

Mathematics

Quarter 3 – Module 5:

Polygons



Mathematics – Grade 7
Quarter 3 – Module 5: Polygons
First Edition, 2020

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Mathematics

Quarter 3 – Module 5:

Polygons

Introductory Message

For the facilitator:

As a facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning at home. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

As a learner, you must learn to become responsible of your own learning. Take time to read, understand, and perform the different activities in the module.

As you go through the different activities of this module be reminded of the following:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *Let Us Try* before moving on to the other activities.
3. Read the instructions carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are done.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone. We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!



Let Us Learn!

After going through this module, you are expected to:

Illustrate polygons: (a) convexity; (b) angles; and (c) sides. **M7GEIIIe-2**

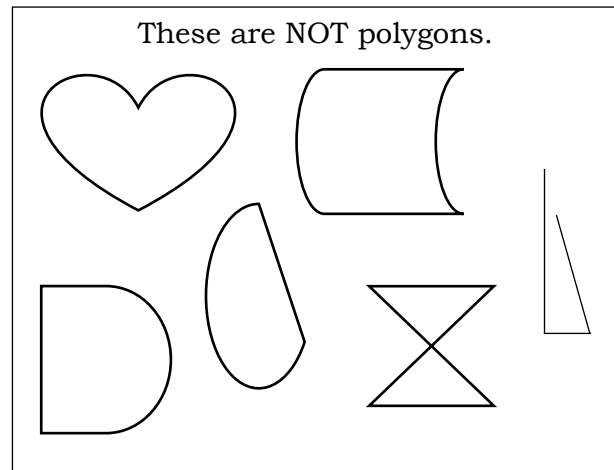
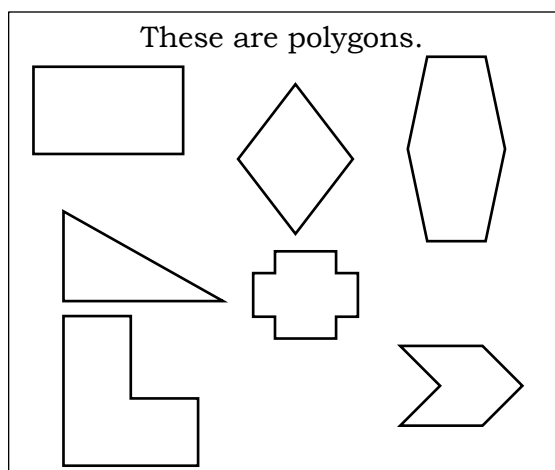
Specifically, you will:

1. define, identify, and illustrate different kinds of polygons according to its convexity, angles, and sides;
2. identify the parts of a polygon: interior, exterior, and the points on the polygon itself; and
3. state the different classifications of a polygon.



Let Us Try!

The figures below are classified into polygons and not polygons. Answer the questions that follow, and it will lead you to the definition of a polygon. Let us try!



Questions:

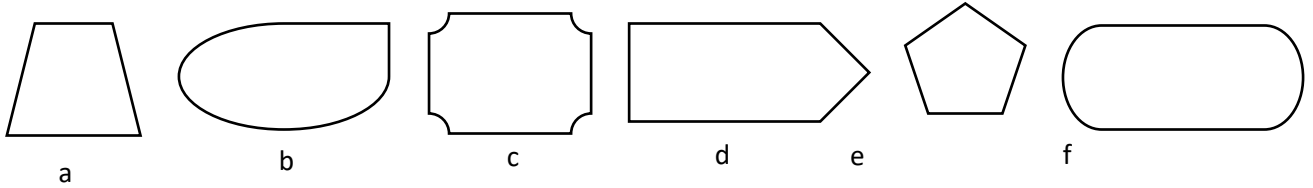
- a. What have you observed with the sides of the polygons?

Answer: All of the sides of polygons are segments which meet at a common endpoint.

b. When can we say that a figure is not a polygon?

Answer: (1) If it has a curved side; (2) if the sides are overlapping; (3) if two endpoints are not shared by two segments.

c. Which of these figures are polygons?



Answer: Figures a, d, and e are polygons.



Let Us Study

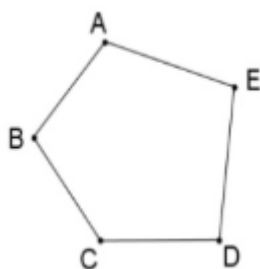
POLYGONS AND ITS PARTS

POLYGON- The word “polygon” comes from the Greek words “poly”, which means “many”, and “gon” which means “angles”.

A **polygon is** a closed figure formed with straight lines/segments. These segments are called **sides**. The endpoints where these sides meet are called **vertices**. **Consecutive sides** of a polygon are sides that have a common vertex. **Consecutive vertices** of a polygon are vertices that have a common side.

Polygons	Not polygons

Polygons are named by writing their consecutive vertices in order, such as ABCDE or AEDCB or CDEAB or CBAED for the polygon below.



Polygon AEDCB above is formed with five segments, namely: **AE, ED, DC, CB, and BA**. It has five vertices: **•A, •B, •C, •D, and •E**.

Consecutive Sides

\overline{AE} and \overline{ED}

\overline{ED} and \overline{DC}

\overline{DC} and \overline{CB}

\overline{CB} and \overline{BA}

\overline{BA} and \overline{AE}

Consecutive Vertices

•A and •E.

•E and •D.

•D and •C.

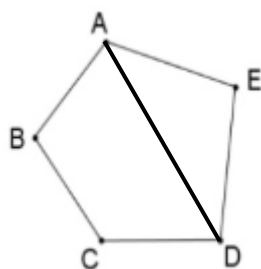
•C and •B.

•B and •A.

Consecutive sides of a polygon formed angles. The number of angles in a polygon is equal to the number of sides and to the number of vertices. Polygon AEDCB has five sides and five vertices. It has also five angles, these are: $\angle AED$, $\angle EDC$, $\angle DCB$, $\angle CBA$, and $\angle BAE$.

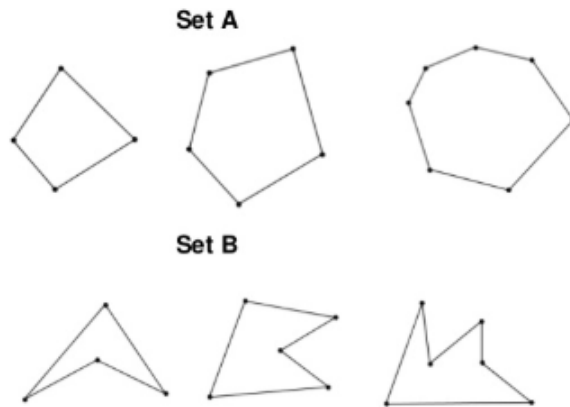
The segment that joins non-consecutive vertices of a polygon is known as **diagonal**. For example, in the figure below, the segment that connects non-consecutive vertices A and D is \overline{AD} . \overline{AD} is a diagonal of polygon AEDCB. Can you name other diagonals in the figure below aside from \overline{AD} ?

We also have \overline{AC} , \overline{EC} , \overline{EB} , \overline{DB} .



KINDS OF POLYGONS ACCORDING TO ITS CONVEXITY

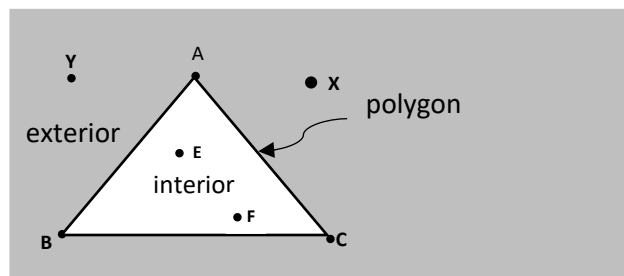
Every polygon is either a **convex** or **non-convex** polygon. A polygon is said to be **convex** if the lines containing the sides of the polygon do not cross the interior of the polygon and all points of its diagonals must lie in its interior, otherwise, it is called **non-convex**.



Polygons in Set A are convex while the polygons in Set B are non-convex.

SETS OF POINTS IN A POLYGON

A polygon separates a plane into three sets of points: the polygon itself, points in the interior (inside) of the polygon, and points in the exterior (outside) of the polygon.



In the figure above, the plane is separated into three sets of points:

- A, •B, and •C are on the polygon itself
- E and •F are in the interior of the polygon; and
- X and •Y are in the exterior of the polygon.

CLASSIFICATIONS OF POLYGONS

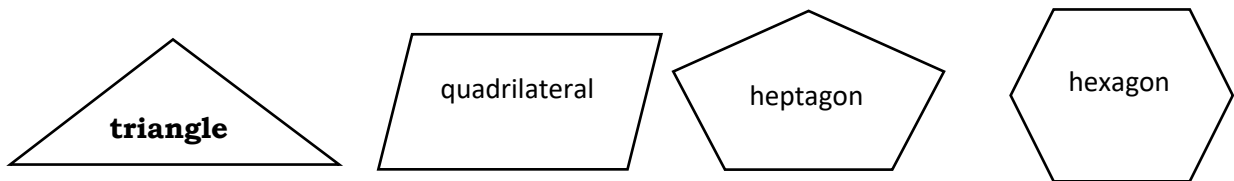
The different types of polygons in terms of congruency parts are **equilateral** (all sides are equal), **equiangular** (all angles are equal) and **regular** (if it is both equilateral and equiangular).

Polygons are named according to the number of its sides.

Number of sides	Name
3	triangle (tri = three)

4	quadrilateral (quad = four)
5	pentagon (penta = five)
6	hexagon (hexa = six)
7	heptagon (hepta = seven)
8	octagon (octa = eight)
9	nonagon (nona = nine)
10	decagon (deca = ten)
11	undecagon (undeca = eleven)
n	n-gon

For example:



Let Us Practice

Write the word or phrase that correctly completes each statement.

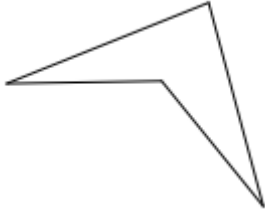
1. A _____ is a closed figure formed with straight lines/segments.
2. A _____ is a segment joining two non-consecutive vertices of a polygon.
3. Consecutive sides of a polygon are sides that have a common _____.
4. For a polygon to be convex, all of its diagonals must lie in its _____.
5. A _____ polygon is a polygon with congruent sides.
6. A _____ polygon is a polygon with congruent angles.
7. A _____ polygon is a polygon with congruent sides and congruent angles.
8. A polygon with three sides is called as _____.
9. A quadrilateral is a polygon with _____ sides.
10. A polygon with seven sides is called _____.



Let Us Practice More

State if each polygon is convex or non-convex.

1.



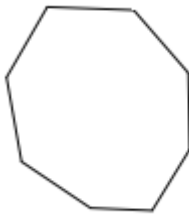
2.



3.



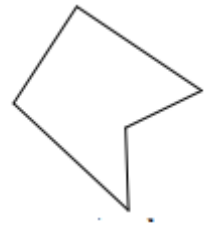
4.




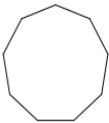
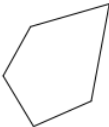
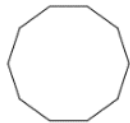
5.

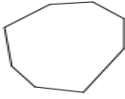



6.



Complete the table by filling in the number of vertices, number of sides and the name of each polygon. *The first one is done for you.*

Figure	Number of Vertices	Number of Sides	Name of Polygon
	7	7	Heptagon
			
			
			



Let Us Remember

A polygon is a closed figure where each side must intersect exactly two other sides at a common point known as vertex. A polygon is named through its consecutive vertices in order.

A polygon can be convex or nonconvex. A polygon is *convex* if the lines containing the sides of the polygon do not cross the interior of the polygon and all points of its diagonals must lie in its interior.

It can be classified according to its congruency: *equilateral*, *equiangular*, and *regular* polygon. A polygon is usually named according to its number of sides, a polygon with n-sides is called n-gon.

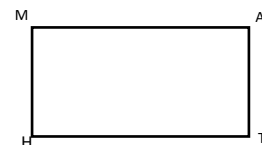


Let Us Assess

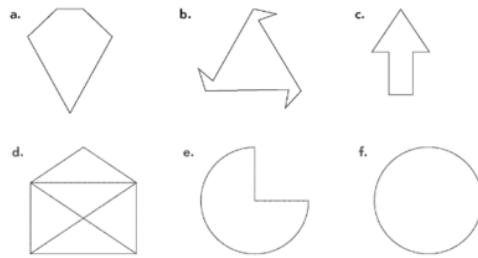
Multiple Choice. Choose the letter of the best answer.

- What is a polygon?
 - A closed figure made up of line segments
 - A closed figure made up of curved edges.
 - An open figure made up of line segments.
 - A closed figure made up of overlapping line segments.
- Which of the following are consecutive sides of polygon MATH?

a. \overline{MA} and \overline{TH}	c. \overline{MA} and \overline{AT}
b. \overline{MT} and \overline{AH}	d. \overline{AT} and \overline{MH}



3. Which of these figures are considered polygons?



a. a, b, c, and d

c. b, d, e, and f

b. a, b, and c.

d. a, e, and f

4. How are polygons named?

a. by the number of sides they have

b. by the number of angles they have

c. both A and B

d. none of the above

5. How many sides does a quadrilateral have?

a. 4

b. 5

c. 6

d. 7

6. How many diagonals does a quadrilateral have?

a. 0

b. 1

c. 2

d. 3

7. What is the least number of sides a polygon can have?

a. 1

b. 2

c. 3

d. 4

8. Squares and rectangles have four sides. What type of polygon are squares and rectangles?

a. Quadrilateral

c. Octagon

b. Heptagon

d. Decagon

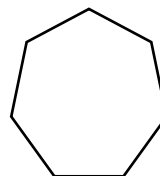
9. What is the name of this polygon?

a. Pentagon

b. Hexagon

c. Heptagon

d. Octagon



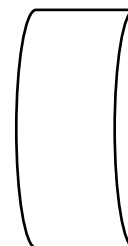
10. Is the figure a polygon? Is it convex or non-convex?

a. Polygon, convex

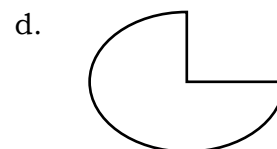
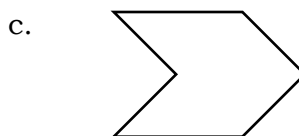
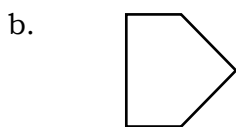
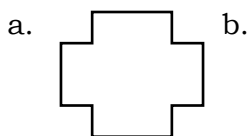
b. Polygon, non-convex

c. Not a polygon, convex

d. Not a polygon, non-convex



11. Which of the following polygons is a convex polygon?



12. What do you call a five-sided figure?

a. Triangle

c. Pentagon

b. Quadrilateral

d. Heptagon

13. Which of the following does not represent a polygon?

a. a sheet of paper

c. a picture frame

b. a coin

d. a door frame

14. What do you call a polygon in which all of its angles and sides are equal?

a. equilateral polygon

c. regular polygon

b. equiangular polygon

d. irregular polygon

15. Which of the following is a regular polygon?

a. Square

c. Trapezoid

b. Rectangle

d. none of the above



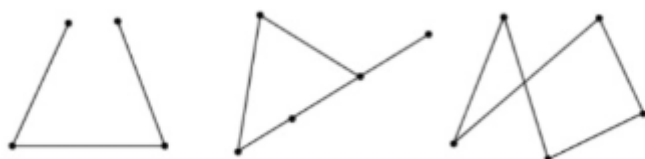
Let Us Enhance

Answer each question and justify your answer.

1. Can two segments form a polygon? If yes, draw the figure. If no, explain why.

2. What is the minimum number of non-collinear segments needed to satisfy the definition of polygon?

3. Why are the following figures not considered as polygons?





Let Us Reflect

#3Things

Using the three hashtags, explain what you have learned, where you can apply what you learned, and what you want to know more about our topic for this week.

1. #IlearnedSomethingToday

2. #ICanUseThis

3. #IWantToKnowMore

Let Us Enhance

1. No, there must be at least three line segments to form a closed figure.
2. Three
3. They are not closed figures, and there are overlapping sides.

Let Us Assess

1. A
2. C
3. B
4. C
5. A
6. C
7. C
8. A
9. C
10. D
11. B
12. C
13. B
14. C
15. A

Let Us Practice More

1. Non-convex
 2. Non-convex
 3. Convex
 4. Convex
 5. Convex
 6. Non-convex
-
1. 9, 9, nonagon
 2. 5, 5, pentagon
 3. 10, 10, decagon
 4. 8, 8, octagon
 5. 6, 6, hexagon

Let Us Practice

1. Polygon
2. Diagonal
3. Vertex
4. Interior
5. Equilateral
6. Equiangular
7. Regular
8. Triangle
9. Four (4)
10. Heptagon





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Oronce, O. & Mendoza, Marilyn O. 2003. *Exploring Mathematics Geometry*. Rex Book Store, Inc.

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