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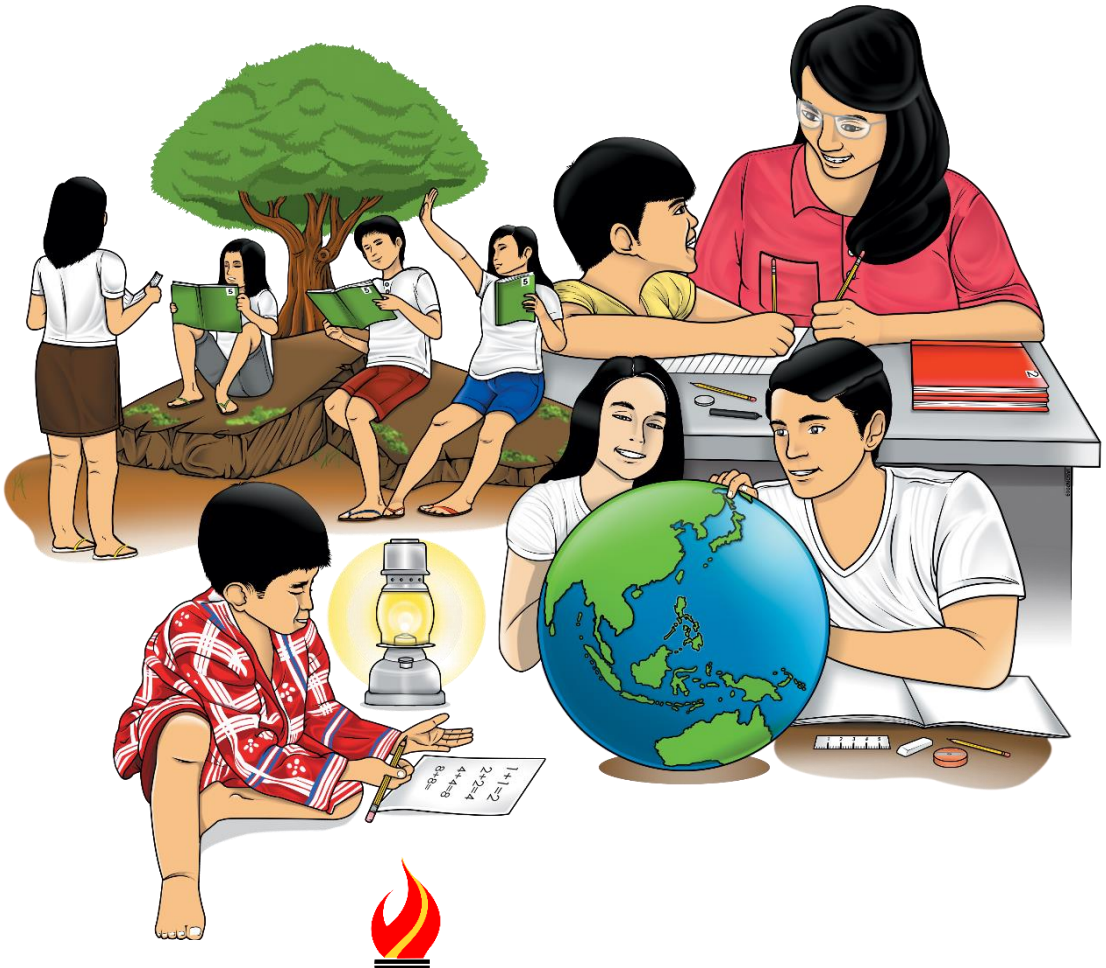
Mathematics

Quarter 3 – Module 4: Relationships of Quadrilaterals to Triangles and Other Quadrilaterals



ALTERNATIVE DELIVERY MODE
ADM

Mathematics – Grade 4
Alternative Delivery Mode
Quarter 3 – Module 4: Relationships of Quadrilaterals to Triangles and other Quadrilaterals
First Edition, 2020

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

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Printed in the Philippines by _____

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Mathematics

Quarter 3 – Module 1: Relationships of Quadrilaterals to Triangles and Other Quadrilaterals

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

In the previous lessons, you learned about triangles and quadrilaterals. Can you describe the difference between triangles and quadrilaterals? Can you also explain their relationship?

In this module, we will further discuss and describe the properties of triangles and quadrilaterals to identify their relationship.

After going through this module, you are expected to:

1. relate triangles to quadrilaterals;
2. relate one quadrilateral to another quadrilateral (e.g. square to rhombus); and
3. explain the relationships among quadrilaterals.

What I Know

Direction: Choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which describes a triangle?
   a. 2-sided polygon
   b. 3-sided polygon
   c. 4-sided polygon

2. Which describes a quadrilateral?
   a. 4-sided polygon
   b. 3-sided polygon
   c. 2-sided polygon

3. What figures are formed when a diagonal is drawn in a quadrilateral?
   a. triangles
   b. squares
   c. parallelograms

4. Which is **TRUE** about the sides of a parallelogram?
   a. 1 pair of sides are parallel and equal
   b. 2 pairs of sides are parallel and equal
   c. 4 sides are equal

5. If two diagonals are drawn in a rhombus or in a square, which of the following will be formed?
   a. 2 triangles of the same size
   b. 2 pairs of triangles of the same size
   c. 4 triangles of the same size

6. Which of the following describes the sides of a square or of a rhombus?
   a. no sides are equal
   b. two sides are equal
   c. all sides are equal

7. Which quadrilateral will have different sizes of triangles if a diagonal is drawn connecting its opposite corners?
   a. rectangle
   b. square
   c. trapezoid

8. How do a triangle and a parallelogram differ?
   a. They differ in the number of angles only.
   b. They differ in the number of sides only.
   c. They differ in the number of sides and angles.

9. Which quadrilateral has only one pair of parallel sides?
   a. parallelogram
   b. trapezoid
   c. rhombus

10. Which figure cannot be a trapezoid?
   a. parallelogram
   b. quadrilateral
   c. polygon

Check your answers with the Answer Key.

CONGRATULATIONS, if you got a score of 8 - 10, you would find this lesson easy.
If your score is below 8, kindly study carefully the lesson and the activities.

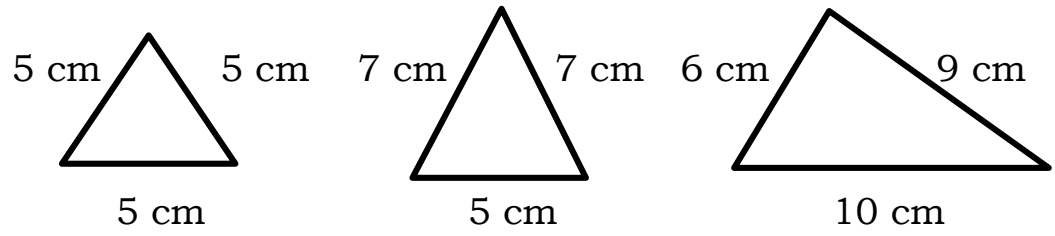
Lesson 1 Relationships of Triangles to Quadrilaterals

What's In

Let us recall our previous lessons on triangles and quadrilaterals. What is a triangle? What is a quadrilateral? How do they differ from one another?

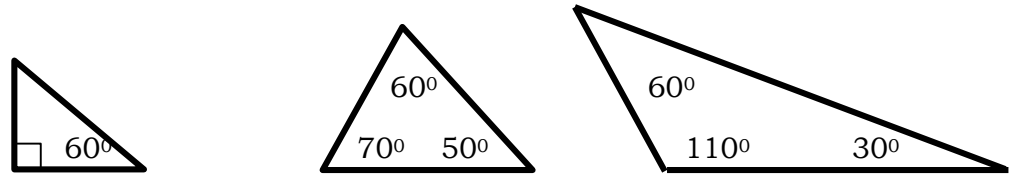
Any **three-sided polygon** is called **triangle**.

KINDS OF TRIANGLES ACCORDING TO SIDES

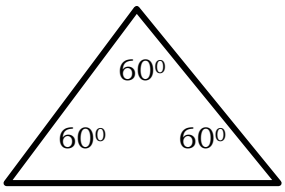


Equilateral triangle **Isosceles triangle** **Scalene triangle**

KINDS OF TRIANGLES ACCORDING TO ANGLES

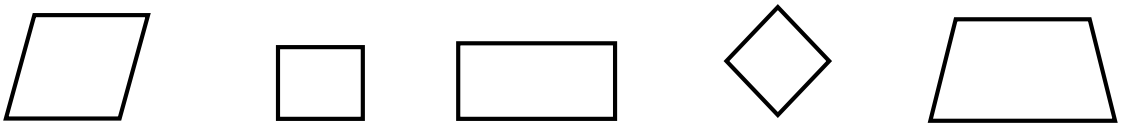


Right triangle **Acute triangle** **Obtuse triangle**



Equiangular triangle

Quadrilaterals are **polygons with 4 sides and 4 angles.** Below are the kinds of quadrilaterals.

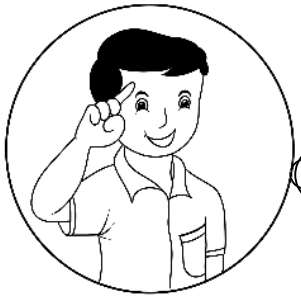


parallelogram square rectangle rhombus trapezoid

How do triangle and quadrilateral differ? They have different number of sides. ***Tri*** means 3 and ***quad*** means 4. So, a triangle has 3 sides while a quadrilateral has four sides. Also, a triangle has 3 angles while a quadrilateral has 4 angles.

What's New

Now that we understand what triangles and quadrilaterals are, let us know their relationship. Let us start with this story.



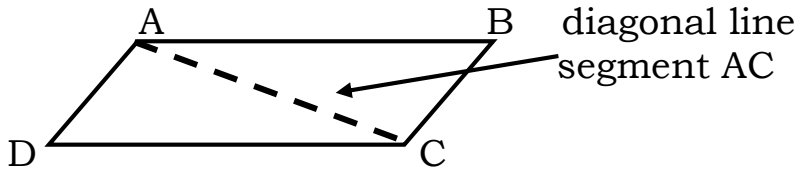
Rene has a cloth in the shape of parallelogram. He would like to make two triangular flaglets that are of the same size. What is the best thing for him to do with the cloth?

If you are Rene, how will you divide the parallelogram to have two triangular flaglets with the same size?

What is It

Consider the parallelogram below to represent Rene's cloth. Each corner is named by a letter as shown. A quadrilateral is named using the consecutive letters in its corner. When naming a quadrilateral, it is important that the consecutive vertices are in the correct sequence, either clockwise or counterclockwise. Thus, the parallelogram below can be named as parallelogram ABCD. This can also be called as parallelogram BCDA, CDAB, DCBA, etc.

A diagonal line segment is drawn from corner A to its opposite corner C. This line segment AC is called a diagonal of parallelogram ABCD. What shapes can we see? Yes, by drawing a diagonal line segment connecting the two opposite corners, we divided the quadrilateral into two triangles of equal sizes.



For our discussion, let us use the name parallelogram ABCD (▱ ABCD).

A **parallelogram** has two opposite sides that are parallel and of equal lengths. In parallelogram ABCD,

the length of side AD is equal to the length of side BC

$$AD = BC$$

the length of side AB is equal to the length of side DC

$$AB = DC.$$

The two triangles formed by diagonals can be named in many ways using the letters representing the corners. The vertices are named in consecutive order either clockwise or counterclockwise.

Triangle 1: ΔABC, ΔACB, ΔCBA, ΔCAB, ΔBAC, ΔBCA

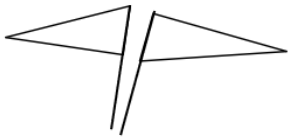
Triangle 2: ΔACD, ΔADC, ΔCAD, ΔCDA, ΔDAC, ΔDCA

These two triangles have equal sizes.

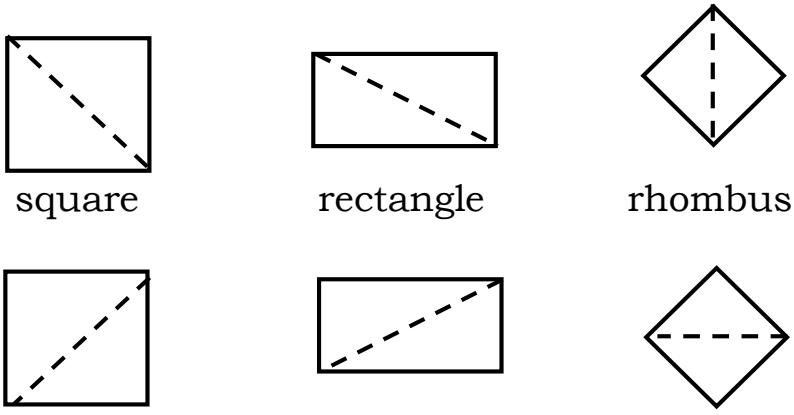
We say that triangle ABC is congruent to triangle ACD. This is written as

$$\Delta ABC \cong \Delta ACD$$

Now, Rene has two triangles of the same size which he can use as flaglets. These are ΔABC and ΔACD.



Look at these other kinds of quadrilaterals. They are divided in two ways by drawing a diagonal line segment connecting the two opposite corners.



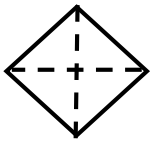
square rectangle rhombus

What shapes were formed out of the parallelogram when a diagonal line segment was drawn connecting the two opposite corners?

Yes, two triangles are formed when a diagonal line segment is drawn connecting the two opposite corners of a parallelogram. So, if a parallelogram is divided by a diagonal, two triangles of the same size can be formed.

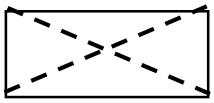
If a rhombus or a square is divided by two diagonals, four triangles of the same size will be formed.

square

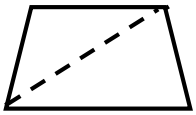


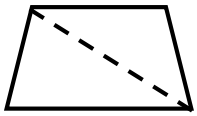
rhombus

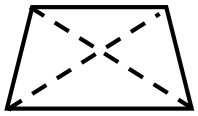
If two diagonals are drawn in a rectangle, the opposite triangles formed are of equal size.



For a trapezoid, if a diagonal line is drawn connecting its two opposite corners, it is divided into two triangles of different sizes. If two diagonals are drawn, four triangles are formed with different sizes.







REMEMBER

All three-sided polygons are called triangles.

All four-sided polygons are called quadrilaterals.

If one diagonal of a parallelogram is drawn, two triangles of the same size are formed.

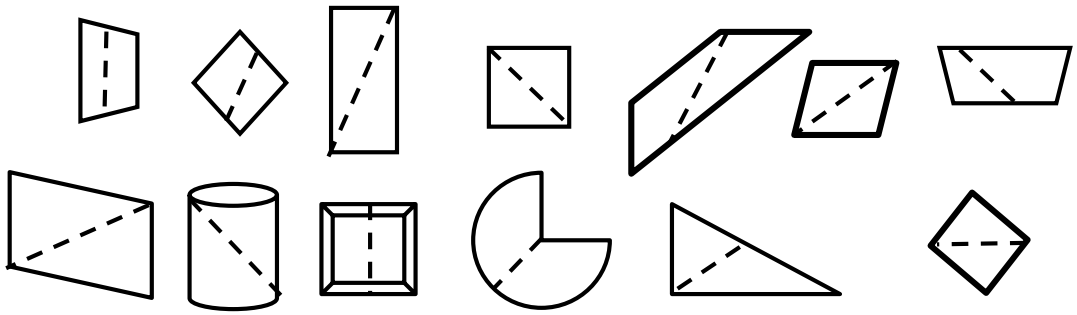
If two diagonals are drawn in parallelograms with four equal sides (square and rhombus), four triangles of the same size are formed.

For a trapezoid, different sizes of triangles will be formed when diagonals are drawn.

What's More

Activity 1 – "Pick Me Up"

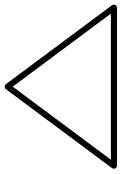
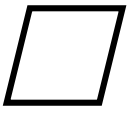
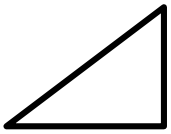
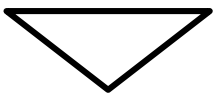
Identify the quadrilateral that has two triangles of the same size. Write your answer on a separate sheet of paper.



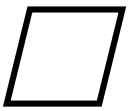
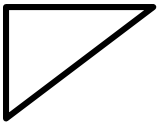
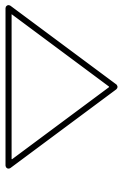
Activity 2 – "Patch It Up"

Match the figure in Column B that when combined with the figure in Column A will form a parallelogram. Write your answer on a separate sheet of paper.

A

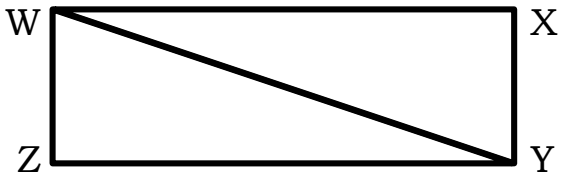
1. 
2. 
3. 
4. 
5. 

B

a. 
b. 
c. 
d. 
e. 

Activity 3 – "Name It"

Refer to the given parallelogram and answer the questions below. Write your answer on a separate sheet of paper.



1-2. Give the two pairs of parallel sides that are equal in length:

_____ and _____

_____ and _____

3-6. Name the parallelogram in at least four ways.

_____, _____, _____, _____

Name the two triangles in at least three ways:

7-9. Triangle 1 _____, _____, _____,

10-12. Triangle 2 _____, _____, _____,

SUPERB, if you got a score of 18 and above. You are now ready for the assessment.

If your score is below 18, kindly study again the lesson and the activities.

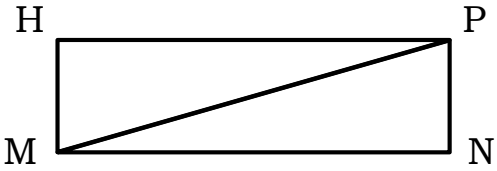
What I Have Learned

Let us remember the following:

1. All three-sided polygons are called triangles.
2. All four-sided polygons are called quadrilaterals.
3. If one diagonal is drawn connecting opposite corners of parallelograms (parallelogram, square, rectangle, rhombus), two triangles of the same size will be formed.
4. If two diagonals are drawn in parallelograms with four equal sides (rhombus and square), four triangles of the same size are formed.
5. If two diagonals are drawn in a rectangle, the opposite triangles formed are of equal size.
6. If a diagonal or two diagonals of a trapezoid are drawn, the triangles formed are of different sizes.

What I Can Do

Using the parallelogram below, fill in the blanks. Write your answer on a separate sheet of paper.



1. Name the parallelogram in at least four ways.
   _____, _____, _____, _____
2. Name the two triangles in at least three ways.
   Triangle 1 - _____, _____, _____
   Triangle 2 - _____, _____, _____
3. Name the two pairs of parallel sides.
   _____ and _____
   _____ and _____

Assessment

I. Fill in the blanks with the correct answers from the box. Write your answer on a separate sheet of paper.

1. A _____ is a 4-sided polygon.
2. If a diagonal is drawn connecting the two opposite corners of a parallelogram, 2 _____ are formed.
3. Triangle is a polygon with ____ sides.
4. The triangles formed by drawing a diagonal in a parallelogram have _____ sizes.
5. Different sizes of triangles will be formed when a diagonal is drawn connecting two opposite corners of a _____.
6. If two diagonals are drawn connecting the opposite corners of a rectangle, the two _____ triangles formed are of equal size.
7. If we will divide a parallelogram into two triangles of the same size, we have to draw a _____ connecting the two opposite corners.
8. If two diagonals are drawn in parallelograms with _____ equal sides, four triangles of the same size are formed.
9. Parallelograms and triangles are named using the _____ in their corners.
10. Parallelogram and triangle differ in the number of _____ and _____.

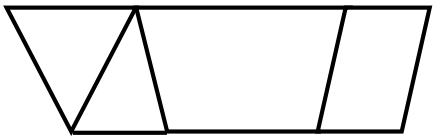
equal	quadrilateral	opposite
triangles	diagonal	letters
rectangle	angles	three
four	trapezoid	sides

Got a score of 8 -10? EXCELLENT! You already understood the lesson. You are now ready for the next module.

If your score is below 8, kindly study again the lesson and the activities.

Additional Activities

Draw a quadrilateral using a combination of different triangles and quadrilaterals. Write your answer on a separate sheet of paper.

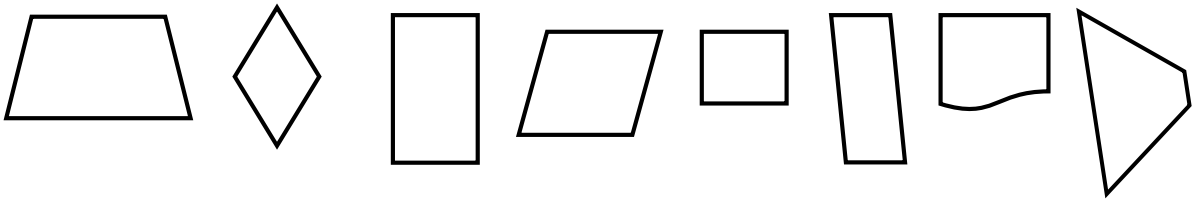
Example: 

What I Know

I. Choose the correct answer. Write your answer on a separate sheet of paper.

1. Which describes a quadrilateral?
   a. 4-sided polygon
   b. 3-sided polygon
   c. 2-sided polygon
2. Is a square a parallelogram? ____ Yes ____ No
3. Is a rectangle a parallelogram? ____ Yes ____ No
4. Is a rhombus a parallelogram? ____ Yes ____ No
5. Is a trapezoid a parallelogram? ____ Yes ____ No

II. Identify the parallelograms and copy them in your answer sheet.



Look at the Answer Key to check your answers.

VERY GOOD, if you got a score of 8 -10. This module is easy for you to learn. If your score is 7 or below, kindly study the lesson carefully and do the activities diligently.

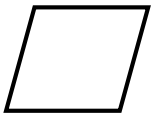
Lesson 2 Relationships of Quadrilateral to Another Quadrilateral

What's In

Let us review what quadrilaterals are.

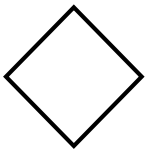
Based on the previous lesson, *quadrilateral* is defined as *a polygon with four sides*. The prefix "**quad**-" means "**four**," and "**lateral**" is derived from the Latin word for "**side**." So, a quadrilateral is a **four-sided polygon**.

A quadrilateral can have parallel opposite sides**.** The following polygons are quadrilaterals with one pair or two pairs of parallel opposite sides.


parallelogram


square


rectangle

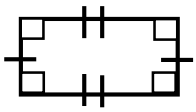

rhombus


trapezoid

What's New

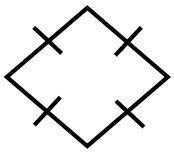
A parallelogram, square, rectangle, rhombus and trapezoid are all quadrilaterals. They are all four-sided polygons and have four corners. However, not all of them have two pairs of parallel opposite sides.

All polygons with **two pairs of parallel opposite sides** are called ***parallelograms***. Parallel lines will never meet or intersect with each other. **Square, rectangle, and rhombus are all parallelograms.** All of them have two pairs of opposite sides that are parallel.



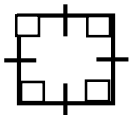
rectangle

A rectangle is a parallelogram with two pairs of parallel sides. Its opposite sides are congruent. Its four corners form right angles.



rhombus

A rhombus is a parallelogram with two pairs of parallel sides. All of its sides are equal. Opposite angles are equal.



square

A square is a parallelogram with two pairs of parallel sides that are of equal lengths. Its four corners are right angles. Therefore, a square is a type of rhombus and rectangle.

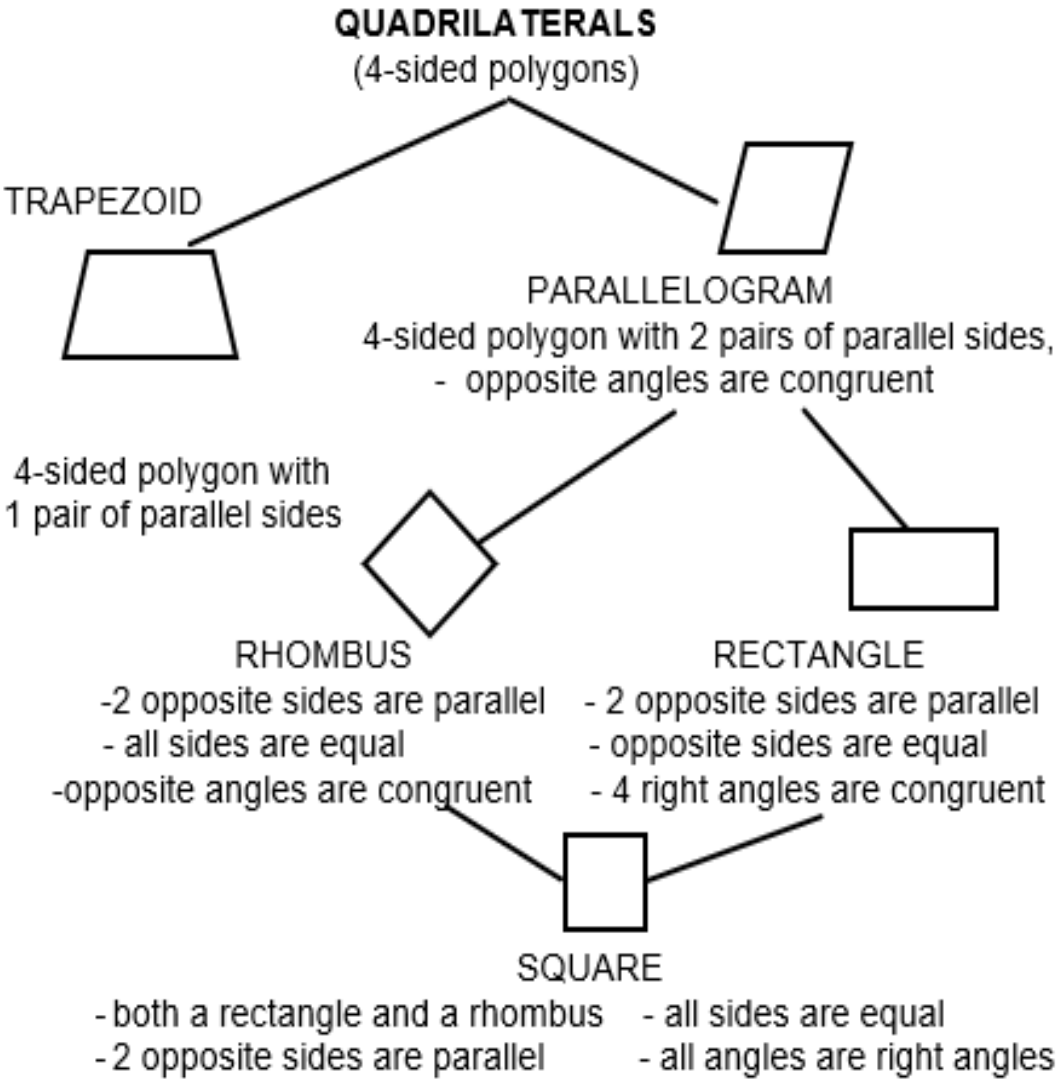
On the other hand, a quadrilateral that has exactly one pair of parallel sides is called a trapezoid. A trapezoid is not a parallelogram.

trapezoid

All four-sided polygons are **quadrilaterals**. All polygons with two parallel opposite sides are called ***parallelograms.*** Square, rectangle, and rhombus are all parallelograms since their opposite sides are parallel. Square is both a rectangle and a rhombus.

What is It

Let us study the diagram on properties of quadrilaterals.



What's More

Activity 1 – "My Properties"

Identify the quadrilateral with the given properties. Select the answer from the box. Write your answer on a separate sheet of paper.

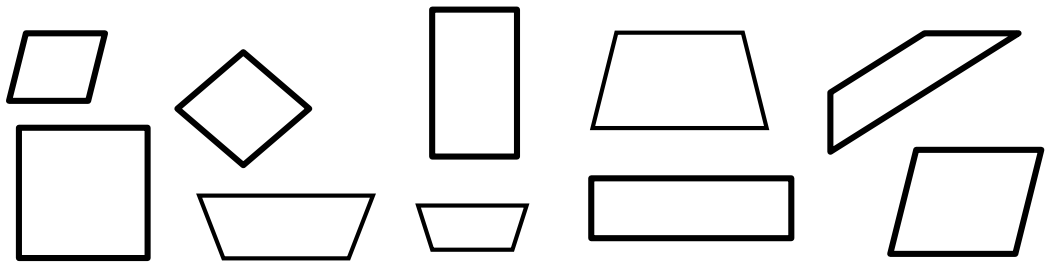
rhombus	rectangle	trapezoid
square	parallelogram	quadrilateral

1. I have 2 pairs of parallel sides. All my sides are equal. My four corners form right angles. I am both a rectangle and a rhombus.
2. My sides are all equal. My opposite sides are parallel. My opposite angles are congruent.
3. I am a 4-sided polygon.
4. My opposite sides are equal.
   I have four right angles.
5. I am a 4-sided polygon with 2 pairs of parallel sides.

Activity 2 – "Where Do I Belong?"

Group the objects based on their properties. Write your answer on a separate sheet of paper.

With 2 pairs of parallel sides and all sides are equal	With only one pair of parallel sides	With 2 pairs of parallel sides and opposite sides are equal



Activity 3 – "Describe Me"

Describe the properties of each quadrilateral. Write your answer on a separate sheet of paper.

1. square
2. rectangle
3. trapezoid
4. rhombus
5. parallelogram

If your score is 18-20, GREAT JOB! You are now ready to answer the assessment.

If your score is below 18, kindly study again the lesson.

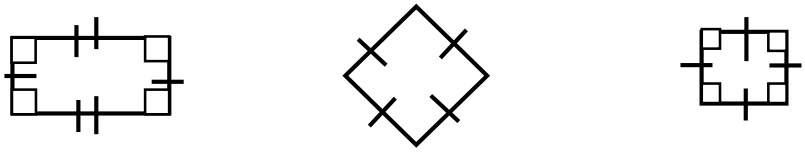
What I Have Learned

Let us remember the following:

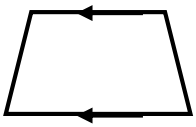
These polygons are **quadrilaterals** because all of them have **four sides.**

parallelogram square rectangle rhombus trapezoid

Quadrilaterals with two pairs of parallel opposite sides are called **parallelograms**. Square, rectangle and rhombus have two pairs of parallel sides. Therefore, they are all parallelograms.



Square is always a rectangle because it is a parallelogram with 4 right angles. Square is also a rhombus because it has 2 pairs of parallel sides that are of equal lengths.



trapezoid

However, one quadrilateral has exactly one pair of parallel sides and is called trapezoid. Since it does not have 2 pairs of parallel sides, a trapezoid is not a parallelogram.

What I Can Do

Using the different kinds of quadrilaterals, make a design of cabinets in your bedroom. Write your answer on a separate sheet of paper.

Assessment

I. Write the letter of the best answer on a separate answer sheet.

1. Which best describes a quadrilateral?
   a. 2-sided polygon
   b. 3-sided polygon
   c. 4-sided polygon

2. Why is a square a rhombus?
   a. It has 4 equal sides.
   b. It has two pairs of parallel sides.
   c. It has two pairs of parallel sides and 4 equal sides.

3. What property makes a square a rectangle?
   a. It has 4 equal sides.
   b. It has 4 right angles.
   c. It has two pairs of parallel sides and 4 right angles.

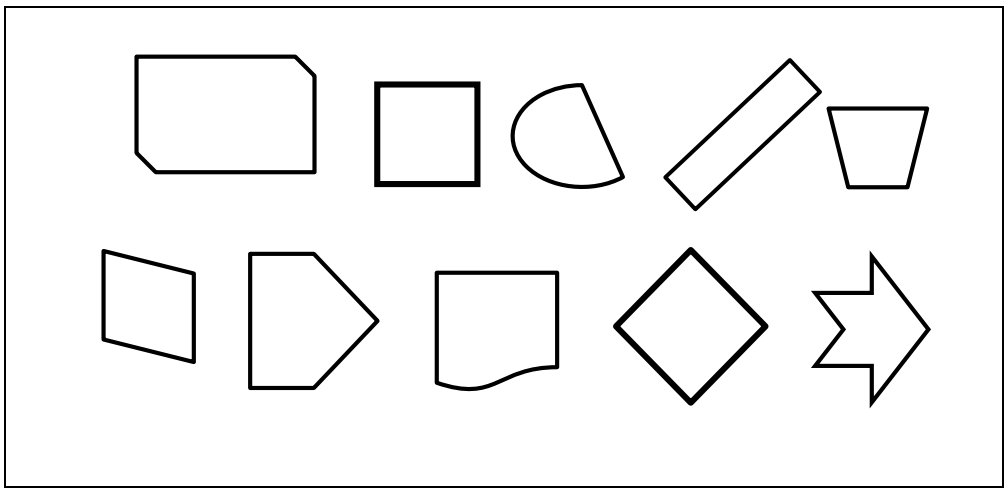
4. What property makes a rhombus a parallelogram?
   a. It has 4 right angles.
   b. It has only 1 pair of parallel sides.
   c. It has 2 pairs of parallel sides.

5. Why is a trapezoid not a parallelogram?
   a. It has 4 right angles.
   b. It has only 1 pair of parallel sides.
   c. It has 2 pairs of parallel sides.

II. Explain how the following quadrilaterals are related. Write your answer on a separate sheet of paper.
1. square and rectangle
2. square and rhombus
3. quadrilaterals and parallelogram
4. rhombus and parallelogram
5. trapezoid and parallelogram

Additional Activities

Identify and copy the parallelograms found in the box. Write your answer on a separate sheet of paper.



Answer Key

What I Can Do

1. Possible names of the parallelogram
▱HPNM, ▱HMNP, ▱PNMH, ▱PHMN, ▱MNPH, ▱ MHPN, ▱NPHM, ▱NMHP

2. Possible names of the triangles

Triangle 1 - ΔHMP, ΔHPM, ΔPHM, ΔPMH, ΔMHP, ΔMPH
Triangle 2 - ΔPNM, ΔPMN, ΔNPM, ΔNMP, ΔMPN, ΔMNP

3. HP and MN, HM and PN

Assessment

1. quadrilateral
2. triangles
3. three
4. equal
5. trapezoid
6. opposite
7. diagonal
8. four
9. letters
10. side and angles

Additional Activities

Some examples only.

LESSON 1

What I Know

1. b
2. a
3. a
4. b
5. c
6. c
7. c
8. c
9. b
10. a

What's More

Activity 1

Activity 2

1. c
2. e
3. a
4. d
5. b

What's More

Activity 1

1-2 side WX and side ZY; side WZ and side XY

3-6 possible names of parallelogram

▱WZYX, ▱WXYZ, ▱XWZY, ▱XYZW, ▱YXWZ, ▱YZWX, ▱ZYXW, ▱ZWXY

7-9 Possible names of triangle 1

△WZY, △WYZ, △YWZ, △ZYW, △YZW, △ZWY

10-12 Possible names of triangle 2

△WXY, △WYX, △YWX, △YXW, △XWY, △XYW

What's More

Activity 3

1. It has 2 pairs of parallel sides.
   Its 4 sides are qual.
   It has 4 right angles.
2. It has 2 pairs of parallel sides.
   The opposite sides are equal.
   It has 4 right angles.
3. It has only 1 pair of parallel sides.
4. It has 2 pairs of parallel sides.
   Its 4 sides are equal.
   Its opposite angles are congruent.
5. It is a polygon with 2 pairs of parallel sides.

What I Can Do

Answers may vary.

Assessment

II.

1. Square is always a rectangle because it has 4 right angles.
2. Square is a rhombus because it has 2 pairs of parallel sides that are of equal length.
3. Both quadrilaterals and parallelograms have 4 sides.
4. Rhombus and parallelogram have two parallel sides and equal opposite angles.
5. Trapezoid is not a parallelogram because it has only 1 pair of parallel sides.

Additional Activities

Assessment

I.

1. c
2. c
3. b
4. c
5. b

LESSON 2

What I Know

I.

1. c. 4-sided polygon
2. Yes
3. Yes
4. Yes
5. No

What I Know

II.

What's More

Activity 1

1. square
2. rhombus
3. quadrilateral
4. rectangle
5. parallelogram

What's More

Activity 2

With 2 pairs of parallel sides and all sides are equal	With only one pair of parallel sides	With 2 pairs of parallel sides and opposite sides are equal

References

DepEd Order No. 12, s. 2020.Adoption of the Basic Education Learning Continuity Plan for SY 2020-2021 In Light of the Covid-19 Public Health Emergency. June 19, 2020. p. 342.

toppr.com. 2021. *Triangles and Quadrilaterals*. [online] Available at: <https://www.toppr.com/guides/maths/basic-geometrical-ideas/triangles-and-quadrilaterals/> [Accessed 23 March 2021].

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