7

DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Mathematics

Quarter 1
Lesson
3

Lesson Exemplar for Mathematics Grade 7
Quarter 1: Lesson 3 (Week 3)
SY 2024-2025

Development Team

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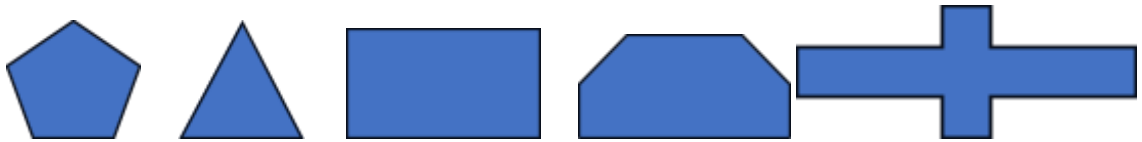
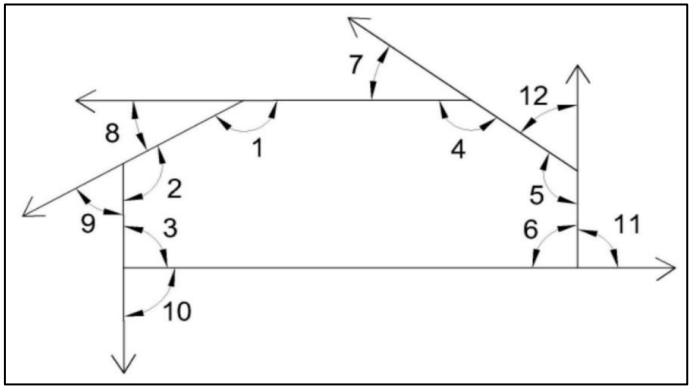
MATHEMATICS / QUARTER 1 / GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners demonstrate knowledge and understanding of: 1. Regular and irregular polygons and their features/properties; and 2. Determination of measures of angles and number of sides of polygons.
B. Performance Standards	By the end of the quarter, the learners are able to draw and describe the features/ properties of regular and irregular polygons. (MG)
C. Learning Competencies and Objectives	The learners… 1. Deduce the relationship between the exterior angle and the adjacent interior angles of a polygon/ 2. Deduce the measures of angles and the number of sides of polygons.
D. Content	1. Exterior and Interior Angles 2. Relationship Between Exterior Angle and Adjacent Interior Angle 3. Measures of Angles in Any Polygon
E. Integration	SDG 4 (Quality Education): Educational Resources

II. LEARNING RESOURCES
Acelajado, M.J. (2003). The New High School Mathematics First Year (elementary Algebra). Diwa Scholastic Press Inc., Philippines. ISBN: 971-48-0628-3 Coronel, I.C. Sr., et al. (1992). Mathematics 1 – An Integrated Approach ISBN: 971-569-182-X Donnel P.P. (2013). 21st Century MATHletes Textbook. https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/8243/7.1.pdf

III. TEACHING AND LEARNING PROCEDURE		**NOTES TO TEACHERS**
A. Activating Prior Knowledge	**DAY 1** **1. Short Review** **Polygon Who?** This is a short review of lessons in weeks 1 and 2. Show drawings or cut-out polygons and let the students name the polygons. This can be done through games, in pairs, or in groups. Feel free to make use of available manipulatives,	To determine the learner's prior knowledge about the lesson, they will answer Duration: 2-5 minutes

	or actual tiles. Students learn more if they can manipulate objects. Short video clips can also be used to activate prior knowledge. Instructions: Identify the type of polygon and state the number of sides. Process their answer by explaining the type of polygon and the number of sides.  Answer the following questions in one or two sentences. 1. Name the polygon and tell the number of sides. 2. Why is number 1 in the previous activity called pentagon? 3. Can you name some other type of polygon you know? **2. Feedback (Optional)**	Materials Needed: Drawing or pictures of polygons or cut-out polygons. Suggestion: The teacher may add other kinds of polygons. Additional Resources (Optional): Include any optional resources such as readings, videos, websites, or references that learner can explore for deeper understanding. This is just an oral activity. Flashing different polygons as a springboard to the topic should not take more than 5 minutes.
B. Establishing Lesson Purpose	**1. Lesson Purpose** Before the formal discussion of interior and exterior angles, ask the learners what they think are the definitions of interior and exterior angles using the activity (and the answers) as a springboard for the discussion. Discuss the differences between interior and exterior angles in a polygon, as well as the relationship between exterior angles and their adjacent angles. **How do we define Exterior and Interior Angles?** These are angles formed within a polygon by the intersection of its sides. They are measured between two adjacent sides of the polygon. **What are adjacent angles?** These are angles formed outside a polygon when one side is extended. They are formed by extending one side of the polygon past the vertex. **2. Unlocking Content Vocabulary** Using what you know about the words (definition/meaning) “interior” and “exterior”, write whether the following angles (symbol: ∠) from the figure are interior or exterior.	

	∠1 ∠2 ∠3 ∠4 ∠5 ∠6 ∠7 ∠8 ∠9 ∠10 ∠11 ∠12  	**Answer Key:** 1. interior 2. interior 3. interior 4. interior 5. interior 6. interior 7. exterior 8. exterior 9. exterior 10. exterior 11. exterior 12. exterior
C. Developing and Deepening Understanding	**DAY 1** **SUB-TOPIC 1: Exterior and Interior Angles** **1. Explicitation** **Understanding Polygons:** **A polygon** is a closed shape with straight sides. Examples include triangles, quadrilaterals, pentagons, and so on. Each polygon has its unique set of angles. **Exterior Angles of a Polygon:** An exterior angle is formed when a side of a polygon is extended outward. The sum of all exterior angles in any polygon is always 360 degrees. Remember, exterior angles are crucial in understanding the properties of polygons. **Adjacent Interior Angles:** These are angles inside the polygon that share a common side. The sum of adjacent interior angles in a polygon is always 180 degrees. This concept helps us analyze the relationships between angles within a polygon. Think back to our previous lessons on angles and geometry. How can we apply our knowledge of angles within triangles and quadrilaterals to understand the angles in more complex polygons? Connecting these concepts will strengthen your understanding of polygons	

2. Worked Example

Step 1: Review the lessons in weeks 1 and 2 by identifying exterior angles and interior angles. From the given figure, identify all exterior angles and record them on a separate paper.

Step 2: Complete the list of exterior angles and pair each one with its adjacent interior angle by placing a heart between them.

Exterior Angle ♥ Adjacent Interior Angle (Ex. ∠7 ♥ ∠4)

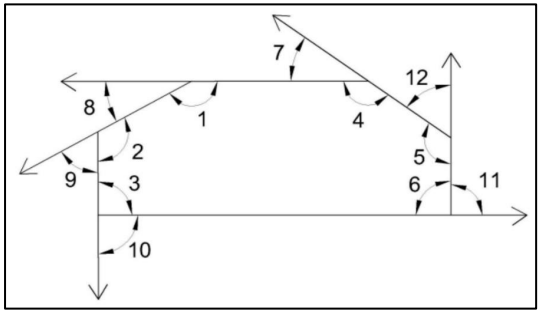


Fig 1. Interior Angles of a Polygon

Step 3: Process the answer. Students should be able to identify which angles are exterior and which are interior. They must also identify the adjacent interior angle of all identified exterior angles.

3. Lesson Activity

Activity 1: Measure and Record

This activity aims to demonstrate how to measure the exterior angle and its adjacent interior angles in a polygon and let the learners share their observations. Measure the interior angle by using your own protractor. Compare each measurement. Indicate how the learners will be assessed on their understanding or completion of the activity.

See Worksheet No. 1

Suggest reflection questions or prompts for learners to think about what they have learned. Provide any notes, directions, or guidance for teachers or facilitators who will be conducting the activity.

Optional: Include any optional resources such as readings, videos, websites, or references that learner can explore for deeper understanding.

DAY 2

SUB-TOPIC 2: Relationship Between Exterior Angle and Adjacent Interior Angle

1. Explicitation

Activity 2: Who Am I?

This activity aims to make the learners understand the frequently used terms in this lesson.

Using Table 1 from Day 1 as a Springboard

An exterior angle is formed when a side of a polygon is extended outward. On the other hand, an interior angle is the angle formed inside the polygon between two adjacent sides.

The exterior angle and the adjacent interior angle (the interior angle next to the exterior angle) are supplementary angles. This means that when you add the

See Worksheet No. 2

Activity 2 Answer Key:

1. Exterior Angles
2. Interior Angles
3. Adjacent Angles
4. Protractor
5. Linear Pair
6. Supplementary Angles
7. Complementary Angles
8. Sum
9. Polygon
10. Angle

	measure of an exterior angle to the measure of its adjacent interior angle, you will always get a sum of 180 degrees. For example, if the exterior angle of a polygon measures 100 degrees, then the adjacent interior angle will measure 80 degrees because 100 + 80 = 180 degrees, making them supplementary angles. Think about a door swinging open - the angle formed on the inside (interior angle) and the angle formed on the outside (exterior angle). This real-life example can help you remember the relationship between exterior and interior angles. Remember, exterior angles and adjacent interior angles are supplementary, meaning they add up to 180 degrees. This is also known as the Exterior Angle Theorem (EAT). **2. Worked Example** Example 1: If ∠1 measures 120 (or m∠1 = 120^0), what is the measure of its adjacent angle? Solution: The adjacent angle to ∠1 is ∠3 (1. Why?) m∠1 + m∠3 = 180^0 (2. Why?) 120^0 + m∠3 = 180^0 (3. Why?) 120^0 + m∠3 - 120^0 = 180^0 – 120^0 (4. Why?) m∠3 = 60^0 (5. Why?) Answer: m∠3 = 600 Example 2: If m∠2 = 38^0, m∠5 = ? Solution: ∠2 and ∠5 are adjacent angles m∠2 + m∠5 = 180^0 38^0 + m∠5 = 180^0 38^0 + m∠5 - 38^0 = 180^0 - 38^0 m∠5 = 142^0 Answer: m∠5 = 142^0 Example 3: What is m∠4? Solution: ∠2, ∠3, and ∠4 are interior angles of a triangle (symbol: △) m∠2 + m∠3 + m∠4 = 180^0 38^0 + 60 + m∠4 = 180^0 980 + m∠4 - 98^0 = 180^0 – 980 m∠4 = 82^0 Answer: m∠4 = 82^0	Use the I do – We do – You do Strategy **Answer to the Whys:** 1. Definition of Adjacent ∠ 2. An exterior (ext) ∠ and its adjacent (adj) interior (int) ∠ are supplementary ∠s. And by definition of supplementary (supp) ∠s, the sum of their measures is 1800. 3. m∠1 = 1200 or substitution 4. Addition (or subtraction, they are the same) Property of Equality (APE) 5. Simplification (both sides

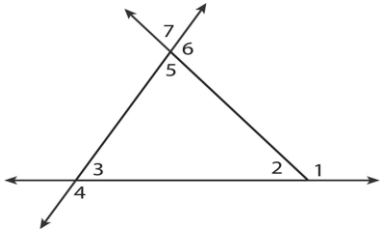
(We Do)
Example 4: If m∠11 = 104^0, what is the measure of its adjacent angle?
Solution: The adjacent angle to ∠11 is ∠8
m∠11 + m∠8 = 180^0
1040 + m∠8 = 180^0
1040 + m∠8 - 104^0 = 180^0 – 104^0
m∠8 = 76^0
Answer: m∠8 = 76^0

Example 5: If m∠6 = 57^0, m∠9 = ?
Solution: ∠6 and ∠9 are adjacent angles
m∠6 + m∠9 = 180^0
57^0 + m∠9 = 180^0
57^0 + m∠9 - 57^0 = 180^0 - 57^0
m∠9 = 123^0
Answer: m∠9 = 123^0

Example 6: What is m∠7?
Solution: ∠6, ∠7, and ∠8 are interior angles of a triangle (symbol: △)
m∠6 + m∠7 + m∠8 = 180^0
38^0 + 60 + m∠4 = 180^0
98^0 + m∠4 - 98^0 = 180^0 - 98^0
m∠4 = 82^0
Answer: m∠4 = 82^0

(You Do) Refer to the figure at the right for the following questions. Show your complete solution.

1. If m∠6 = 107^0, what is the measure of its adjacent angle?
2. If m∠2 = 67^0, m∠1 = ?
3. What is m∠3?



3. Lesson Activity
See Worksheet Activity No. 3

You Do Answer Key:
1. m∠5 = 83^0
2. m∠1 = 113^0
3. m∠3 = 27^0

Activity 3 Answer Key:
A. m∠2 = 50
B. m∠3 = 60
C. m∠4 = 120
D. m∠5 = 70
E. m∠6 = 110

DAY 3

SUB-TOPIC 3: Determine the Measures of Angles and the Number of Sides of Polygons

1. Explicitation

Understanding Polygons:

A polygon is a closed shape with straight sides. Remember, polygons can range from triangles to hexagons and beyond.

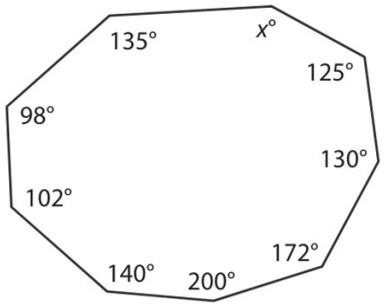
Sum of Interior Angles: One essential concept when dealing with polygons is the sum of interior angles. The sum of interior angles in any polygon can be found using a simple formula: (n-2) * 180 degrees, where 'n' represents the number of sides in the polygon.

Regular vs. Irregular Polygons: It's important to differentiate between regular and irregular polygons. In a regular polygon, all sides and angles are equal. On the other hand, irregular polygons have sides and angles of varying lengths and measures.

Exterior Angles: The exterior angle of a polygon is the angle formed between a side of the polygon and an extension of an adjacent side. The sum of exterior angles in any polygon is always 360 degrees.

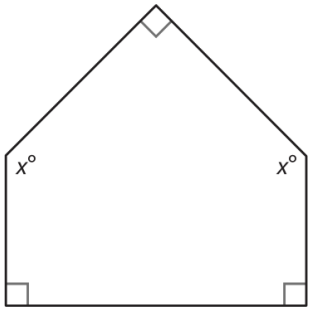
2. Worked Example

Example 1: Given the figure at the right, find x^0



1. How many sides does the figure have? **9**
2. What is the name of the polygon? **nonagon**
3. What is the sum of the interior angles of a nonagon?
   $180t = 180(n-2) = 180(9-2)$
   $180(7) = 1260$
4. What is the value of x^0?
   $135^0 + 98^0 + 102^0 + 140^0 + 200^0 + 172^0 + 130^0 + 125^0 + x^0 = 1260$
   $\Rightarrow 1102^0 + x^0 = 1260 \quad \Rightarrow \quad 1102^0 + x^0 - 1102^0 = 1260^0 - 1102^0$
   $\Rightarrow x^0 = 158^0$

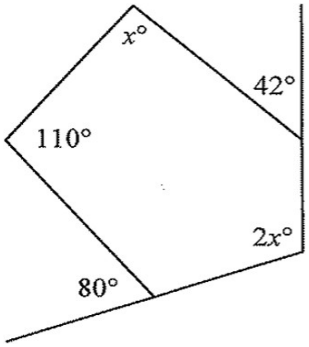
Example 2: Given the figure at the right, find x^0



Note: three of the angles are right angles.

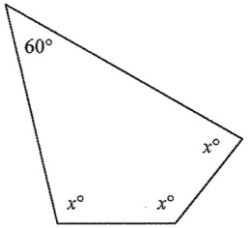
1. How many sides does the figure have? **5**
2. What is the name of the polygon? **pentagon**
3. What is the sum of the interior angles of a nonagon?
   180t = 180(n-2) = 180(5-2)
   180(3) = 540
4. What is the value of x^0?
   ⇒ **$x^0 + x^0 + 3(90^0) = 540^0$**
   ⇒ **$2x^0 + 270^0 = 540^0$**
   ⇒ **$2x^0 = 270^0 \Rightarrow x^0 = 135^0$**

Example 3: Given the figure at the right, find x^0



1. How many sides does the figure have? **5**
2. What is the name of the polygon? **pentagon**
3. What is the sum of the interior angles of a pentagon?
   180t = 180(n-2) = 180(5-2)
   180(3) = 540

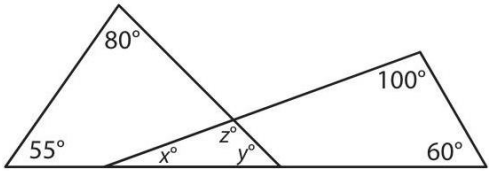
Example 4: What is the value of x^0?



⇒ **$x^0 + 2x^0 + 110^0 + 100^0$ (why?) + 138^0 (why?) = 5400^0**
⇒ **$3x^0 + 348^0 = 540^0$**
⇒ **$3x^0 = 192^0 \Rightarrow x^0 = 64^0$; $2x^0 = 128^0$**

Example 5: (Guided Practice)

a. Five angles of a hexagon measure 100^0, 110^0, 120^0, 130^0, and 140^0. What is the measure of the sixth angle? **240^0**
b. Given the figure above left, find x^0. **100^0**
c. Given the figure below, find x^0, y^0, z^0. **20^0, 45^0, 115^0, respectively.**

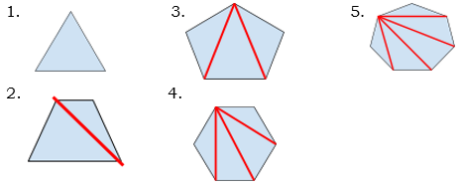


3. Lesson Activity

See Worksheet Activity No. 4

DAY 4

Activity 4 Answer Key:



Name of the Polygon	No. of Sides (n)	How many triangles can you form if you draw diagonals from a single vertex? (t)	180°t (Why?)	Sum of the interior angles
triangle	3	no of △ = 1	180(1)	180°
quadrilateral	4	no of △ = 2	180(2)	360°
pentagon	5	no of △ = 3	180(3)	540°
hexagon	6	no of △ = 4	180(4)	720°
heptagon	7	no of △ = 5	180(5)	900°
In general,	n	t = n-2	180t	

SUB-TOPIC 4: Determination of Measures of Angles and Numbers of Sides of Regular Polygons

1. Worked Example

Example 1: Find the measure of each angle of a regular octagon.

1. How many sides does the figure have? **8**
2. What is the sum of the interior angles of an octagon?
   180t = 180(n-2)
   = 180(8-2) = 180(6) = 1080
3. What is the measure of each angle? **$1080^0 \div 8 = 135^0$**

Example 2: Find the measure of an interior and an exterior angle of a regular 32-gon.

1. How many sides does the figure have? **32**
2. What is the sum of the interior angles of a 32-gon?
   180t = 180(n-2)
   = 180(32-2) = 180(30) = 5400
3. What is the measure of an interior angle of a 32-gon?
   $5400^0 \div 32 = 168.75^0$
4. What is the measure of an exterior angle of a 32-gon?
   $360^0 \div 32 = 11.25^0$ (To check: 168.75 + 11.25 = 180; why?)

Example 3: The measure of one interior angle of a regular polygon is 144^0.
How many sides does the polygon have?

1. What is the sum of the interior angles of the polygon?
   180t = 180(n-2) but because it is a regular polygon,
   then, 180(n-2) ÷ n = 144
   ⇒ 180n - 360 = 144(n); why?
   ⇒ 180n - 144n = 360 ⇒ 36n = 360
   ⇒ n = 10
2. How many sides does the polygon have? **10**
3. What is the name of the polygon? **decagon**

2. Lesson Activity

Activity 5 Answer Keys:

	See Worksheet Activity No. 5 **DAY 5** **SUB-TOPIC 5: Determination of Measures of Angles and Numbers of Sides of Polygons** **1. Lesson Activity** See Worksheet Activity No. 6	Activity No. 5 Answer Key: 1. 180(n-2); [180(n-2)]/n; 360; 360/n 2. 2160; 154.29; 360; 25.71 3. 3960; 165; 360; 15 4. 2700; 158.82; 360; 21.18 5. 8; 135; 360; 45 6. 7; 128.57; 360; 51.43 7. 30; 168; 360; 12 8. 11; 147.27; 360; 32.73 9. 12; 1800; 360; 30 10.6; 720; 360; 60 11.15; 2340; 360; 24 12. 36; 6120; 170; 360 13. 50; 8640; 172.8; 360 14. 4; 360; 90; 360 15. 72; 12600; 175; 360 **Activity 6 Answer Keys:** ASSESSMENT ANSWER KEY A: 1. 180°; 2. ∠8; 3. They are vertical angle. No, because vertical angles are congruent, and they do not always add up to 180.; 4. ∠1; 5. Because they form a linear pair B: 1. True; 2. Sometimes; 3. True; 4. Supplementary; 5. True C: 1. 180°; 2. 900°; 3. 8 triangles; 4. 180° (n-2); 5. 360/n
D. Making Generalizations	**1. Learners' Takeaways** What I Learned about Polygons and Angles… **2. Reflection on Learning** How can we connect this lesson to our everyday lives? Cite instances where knowledge of polygons and angles is useful in practical context.	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION				**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** See Worksheet Nos. 1-6 **2. Homework (Optional)**			
B. Teacher's Remarks	*Note observations on any of the following areas:*	**Effective Practices**	**Problems Encountered**	The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement, and other related stuff.
	strategies explored			
	materials used			

	learner engagement/ interaction			Teachers may also suggest ways to improve the different activities explored/lesson exemplar.
	others			
C. Teacher's Reflection	*Reflection guide or prompt can be on:* • *<u>principles behind the teaching</u>* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* • *<u>students</u>* *What roles did my students play in my lesson?* *What did my students learn? How did they learn?* • *<u>ways forward</u>* *What could I have done differently?* *What can I explore in the next lesson?*			Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.