buys paper measuring 60 cm × 105 cm. Budi will use the paper to make a kite with a diagonal length30 cm and 35 cm as many as 6 pieces. How much paper did Budi buy?

23. A figure in the shape of a kite with a diagonal length1(d1) measures 16cm and diagonal 2 (d2) measures 14cm. Determine the area of the figure.

24. A kite has a horizontal diagonal of 14 cm(d2) and a vertical diagonal of 22 cm(d1). How wide is the kite?

25. A kite has sides AB = 13 cm and side CD = 15 cm. What is the perimeter of the kite?

26. A kite has an area of 240 cm2 and the length of its vertical diagonal is 32 cm. what is the length of the other diagonal(horizontal diagonal)?

27. A kite has a horizontal diagonal of 14 cm(d2) and a vertical diagonal of 30 cm(d1). How big is the kite?

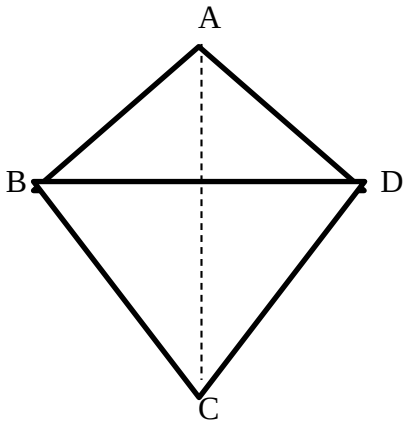
28. A kite has an area of 275 cm2 and the length of its vertical diagonal is 20 cm. what is the length of the other diagonal (horizontal)

29. Find the diagonals of the kite whose lengths are 6 cm and 15 cm.

30. Pak Arman's land area in the form of a kite is 1,200. The soil has a diagonal of 80 cm. Find the other diagonal.

31. A kite has an area of 180 cm2 and one of its diagonals is 5 cm. find the other diagonal.

32. Look at the figure below



If <ABC = 110° and <ADC = 40°, then large <BAD =…

33. If the area of a kite is 140 cm2 and the length of one of its diagonals is 14 cm, then the length of the other diagonal is...

34. A PQRS kite build. If it is known that the length of PR = 20 cm, QS =(X + 3)cm, and the area of PQRS = 100 cm2. Determine the length of QS.

35. A house building is shaped like a kite. The length of the diagonal 1(d1) is 10 cm and the diagonal 2(d2) is 20 cm. What is the diagonal area of the building?

36. The area of a kite is 192 cm2. If the diagonals d1 and d2 have the ratio d1 : d2 = 2: 3, find the lengths of the diagonals d1 and d2.

37. It is known that d1 = 12 cm and d2 = 10 cm. what is the area of the kite?

38. It is known that the length of a kite is BD = 14 and AC = 28 cm. determine the area.

39. Siska wants to make a kite whose diagonals are 31 cm and 18 cm. the area of the kite

40. If it is known that a kite has sides AB = 13 cm and side CD = 15 cm, what is the perimeter of the kite?

CHAPTER 6

System of Linear Equations

A. Learning Outcomes

Students are able to understand and master the concept of a two-variable linear equation system using various methods.

B. Study Material

1. Understanding Linear Equations of Two Variables (TVLES)
2. Solution of Two Variable Linear Equations
3. General Linear Equation of Two Variables in X and Y
4. Contextual issues related to TVLES

CHAPTER 6

System of Linear Equations

6.1. Understanding the System of Linear Equations

Two-variable Linear Equation is a linear equation that has two variables, with the power of each variable being one and when depicted in a graph it will form a straight line. And because of this, this equation is called a linear equation. The general form of a Linear equation with two variables in x and y can be written as follows.

$$ax + by = c$$

a, b, and is a real number$c$

Description :, , and Constants, and$abc =$
$x$and$y =$ Variable

Specific steps for solving problems using TVLES, namely:

1. Replacing each quantity in the problem with a variable (usually denoted by a letter or symbol),
2. Make a Mathematical Model of the problem. This Mathematical Model is formulated following the general form of TVLES,
3. Looking for a solution to the problem model by using the TVLES penyelesaian solution method

Example 1.
Linear Equation of two variables $2x + y = 4$
Discussion:
For example, to find the equation of ,$2x + y = 4$
Step 1, if x = 0, then 0 + y = 4. The solution is (0,4) Step 2, if x = 1, then 2(1) + y = 4, so y = 2, the solution is (1, 2).
Step 3, if x = 2, then 2(2) + y = 4, so y = 0, nthe solution is (2,0)

When $x = p$and , such that the equation becomes a true statement, then (p,q) is called from the statement;$y = qax + by = cap + bq = c$
$ax + by = c$

Example 2.
Determine the solution set for the system of linear equations $x + y = 4$, for x and y members of whole numbers?
Answer:
$x + y = 4$
If then $x = 0y = 4$
If then $x = 1y = 3$
If then$x = 2\ y = 2$
If then $x = 3y = 1$
If then $x = 4y = 0$
If , then (does not meet)$x = 5y = -1$
The consecutive pairs (0.4), (1,3), (2,2), (3,1), (4,0) are the results of the settlement, while (5,1) is not a solution because−
$y = -1$is not a whole number

The general form of a two-variable system of linear equations in x and y can be written as follows:

$$a_1x + b_1y = c_1 \text{ and } a_2x + b_2y = c_2$$

Information:
a_1, a_2 = The coefficient of the variable x
b_1, b_2 = The coefficient of the variable y
c_1, c_2 = Constant
x, y = Variable

Some of the effective methods for determining the solution to a system of linear equations of two variables and we will study in this article, include using:

(i) Substitution Method
(ii) Elimination Method
(iii) Mixed Method (Elimination and Substitution)
(iv) Determinant Method
(v) Graphic Method

A. Substitution method

When using the substitution method, we can replace a variable with a variable from another equation.

The substitution method is carried out using the following steps:

1. Separate one variable from another variable and a constant in one of the equations (make one of the equations explicit form [change the form of a variable],
2. Substitute the result (from step 1) into another equation,
3. Solve the equation to get the value of the variable,
4. Substitute the value of the variable in (3rd result) into one of the equations to get the value of the other variable.

Example 3.
Determine the solution set for the following system of linear equations:
$4x + y = 14$
$5x - 7y = 1$
Use the Substitution Method!
Answer:
Equality $4x + y = 14$, made explicit the variable y to be,
$y = 14 - 4x$
Then substitute it into the equation $y = 14 - 4x5x - 7y = 1$
$5x - 7(14 - 4x) = 1$
$5x - 98 + 28x = 1$
$33x = 99$
$x = \frac{99}{33} = 3$

Substitute into the explicit equation the variable y,$x = 3$
$y = 14 - 4x$
$y = 14 - 4(3)$

$y = 14 - 12 = 2$

So the solution set is {(3,2)}

Example 4.

Find the solution set for the following system of linear equations:

$4x - y = 11$

$2x + 6y = 12$

Use the Substitution Method!

Answer :

Equation , made explicit the variable y becomes, $4x - y = 11y = 4x - 11$

Then substitute it into the equation , $y = 4x - 112x + 6y = 12$

$2x + 6(4x - 11) = 12$

$2x + 24x - 66 = 12$

$26x = 78$

$x = \frac{78}{26} = 3$

Substituting , into the explicit equation for the variable y,$x = 3$

$y = 4x - 11$

$y = 4(3) - 11$

$y = 1$

So the solution set is {(3,1)}.

B. Solution by Elimination Method

Elimination method is done by eliminating one of the variables.

Eliminating means temporarily eliminating or hiding one of the variables so that from two variables there is only one variable and a system of equations can be solved. For example, if you are looking for the value of y, then the problem is multiplied by the coefficient x, and vice versa if you are looking for x, the problem is multiplied by the coefficient y. .

The steps are as follows:

1. Equalize the coefficient of one of the variables from the two equations,
2. Eliminate that variable (subtract if equal sign; add if different sign),
3. Solve the equation to get the value of the variable,
4. Repeat steps 1, 2, and 3 to find other variables.

Example 5.

Determine the solution set of the following system of linear equations using the Elimination method!

$8x + y = 12$

$2x - 3y = 16$

Answer:

Looking for the value of y, then eliminate the variable x

$8x + y = 12 \ |\times 1| \ 8x + y = 12$

$2x - 3y = 16|\times 4| \ 8x - 12y = 64 -$

$13y = -52$

$y = -4$

Find the value of x, then eliminate the variable y,

$8x + y = 12|\times 3|24x + 3y = 36$

$2x - 3y = 16 \ |\times 1|2x - 3y = 16 +$

$26x = 52$

$x = 2$

So the solution set is {(2,-4)}

Example 6.

Determine the solution set for the following system of linear equations:

$2x - 3y = -12$

$3x + 5y = 1$

By using the Elimination method!

Answer:

Looking for the value of y, then eliminate the variable x,

$2x - 3y = -12|\times 3|6x - 9y = -36$

$3x + 5y = 1 \quad |\times 2|6x + 10y = 2 -$

$-19y = -38$

$y = 2$

Find the value of x, then eliminate the variable y,

$2x - 3y = -12|\times 5|10x - 15y = -60$

$3x + 5y = 1 \quad |\times 3| \ 9x + 15y = 3 +$

$19x = -57$

$x = -3$

So the solution set is {(-3,2)}.

C. Mixed Method (Elimination and Substitution)

The combined method is a method used to find the solution for TVLES by combining both methods at once, namely the elimination method and the substitution method. First, using the elimination method to find one of the variable values, after the variable value is obtained, then the variable value is substituted into one of the equations to get the value of the other variable.

The steps are as follows:

1. Equalize the coefficient of one of the variables from the two equations,
2. Eliminate the variable (subtract if equal sign and add if different sign)
3. Solve the equation to get the value of the variable,
4. Substitute the value of the variable in (step 3) into one of the equations to get the value of the other variable.

Example 7

If x and y are solution sets of,

$2x - y = 7$

$x + 3y = 14$

By mixed methods (Elimination and Substitution)!

Answer:

To find the value of x, eliminate the variable y,

$2x - y = 7 \quad |\times 3| 6x - 3y = 21$

$x + 3y = 14 \; |\times 1| \quad \underline{x + 3y = 14} \; +$

$7x = 35$

$x = 5$

Substitute the value of x = 5 in one of the equations, for example in the first equation,

$2x - y = 7$

$2(5) - y = 7$

$10 - y = 7$

$3 = y$

So the solution set is {(5,3)}.

Example 8.
If x and y are solution sets of,
$2x - y = -3$
$5x - 3y = -1$
By using the Mixed method (Elimination and Substitution)
Answer:
To find the value of x, eliminate the variable y.

$$\begin{array}{l} 2x - y = -3 \quad |\times 3 | 6x - 3y = -9 \\ 5x - 3y = -1 \;\; |\times 1 | 5x - 3y = -1 \quad - \\ \hline \qquad\qquad\qquad\qquad\quad x = -8 \end{array}$$

Substitute the variable , into the first equation to find the value of y.$x = -8$
$2x - y = -3$
$2(-8) - y = -3$
$-16 - y = -3$
$-y = -13$
$y = 13$

So the solution set is {(-8,13)}.

D. **Solution Using the Determinant Method**

Matrices can be used to make it easier to determine the solution of a system of linear equations. In this discussion, we will use it to solve a two-variable system of linear equations.

Step 1

Change the system of linear equations of two variables into a matrix form, as follows,

$a_1x + b_1y = c_1$
$a_2x + b_2y = c_2$

We can change the above equation to

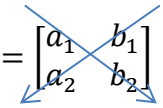
$AX = B$

$$\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$$

Step 2

Determine the value of the determinant A , the determinant x and the determinant y , with the following matrix equation: $(D_A)(D_x)(D_y)$

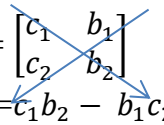
$$|D_A| = \begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix}$$



$|D_A| = a_1 b_2 - b_1 a_2$

$|D_A|$ is the determinant of the matrix A

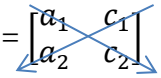
$$|D_x| = \begin{bmatrix} c_1 & b_1 \\ c_2 & b_2 \end{bmatrix}$$



$|D_x| = c_1 b_2 - b_1 c_2$

$|D_x|$ is the determinant of matrix A whose first column is replaced by the elements of matrix B.

$$|D_y| = \begin{bmatrix} a_1 & c_1 \\ a_2 & c_2 \end{bmatrix}$$



$|D_y| = a_1 c_2 - c_1 a_2$

$|D_y|$ is the determinant of matrix B whose second column is replaced by the elements of matrix A.

Step 3

Determine the value of the variables x and y with the following equation:

$$x = \frac{D_x}{D_A}$$

$$y = \frac{D_y}{D_A}$$

Example 9.

Determine the TVLES solution of,

$5x + y = 3$

$6x + y = 1$

By using the method of Determinants

Answer :

Step 1

Write the linear equation in matrix form

$$\begin{bmatrix}5 & 1\\ 6 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}3\\ 1\end{bmatrix}$$

Step 2

Find the determinant of A ( ), the determinant of x , and the determinant of y

$.D_A(D_x)(D_y)$

Finding the determinant of A

$$D_A = \begin{vmatrix}5 & 1\\ 6 & 1\end{vmatrix}$$

$D_A = \{ [\ 5\ 1\ ] - [\ 1\ 6\ ] \} \times\times$

$D_A = \{\ 5 - 6\ \}$

$D_A = -1$

Finding the Determinant of x

$$D_x = \begin{vmatrix}3 & 1\\ 1 & 1\end{vmatrix}$$

$D_x = \{ [\ 3\ x\ 1\ ] - [\ 1\ x\ 1\ ] \}$

$D_x = \{\ 3 - 1\ \}$

$D_x = 2$

Finding the Determinant of y

$$D_y = \begin{vmatrix}5 & 3\\ 6 & 1\end{vmatrix}$$

$D_y = \{ [\ 5\ x\ 1\ ] - [\ 3\ x\ 6\ ] \}$

$D_y = 5 - 18$

$D_y = -13$

Step 3

Finding the values of x and y

$$x = \frac{D_x}{D_A} = -\frac{2}{1} = -2$$

$$y = \frac{D_y}{D_A} = \frac{-13}{-1} = 13$$

So, the solution set is {(-2.13)}.

Example 10.

Determine the solution set for the following equation:

$7x + 2y = 8$

$3x - 2y = 12$

By using the Determinant method!

Answer:

Step 1

Write the linear equation in matrix form

$$\begin{bmatrix} 7 & 2 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 12 \end{bmatrix}$$

Step 2

Find the determinant of A ( ), the determinant of x , and the determinant of y .$D_A(D_x)(D_y)$

Finding the determinant of A

$$D_A = \begin{vmatrix} 7 & 2 \\ 3 & -2 \end{vmatrix}$$

D_A ={ [7 -2] – [2 3] } ××

D_A ={ -14 – 6 }

$D_A = -20$

Finding the Determinant of x

$$D_x = \begin{vmatrix} 8 & 2 \\ 12 & -2 \end{vmatrix}$$

D_x ={ [8 x -2] – [2 x 12] }

D_x ={ -16 – 24 }

D_x = -40

Finding the Determinant of y

$$D_y = \begin{vmatrix} 7 & 8 \\ 3 & 12 \end{vmatrix}$$

D_y ={ [7 x 12] – [3 x 8] }

$D_y = 84 - 24$

$D_y = 60$

Step 3

Find the value of the variables x and y,

$$x = \frac{D_x}{D_A} = \frac{-40}{-20} = 2$$

$$y = \frac{D_y}{D_A} = -\frac{60}{20} = -3$$

So the solution set is {(2,-3)}

E. Solution by means of the Graphics method

The graph of a linear equation of two variables is a straight line. The steps to determine the TVLES solution using the graphical method are as follows:

1. Find the x-intercept, given that y = 0,
2. Determine the y-intercept, provided that x = 0, Steps (1) and (2) can be simplified in tabular form,
3. Draw the line of each equation,
4. Determine the point of intersection of the two lines. The intersection point is the TVLES penyelesaian solution

Example 11.

Find the solution set for the following equation,

$2x + 4y = 8$

$2x + 3y = 6$

After that, make a graph of the linear equation!

Answer :
Step 1
Find the point where the x and y axes intersect in the first equation.
The x-intercept where y = 0, we get:
$2x + 4y = 8$
$2x + 0 = 8$
$x = \frac{8}{2} = 4$
Then the x-intercept is (4,0).
The y-intercept where x = 0, we get:
$2x + 4y = 8$
$0 + 4y = 8$
$y = \frac{8}{4} = 2$
Then the y-intercept is (0.2).
Step 2
Find the point where the x and y axes intersect in the second equation.
Find the x-intercept where y = 0, we get:
$2x + 3y = 6$
$2x + 3(0) = 6$
$2x = 6$
$x = \frac{6}{2} = 3$
Then the x-intercept is (3,0).
Find the y-intercept where x = 0, we get:
$2x + 3y = 6$
$2(0) + 3y = 6$
$3y = 6$
$y = 2$
Then the y-intercept is (0.2).
Step 3
Make a graph of the linear equation of the two variables!

To find the solution set, we look at the two equations of the straight line that have a point of intersection (lines that coincide), we can use the elimination method.
From the following linear equation,

$2x + 4y = 8$
$2x + 3y = 6$
Eliminate the variable x to get the value of y.
$2x + 4y = 8$
$\underline{2x + 3y = 6 -}$
$y = 2$
Substitute the value of y = 2 into the equation to get the variable x. $2x + 4y = 8$
$2x + 4y = 8$
$2x + 4(2) = 8$
$2x + 8 = 8$
$2x = 0$
$x = \frac{0}{2} = 0$
So the graph above is a linear equation of the equation:
$2x + 4y = 8$
$2x + 3y = 6$
And the solution set is (0,2).

Example 12.
Find the solution set for the following equation,
$3x + 5y = 15$
$6x + 10y = 60$
After that, make a graph of the linear equation!
Answer :
Step 1
Find the point where the x and y axes intersect in the first equation
The x-intercept where y = 0, we get:
$3x + 5y = 15$
$3x + 5(0) = 15$
$3x + 0 = 15$
$x = \frac{15}{3} = 5$
Then the x-intercept is (5,0).

The y-intercept, where x = 0, is obtained:

$3x + 5y = 15$
$3(0) + 5y = 15$
$0 + 5y = 15$
$y = \frac{15}{5} = 3$
Then the y-intercept is (0.3)
Step 2
Find the x-intercept, where y = 0. We get:
$6x + 10y = 60$
$6x + 10(0) = 60$
$6x + 0 = 60$
$x = \frac{60}{6} = 10$
Then the x-intercept is (10,0).
Find the y-intercept, where x = 0. We get:
$6x + 10y = 60$
$6(0) + 10y = 60$
$0 + 10y = 60$
$y = \frac{60}{10} = 6$
Then the y-intercept is (0, 6)
Step 3
Make a graph on the linear equation of the two variables.

Graph of equations and $3x + 5y = 156x + 10y = 60$
Shown in the graph above. It turns out that the two lines are parallel.
So, the solution set for the Two-variable Linear Equation System has no members, or the solution set is an empty set, written In everyday life as well as in mathematical calculations, we are often faced with problems that can be translated into mathematical models in the form of a two-linear equation system. variable (TVLES). Creating a mathematical model in the form of a system of linear equations of two variables (TVLES), determining the answer, and interpreting the answer can be done through the following steps.∅.

1. Ny0061 Express the quantity in the problem as a variable (denoted by letters) to obtain a mathematical relationship,
2. Formulate a system of linear equations which is a mathematical model of the problem,

3. Determine the solution of the mathematical model obtained in step 2,
4. Interpret the results obtained in step 3 against the original problem.

In order to understand how to create and solve mathematical models of contextual problems related to the two-variable linear equation system (TVLES), consider the following examples of problems.

Example 13.

A parking attendant gets Rp. 17,000.00 from 3 cars and 5 motorbikes, while from 4 cars and 2 motorbikes, he gets Rp. 18.000,00. If there are 20 cars and 30 motorbikes, how much parking money will he get?
Answer:
For example: Parking Rates per Car = x
Parking Rates per Motor = y

Based on the story in the problem above, we can get the mathematical model as below,
$3x + 5y = 17.000$
$4x + 2y = 18.000$
Then, multiply the first equation by 4 (four) and the second equation by 3 (three). It is used to make one of the variables equal, so that they can subtract from each other.
$3x + 5y = 17.000 |\times 4| 12x + 20y = 68.000$
$4x + 2y = 18.000 |\times 3| \underline{12x + 6y \ = 54.000 -}$
$14y = 14.000$
$y \ = \ 1.000$
Based on the above calculation, the value of y = 1000 is obtained. substitute the value of y = 1,000 in one of the known equations, for example (selecting a different equation will still produce the same final result).$3x + 5y = 17.000$
$3x + 5y = 17.000$
$3x + 5(1.000) = 17.000$
$3x + 5000 = 17.000$
$3x = 17.000 - 5.000$
$3x = 12.000$

$x = \frac{12.000}{3} = 4.000$

So, the result obtained,

Car parking fee = x = IDR 4,000.00

Motorcycle parking fee = y = IDR 1.000,00

So, the money earned for 20 cars and 30 motorcycles is...

$(20 \times 4.000) + (30 \times 1.000)$

$= 80.000 + 30.000$

110.000

Example 14.

In the new school year, Afryanti represented several of her friends to buy 5 Mathematics books and 4 Chemistry books. He had to pay Rp410,000.00 at the same time, Sukijan represented his friends to buy 10 Mathematics books and 6 Chemistry books. He had to pay Rp740,000.00 for everything.

If Suminto buys 3 math books and 8 chemistry books, how much money will he have to pay!

Answer: Solving using the Matrix method

Step 1

From the problem above, the first thing we have to do is create a mathematical model in the variables x and y.

For example:

Math book = x

Chemistry Book = y

Then the equation,

$5x + 4y = 410.000$

$10x + 6y = 740.000$

Step 2

From the above equation, we change the equation in matrix form.

$\begin{bmatrix} 5 & 4 \\ 10 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 410.000 \\ 740.000 \end{bmatrix}$

Step 3

Find the determinant of A ( ), the determinant of x , and the determinant of y .$D_A(D_x)(D_y)$

Finding the determinant of A

$D_A = \begin{vmatrix} 5 & 4 \\ 10 & 6 \end{vmatrix}$

D_A ={ [5 6] – [4 10] }××

D_A ={ 30 – 40 }

$D_A = -10$

Finding the Determinant of x

$D_x = \begin{vmatrix} 410.000 & 4 \\ 740.000 & 6 \end{vmatrix}$

D_x ={ [410,000 x 6] – [4 x 740,000] }

D_x ={ 2,460,000 – 2,960,000 }

D_x = -500,000

Finding the Determinant of y

$D_y = \begin{vmatrix} 5 & 410.000 \\ 10 & 740.000 \end{vmatrix}$

D_y ={ [5 x 740,000] – [410,000 x 10] }

D_y = 3,700,000 – 4,100,000

$D_y = -400.000$

Step 3

Find the value of the variables x and y,

$$x = \frac{D_x}{D_A} = \frac{-500.000}{-10} = 50.000$$

$$y = \frac{D_y}{D_A} = \frac{-400.000}{-10} = 40.000$$

It means that the price of a Mathematics book is Rp. 50,000.00 and the price of a Chemistry book is Rp. 40,000.00

So, if Suminto buys 3 Mathematics books and 8 Chemistry books, then the equation is obtained:

$3x + 8y$

$= 3(50.000) + 8(40.000)$

$= 150.000 + 320.000$

$= 470.000$

Suminto bought all the books by paying Rp.470,000.00

Summary

1. The system of understanding Linear Two Variables (TVLES) is a system that involves two different variables.

2. The general form of a two-variable system of linear equations is,
   $\begin{cases} a_1x + b_1y = c_1 \\ a_1x + b_2y = c_2 \end{cases}$

3. TVLES can be solved by graphical method, substitution method, elimination method, and determinant method.

4. The settlement of TVLES using the graphical method is as follows;
   Step 1:
   Draw a graph of each equation on a Cartesian plane.
   Step 2:
   a. If the two lines intersect at one point, then the solution set still has one member.
   b. If the two lines are parallel, then the solution set has no members, it is said that the solution set is an empty set.
   c. If the two lines coincide, then the solution set has an infinite number of members.
   5. The solution for TVLES using the substitution method, or the elimination method, or a combination of both is:
      $x = \frac{c_1b_2 + c_2b_1}{a_1b_2 + a_2b_1}$ dan $y = \frac{a_1c_2 + a_2c_1}{a_1b_2 + a_2b_1}$

6.2. Group Discussion Questions

1. Determine the solution set for Two Variable Linear Equations $x + y = 5$!
   Answer:
   We will find the solution set of ,$x + y = 5$
   If x = 0, then 0 + ... = 5, the solution is (....,....)
   If x = ..., then (....) + ... = 5, the solution is (....,....)
   If x = ..., then (....) + ... = 5, the solution is (....,....)
   If x = ..., then (....) + ... = 5, the solution is (....,....)

If x = ..., then (....) + ... = 5, the solution is (....,....)

So that up to any x we can look for it because there are no requirements.

2. Determine the solution set for the Two Variable Linear Equation, where x and y are whole numbers! $3x + 4y = 12$
   Answer:
   $3x + 4y = 12$
   $x = 0$, so $y = \ldots..$
   $x = \ldots, so\ y = \ldots$
   $x = \ldots\ so\ y = \ldots$
   $x = \ldots, so\ y = \ldots$
   $x = \ldots, so\ y = \ldots$
   $x = \ldots, so\ y = \ldots$
   Sequential pairs: .....
   And what is not the result of the solution is .....
3. Determine the solution set for the following system of linear equations:
   $3x + 2y = -2$
   $x - 2y = 10$
   By using the substitution method!
   Answer:
   We can make an explicit equation for the variable x to be, x = ...y + ... , $x - 2y = 10$
   Then substitute the variable x = ...y + ...into the first equation,
   (.....) + 2y = 2−
   (.....) + 2y = 2−
   ....y =...
   y = ...
   Substitute the value of y = ... into the explicit equation for the variable x,
   x = ...y + ...
   x = ... (....) + ...
   x = ... + ...
   x = ...
   So the solution set is {(....,....)}

4. Find the solution for each of the following TVLESs,
   $5x + 4y = 1$
   $3x - 6y = 2$
   By using the Elimination method!
   Answer:
   To find the value of x, eliminate the variable y!

   .... + ... = ... + ... = ...|× ... |
   .... = ... = ... −|× ... | − +
   ...y = ...
   To find the value of y, eliminate the variable x!
   .... + ... = ... + ... = ...|× ... |
   .... = ... = ... −|× ... | − −
5. Determine the solution set for the following equation:
   $2x + y = 3$
   $3x + 5y = 1$
   By using the determinant method!
   Answer :
   First, we convert the system of equations into a matrix form.
   $\begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}\begin{bmatrix} \cdots \\ \cdots \end{bmatrix} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$

   Second, find the determinant A (), the determinant x , and the determinant y .$D_A(D_x)(D_y)$
   Finding the determinant of A
   $D_A = \begin{vmatrix} \cdots & \cdots \\ \cdots & \cdots \end{vmatrix}$
   D_A = { [.... ....] – [.... ....] } ××
   D_A = { .... – ..... }
   D_A = ...

   Finding the Determinant of x
   $D_x = \begin{vmatrix} \cdots & \cdots \\ \cdots & \cdots \end{vmatrix}$

   D_x ={ [.... x ....] – [.... x ....] }
   D_x = { .... – .... }

$D_x = ...$

Finding the Determinant of y

$D_y = \begin{vmatrix} ... & ... \\ ... & ... \end{vmatrix}$

D_y ={ [.... x ....] – [.... x ....] }

$D_y = ... - ....$

$D_y = ...$

Third, find the value of the variables x and y,

$x = \frac{D_x}{D_A} = \frac{...}{...} = \cdots$

$y = \frac{D_y}{D_A} = \frac{...}{...} = \cdots$

So the solution set is {(....,....)}

6. Determine the solution set for the following system of linear equations:

$2x + 3y = 8$

$3x + y = 5$

Then draw the graph of the linear equation!

Answer :

Step 1

Find the point where the x and y axes intersect in the first equation.

The x-intercept where y = 0, we get:

$2x + 3y = 8$

…. + …. = ….

$x = \frac{...}{...} = \cdots$

Then the x-intercept is (...,...).

The y-intercept where x = 0, we get:

$2x + 3y = 8$

…. + …. = ….

$y = \frac{...}{...} = \cdots$

Then the y-intercept is (...,...).

Step 2

Find the point where the x and y axes intersect in the second equation.
Find the x-intercept where y = 0, we get:

$3x + y = 5$

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

$\ldots + \ldots = \ldots$

$x = \frac{\ldots}{\ldots} = \cdots$

Then the x-intercept is (...,...).
Find the y-intercept where x = 0, we get:

$3x + y = 5$

$\ldots(\ldots) + \ldots = \ldots$

$\ldots y = \ldots$

$y = \ldots$

Then the y-intercept is (...,...).
Step 3
Make a graph of the linear equation of the two variables!

7. Aqilah bought 4 donuts and 2 chocolates for Rp. 13,000.00. Meanwhile, Shilviana bought 3 donuts and 4 chocolates for Rp. 16,000.00. If Rizki buys a donut and a chocolate by paying IDR 10,000, the change he receives is ....
   Answer: Using the Elimination method
   Example: Donuts = x
   Chocolate = y

   Based on the story in the problem above, we can get the mathematical model as below,
   .... + ... = ...
   .... + ... = ...

   To find the value of x, eliminate the variable y!

   .... = ...| .... = |....+ × ... +
   .... = ...| .... = |.... + × ... + −
   ....x = ...
   x = ...

To find the value of y, eliminate the variable x!

.... = ...| .... = |....+ × ... +
.... = ...| .... = |.... + × ... + −
....y = ...
y = ...

The cost of a donut and a chocolate bar where the mathematical capital, x + y, is .... + ... = ...

So when Rizki bought donuts and chocolates with IDR 10,000, he received a change of ....

8. Zahrah bought three oranges and an apple for Rp. 5,000.00. Meanwhile, Putri bought two oranges and two apples for Rp. 6,000.00. If Rahmani buys five oranges and three apples, then he pays as much as ....

   Answer: Using Mixed method

   Example: Orange = x

   Apple = y

   Based on the story in the problem above, we can get the mathematical model as below,

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

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

   To find the value of x, eliminate the variable y!

   .... = ...| .... = |....+ × ... +
   .... = ...| .... = |.... + × ... + −
   ....x = ...
   x = ...

   Substituting the value of x = ...into one of the equations, say into the second equation, we get:

   .... (....) + ... = ...

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

   ....y = ...

y = ...
Then the price of an orange and an apple are Rp..... and Rp....., respectively.
If Rahmani buys five oranges and three apples, then he pays Rp.....

9. The price of 5 notebooks and 3 erasers is Rp. 34,000.00. If the price of a notebook is Rp. 2,000.00 more than an eraser, then the price of 3 notebooks and 6 erasers is...
Answer :
For example: Notebook = x
Eraser = y

The price of 5 books and 3 erasers is Rp. 34,000.00, then the mathematical model,
.... + ... = ... (1)

The price of a notebook is Rp. 2,000.00 more than an eraser, so the equation is:
x = ... + ... , then substituting into equation (1), we get:
.... (.....) + ... = ...
.... + ... + ... = ...
....y = ...
y = ...

Substitute the value of y = ...in the equation x = ... + ... then,
x = ... + ...
x = ...
So, the price of 3 books and 6 erasers where the mathematical capital, ... + ... is
.... + ... = 3 (....) + 6 (....)
= .... + ...
= ....

So the total price is Rp.....

10. Seven years ago, my father's age was 6 times Wiyan Intan's age. In the next four years, 2 times the age of the father equals 5 times the age of Wiyan Intan plus 9 years. Wiyan Intan's age 3 years ago was....
    Answer :
    For example: Father's age = x
    Wiyan Intan's age = y
    Seven years ago, my father's age was 6 times Wiyan Intan's age.
    .... - .... = ...(....-....)
    .... - .... = ... - ....
    x = ... - .... (1)

    In the next four years, 2 times the age of the father is equal to 5 times the age of Wiyan Intan plus 9.
    ....(....+....) = ...(.... + ...) + ...
    .... + ... = ... + ... + ...
    .... + ... = ... + ... (2)
    2x = ...

    Substitute equation (1) into equation (2).
    2(.....) = ... + ...
    .... - .... = ... + ...
    .... - .... = ... + ...
    ....y = ...
    y = ...

    Wiyan Intan's age 3 years ago,
    y - .... = ... - .... = ...
    So Wiyan Intan's age 3 years ago was....

11. The perimeter of a rectangle is 28 cm. While the length is 2 cm longer than the width. The area of the rectangle is...
    Answer :
    For example: p = ...
    L = ...
    The perimeter of a rectangle is 28 cm,
    K = 2 (.... + ...)

.... = 2 (.... + ...) (1)

The length is 2 cm longer than the width, so;
p = ... + ...

Substitute p = ... + ... into equation (1).
2({.....} + ...) = ...
.... + ... = ...
4l = ...
l = ...

Substitute the value of l = ...into the equation p = ... + ... ,
So;
p = (.....) + 2
p = ... + ...
p = ...

So the area of the rectangle with the formula,
L = ...x ....is ....

12. We know the system of equations
$5x - 3y = 16$
$3x - 4y = 14$
Have a solution x = a and y = b. The value of a + b is....

Answer :
To find the value of x, eliminate the variable y!

.... = ... | .... = | ....+ × ... +
.... = ... | .... = | .... + × ... + −
....x = ...
x = ...

Substituting the value of x = ...into one of the equations, say into the second equation, we get:
3(....) - .... = ...

.... - .... = ...
....y = ...
y = ...

Then the value of x = ...and y = ..., so the value of a + b is
.... + ... = ...

13. Find the solution set for the following system of equations,
$2x + y = 4$
$x - 2y = -3$
By using the determinant method!
Answer :
First, we convert the system of equations into a matrix form.
$\begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}\begin{bmatrix} \cdots \\ \cdots \end{bmatrix} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$

Second, find the determinant A (), the determinant x , and the determinant y .$D_A(D_x)(D_y)$
Finding the determinant of A
$D_A = \begin{vmatrix} \cdots & \cdots \\ \cdots & \cdots \end{vmatrix}$
D_A = { [.... ....] – [.... ....] } ××
D_A = { .... – ..... }
D_A = ...

Finding the Determinant of x
$D_x = \begin{vmatrix} \cdots & \cdots \\ \cdots & \cdots \end{vmatrix}$
D_x ={ [.... x ....] – [.... x ....] }
D_x = { .... – .... }
D_x = ...

Finding the Determinant of y
$D_y = \begin{vmatrix} \cdots & \cdots \\ \cdots & \cdots \end{vmatrix}$

D_y ={ [.... x ....] – [.... x ....] }
D_y = ... - ....
D_y = ...

Third, find the value of the variables x and y,

$x = \frac{D_x}{D_A} = \frac{...}{...} = \cdots$

$y = \frac{D_y}{D_A} = \frac{...}{...} = \cdots$

So the solution set is {(....,....)}

14. Find the solution set for the following system of linear equations,

$2x + y = 4$

$x - 2y = -3$

Then make a graph of the system of linear equations!

Answer :

Step 1

Find the point where the x and y axes intersect in the first equation.

The x-intercept where y = 0, we get:

$2x + y = 4$

…. + …. = ….

$x = \frac{...}{...} = \cdots$

Then the x-intercept is (...,...).

The y-intercept where x = 0, we get:

$2x + y = 4$

…. + …. = ….

$y = ...$

Then the y-intercept is (...,...).

Step 2

Find the point where the x and y axes intersect in the second equation.

Find the x-intercept where y = 0, we get:

$x - 2y = -3$

..... = ... −

$\ldots . x = \ldots .$

Then the x-intercept is (...,...).

Find the y-intercept where x = 0, we get:

$x - 2y = -3$

$(\ldots.)-\ldots.=\ldots.$

$-\ldots.y=\ldots.$

$y=\ldots.$

Then the y-intercept is (...,...).

Step 3

Make a graph of the linear equation of the two variables!

15. If we know the system of equations,

$ax+y=4$

$x+by=7$

And , then is ....$ab=2x+y$

Answer:

From the equation , we can change in explicit form the variable y, then

y = ... - .... and substitute it into equation .$ax+y=4x+by=7$

.... + (....-....) = ...

.... + ... - .... = ...

Because , then:$ab=2$

.... + ... - ....x = ...

-x = ... - ....

x = ... - ....

Substitute the value of x into y = ... - ....

y = ... - ....

y = ... - ....(.... - ....)

y = ... - .... + ...

y = ...(....) + ...

6.3. Independent Practice Questions

1. The Two Linear Equation of is....$5a+3b=30$

2. The Two Linear Equation of is....$2x+5y=15$

3. Find the solution set for the following equation,

   $x+y=3$

   $x-1=1$

   By using the Substitution method!

4. Find the solution set for the following equation,
   $2x - y = 5$
   $x - 1 = 1$
   By using the Elimination method!

5. Find the solution set for the following equation,
   $2x - y = 7$
   $3x + 2y = 7$
   By using the Determinant method!

6. The price of 4 pens and 5 rulers is Rp. 30,000.00. If the price of a pen is Rp. 1.500.00 cheaper than a ruler, the price of 5 pens and 3 rulers is ....

7. Bam bought 4 pencils and 3 periodic tables, he paid Rp. 19,500. If Bwang buys 2 pencils and 4 periodic tables, he has to pay Rp. 16,000.00. Determine the price of a pencil and a sheet of the periodic table!

8. A parking attendant gets IDR 17,000.00 from 3 cars and 5 motorbikes, while from 4 cars and 2 motorbikes he gets IDR 18,000.00. If there are 20 cars and 30 motorbikes, how much parking money will you get?

9. At the school cooperative, Andi bought 6 books and 5 pens. Afryanti bought 6 books and 5 pens. Nadya bought 3 books and 2 pens of the same type. Afryanti had to pay IDR 59,500, and Nadya had to pay IDR 28,000. If Any buys 2 books and 1 pen of the same type and he pays Rp. 20,000.00. So the change he received was....

10. Find the solution set of the following linear equations,
    $-x + y = 70$
    $2x - y = 30$
    Then make a graphic illustration of the system of linear equations!

11. Solution of the linear equation,
    $3x + 2y = 8$
    $5x - 4y = 6$
    are x and y. The value of is....$3x - y$

12. Solution of the linear equation,
    $x + 2y = 21$
    $3x - y = 7$
    are x and y. The value of is....$2x + 2y$

13. It is known that the solution set of
    $ax - y = 11$
    $2x + 6 = 12$
    Is (3,b). Value is....$a - b$

14. Solution of the system of linear equations
    $\frac{x - 2y - 3}{x - 3y} = -6$
    $\frac{2x - y - 5}{2y - x} = -3$
    are x and y. Value is....$x - y$

15. If x 0 and y 0 satisfy the system of equations:≠≠
    $\frac{5}{x} - \frac{3}{y} = 1$
    $\frac{2}{x} + \frac{1}{y} = 7$
    The result of is....$x^2 + y^2$

16. If x 0 and y 0 satisfy the system of equations:
    $\frac{3}{x + 2y} - \frac{2}{2x - y} = 5$
    $-\frac{2}{x + 2y} - \frac{3}{2x - y} = 1$
    Then the value is....$\frac{x}{y}$

17. A trader bought 45 packs of bread consisting of brown bread and cheese bread. If it is known that the price of brown bread is Rp. 12,000.00 per pack, the price of cheese bread is Rp. 16,000.00 per pack, and the amount of money spent is Rp. 600,000.00, then the amount of brown bread purchased is ....

18. Bam bought 2 kg of apples and 3 kg of oranges, for Rp. 60,000.00. Bwang buys 3 kg of apples and 5 kg of oranges at the same fruit shop for Rp. 95,000.00. Bambang bought 3 kg of apples and 3 kg of oranges at the same fruit shop, then he paid with 2 bills of Rp. 50,000.00. The rest of the money (change) that Bambang received was....

19. The price of 3 kg of rice and 2 kg of sugar in store A is IDR 49,000, while in store B the price of 4 kg of rice and 5 kg of sugar is IDR 91,000. At that time the price of rice and sugar in stores A and B were the same. Pipie bought 1 kg of rice and half a kg of sugar, then she paid Rp 20,000.00. The change Pipie received was....

20. Ten years ago, my grandfather's age was six times younger. Five years from now, the sum of the ages of grandfather and sister will be 93 years. If grandma is 6 years younger than grandpa, then the sum of grandma's present age is...

REFERENCES

Aisyah, S. (2019). *Mencari Luas dan Keliling Persegi Jika diketahui Diagonalnya*. Diakses melalui https://aisyahpedia.blogspot.com

Ardi, M. (2019). *Contoh Soal dan Rumus Luas Persegi*. Diambil dari https://plus.google.com

Ardiyanto, D. (2019). *Cara Menemukan Rumus Mencari Luas Persegi yang Diampit oleh Dua Buah ¾ Lingkaran.* Diambil dari http://amazingblogsszshadow.blogspot.com

Aurelia, I. (2018). *Materi 14 Keliling dan Luas Bangun Datar*. Diakses melalui https://ireneaureliaw.blogspot.com

Gede, L. (2018). *Contoh Soal dan Pembahasan Keliling dan Luas Persegi*. Diakses melalui https://mafia.mafiaol.com

Husni, A. (2016) *Makalah Bangun Datar.* Diakses melalui https://unikublogger.blogspot.com

https://mafia.mafiaol.com/2013/01/pengertian-dan-sifat-sifat-jajargenjang.html (Diakses melalui https://mafia.mafiaol.com pada tanggal 25 September 2019.

https://www.konsep-matematika.com/2015/12/sifat-keliling-dan-luas-jajargenjang.html (Diakses melalui https://www.konsep-matematika.com pada tanggal 25 September 2019.

https://natalia23jms.wordpress.com/materi-bangun-jajargenjang/ (Diunduh atau diakses pada tanggal 25 September 2019, pada pukul 19.10)

http://belajarmatematika062.blogspot.com/2015/04/cntoh-soal-dan-pembahasan-luas-dan.html (Diunduh atau diakses pada tanggal 25 September 2019)

http://materi4belajar.blogspot.com/2017/12/rumus-jajar-genjang-luas-keliling-dan.html (Diunduh atau diakses pada tanggal 25 September 2019)

https://www.rumusmatematika.org/2015/06/rumus-luas-dan-keliling-jajar-genjang.html (Diunduh atau diakses pada tanggal 26 September 2019)

https://www.juraganles.com/2017/12/soal-bangun-datar-jajar-genjang-plus-kunci-jawaban.html (Diunduh atau diakses pada tanggal 26 September 2019)

https://www.haruspintar.com/rumus-jajar-genjang/(Diunduh atau diakses pada tanggal 26 September 2019)

Istafida. (2018). *Mencari Luas Daerah yang Diarsir pada Bangun Datar*. Diambil dari https://rumusonline.com

Maulana, A. (2015). *Fresh Update Buku Pintar Matematika SMA/MA IPA Kelas 1, 2, & 3*. Jakarta: Kawah Media

Nuharini, D. (2008). *Matematika Konsep dan Aplikasinya untuk SMP/MTs Kelas VII*. Pusat Perbukuan: Jakarta

Pengertianhttps://www.google.com/amp/s/www.advernesia.com/blog/matematika/rumus-luas-dan-rumus-keliling-persegi/amp/

Penguin, Edu. (2018). *USBN SD/MI 2019*. Jakarta

Putri, A.K. (Tanpa tahun). *Rumus Ekspres Matematika SMA/MA*. Jakarta: Kompas Ilmu

Rosida, D. (2009). *Penunjang Belajar Matematika Untuk SMP/MTs Kelas 7*. Pusat Perbukuan: Jakarta

Sembiring, S, dkk. (2017). *Matematika, untuk siswa SMA/MA Kelas XI*. Bandung: Srikandi Empat Widya Utama

Sugiyono. (2008). *Matematika SD/MI Kelas V*. Pusat Perbukuan: Jakarta

Sukino. (Tanpa tahun). *Matematika, Kelompok Peminatan Matematika dan Ilmu Alam*. Jakarta: Erlangga

Suparmin, dkk. (Tanpa tahun). *Buku Siswa Matematika XI*. Surakarta: Mediatama

Supradiarini, I. (2008). *Pegangan Belajar Matematika 1 untuk SMP/MTs Kelas VII*. Pusat Perbukuan: Jakarta

Sutrisna, dkk. (Tanpa tahun). *Konsep dan Penerapan Matematika SMA/MA Kelas IX*. Jakarta: PT. Bumi Aksara

Wintarti, A. (2008). *Contextual Teaching and Learning Matematika SMA/MTs Kelas VII Edisi 4.* Pusat Perbukuan: Jakarta

Zahra, E. (2016). *Sifat, Luas, Keliling, dan Penerapan Persegi.* Diakses melalui http://evayatimatuz-zahro.blogspot.com

INDEX

A

B

D

E

G

H

I

J

K

L

P

R

S

Pentagon,
Hexagon,
Triangle,
any triangle,
Parallel,
Elbow,
Symmetry,
curved side,
parallel sides,
stationary,
Substitution,
Corner,
Axis,
axis of symmetry,

T

upright,
trapezoidal height,
cut point,
trapezoid,

V

Vertical,
Volume,

GLOSSARY

Axiom: A statement that is assumed to be true without evidence

Abscissa: is the first element of an ordered pair of two terms (x,y) in the Cartesian coordinate system to address a point, on a fixed perpendicular coordinate axis.

Abstract : a brief presentation of the content of the article that contains the main points in the article so that it becomes a separate part of the article.

Field: a flat, two-dimensional surface. A plane is a two-dimensional analogue of a point (zero dimension), a line (one dimension) and space (three dimensions). A plane can appear as a subspace of a higher dimensional space, such as a room wall, or stand alone as in Euclidean geometry.

Ball : construct a three-dimensional space formed by circles of the same radius and center at the same point.

Two-dimentional figure: a two-dimensional shape that has only length and width, which is bounded by straight and curved lines.

Beam: build a closed space formed from 6 areas, 4 rectangles

Geometry: a shape that does not lie entirely in the plane

Diagonal plane : plane that connects opposite, parallel, and does not lie in the same plane of a figure/plane that passes through the diagonal of the base and the vertical side.

Side Field: area that limits the outside with the inside of a building.

Diagonal: A line drawn from the vertex to the vertex of the non-adjacent vertex of a plane figure.

Level: Unit of Measure Angle, Air Pressure, And Temperature

Space Diagonal: a line segment that joins two opposite points on the figure.

Side Diagonal: a line segment that joins two opposite points on that side.

Discriminant: A function whose properties make and how many solutions of a square.

Dimension: the minimum number of coordinates needed to define a point in it.

Ellipse: the locus of points whose total distance from a given point is fixed, the two fixed points are called the focal point

Focus: special point on the conic section

Combined: Operation Merging Two Sets, So As To Generate A New Set That Contains The Initial Members.

Line: long scribble

Geometry: Geometry is one of the systems in mathematics that begins with a basic concept, namely the point.

Gony "knee": is used by both Strabo and Euclid to refer to a channel connecting the two vertices of a split.

Directive Line: the axis of symmetry on the parabola with respect to the focus.

Horizontal: horizontally from right to left or vice versa.

Parallelogram : A parallelogram is a flat shape two dimensional formed by two pairs lateral which are each the same length and parallel with a partner, and have two pairs corner each of which is equal to the angle opposite it.

Fingers: the line connecting the center point to the circumference of the circle

Around Two-dimentional figure : the total number of sides that a flat shape has.

Congeniality: the similarity of the ratio of side lengths and angles between two or more flat shapes.

Congruent: the state of two flat shapes that are the same and congruent

Area, perimeter, or area: a quantity that expresses the size of a two-dimensional (two-dimensional) part of a surface that is clearly demarcated, usually an area bounded by a closed curve. Surface area represents the surface area of a three-dimensional solid.

Flat Build Area: the number of squares with a side of one unit length that cover the entire flat figure.

Wide: the size of the area bounded by the flat shape.

Kite: a two-dimensional flat shape formed by two pairs of ribs, each of which is the same length and forms an angle to each other.

Pyramid: build a space whose base is in the form of a polygon (triangle, quadrilateral, or pentagon) and the plane of the upright sides is a triangle that intersects at one point.

Surface area: the size of the entire surface of an object bounded by a closed curve.

Ordinate: the perpendicular distance of a point from the x-axis.

Rectangle: a quadrilateral whose four sides are the same length and the same measure of angles is 900. This shape was formerly known as a square

Pythagoras: an entanglement in Euclidean geometry between three sides an elbow.

BIOGRAPHY

Hendrikus Male, S.Pd., M.Hum graduated from a bachelor program at English Language Education Study Program Universitas Kristen Indonesia and completed his master program in Applied English Linguistics in Atma Jaya Catholic University of Indonesia, Jakarta, and graduated in 2014.

Currently he is teaching English at the English Language Education Study Program, FLL Universitas Kristen Indonesia. English for Basic Math teaching materials is designed to the students of English Language Education Study Program and also as one of the teaching materials written to facilitate the teaching and learning process in the classroom specifically the knowledge of Basic Math. I hope that with the help of these teaching materials, students or readers will find it easier to understand and may have broaden knowledge and get better results as well. Any suggestions and constructive criticism are then welcomed for a betterment. He is interested in English learning and teaching, Teaching English as a Foreign Language (TEFL), and Applied Linguistics. He can be reached at e-mail: hendrikus.male@uki.ac.id. Thank you :)

ISBN 978-623-6963-63-0

Publisher

UKI Press
Jl. Mayjen Sutoyo No.2 Cawang, Jakarta 13630
Telp. (021) 8092425. Email: ukipress@uki.ac.id