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DEPARTMENT OF EDUCATION

Lesson Exemplar for Mathematics

Quarter 1
Week
3

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Lesson Exemplar for Mathematics Grade 7
Quarter 1: Week 3

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Secretary: Sara Z. Duterte
Undersecretary: Gina O. Gonong

Development Team

Writer: Josephine C. Reynoso, Marilyn B. Soriano
Content Reviewer: Aurelia G. Vivas, Resty I Rodelas, Alberto J. Tiangco, Marilyn B. Soriano, Evelyn C. Callada, Dominador J. Villafria
External Content Validator: Dr. Errol Matthew C. Garcia, Dr. Winston S. Sirug
External Language Validator: Rafael John Sotto
Illustrator:
Layout Artist: Vergel Junior C. Eusebio

Management Team

JOCELYN DR ANDAYA, *CESO IV,* Director IV
CRISTITO A. ECO, *CESO III*, Assistant Regional Director
MICAH G. PACHECO, OIC-Chief Education Program Supervisor, CLMD
DENNIS M. MENDOZA, Regional EPS/Learning Resource Management Section Head
RESTY I. RODELAS, Regional Mathematics Education Program Supervisor
DAISY L. MATAAC, SDO Taguig City & Pateros LRMS Education Program Supervisor
ELSA R. MATA, SDO Navotas LRMS Education Program Supervisor

MATATAG **K to 10 Curriculum** **Weekly Lesson Log**	School		Grade Level	Grade 7
	Name of Teacher		Learning Area	Mathematics
	Teaching Dates and Time		Quarter	1

	DAY 1	**DAY 2**	**DAY 3**	**DAY 4**
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 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*	The learners deduce the relationship between the exterior angle and adjacent interior angle of polygon.		The learners determine the measures of angles and the number of sides of polygons.	
D. *Learning Objectives*	At the end of the lesson the learners will be able to: a) identify the exterior angle and exterior angle of a convex polygon; b) find the relationship between the interior and exterior angle in a convex polygon; and measure angles using protractor.	At the end of the lesson the learners will be able to: a) identify the relationships between the measures of an exterior angle and its adjacent interior angle of a convex polygon; and b) find the unknown measure of an angle	At the end of the lesson the learners will be able to: a) find the sum of measures of angles of a convex polygon given the number of sides; and b) find the number of sides of a convex polygon given the angle sum.	At the end of the lesson the learners will be able to: a) find the sum of measures of exterior angles of a **convex** polygon; and b) find the unknown measure of angles
E. *Instructional Design framework feature (s)*	Visual Literacy	Technology Literacy, Interactive Communication	Technology Literacy	Problem Solving
F. *21st Century Skills*	Engage, Explore, Experience, Empathize Innovative, Ideation, Integrative, Inclusive Connection, Creativity, Collaboration, Context			

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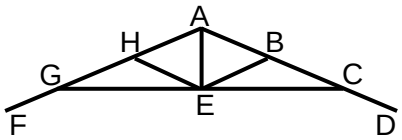
II. CONTENT	EXTERIOR AND ADJACENT INTERIOR ANGLES OF A CONVEX POLYGON	RELATIONSHIP BETWEEN EXTERIOR ANGLE AND ADJACENT INTERIOR ANGLE OF CONVEX POLYGON	SUM OF MEASURES OF ANGLES AND NUMBER OF SIDES OF CONVEX POLYGON	SUM OF MEASURES OF EXTERIOR ANGLES AND MEASURES OF ANGLES OF CONVEX POLYGON
III. LEARNING RESOURCES				
A. References				
B. Other Learning Resources				
IV. TEACHING AND LEARNING PROCEDURES				
Before/Pre-Lesson Proper				
Activating Prior Knowledge	To determine the learners' prior knowledge about the lesson, you may use any of the following activities to be done by small groups or through recitation: a) Use a complex geometric pattern as in the figure below (show a slide deck of the geometric figure). Ask the learners to find as many different polygons as they can. They should name the polygons and give the number of sides and angles. A table for the answers may be provided.	To determine the learners' prior knowledge about the lesson, a simple recall from yesterday's lesson. Learners should - Look around the classroom and find anything that illustrates interior and exterior angles. - Name, draw, and measure the interior and exterior angles of the figure. - **Example:** *trusses*  Use GeoGebra to demonstrate how to draw the figure and how to find	To determine the learners' prior knowledge about the lesson, use a simple visualization of the concepts learned from the previous discussion. *Materials Needed:* - bond paper - colored paper - ruler - pencil - paste - pair of scissors *Procedure:* a) On a colored paper, draw the biggest triangle that you can. b) Cut-out the triangle. c) Mark the three angles of the triangle with curved-dashed lines and name as angle 1, 2, and 3. d) Cut the three angles of	To determine the learners' prior knowledge about the lesson, use a game-based activity such as first five who can give the correct answer shall be given extra point in the recitation. *Find the angle sum or the number of sides given the* following: A. Find the angle sum given the number of sides of a polygon. 1) 8 3) 25 5) 42 2) 17 4) 38 B. Find the number of sides given the angle sum of a polygon. 1) 6,120° 2) 11,700° 3) 4,860°

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	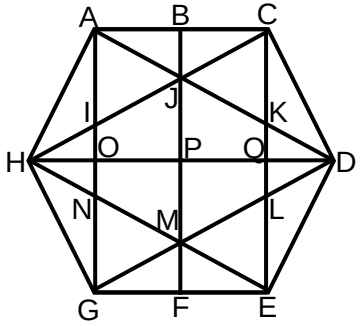 b) Use of tangrams to form different types of polygons may be considered. Students learn more if they can manipulate objects. c) Short video clips can also be used.	the measures of the angles. Make sure that the learners know how to use GeoGebra.	the triangle. e) Place the angles altogether to have a common vertex and adjacent angles and paste in a bond paper. Recall the relationship of the measures of an exterior angle and adjacent interior angle in a polygon by posing the following questions. 1) What was formed by the two outer sides of the new figure after joining together the three angles? 2) Based on the figure, what is the sum of the measures of the angles of the triangle? Justify. *Process the answers and formulate the conclusion that the sum of the measures of angles of a triangle is 180°.*	
Lesson Purpose/Intention	Following the completion of the activity, the teacher will provide an overview of the expected outcomes: a) identify the exterior angle and exterior angle of a convex polygon; b) find the relationship between the	Following the completion of the activity, the teacher will provide an overview of the expected outcomes: a) identify the relationships between the measures of an exterior angle and its adjacent interior angle of a convex	Following the completion of the activity, the teacher will provide an overview of the expected outcomes: a) find the sum of measures of angles of a **convex** polygon given the number of sides; and b) find the number of	Following the completion of the activity, the teacher will provide an overview of the expected outcomes: a) find the sum of measures of external angles of a **convex** polygon given the number of sides; and

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	interior and exterior angle in a convex polygon; and c) measure angles using protractor. Specify and emphasize that all discussions during Week 3 pertain only to **convex** polygons.	polygon; and b) find the unknown measure of an angle. Specify and emphasize that all discussions during Week 3 pertain only to **convex** polygons.	sides of a **convex** polygon given the angle sum. Specify and emphasize that all discussions during Week 3 pertain only to **convex** polygons.	b) find the unknown measure of angles. Specify and emphasize that all discussions during Week 3 pertain only to **convex** polygons.
Lesson Language Practice	To facilitate language learning, and enhance learning experiences, ask the learners to identify the that describes by the following: 1) It is an angle formed by one of the sides of a polygon and the line extended from the adjacent (next) side. 2) Two angles with a common side and a common vertex but no common interior point. 3) An angle of a polygon with common side and common vertex to a given exterior angle of the polygon. 4) A closed-sided figure made up of line segments in a two-dimensional plane. 5) It is an angle formed by any two consecutive sides of a polygon.	To facilitate language learning, and enhance learning experiences, ask the learners to give words that are related to each of the following words: 1) convex polygon 2) interior angle 3) exterior angle 4) adjacent exterior angle 5) supplementary angles 6) linear pair Use mentimeter to know which word is the common answer of the learners for each of the given words. Use the responses to recall the definition/ description of the words. **Answers:** 1) A polygon whose measures of angles are between 0^o and 180^o. 2) Interior angle is an	To facilitate language learning, and enhance learning experiences, ask the learners to describe the following: 1) Diagonal 2) Angles of a polygon 3) Reverse operation Process the answers of the learners and correct the misconception. Post the definition/ description of each of the given terms. **Answers:** 1)Diagonal is a segment connecting any two non-consecutive vertices of a polygon. 2)Angles of a polygon usually refers to the interior angles of the polygon. Reverse operation means the opposite operation, i.e. subtraction is the reverse	To facilitate language learning, and enhance learning experiences, ask the learners to describe the following: 1) Regular polygon 2) Irregular polygon 3) External Angle 4) Equilateral 5) Equiangular *Show each term with a picture or an image that will give hint to its meaning.* **Answers:** 1) Regular polygon is an equilateral and equiangular polygon. 2) Irregular polygon is a non-equilateral and non-equiangular polygon. 3) Exterior angle is an angle formed by any two consecutive sides of a polygon.

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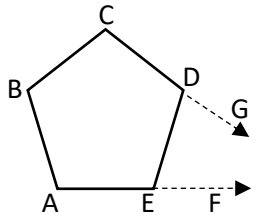
	6) It is formed by two adjacent and supplementary angles. 7) Two angles whose sum of measures is 180°. 8) A polygon whose measures of angles are between 0° and 180°. **Answers:** 1) exterior angle 2) adjacent angles 3) adjacent interior angle 4) polygon 5) interior angle 6) linear pair 7) supplementary 8) convex polygon *Teachers may opt to show the illustrations and ask questions as follows.*  Polygon: _____ Linear Pair: _____ Interior Angle: _____ _____ Exterior Angle: _____	angle formed by one of the sides of a polygon and the line extended from the next side. 3) Exterior angle is an angle formed by any two consecutive sides of a polygon. 4) Adjacent exterior angle is an angle of a polygon with common side and common vertex to a given exterior angle of the polygon. 5) Supplementary angles are two angles whose sum of measures is 180°. Linear pair is formed by two adjacent and supplementary angles.	of addition, multiplication is the operation of division, or vice-versa.	4) Equilateral polygon is a polygon with sides of equal length. 5) Equiangular polygon is a polygon with angles of equal measure. *Emphasize that any regular polygon is equilateral and equiangular*

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(02) 85229412
ncr@deped.gov.ph
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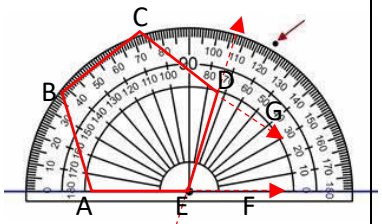
	Adjacent Exterior and Interior Angles: ____ *Pose the following questions and process the answers of the learners.* 1) Aside from the identified angles from the figure, name other angles or angle pairs. Extend other sides of the polygon to give the proper identification. How is each pair of interior angle and adjacent exterior angle at the same vertex related?			
During/Lesson Proper				
Reading the Key Idea/ Stem	For concept development, the teacher shall demonstrate and explain how to use the protractor in measuring angles using the same figure in the previous activity.  Let them realize that there are two exterior angles adjacent to an interior angle of a polygon, but they are just the same and equal	For concept development, the teacher shall demonstrate and explain on how to use GeoGebra or any Dynamic Geometric Software to draw polygons and measure angles. Ask the learners to prepare the materials to be used for the next activity. *Materials Needed:* Activity sheets, protractor, mobile phone/ computer or laptop	For concept development, the teacher shall demonstrate and explain on what to do for the next activity. Procedure: 1) Form groups of five (5). 2) For each member of the group, choose a polygon below. Triangle, pentagon, heptagon, nonagon, quadrilateral, hexagon, octagon, decagon 3) In a bond paper, draw a polygon of your choice. 4) Draw all diagonals from one vertex of the polygon. How many triangles were formed?	For concept development, the teacher shall demonstrate and explain on how to visualize the sum of measures of exterior angle by doing the following activity. 1) Draw any convex polygon. 2) Draw the lines containing the sides of the polygon. 3) Shade one exterior angle at each vertex. 4) Cut out the exterior angles. 5) Arrange the exterior angles to have a common vertex and adjacent

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	because of Vertical Angle Theorem. Hence, we only consider one exterior angle that is adjacent to an interior angle. Remind the learners to always bring a protractor during geometry lessons.	Read and explain the instruction for **Activity 1: Relationship of an Exterior Angle of a Polygon and its Adjacent Interior Angle. Part A**. Let them work for Part A of the activity.	Complete the given table based on the data from the activity.	angles. 6) What figure was formed by all the angles joining together? Ask the learners to prepare their materials and do the same activity. *Materials Needed:* - bond paper - colored paper - ruler - pencil - paste - pair of scissors *Let the learners to follow the same procedure as what the teacher did.*
Developing Understanding of the Key Idea/ Stem	To develop learners' understanding of the key ideas presented in the previous activity, ask the learners to work and discuss by pair or small group on **Activity 1: Measuring Exterior Angle and Its Adjacent Interior Angle**. After working on the activity sheet, do the following: - Write the answers on manila paper. - Post the output on respective places of the room. - Have a gallery walk and ask them to give	To develop learners' understanding of the key ideas presented in the previous activity, ask the learners to group themselves by five and work on **Part B** of **Activity 1: Relationship of an Exterior Angle of a Polygon and its Adjacent Interior Angle.** After working on the activity, call on a representative from each group to present their work. Emphasize that the sum of every pair of exterior angle and adjacent interior angle	To develop learners understanding of the key ideas presented in the previous activity, the learners shall be asked to work by group but with individual task for **Activity 1: Sum of Angles of a Convex Polygon** From their cut outs, let the students measure all the interior angles of each polygon. Use of GeoGebra or other math application software to show the precise measures of angles and their sum. It is better to show the sum using	To develop learners understanding of the key ideas presented in the previous activity, the learners shall be asked to work by group but with individual task for **Activity 1: Sum of Measures of Exterior Angles of a Polygon** Emphasize that the number of sides is the same as the number of vertices, as well as the number angles. Guide the learners to formulate the generalization.

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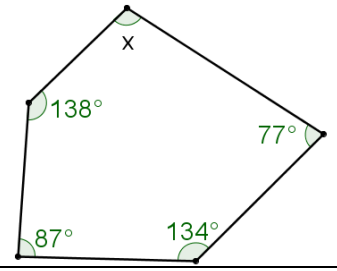
	comments and reactions. Process the learners' answers. Let them visualize that an exterior angle and adjacent interior angle of a **convex** polygon form a linear pair. Hence, they are supplementary.	is 180^o since the two angles form a linear pair and so, they are supplementary.	worksheet formula. Move the vertices to show various measurement of angles but the sum remains constant. Guide the learners to formulate the generalization based on the data. Flow of suggested discussions are as follow: *Finding the angle sum of a convex **n**-gon* - The angle sum given the number of sides is: $\boldsymbol{S = (n-2)180°}$ - So, to get the angle sum, we do the following operations/ steps: Decrease the number of sides by 2. Multiply the result by 180^o. *Give an example on how to use the angle sum to find the unknown measure of an angle in a convex polygon.* Example: 	- The exterior angle sum is always **180°.** - There are ***n*** exterior angles in a polygon. - Hence, the measure of each exterior angle of a **regular convex** is $\frac{180^o}{n}$. *Process the answers of the learners.*

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			Solution: ***Step 1****: Find the number of sides of the given polygon.* Number **n** of sides = 5 ***Step 2****: Find the sum* ***S*** *of the measures of angles of polygon.* S = (n – 2)(180°) = (5 – 2)(180°) = 3(180°) = 540° ***Step 3****: Find the sum of the known angle measures.* 138° + 87° + 134° + 77° = 436° *Step 4: Subtract the sum of the known angle measures.* x = 540° – 436° = 104°	
Deepening Understanding of the Key Idea/ Stem	To enhance learners' understanding of the concepts, ask them to work independently on **Activity 2: Angle Measure Match-Up.** Give the correct answers and let the learners to check the papers of one another and discuss their mistake/s. Give immediate feedback to correct any misconception.	To enhance learners' understanding of the concepts, ask them to work independently on Part B of **Activity 2: Finding the Missing Measure of an Angle.** Give the correct answers and let the learners to check the papers of one another and discuss their mistake/s. Give immediate feedback to correct any misconception.	To enhance learners understanding on the concepts, ask them to work independently on **Activity 2: Number of Sides of a Polygon Given the Angle Sum**. Process the answers of the learners for the following questions: 1) What pattern did you observe? 2) Write your generalization on how to find the sum of the measures of angles of a	To enhance learners' understanding of the concepts, ask them to work independently on **Activity 2: Measures of Angles of Regular Polygons.** Recall and emphasize that an exterior angle and adjacent interior angle form a linear pair and the sum of measures is 180°. Hence, to find the measure of each interior angle of a **regular** polygon, we can do the following:

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			polygon. 3) How is the number of sides and triangles formed related to the sum of the measures of the angles of a polygon Point of discussion to give the formula for *finding the number* ***n*** *of sides given the angle sum* ***S*** *of a convex n-gon.* - *Reverse the previous process to get the number* ***n*** *of sides from the angle sum* ***S****. Remember that* ***reversing a process*** *means you undo the last thing you did first. Think of putting on socks and shoes. To reverse this, you take off the shoes first then the socks.* - Begin by undoing #2 above, followed by undoing #1. Recall also that the reverse operation of multiplication is division, and the reverse of subtraction is addition. We therefore have the following: 1) Divide the angle sum S by 180. 2) Increase the result by 2	- Find the measure of each exterior angle using the formula $\frac{360^o}{n}$. - Find the measure of each interior angle by subtracting the measure of each exterior angle from 180^o. Give the correct answers and let the learners to check the papers of one another and discuss their mistake/s. Give immediate feedback to correct any misconception.

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			- The number of sides given the angle sum is $n = \frac{S}{180^o} + 2$ **Note:** Because the students have not yet studied algebraic expressions, the algebraic formula can be skipped, and the operations (#1 and #2) can be used. Although, they have already encountered such formulas in finding areas and perimeters/ circumference in elementary school.	
After/Post-Lesson Proper				
Making Generalizations and Abstractions	As a concluding part of the lesson, based on the previous activities, ask the learners to form their own generalization by answering the following questions. 1) What pair of angles is formed by an exterior angle and adjacent interior angle of a polygon? 2) What relationship exists between an exterior angle and adjacent interior angle of a polygon based on the sum of their measures? Why?	As a concluding part of the lesson, ask the learners to state their observation on the relationship of the measures of an exterior angle and adjacent interior angle of a polygon. Pose the following questions: 1) How are the exterior angle and its adjacent interior angle related? 2) Make a concluding statement about the sum of the measures of every pair of an exterior angle and adjacent interior angle of a **convex** polygon	As a concluding part of the lesson, ask the learners to state the result of the observation regarding the relationship of the measures of an exterior angle and adjacent interior angle of a polygon. Use the following to guide the learners to formulate the generalization as follows: 1) What is the formula in finding the angle sum **S** given the number **n** of sides of a polygon? 2) What is the formula for finding the number **n** of sides given the angle sum **S**?	As a concluding part of the lesson, ask the learners will form their own conclusion by posing the following questions: 1) How do you find the number of sides of a polygon given the sum of the measures of its interior angles? Does it hold to both irregular polygon? Justify. 2) How can you find the measure of each interior angle and exterior angle of a regular polygon given the sum of the measures of all its angles? Does it also hold

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	Answers: 1) An exterior angle and adjacent interior angle of a polygon form a **linear pair**. An exterior angle and adjacent interior angle of a polygon are **supplementary** because they form a linear pair.	**Answers:** 1) The exterior angle and its adjacent interior angle of a polygon form a linear pair and so, they are supplementary. The sum of the measures every pair of an exterior angle and adjacent interior angle of a **convex** polygon is **180°**.	**Answers:** - The angle sum given the number **n** of sides is: $S = (n-2)180°$ - The number of sides given the angle sum is $n = \frac{S}{180^o} + 2$	true to irregular polygon? Given the sum (S) of the measures of all the angles of a regular n-gon, write the formulas for finding the following:(a) number of sides; (b) measure of each interior angle; and (c) measure of each exterior angle.
Evaluating Learning	To determine the learning outcomes, learners will answer **Activity 3: Let's Measure and Draw!** Process the answers of the learners.	To determine the learning outcomes, learners will answer **Activity 3: Let's Apply!** Process the answers of the learners.	To determine the learning outcomes, learners will answer **Activity 3: Let's Apply!** Process the answers of the learners.	To determine the learning outcomes, learners will answer **Activity 3: Let's Apply!** Process the answers of the learners.
Additional Activities for Application or Remediation (if applicable)	For learners who will not be able to reach 75%, Part A of **Activity 4: Extra Practice on Exterior and Interior Angles** shall be provided for intervention otherwise, Part B as enhancement.	For learners who will not be able to reach 75%, Part A of **Activity 4: Extra Practice on Relationship of the Measures of Exterior Angle and Adjacent Interior Angle** shall be provided for intervention otherwise, Part B as enhancement.	For learners who will not be able to reach 75%, Part A of **Activity 4: Extra Practice on the Sum of Measures of Angles of Polygon and Number of Sides** shall be provided for intervention otherwise, Part B as enhancement.	For learners who will not be able to reach 75%, **Activity 4: Extra Practice on Number of Sides, Measure of Each Interior Angle, and Exterior Angle of a Regular Polygon** shall be provided for intervention otherwise, Part B as enhancement.
Remarks	The lesson focuses on the relationships between exterior angle and adjacent interior angle of a **convex** polygon only.	The lesson focuses on the relationships between measures of an exterior angle and adjacent interior angle of a **convex** polygon only.	**Note:** Because the students have not yet studied algebraic expressions, the algebraic formula can be skipped but explained using the	The lesson focuses on the measures of angles and the number of sides of a regular polygon.

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		As additional enrichment task, ask the learners to explore for the relationship of the measures of an exterior angle and adjacent interior angle of a **non-convex** polygon.	ideas of basic operations. Although, they have already encountered such formulas in finding areas and perimeters/circumference in elementary school.	
Reflection				

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