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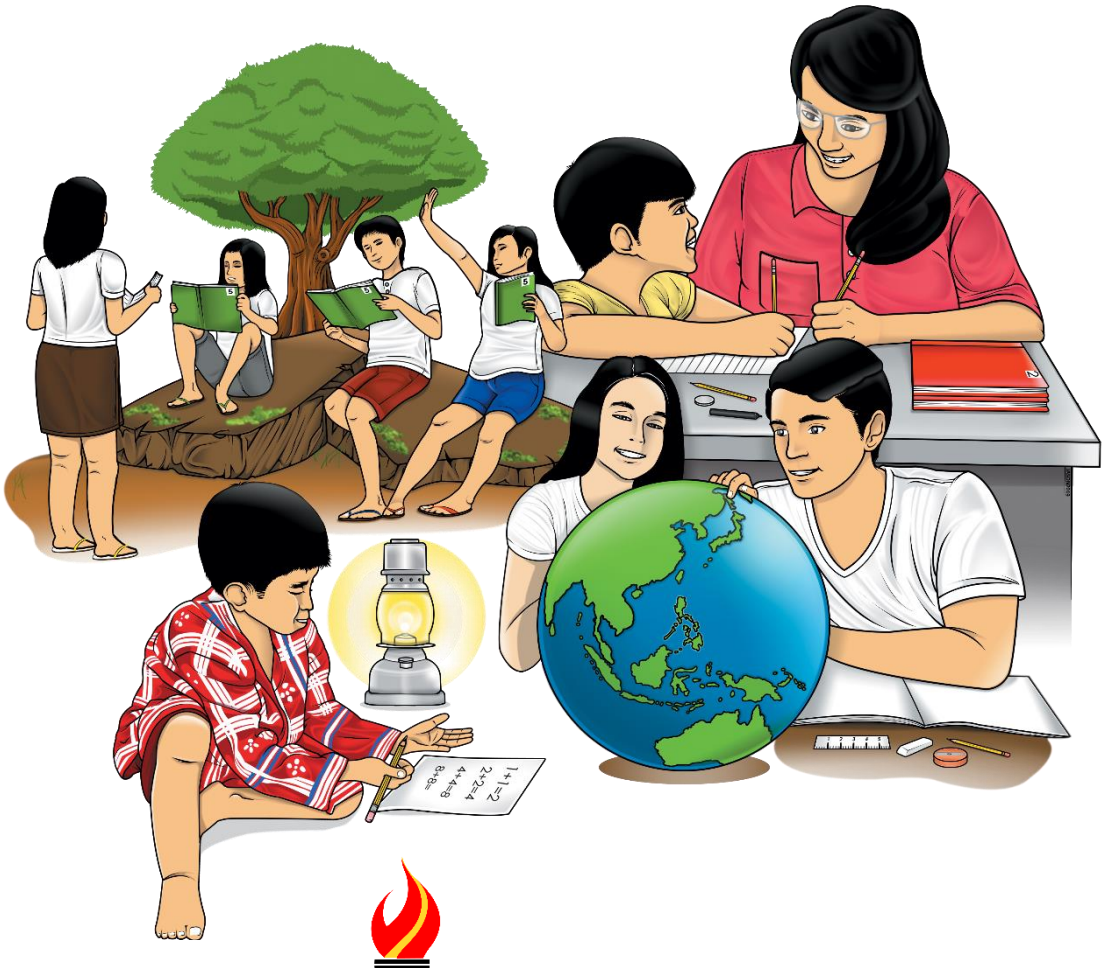
Mathematics

Quarter 3 – Module 8:
Solving Problems Involving Side and Angle of a Polygon



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Mathematics

Quarter 3 – Module 8:
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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

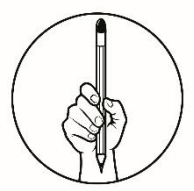
This module was designed and written with you in mind. It is here to help you learn solving problems involving side and angle of polygons. The scope of this module may be used in many different learning situations. The language used recognizes your vocabulary level. The lessons are arranged to follow the standard sequence of the course. But the order in which you study can be rearranged to correspond with the textbook you are now using.

The lesson presented in this module is:

1. Sides and angles of a polygons

After going through this module, you are expected to:

1. Solve problems involving sides and angle of a polygons.



What I Know

Multiple choice. Read each item carefully. Choose the letter of the best answer and write it on a separate sheet of paper.

1. What is the sum of the measures of the vertex angles of octagon?
   A. $1{,}080^0$
   B. 900^0
   C. $1{,}260^0$
   D. 720^0

2. What is the sum of the measures of the vertex angles of a pentagon?
   A. 540^0
   B. 360^0
   C. 720^0
   D. 900^0

3. The number of sides of the polygons with $1{,}260^0$ as the sum of the measures of the vertex angles is _____.
   A. 6
   B. 7
   C. 8
   D. 9

4. What is the number of sides of the polygons when the sum of the measures of the vertex angles is $1{,}620^0$?
   A. 11
   B. 12
   C. 13
   D. 14

5. What is the perimeter of an isosceles triangle with the base measuring 12.3 cm. and one of the equal sides equal to 15cm?
   A. 27.3 cm
   B. 27.3 cm^2
   C. 42.3 cm
   D. 42.3 cm^2

6. What is the sum of all interior angle of a polygon having 29 sides?
   A. $4{,}860^0$
   B. $5{,}040^0$
   C. $5{,}220^0$
   D. $5{,}400^0$

7. If the sum of the measure of the interior angle of a polygon is 3,240, what is the number of sides of the polygon?
    A. 18
    B. 19
    C. 20
    D. 21

8. What is the sum of the interior angles of a decagon?
    A. 90^0
    B. 180^0
    C. 360^0
    D. $1{,}440^0$

9. The sum of all interior angles of a polygon is $3{,}060^0$. How many sides does the polygon have?
    A. 12
    B. 14
    C. 17
    D. 19

10. What is the measure of each interior angle of a regular polygon with 9 sides?
    A. 90^0
    B. 140^0
    C. 160^0
    D. 240^0

Lesson 1 Solving Problems Involving Side and Angle of a Polygon

In this lesson, you will learn how to solve problems involving side and angle of a polygon.

What's In

Recall that a polygon is a closed figure made up of three or more line segments joined at their endpoints. When all sides and all angles of a polygons are congruent, the polygons is a regular polygons or regular n-gon.

Illustrative examples:

Find the perimeter of each polygon.

A. Pentagon with a sides 5cm
B. Equilateral triangle with sides 7cm
C. Square with sides 26mm

Solution:

A. Pentagon with sides 5cm
$P = s_1 + s_2 + s_3 + s_4 + s_5$
$= 5 \text{ cm} + 5 \text{ cm} + 5 \text{ cm} + 5 \text{ cm} + 5 \text{ cm}$
$= 25 \text{ cm}$

B. Equilateral triangle with sides 7cm
$P = s_1 + s_2 + s_3$
$= 7 \text{ cm} + 7 \text{ cm} + 7 \text{ cm}$
$= 21 \text{ cm}$

C. Square with sides 26mm
$P = s_1 + s_2 + s_3 + s_4$
$= 26 \text{ mm} + 26 \text{ mm} + 26 \text{ mm} + 26 \text{ mm}$
$= 104 \text{ mm}$

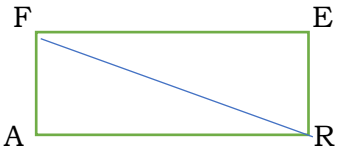
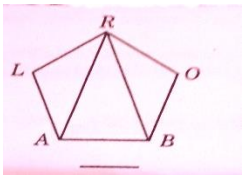
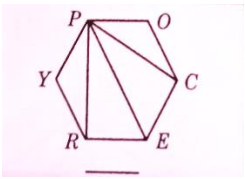
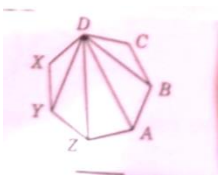
What's New

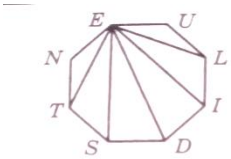
To help you understand problems involving sides and angles of a polygon, recall that the sum of the measures of the interior angles of a triangle is 180^0. Now, try to determine inductively the sum of the measures of the interior angles of any polygon by doing the following activity.

Activity 1.

1. Draw convex polygons with four, five, six, seven and eight sides.
2. Divide each polygon into triangles by drawing diagonals from one of its vertices.
3. Find the sum of the measures of the interior angles of each polygon by multiplying the number of triangles formed by 180^0.
4. Record all the resulting values in a separate sheet of paper using a table similar to ***table 1.1***. The first one has been done for you.

Table 1.1 Sum of the Interior Angles of a Polygon

Polygon	**No. of Sides**	**No. of Triangles Formed in the Figure**	**Sum of the Angle Measure**
Quadrilateral	4	 **2**	**2** x 180^0 = **360^0**
Pentagon	5	 _____	_____ x 180^0 = _____
Hexagon	6	 _____	____ x 180^0 = _____
Heptagon	7	 _____	_____ x 180^0 = _____

Octagon	8		_____ x 180^0 = _____

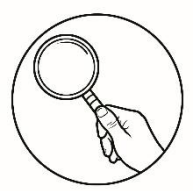
Remember!

The sum of the measures of the interior angles of an n-gon is ,

S = (n – 2)180^0, where **n** is the number of sides.

Questions:

What did you discover? What is the sum of the measures of the interior angles of a polygon with 10 sides? of an n-gon?



What is It

The sum of the measures of the interior angles of an n-gon is, **S = (n – 2)180^0**, where **n** is the number of sides. The sum of the measures of the exterior angles of any polygon is equal to 360^0. The measure of each angle of a regular polygon with n sides is $\frac{(n-2)180^0}{n}$.

Example 1. Find the sum of the measures of the vertex angles for pentadecagon.

Solution: Pentadecagon is a 15-sided polygon

S = (n – 2)180^0

= (15 – 2) 180^0

= (13) 180^0

= 2,340^0

Therefore, the sum of the measures of the angles of a pentadecagon is $2{,}340^0$.

Example 2. Find the number of sides of a regular polygon when the measure of an exterior angle is 45^0.

Solution:

Recall that each exterior angle of a regular polygon measures $\mathbf{360^0/n}$. Since each exterior angle measures 45^0, hence,

$45^0 = 360^0/n$

$45^0n = 360^0$

$n = 360^0/45^0$

$\mathbf{n = 8}$

Therefore, the polygon has 8 sides.

What's More

Activity 1. Draw the figure as a guide. Eddie estimated that he would need at least 1 meter of wooden sidings to make a picture frame. What are the dimensions of the largest frame he could make if the frame is

a. a square?
b. rectangular shape?
c. pentagon?

Activity 2

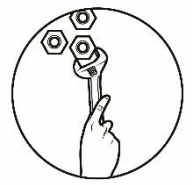
For their project in TLE, Belen decided to sew red piping along the edges of the table cloth measures 1.75m by 2.85m, at least how many meters of piping should she prepare?

What I Have Learned

On a separate sheet of paper, match the correct answer in column B. Write only the letter of your answer in the space provided.

	Column A	Column B
_____ 1.	Find the sum of the measures of the vertex angles for octagon.	a. 900^0
_____ 2.	Find the sum of the measures of the vertex angles for hexagon	b. 9
_____ 3.	Find the sum of the measures of the vertex angles for heptagon	c. $1,080^0$
_____ 4.	Find the number of sides of the regular polygon when the sum of the measures of the vertex angle is $1,260^0$	d. 13
_____ 5.	Find the number of sides of the regular polygon when the sumof the measures of the vertex angle is $1,980^0$	e. 720^0
		f. $1,260^0$

Good job! Now you're up for the next challenge of this lesson.



What I Can Do

Activity 3

Use your learning on solving problems involving sides and angles of polygons.

A six sided regular polygon is inscribed in a circle of radius 10cm, find the length of one side of hexagon.

Excellent work! You did a good job in applying what you have learned!

Assessment

Multiple choice. Read each item carefully. Choose the letter of the best answer and write it on a separate sheet of paper.

1. Find the sum of the interior angles of a heptagon.
   A. 900^0
   B. 135^0
   C. $1{,}800^0$
   D. 40^0

2. Find the interior angle of a regular octagon.
   A. 160^0
   B. 135^0
   C. $1{,}800^0$
   D. 40^0

3. Find the measure of each interior angle, each exterior angle and the sum of the interior angle of a regular dodecagon.
   A. 150^0 , $40^{0,}$ 1800^0
   B. 150^0 , $60^{0,}$ 1800^0
   C. 150^0 , $30^{0,}$ 1800^0
   D. 150^0 , $20^{0,}$ 1800^0

4. Jacob has a large sandbox, the sandbox is 12meters long and 8meters wide. He wants to surround the sandbox with new pieces of wood. How many meters of wood will he need?
   A. 40 meters
   B. 50 meters
   C. 60 meters
   D. 70 meters

5. The perimeter of Sophia's Garden is 42 meters. The garden is 6 meters wide. What is the length of the garden?
   A. 30 meters
   B. 25 meters
   C. 15 meters
   D. 10 meters

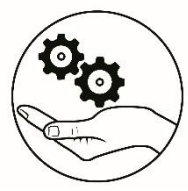
6. What is the sum of all interior angle of a regular hexagon?
   A. 540^0
   B. 720^0
   C. $1{,}260^0$
   D. $1{,}440^0$

7. If the sum of the measure of the interior angle of a polygon is $2{,}160^0$, what is the number of sides of the polygon?
   A. 11
   B. 12
   C. 13
   D. 14

8. What is the measure of each interior angle of a regular octagon?
   A. 135^0
   B. 180^0
   C. 360^0
   D. 540^0

9. A regular polygon has an exterior angle that measures 40^0. How many sides does the polygon have?
   A. 7
   B. 8
   C. 9
   D. 10

10. What is the measure of each interior angle of a polygon with 12 sides?
    A. 120^0
    B. 140^0
    C. 150^0
    D. 160^0



Additional Activities

In each of the following polygons, find the sum of the interior angles and the sum of exterior angles.

1. Hexagon
2. Octagon

Answer Key

What I Know

1. A
2. A
3. D
4. A
5. C
6. A
7. C
8. D
9. D
10. B

What I have learned

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

What's New

No. of triangles formed in the figure	Sum of the angle measure
2	360^0
3	540^0
4	720^0
5	900^0
6	1080^0

What's More

Activity 1

1. S = 25cm
2. W =254cm, L =25cm
3. S = 20cm

Activity 2

1. 9.2 meter

What Can I Do

1. 10cm

Assessment

1. A
2. B
3. C
4. A
5. C
6. B
7. D
8. A
9. C
10. C

Additional Activity

1. Sum of interior angle is 720**o**
Sum of exterior angle is 360^0

2. Sum of interior angle is 1080**o**
Sum of exterior angle is 360^0

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