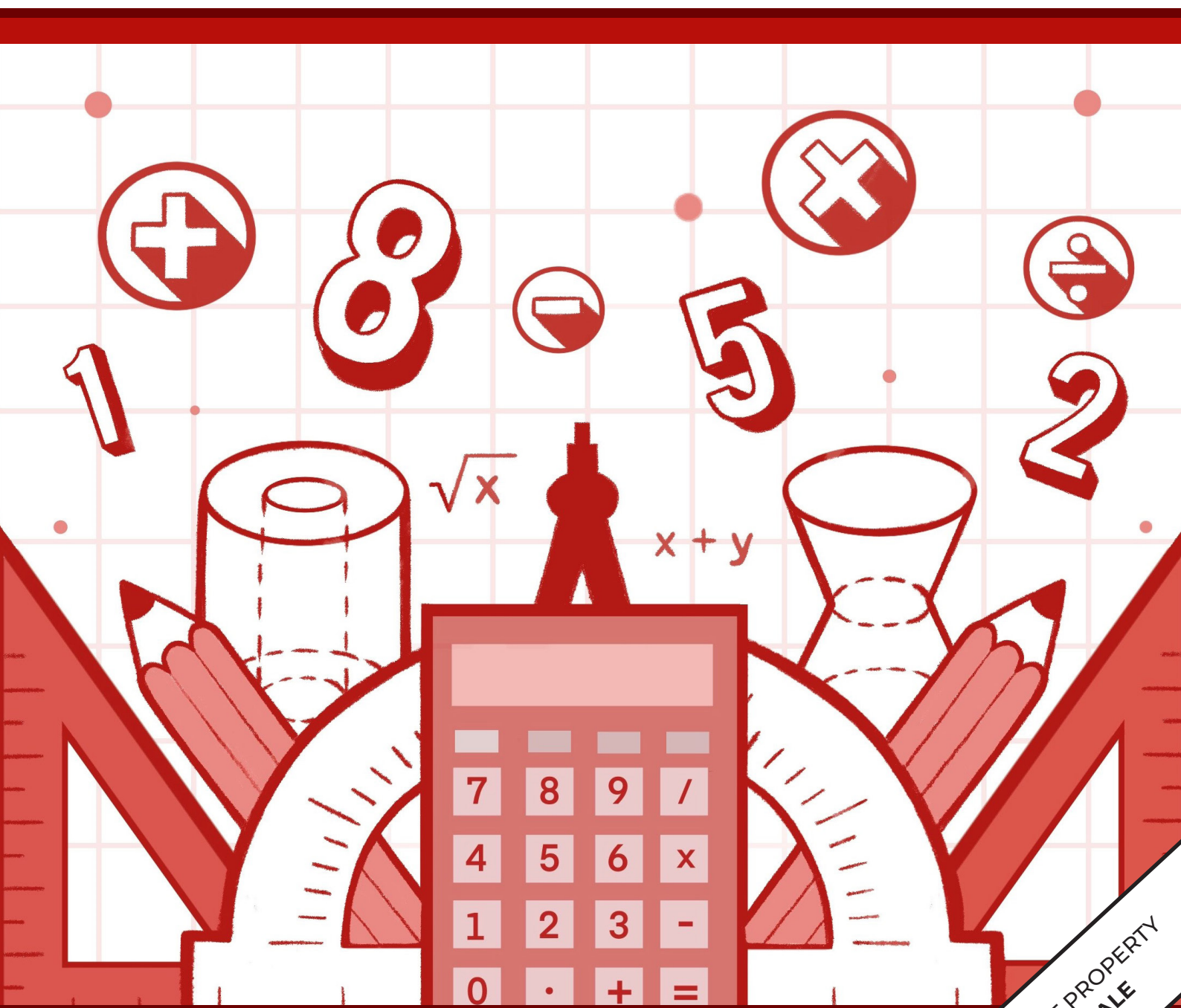
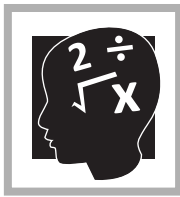


LEARNING STRAND 3 MATHEMATICAL & PROBLEM-SOLVING SKILLS

MODULE 4: RECOGNIZING SHAPES AND MEASUREMENT AROUND ME

ALS Accreditation and Equivalency Program: Junior High School





**RECOGNIZING SHAPES
AND MEASUREMENTS
AROUND ME**

**MATHEMATICAL AND PROBLEM-SOLVING SKILLS
MODULE 4**

ALS Accreditation and Equivalency Program: Junior High School
Learning Strand 3: Mathematical and Problem-Solving Skills
Module 4: Recognizing Shapes and Measurements Around Me

Published in 2020 by the United Nations Educational, Scientific and Cultural Organization
UNESCO Office, Jakarta
Jalan Galuh II No. 5, Kebayoran Baru, Jakarta, Indonesia

and

Department of Education
DepEd Complex, Meralco Avenue, Pasig City, Philippines

Copyright © UNESCO and DepEd 2020

This publication is available in Open Access under the Attribution-Share Alike 3.0 IGO (CC-BY-SA) 3.0 IGO license (<http://creativecommons.org/licenses/by-sa/3.0/igo/>). By using the content of this publication, the users accept to be bound by the terms of use of the UNESCO Open Access Repository (<http://www.unesco.org/open-access/terms-use-ccbysa-en>).

The designations employed and the presentation of material throughout this publication do not imply the expression of any opinion whatsoever on the part of UNESCO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The selection and presentation of the material contained in this publication, as well as the opinions expressed herein are the sole responsibility of the authors and not necessarily those of UNESCO, nor do they commit the organization in any way.

This educational resource material was developed and printed through the project “Better Life for Out-of-School Girls to Fight Against Poverty and Injustice in the Philippines” with financial support from Korea International Cooperation Agency (KOICA).

Printed by APC Printers Corporation
Printed in Makati City, Philippines

ISBN 888-888-8888-88-8

DEVELOPMENT TEAM



Jenelyn Marasigan Baylon	Master Teacher I, ALS Task Force (On-detail)
Kristine Lee S. Lumanog	Education Program Specialist II, ALS Task Force (On-detail)
Judy R. Mendoza	Project Development Officer III, Bureau of Learning Resources
Reyangie V. Sandoval	Education Program Specialist II, Bureau of Learning Resources
Josephine C. Intino	Senior Education Program Specialist, Bureau of Curriculum Development
Eric U. Labre	Senior Education Program Specialist, Bureau of Learning Resources
Roderick P. Corpuz	Supervising Education Program Specialist, ALS Task Force
Daisy Asuncion O. Santos	Chief Education Program Specialist, Bureau of Learning Resources
Marilette R. Almayda	Director III/Head, ALS Task Force
Ariz Delson Acay D. Cawilan	Officer-In-Charge, Office of the Director IV, Bureau of Learning Resources
G. H. S. Ambat	Assistant Secretary for Alternative Learning System Program and Task Force
Tonisito M. C. Umali	Undersecretary for Legislative Liaison Office, External Partnership Service and Project Management Service
Leonor Magtolis Briones	Secretary



Ermil P. Gabuat	Author
Ramonette Ruzgal	Content Expert
Bernadette Sison	Admin and Finance Staff
Mildred Parbo	Project Lead
Ma. Teresita Medado	President

Content and Language Evaluators and Instructional Design Reviewer

Marilyn E. Macababbad	Schools Division Office of Biñan City, Department of Education
Lourdes A. Navarro	Regional Office XI – Davao, Department of Education
Ivy S. Yasis	Freelance Language Editor



United Nations
Educational, Scientific and
Cultural Organization

Ade Sandra	Admin and Finance Assistant
Rusyda Djamhur	Project Assistant
Marmon Abutas Pagunsan	National Project Consultant
Remegio Alquitran	National Project Officer
Maria Karisma Bea Agarao	National Programme Coordinator
Mee Young Choi	Head of Education Unit
Shahbaz Khan	Director and Representative

User's Guide

For the ALS Learner:

Welcome to this Module entitled Recognizing Shapes and Measurements Around Me under Learning Strand 3 Mathematical and Problem-Solving Skills of the ALS K to 12 Basic Education (BEC).

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:



Let's Get to Know

This will give you an idea of the skills or competencies you are expected to learn in the module.



Pre-assessment

This part includes an activity that aims to check what you already know about the lesson. If you get all the answers correct (100%), you may decide to skip this module.



Setting the Path

This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.



Trying This Out

This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.



Understanding What You Did

This includes questions that process what you learned from the lesson.



Sharpening Your Skills

This section provides an activity that will help you transfer your new knowledge or skill in real-life situations or concerns.



Treading the Road to Mastery

This is a task which aims to evaluate your level of mastery in achieving the given learning competency.



Don't Forget

This part serves as a summary of the lessons in the module.



Explore More

In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.



Reach the Top

This part will assess your level of mastery in achieving the learning competencies in each lesson in the module.

Answer Key

This contains answers to all activities in the module.

Glossary

This portion gives information about the meanings of the specialized words used in the module.

At the end of this module you will also find:

References

This is a list of all sources used in developing this module.

The following are some reminders in using this module:

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 the Pre-assessment before moving on to the other activities included in the module.
3. Read the instruction 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 ALS Teacher/Instructional Manager/Learning Facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your ALS Teacher/Instructional Manager/Learning 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!

CONTENTS

Let's Get to Know	1
Pre-Assessment	2
LESSON 1: The Foundation of Shapes & Figures	4
Setting the Path	4
Trying This Out	5
Understanding What You Did	6
Sharpening Your Skills	17
Treading the Road to Mastery	21
LESSON 2: How Open is It?	21
Setting the Path	21
Trying This Out	22
Understanding What You Did	25
Sharpening Your Skills	31
Treading the Road to Mastery	33
LESSON 3: Many Angles	34
Setting the Path	34
Trying This Out	35
Understanding What You Did	36
Sharpening Your Skills	44
Treading the Road to Mastery	46

CONTENTS

Don't Forget	47
Explore More	52
Reach the Top	53
Answer Key	56
Glossary	61
References	65



MODULE 4

LET'S GET TO KNOW

Miranda thinks very highly of her father who is a carpenter. She dreams that someday she could be as good as him. She believes that her father is very knowledgeable with numbers because of his ability to measure, but her father humbly says that he is not.



Miranda needs your help in explaining to her father that carpenters are great with numbers in their own way.

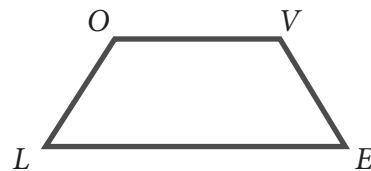


MODULE 5

PRE-ASSESSMENT

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

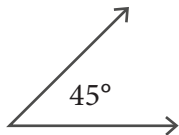
1. What is the best term that describes two lines that will never meet?
a. perpendicular b. parallel c. intersecting d. adjacent
2. What do you call the figure that extends in both directions without end?
a. line segment b. ray c. point d. line
3. What kind of lines form right angles?
a. intersecting b. adjacent c. perpendicular d. parallel
4. It refers to an exact location in space.
a. line b. plane c. point d. angle
5. What shape represents a paper in geometry?
a. point b. angle c. line d. plane
6. What is the intersection of two lines?
a. plane b. line c. point d. ray
7. In the figure on the right, which segments are parallel?
a. OV and VE
b. OV and LE
c. LO and VE
d. LO and LE



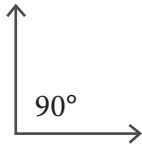
MODULE 4

8. Which of the following is a right angle?

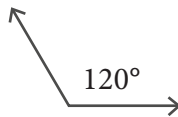
a.



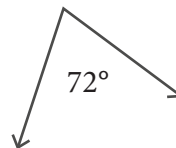
b.



c.



D.



9. What is the sum of two complementary angles?

a. 360°

b. 270°

c. 180°

d. 90°

10. What is the supplement of 110° ?

a. 70°

b. 55°

c. 45°

d. 20°

11. It refers to a closed plane figure formed by straight lines.

a. polygon

b. angle

c. ray

d. point

12. What is the name of the polygon with 8 sides?

a. triangle

b. pentagon

c. octagon

d. nonagon

13. What is the sum of the measures of the interior angles of a quadrilateral?

a. 180°

b. 360°

c. 540°

d. 720°

14. What is the measure of each interior angle of a regular pentagon?

a. 108°

b. 90°

c. 72°

d. 60°

15. How many sides does a decagon have?

a. 10

b. 9

c. 8

d. 7



LESSON 1

SETTING THE PATH

THE FOUNDATIONS OF SHAPES AND FIGURES

At the end of this lesson, you will be able to:



represent point, line, and plane using concrete and pictorial models (LS3MP-G-PSC-JHS-17);



identify objects that represent point, line, and plane such as paper, rope, farmland, wall, ceiling, etc. (LS3MP-G-PSC-JHS-18);



illustrate subsets of a line (LS3MP-G-PSC-JHS-19); and



determine the conditions under which lines and segments are parallel or perpendicular (LS3MP-G-PSC-JHS-20).



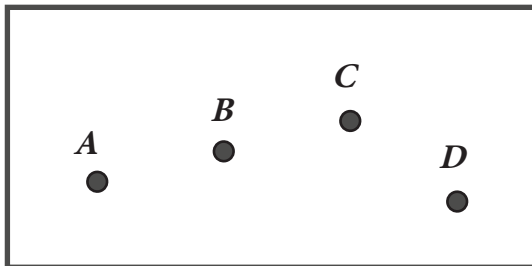
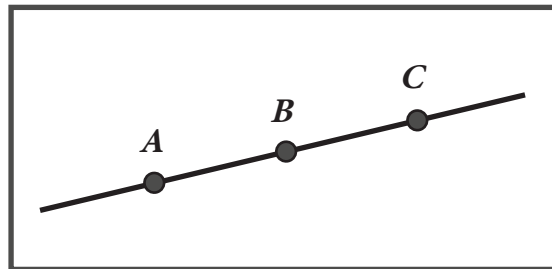
LESSON 1

TRYING THIS OUT

Let us learn by doing. Try to do this with your friends. Get two pieces of sticks, a piece of clean paper, and a box. Let us observe figures that we see every day but do not know how they are called. Write your answers on a separate sheet of paper.

Preliminary

1. Put one stick on the piece of paper. Then, use the stick as a guide to mark three dots on the paper as shown on the figure on the right. Name them using A , B , and C , respectively.



2. Mark a fourth dot on the paper away from the first three and name it D .

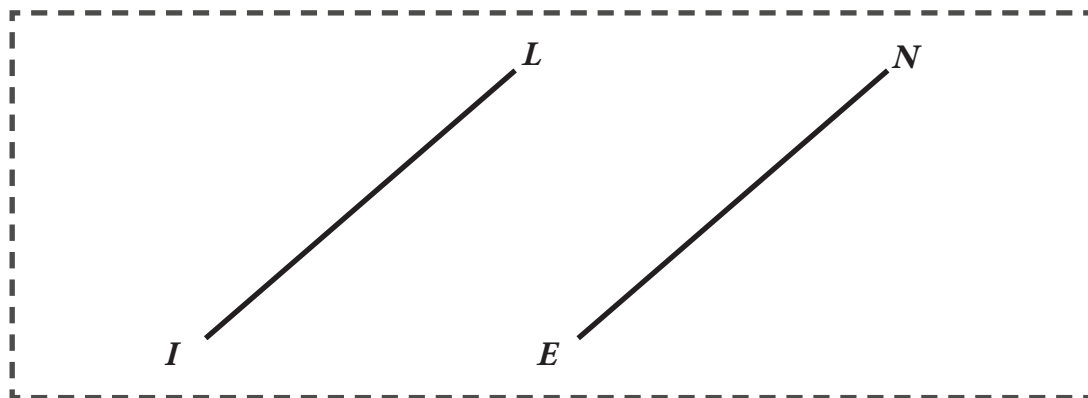
Just so we are on the same page before the activity, let us name the **figures** so we will not be confused in differentiating them.

- We will call each location on the piece of paper as a **point**. We have four points on the paper, Point A , Point B , Point C , and Point D .
- We will call the stick that connects two points as a segment of a **line**.
- We will call the paper that is a flat surface containing the points and the line as a **plane**.

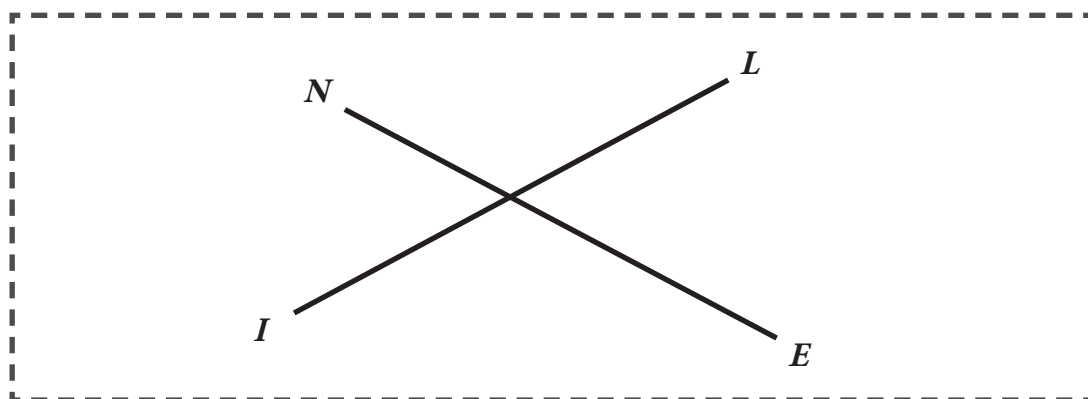
Let us investigate.

LESSON 1

1. **STICKS:** Mark the ends of the sticks as L and I , and N and E as shown in the figure below.



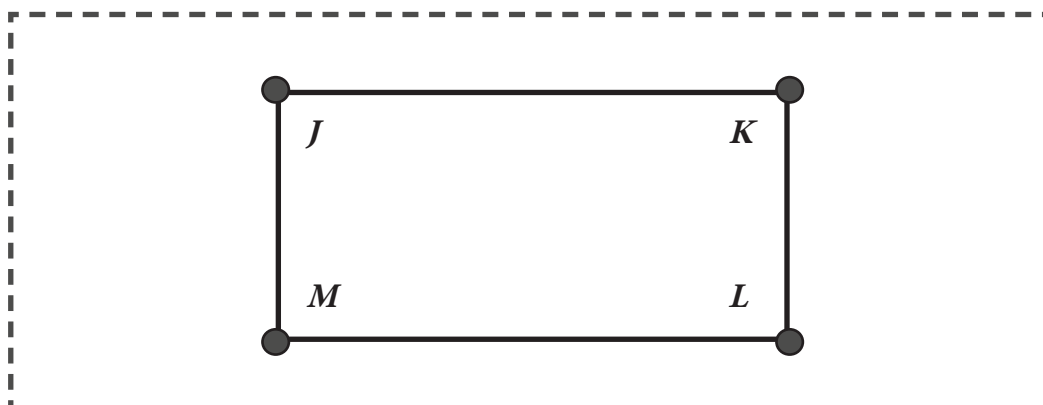
We will name these two sticks using the points they are connecting. We have two lines **line LI** and **line EN** . Now, try to cross lines LI and EN with each other by putting one on top of the other.



What do we call the figure where these two lines meet?

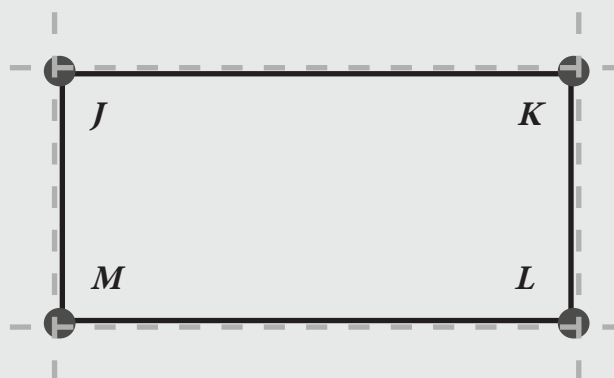
2. **PAPER:** Mark the corners of the paper using the letters J , K , L , and M as shown in the figure (see next page). We will name the piece of paper using the letters we wrote on each corner points. So, we name this as **Plane $JKLM$** .

See the figure on the next page.



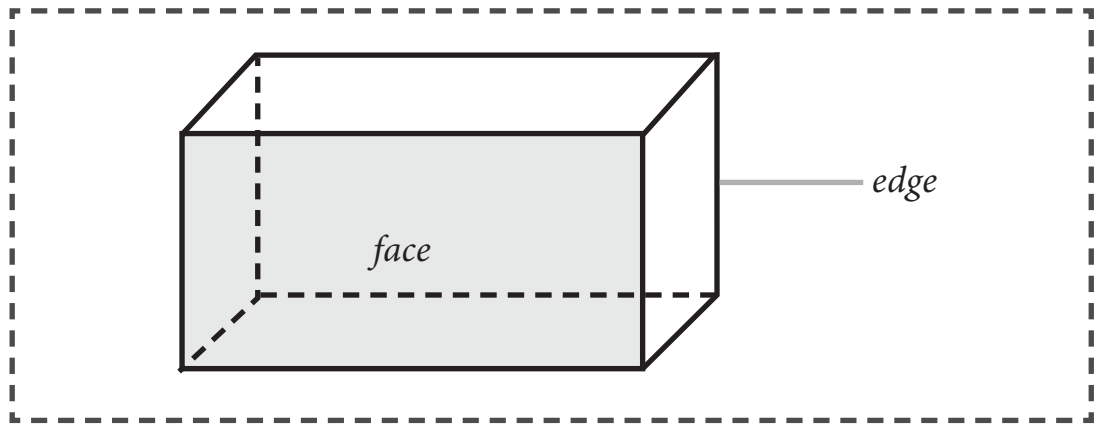
Question 2

- A. What figure represents each side of the paper?
- B. What figures meet at the following points?
 - Point *J* - Point *K* - Point *L* - Point *M*
- C. What pairs of sides in the paper are across each other?
- D. Imagine extending the sides of the paper in all direction. Will the sides of the papers cross each other?



- 3. **BOX:** Now, look at the box and answer the questions using your observations.

LESSON 1



Question 3

- A. What figure represents the edges of the box?
- B. What figure represents the faces of the box?
- C. What relationship exists between the faces and the edges of the box?



LESSON 1

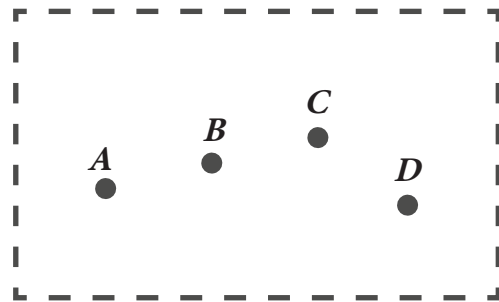
UNDERSTANDING WHAT YOU DID

Let us discuss all the things that you were able to observe.

UNDEFINED TERMS

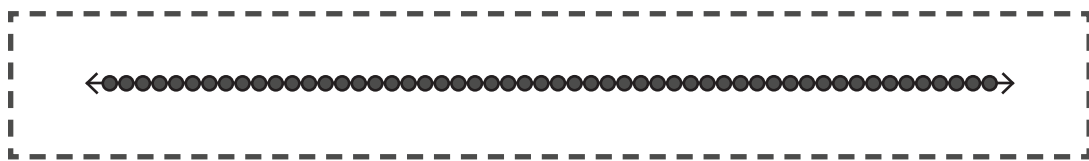
Points, lines, and planes are called the **undefined terms** in geometry and are the basic figures that make up other more complex and difficult shapes and objects.

- A **point** is a representation of any location in space. It is usually represented by a **dot** (.) that has no dimensions (length or width). This is the same as the dots you made on the piece of paper.

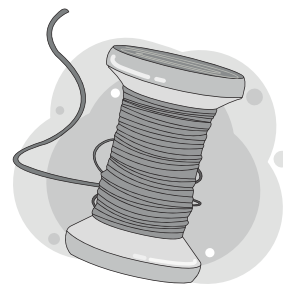


TRY IT! Make a dot on any piece of paper. Can you measure its length or width? It is too small to measure, so we say that it has no dimensions.

- A **line** in geometry is a straight path made up of a group of points that extend to both directions without end (represented by the arrow heads).



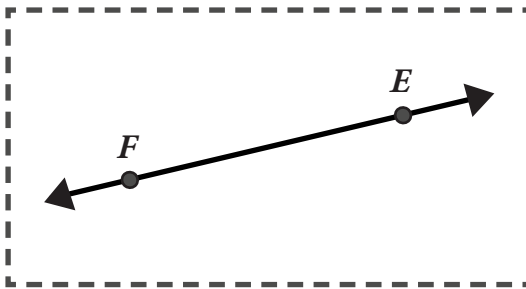
The stick we used in the activity can be imagined as a small piece of an unending line. We can use a string or thread that is stretched as a representation of an unending line. Remember that we can connect any two points to form a line.



LESSON 1

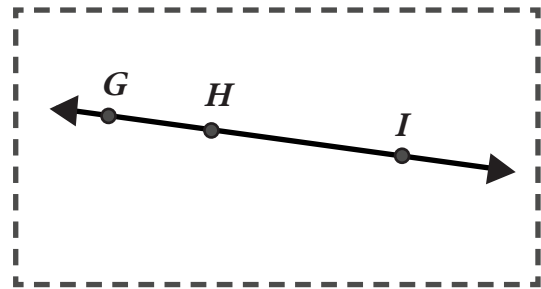
TRY IT! Make three different dots in different positions. How many lines can you make when you connect two points at a time?

We can name a line using any two points in it.



This can be named as

line FE or EF.

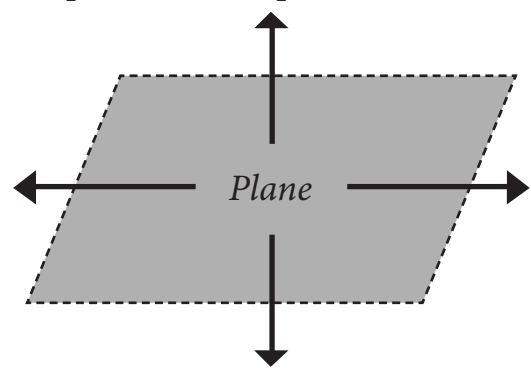
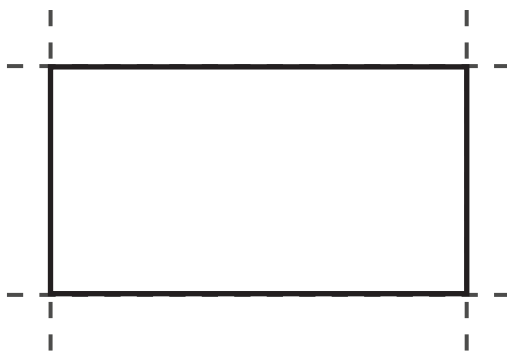


This can be named as

line GH, HI, or GI.

- A **plane** in geometry is an endless and boundless flat surface. It is usually represented as a rectangular space, like the paper we used, but this is just a piece of a plane.

A plane is named using any three or four points on the plane.

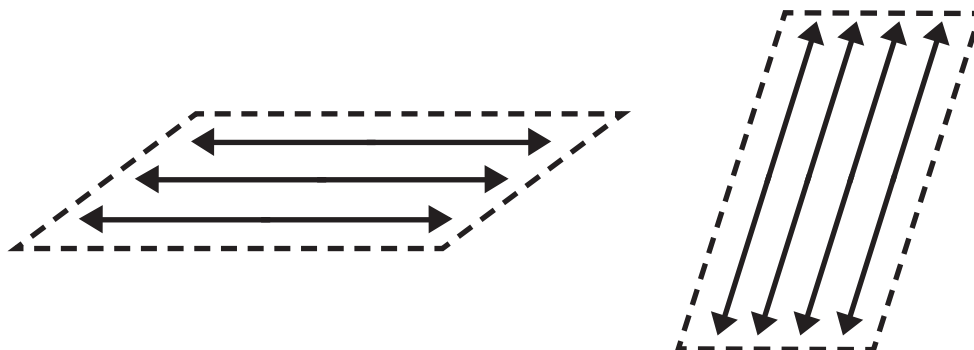


Answer to Question 3(B)

The faces of a box can be represented as planes.

LESSON 1

A plane is made up of several lines on its surface.

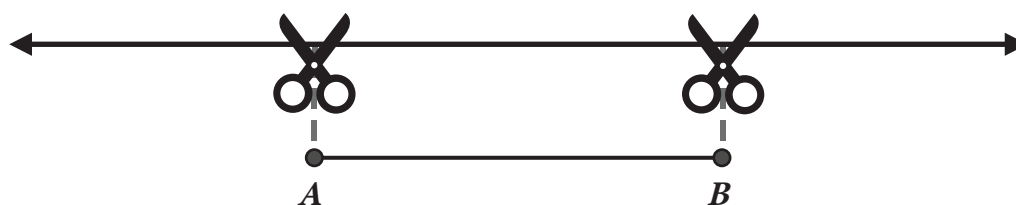


Examples of plane include a very large field, the surface of the ocean, and a high wall.



SUBSETS OF A LINE

- A line segment is a part of a line that has two end points. This means it cannot extend on either side. Imagine a line being cut at both points A and B, as shown below.



In symbols, we write this segment as \overline{AB} which can be read as "line segment AB ".

LESSON 1

To name a line segment, we use the two endpoints with a bar at the top, as written on page 11.

Answer to Question 2(A)

The sides of a paper can be represented as line segments.

Answer to Question 3(A)

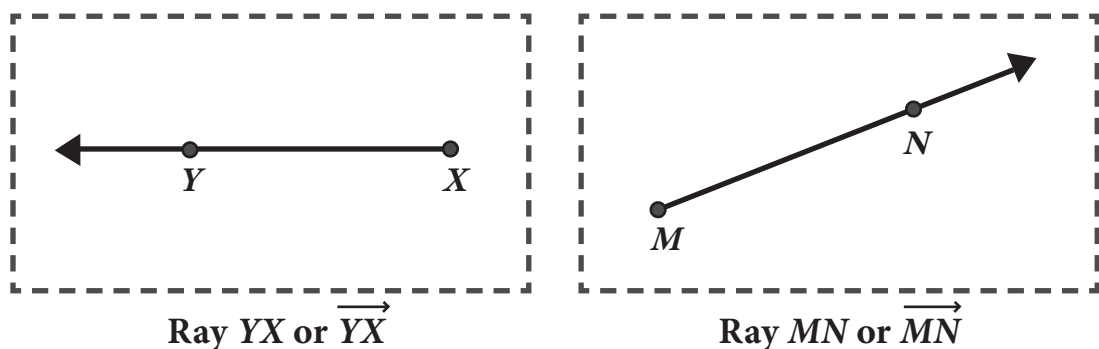
The edges of the box can be represented as line segments.

- A ray is a part of a line that has only one endpoint. It only extends on one side. Imagine a line being cut at one point.



In symbols, we write this ray as \overrightarrow{AB} which can be read as "ray AB ".

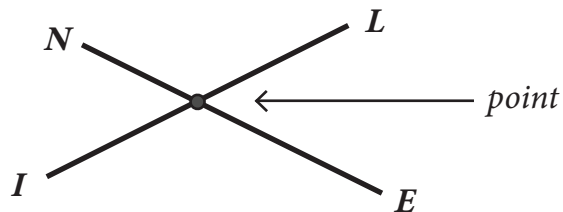
To name a ray, we write the endpoint first, followed by any point on the ray and an arrow on top as written above.



INTERSECTION OF LINES AND PLANES

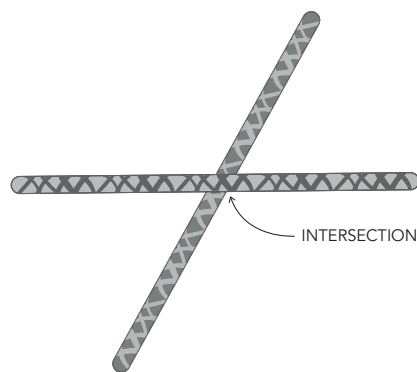
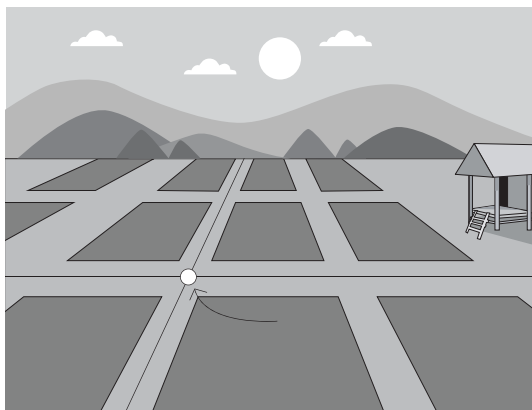
Intersection is where two geometric figures meet.

- The intersection of two lines is a point.



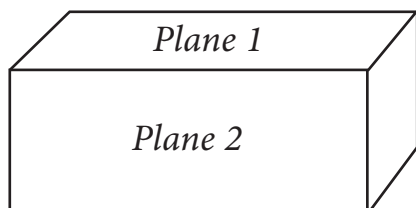
Answer to Question 1

The intersection of the two sticks can be represented with a **point**.



A rice field is an example of an illustration showing intersections. In the given picture, how many points of intersection do you see?

- The intersection of two planes is a line.



Look at your box. Planes 1 and 2 meet at an edge represented by a line segment. Each face is represented by a plane.

Answer to Question 3(C)

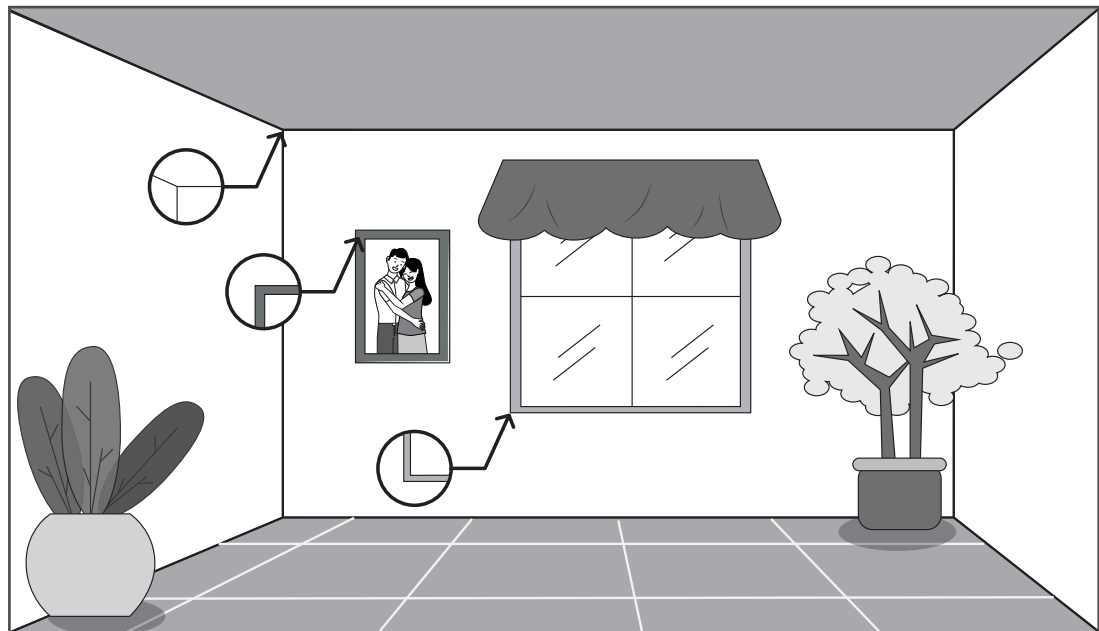
The edges of the box is where the faces of the box meet.

PERPENDICULAR AND PARALLEL LINES

- **Perpendicular lines** are lines that intersect each other at a right angle. A small box in the point of intersection indicate that the lines are perpendicular.



Think of the corners of windows, of a room, and of picture frames.



Answer to Question 2(B)

We can observe that two lines meet at each point of every corner.

- a.** At point J , lines JK and JM meet.
- b.** At point K , lines JK and KL meet.
- c.** At point L , lines KL and LM meet.
- d.** At point M , lines JM and LM meet.

The lines meeting at each corner of the paper are all perpendicular to each other. Perpendicularity is symbolized by “ \perp ”.

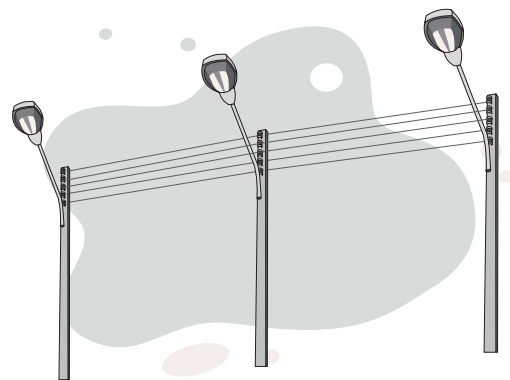
Using the lines on the paper, we can write each pair of perpendicular lines as:

- $JK \perp JM$ (JK is perpendicular to JM)
- $JK \perp KL$ (JK is perpendicular to KL)
- $KL \perp LM$ (KL is perpendicular to LM)
- $JM \perp LM$ (JM is perpendicular to LM)

- **Parallel lines** are lines that will never intersect even if we extend them without end or limit. Imagine if you and your crush are walking on an endless road across each other on opposite sides of the road, heading towards the same direction. You will never meet no matter how far you travel. This is how parallel lines work.

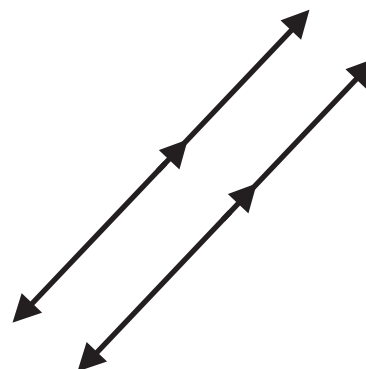
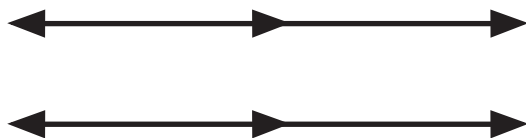
Think of highways, railroads (MRT or PNR trains), electric cables, and pedestrian crossing lines.

Parallel lines use tick marks (arrows on the line) that indicate that they are parallel.



LESSON 1

Examples of parallel lines:

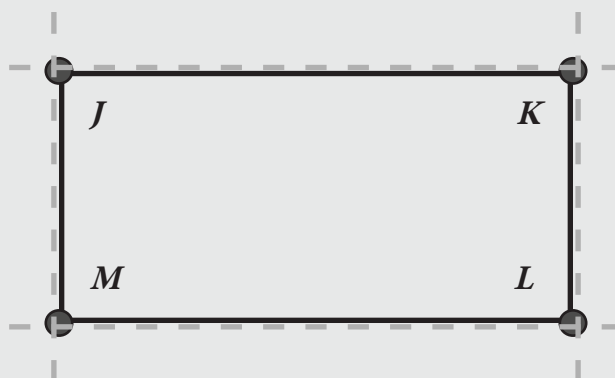


Answer to Question 2(C)

The sides of the paper that are across each other are the pairs JK and LM , and JM and KL .

Answer to Question 2(D)

Perpendicular sides cross at the corner of the paper.



The pairs of lines across each other on the paper are parallel to one another. Parallelism is symbolized by “ \parallel ”.

Using the lines on the paper, we can write each pair of parallel lines as:

- $JK \parallel LM$ (JK is parallel to LM)
- $JM \parallel KL$ (JM is parallel to KL)



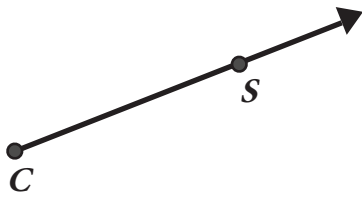
LESSON 1

SHARPENING YOUR SKILLS

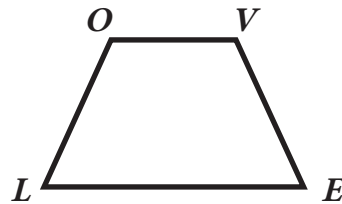
Write your answers on a separate sheet of paper.

I. Identify the illustrated figure in each item and provide the correct name or description for each.

1.



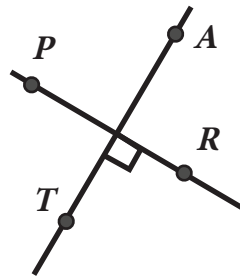
2.



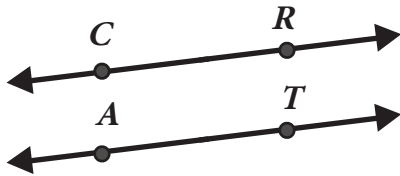
3.



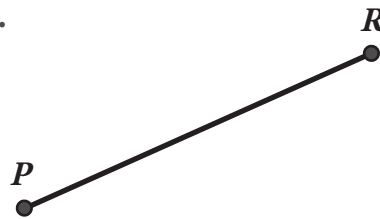
4.



5.



6.

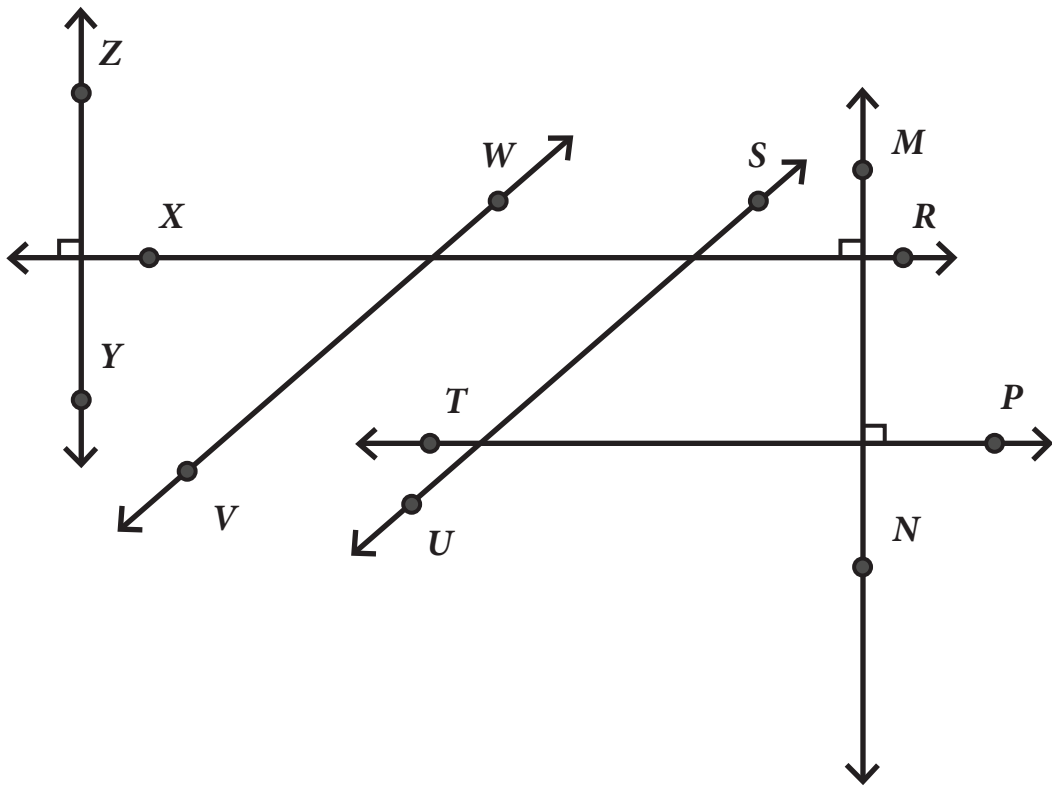


II. Draw the given figure.

1. Ray DU
2. Plane $INUT$
3. Line Segment TS
4. Line IL

LESSON 1

III. Identify the lines that are perpendicular or parallel to each other.



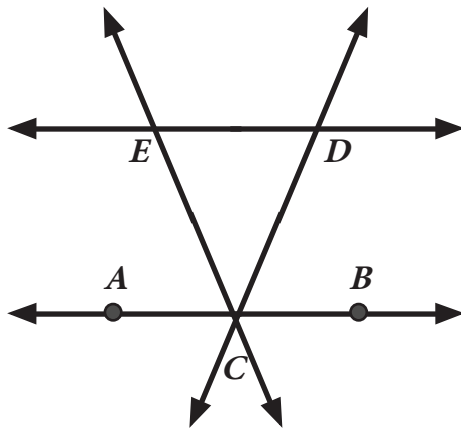


LESSON 1

TREADING THE ROAD TO MASTERY

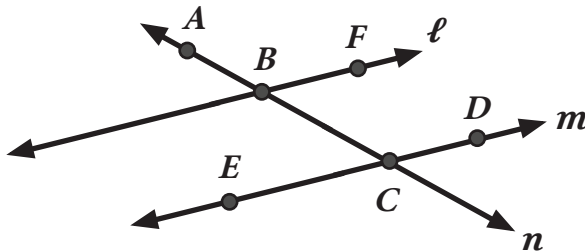
Directions. Name the intersection of each given pair of figures. Do this activity on a separate sheet of paper.

1.



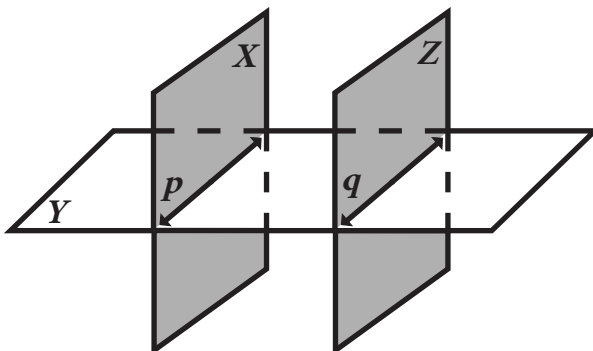
- A. DE and CE
- B. DC and AB
- C. EC and AB
- D. ED and AB

2.



- A. Line l and n
- B. Line n and m
- C. Line l and m

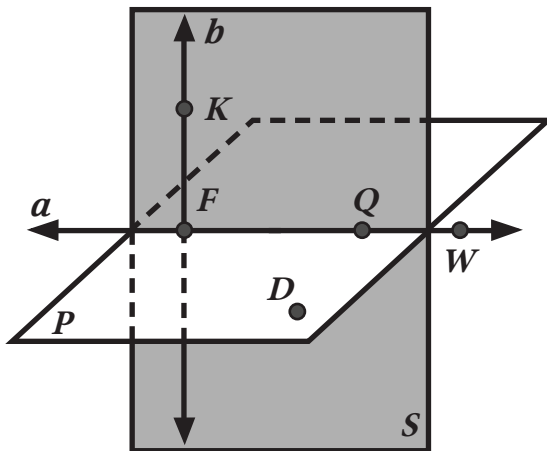
3.



- A. Plane X and Z
- B. Plane X and Y
- C. Plane Y and Z

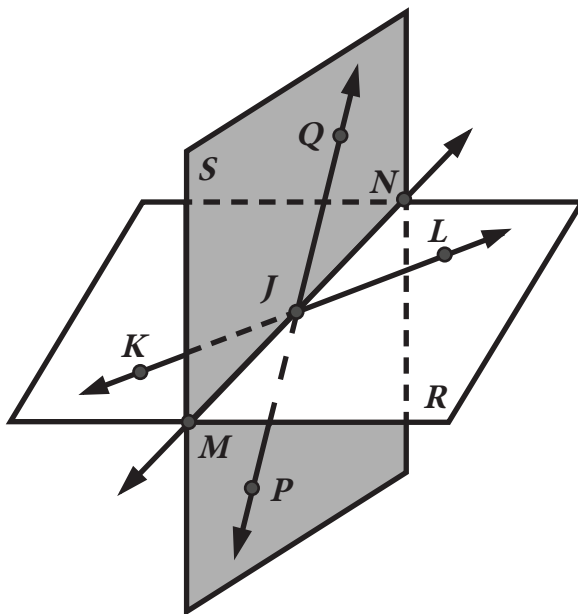
LESSON 1

4.



- A. Plane S and P
- B. Line a and b

5.



- A. Line QP and KL
- B. Line MN and KL
- C. Line QP and MN
- D. Plane R and S



HOW OPEN IS IT?

At the end of this lesson, you will be able to:



illustrate an angle (LS3MP-G-PSC-AE/JHS-21);



draw different types of angles found in the objects used in daily life, e.g., right angles, acute angles, obtuse angles (LS3MP-G-PSC-AE/JHS-22); and



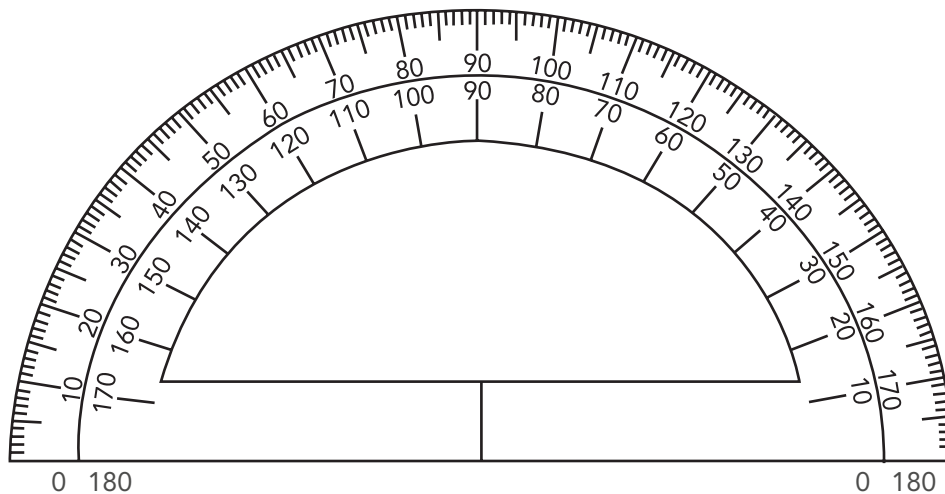
measure angles found in geometric shapes using a protractor (LS3MP-G-PSC-AE/JHS-23).



LESSON 2

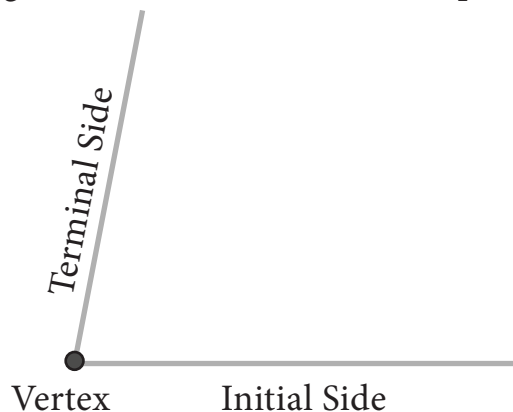
TRYING THIS OUT

Miranda asked her father to teach her how to use a protractor which is a tool for measuring angles. Let us learn how to use one, too, by following the instructions given by Miranda's father. Below is a sample protractor that you may trace if you don't have one.



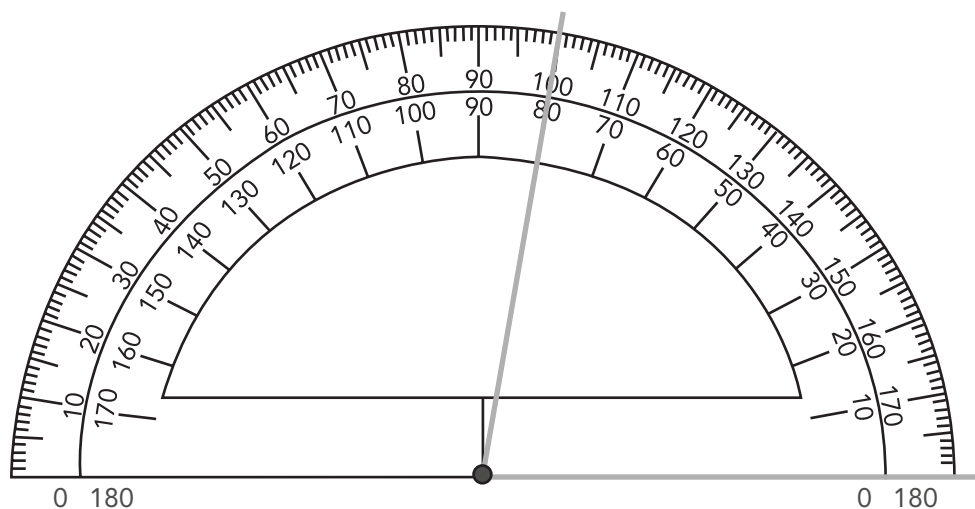
1. Suppose we want to measure angles such as the given figure below.

A. Refer to the figure to see the names of each part of the angles.



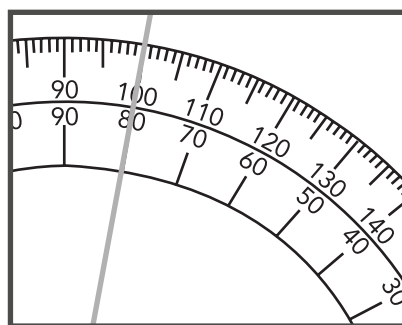
B. Make sure that the vertex is aligned to the center of the protractor and the initial side is aligned to the horizontal length of the protractor.

LESSON 2



Vertex aligned to center and initial side aligned to the horizontal length of protractor

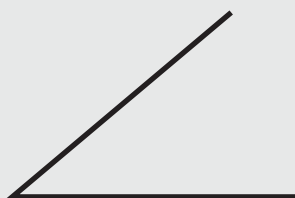
- C. Then, carefully read at which measure the terminal side is aligned. Read the measurement from zero (numbers in the lower group).



We see that the terminal side aligns with 80. Therefore, the measure of the angle is 80° .

Try measuring some of the angles as practice.

A.



B.

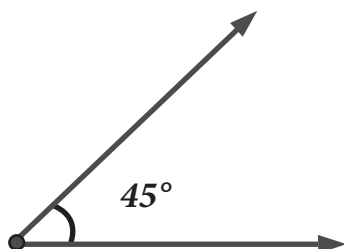
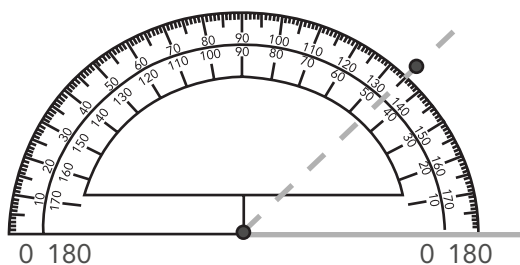
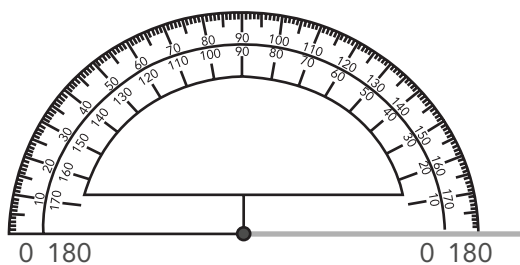


C.



LESSON 2

You can also use the protractor to create your own angle based on their measurement. Supposed we want to draw an angle of measure 45° , let us learn how to do it with our protractor by following these steps.



1. Start by drawing the vertex and terminal side by tracing a straight line from the center of the protractor along its horizontal length.
2. Mark the point aligned with the measure you want. In this case, 45.
3. Then, trace the terminal side by drawing a straight line from the vertex to the point we made using the protractor.
4. Therefore, the angle that measures 45° looks like this, with correct label.

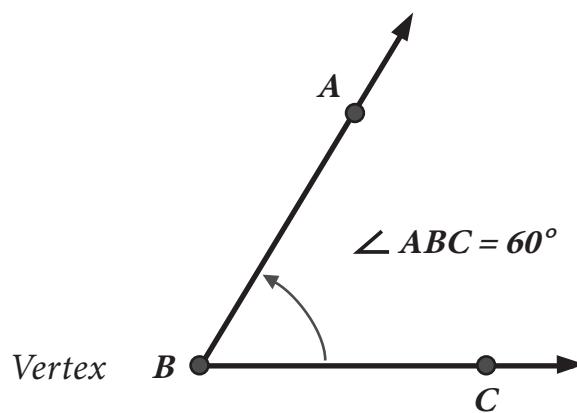


LESSON 1

UNDERSTANDING WHAT YOU DID

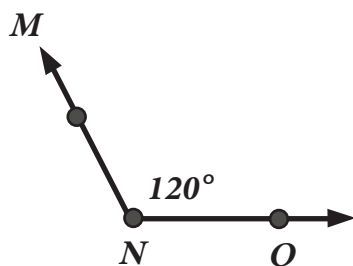
An **angle** is a union of two rays that share a common point called **vertex**. The angle is symbolized by “ \angle ”. The angle is the measurement of the opening created by the rays.

We name the angle using the three points on the angle with the vertex always in the middle. The angle below is named $\angle ABC$ or $\angle CBA$.

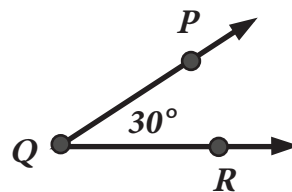


The measurement of an angle uses the unit of degrees ($^\circ$).

Examples:



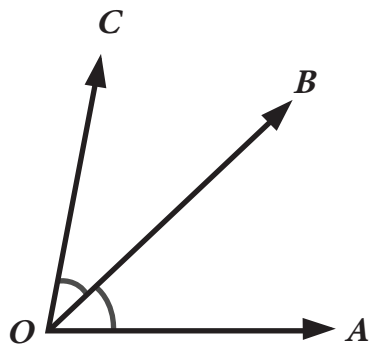
$m\angle ONM = 120^\circ$
measure of ONM



$m\angle PQR = 30^\circ$
measure of PQR

LESSON 2

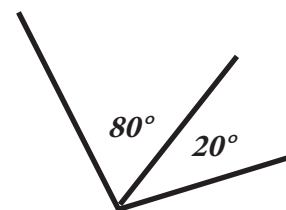
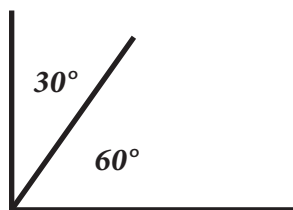
Adjacent angles are pairs of angles that share the same vertex and a common side. In other words, these are angles that are side-by-side.



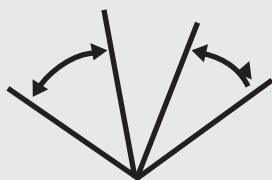
$\angle COB$ and $\angle BOA$ are adjacent angles

- ✓ Common vertex at point O
- ✓ Common side is ray \overrightarrow{OB}

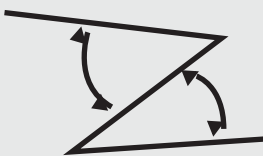
Other examples:



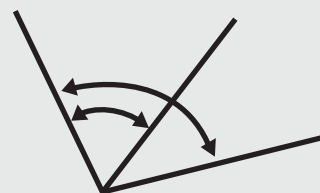
BEWARE! The following are NOT adjacent angles:



DOES NOT SHARE
A COMMON SIDE



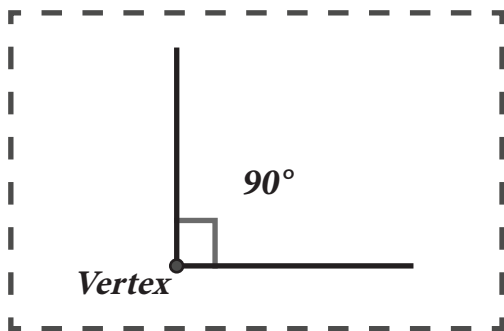
DOES NOT SHARE A
COMMON VERTEX



OVERLAPPING
ANGLES

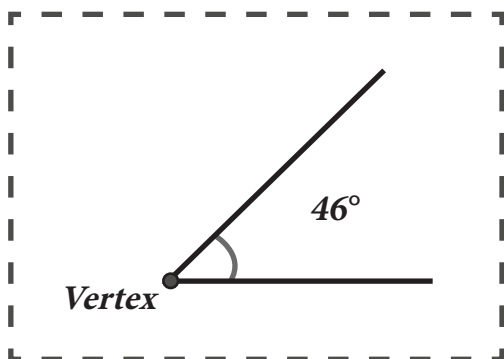
TYPES OF ANGLES

Angles have different names depending on their measurement.

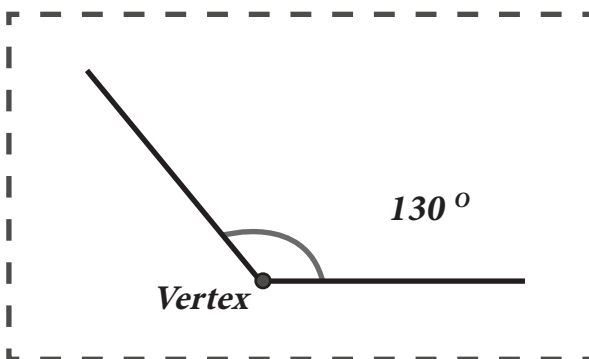


- **Right angle** has a measure that is exactly 90° . Perpendicular lines that we learned in Lesson 1 form a right angle.

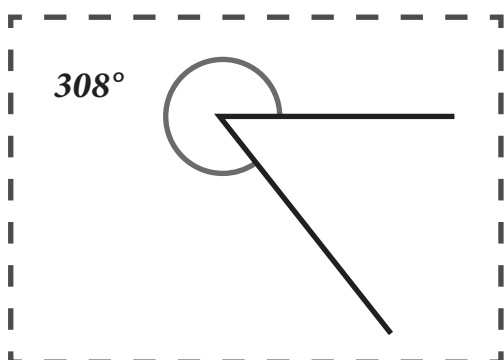
A right angle is symbolized by a small square in the figure.



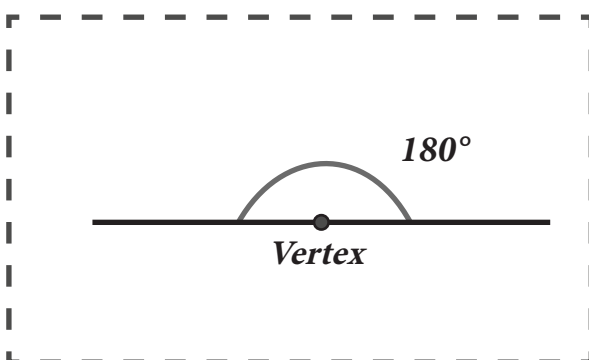
- **Acute angle** has a measure greater than 0° but less than 90° .



- **Obtuse angle** has a measure greater than 90° but less than 180° .

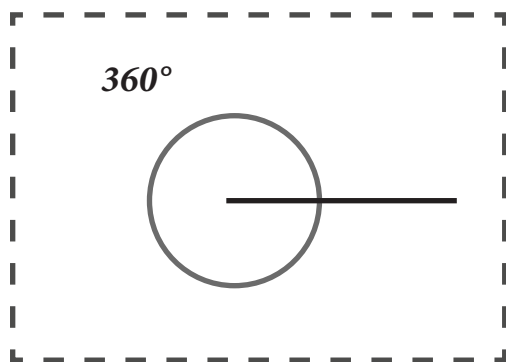


- **Reflex angle** has a measure greater than 180° but less than 360° .



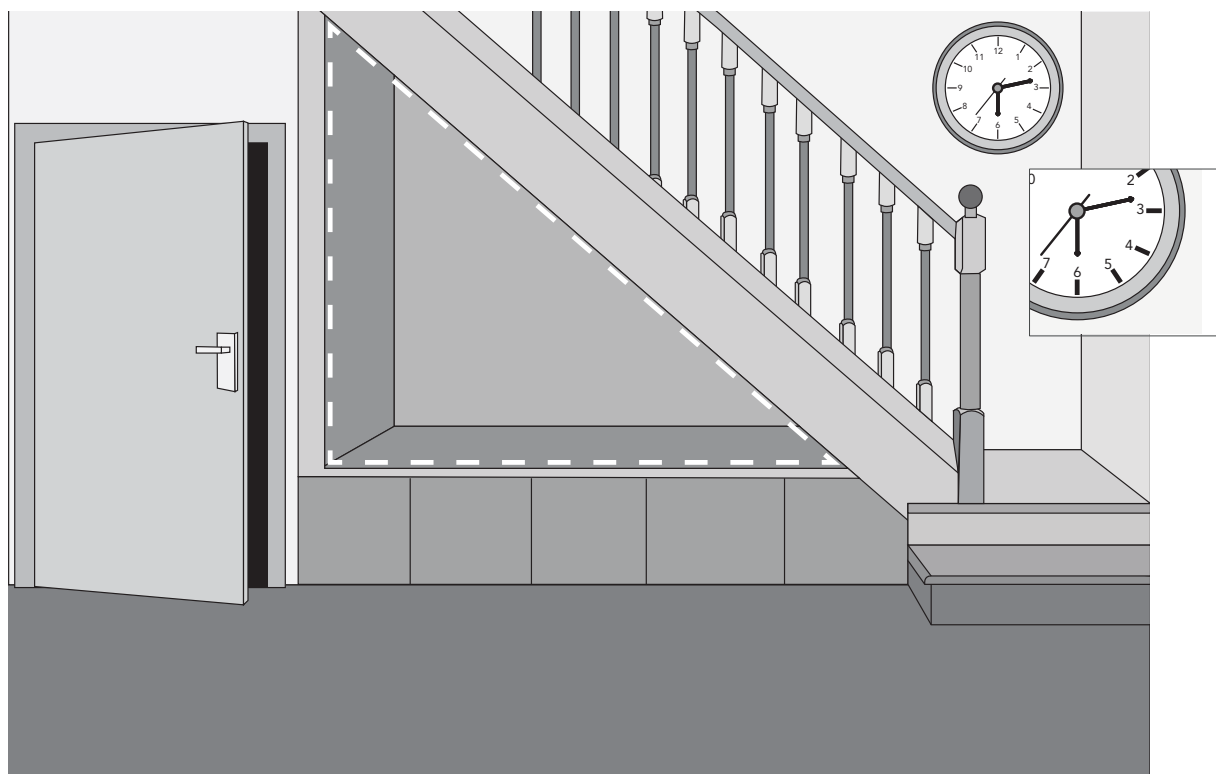
- **Straight angle** is an angle that has a measure of exactly 180° . This type of angle looks like a straight line.

LESSON 2



- A **full angle** looks like a circle and has an angle measure of 360°.

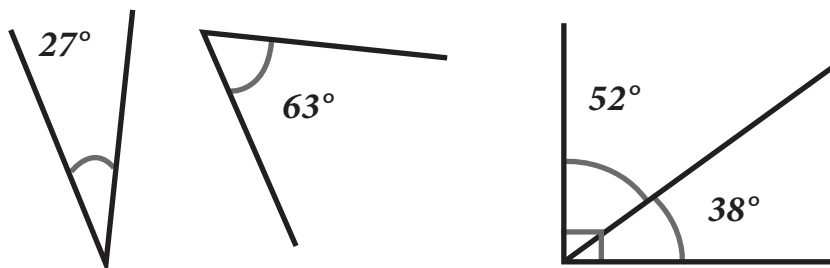
Some examples of angles are the space created by the hands of a clock, space under the stairs, or the space created when opening a door.



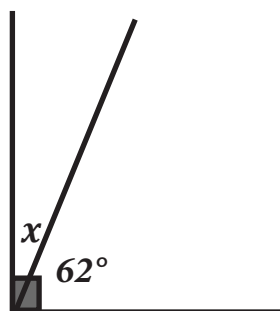
LESSON 2

COMPLEMENTARY AND SUPPLEMENTARY ANGLES

Complementary angles are pairs of angles whose measurements add up to 90° .



Example: Find the measure of the **complement** of the given angle with measure 62° in the given figure below:



Complementary angles add up to 90° .

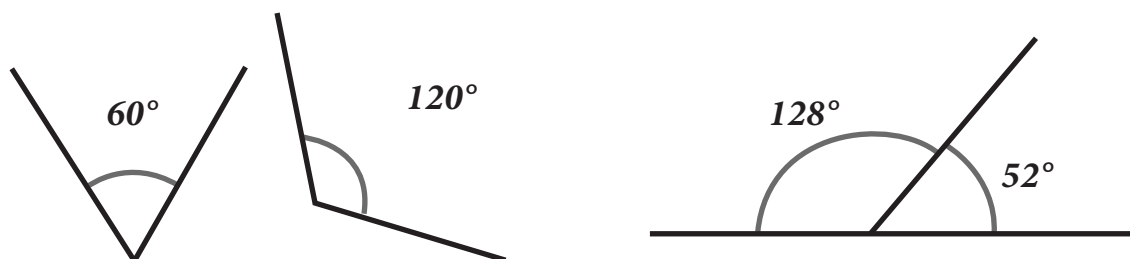
Using x as the missing measure:

$$x + 62^\circ = 90^\circ$$

$$x = 90^\circ - 62^\circ$$

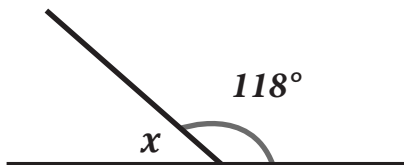
$$x = 28^\circ$$

Supplementary angles are pairs of angles whose measurements add up to 180° .



LESSON 2

Example: Find the measure of the **supplement** of the given angle that measures 118° in the given figure below:



Supplementary angles add up to 180° .

Using x as the missing measure:

$$x + 118^\circ = 180^\circ$$

$$x = 180^\circ - 118^\circ$$

$$x = 62^\circ$$



LESSON 2

SHARPENING YOUR SKILLS

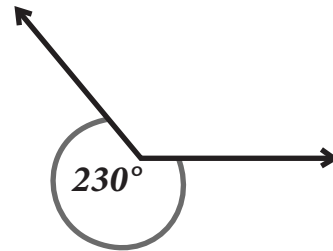
Write your answers on a separate sheet of paper.

I. Identify the type of angle that is given in each item.

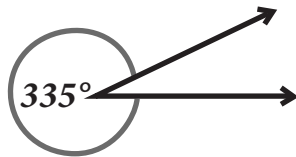
1.



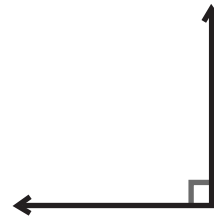
5.



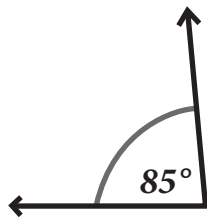
2.



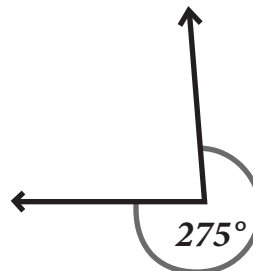
6.



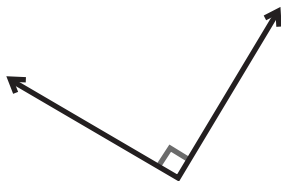
3.



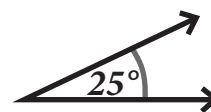
7.



4.



8.



LESSON 2

II. Use a protractor to create the indicated angle.

1. 80°
2. 135°
3. 210°
4. 55°
5. Adjacent angles 45° and 60°
6. Adjacent angles 72° and 18°



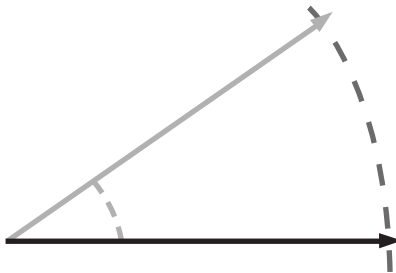
LESSON 2

TREADING THE ROAD TO MASTERY

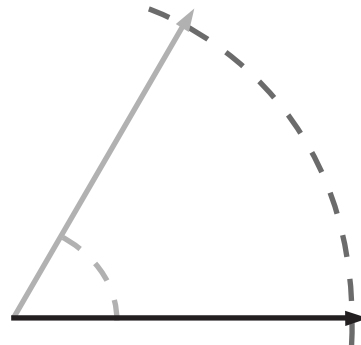
Directions: Use a protractor to measure the angle then find its complement or supplement. Do this activity on a separate sheet of paper.

COMPLEMENT

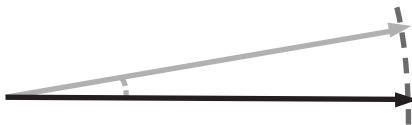
1.



2.

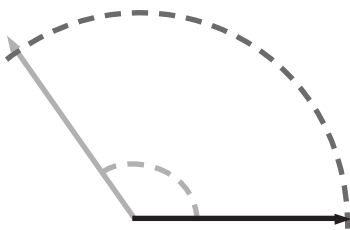


3.

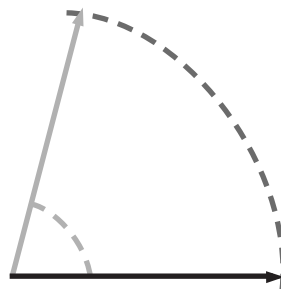


SUPPLEMENT

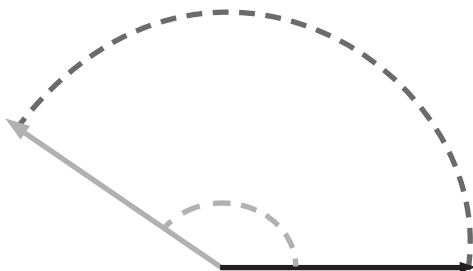
1.



2.



3.





MANY ANGLES

At the end of the lesson, you will be able to:



illustrate polygons: (a) convexity, (b) angles, and (c) sides (LS3MP-G-PSC-JHS-38);



solve problems involving sides and angles of a polygon (LS3MP-G-PSC-JHS-40); and



apply the principles of geometric shapes in daily life situations (LS3MP-G-PSC-BL/LE/AE/JHS-7).



LESSON 3



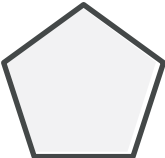
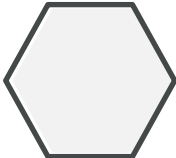
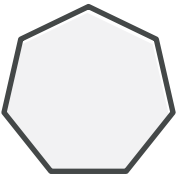
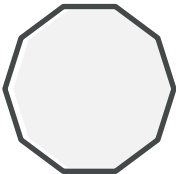
TRYING THIS OUT

Miranda went with her father one day while he was laying tiles on a house they recently constructed. She was amazed with all the different shapes put together to form a beautiful floor. Miranda wondered what the names for these shapes and figures are. Let us help her discover.



Copy the sketches that Miranda made from the figures created by the tiles on a clean sheet of paper and fill up the following table.

How many corners does each tile have?

FIGURE	CORNERS	FIGURE	CORNERS
			
			
			

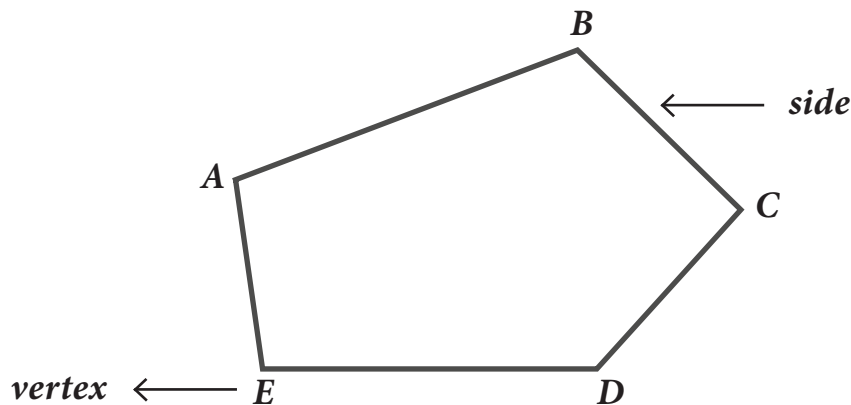


LESSON 3

UNDERSTANDING WHAT YOU DID

A **plane figure** is a figure that lies in a plane. From the activity, you were able to discover different plane figures, more specifically, polygons.

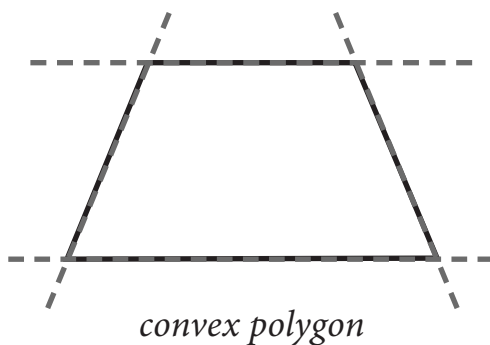
A **polygon** is a closed plane figure that is formed by straight lines. Polygons have sides and vertices.



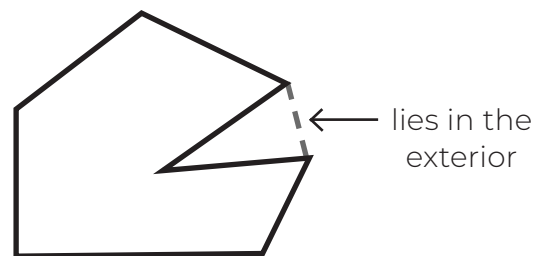
Polygons are named by listing the vertices in consecutive order. For the polygon above, it can be called polygon *ABCDE*, *CDEAB* or *BCDEA*.

CONVEX AND CONCAVE POLYGONS

A polygon is **convex** if all line segments connecting any pair of vertices do not lie in the exterior of the polygon. A polygon that is not convex is called **concave**.



convex polygon



concave polygon

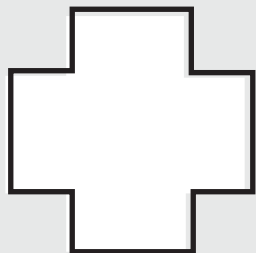
← lies in the exterior

LESSON 3

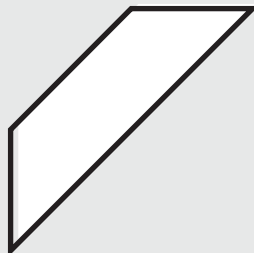
Observe that all the polygons in the activity are convex.

Example 1. Classify the given polygon as convex or concave.

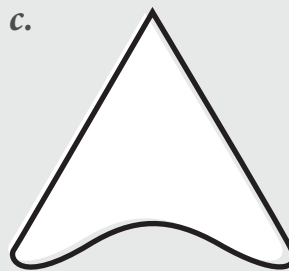
a.



b.



c.



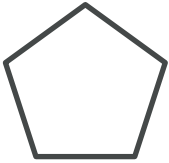
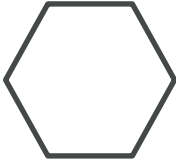

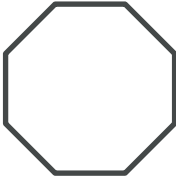
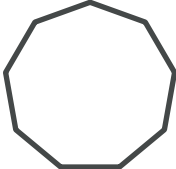
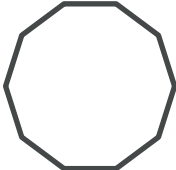
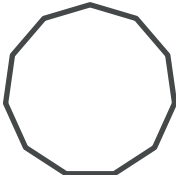
Only plane figure (b) is a convex polygon. Plane figure (a) is concave because connecting some pairs of vertices results to a line segment in the exterior of the polygon. Figure (c) is not a polygon because the bottom part is not a segment.

POLYGONS ACCORDING TO SIDES AND ANGLES

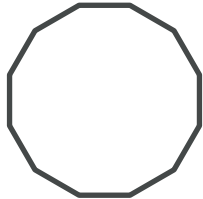
We can classify polygons according to the number of sides and measure of interior angles.

NUMBER OF SIDES	TYPE OF POLYGON	ILLUSTRATION
3	TRIANGLE	
4	QUADRILATERAL	

LESSON 3

NUMBER OF SIDES	TYPE OF POLYGON	ILLUSTRATION
5	PENTAGON	
6	HEXAGON	
7	HEPTAGON	
8	OCTAGON	
9	NONAGON	
10	DECAGON	
11	UNDECAGON or HENDECAGON	

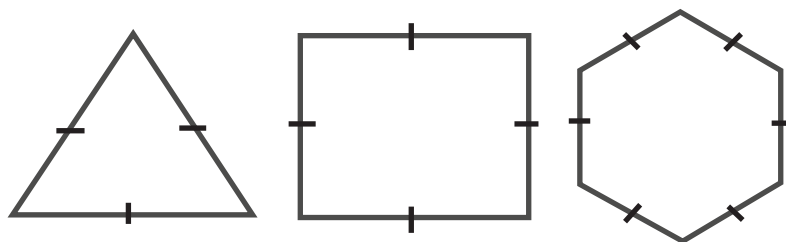
LESSON 3

NUMBER OF SIDES	TYPE OF POLYGON	ILLUSTRATION
12	DODECAGON	

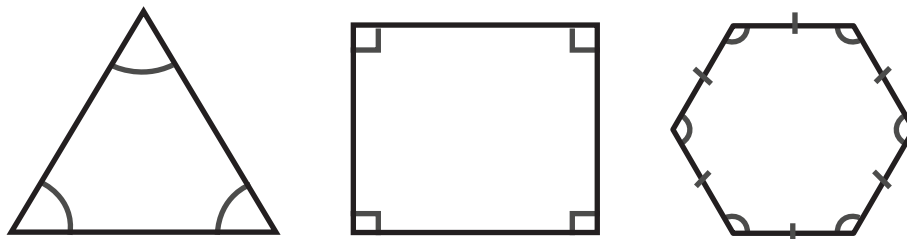
If a polygon has n number of sides, we usually use the term **n - gon**. For instance, a polygon with 16 sides is called a 16-gon.

Go back to the activity, try to name the figures that you have discovered.

If all sides of a polygon are congruent or have equal measures, then it is called an **equilateral polygon**. These are examples of equilateral polygons. The tick marks are used to show that the sides are congruent.

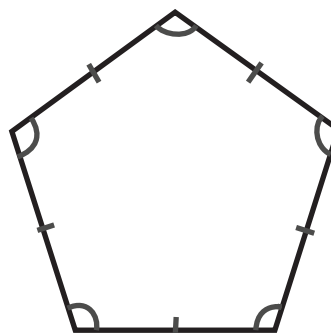


If all interior angles of a polygon are congruent or have equal measures, then it is called an **equiangular polygon**. These are examples of equiangular polygons. The small arcs are used to show that the angles have the same measure.



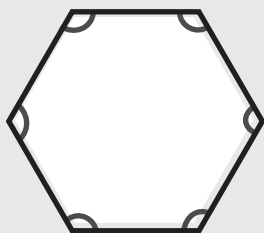
LESSON 3

A convex polygon that is both equilateral and equiangular is called a **regular polygon**. Observe in the regular polygon shown here that it has tick marks and small arcs. This shows that it is both equilateral and equiangular.

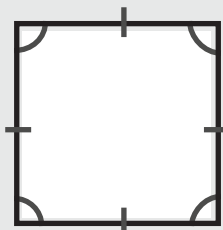


Example 2. Classify each polygon below by the number of its sides and determine if it is equilateral, equiangular, or regular.

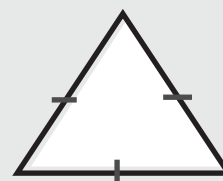
a.



b.



c.



In item (a), the polygon is a hexagon (with 6 sides) and is equiangular. In item (b), the polygon is a quadrilateral (with 4 sides) and is regular. In item (c), the polygon is a triangle (with 3 sides) and is equilateral.

The measure of interior angles of regular polygons can be computed using the formula:

$$A = \frac{180(n - 2)}{n}$$

and the sum of the measure of interior angles is given by

$$S = 180(n - 2)$$

where n is the number of sides of the polygon.

Example 3. For the given regular polygon, find the measure of each interior angle and the sum of the measures of the interior angles

- a. Regular triangle
- b. Regular quadrilateral
- c. Regular hexagon
- d. Regular octagon

We first identify the number of sides for each regular polygon and use the formulas mentioned above.

- a. Since a triangle has 3 sides, $n = 3$.

$$A = \frac{180(n - 2)}{n} = \frac{180(3 - 2)}{3} = \frac{180(1)}{3} = \frac{180}{3} = 60$$

$$S = 180(n - 2) = 180(3 - 2) = 180(1) = 180$$

- b. Since a quadrilateral has 4 sides, $n = 4$.

$$A = \frac{180(n - 2)}{n} = \frac{180(4 - 2)}{4} = \frac{180(2)}{4} = \frac{360}{4} = 90$$

$$S = 180(n - 2) = 180(4 - 2) = 180(2) = 360$$

- c. Since a hexagon has 6 sides, $n = 6$.

$$A = \frac{180(n - 2)}{n} = \frac{180(6 - 2)}{6} = \frac{180(4)}{6} = \frac{720}{6} = 120$$

$$S = 180(n - 2) = 180(6 - 2) = 180(4) = 720$$

LESSON 3

d. Since an octagon has 8 sides, $n = 8$.

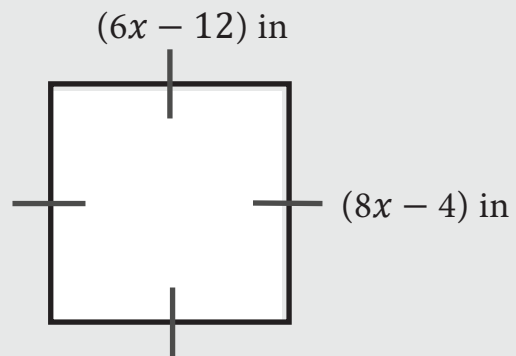
$$A = \frac{180(n - 2)}{n} = \frac{180(8 - 2)}{8} = \frac{180(6)}{8} = \frac{1080}{8} = 135$$

$$S = 180(n - 2) = 180(8 - 2) = 180(6) = 1080$$

The measures can be summarized in the table below:

REGULAR POLYGONS	NUMBER OF SIDES	MEASURE OF EACH INTERIOR ANGLE	SUM OF THE MEASURES OF THE INTERIOR ANGLES
TRIANGLE	3	60°	180°
QUADRILATERAL	4	90°	360°
PENTAGON	5	108°	540°
HEXAGON	6	120°	720°
HEPTAGON	7	128.60°	900°
OCTAGON	8	135°	1080°
NONAGON	9	140°	1260°
DECAGON	10	144°	1440°

Example 4. A table is shaped like regular quadrilateral. Each side length is represented by the expression on the right. Find the length of each side.



LESSON 3

Since the quadrilateral is regular, the sides have equal measures. This implies that we can equate the length of the given sides and solve for the value of x .

$$\begin{aligned}6x + 12 &= 8x - 4 \\6x - 8x &= -12 - 4 \\-2x &= -16 \\ \frac{-2x}{-2} &= \frac{-16}{-2} \\x &= 8\end{aligned}$$

We use the value the length of x to evaluate the length of one of the given sides:

$$6x + 12 = 6(8) + 12 = 60$$

Thus, the length of the side of the table is 60 inches.



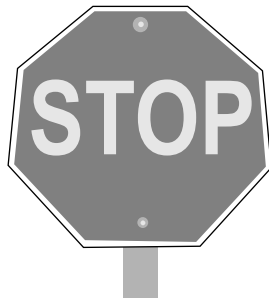
LESSON 3

SHARPENING YOUR SKILLS

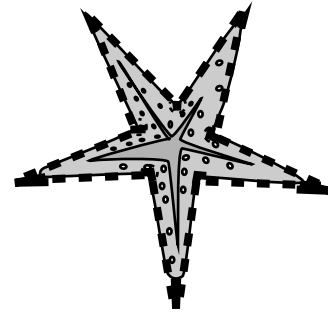
Write your answers on a separate sheet of paper.

- I. Identify whether the given figure is a polygon or not. If it is a polygon, classify as convex or concave. If it is not a polygon, explain why.

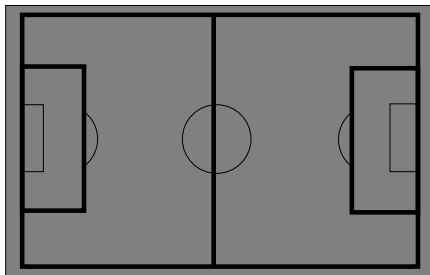
1.



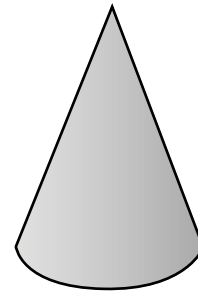
3.



2.



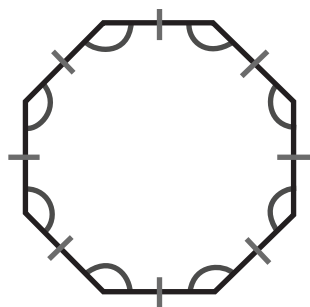
4.



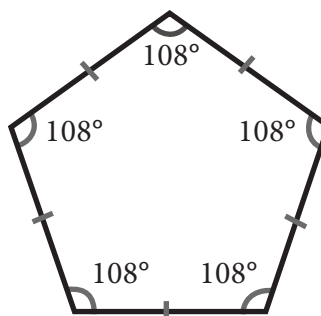
LESSON 3

II. Classify each polygon below by the number of its sides and determine if it is equilateral, equiangular, or regular. Justify your answer.

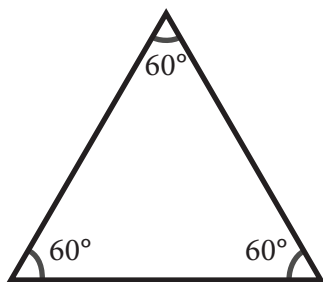
1.



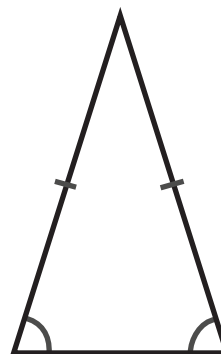
4.



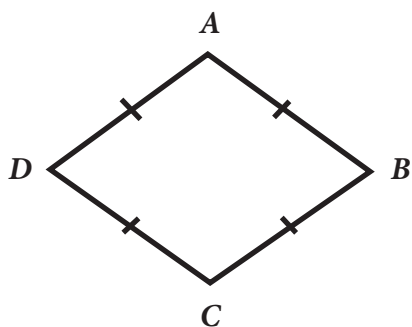
2.



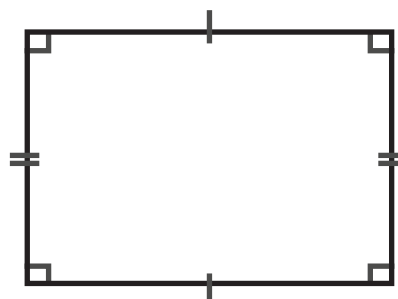
5.



3.



6.





LESSON 3

TREADING THE ROAD TO MASTERY

Solve the following problems. Place your answers on a separate sheet of paper.

1. The base of a jewelry box is shaped like a regular 15-gon. What is the measure of each interior angle of the base of the jewelry box.
2. A coin is in the shape of a regular undecagon. Find the sum of the measures of its interior angles.
3. A trampoline is shaped like a regular dodecagon. Find the measure of each interior angle.



MODULE 4

DON'T FORGET



- The undefined terms in geometry are **points**, **lines**, and **planes**.

— A **point** represents a location in space and is usually represented by a dot.

— A **line** is a straight path made up of connected points extending to both directions.

— A **plane** is a boundless flat surface that extends on all sides where points and lines lie on.

- A **line segment** is a part of a line that has two end points.
- A **ray** is a part of a line that has one end point and extends on one direction (half-line).
- **Parallel lines** are lines that do not intersect even when extended without end and are symbolized by “||”.
- **Perpendicular lines** are lines that intersect each other forming a right angle (exactly 90°) and are symbolized by “ \perp ”. These are denoted with a small box at their point of intersection.
- The intersection of two lines is a point. The intersection of two planes is a line.



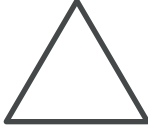

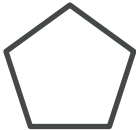




- An **angle** is a union of two rays sharing a common point called the **vertex**.
- Angles can be classified according to their measure.
 - A **right angle** has a measure of exactly 90° made by two perpendicular lines.
 - An **acute angle** has a measure greater than 0° but less than 90° .
 - An **obtuse angle** has a measure greater than 90° but less than 180° .
 - A **straight angle** has a measure of exactly 180° whose rays form a straight line.
 - A **reflex angle** has a measure greater than 180° but less than 360° .
 - A **full angle** has a measure of 360° and looks like a circle.
- **Complementary angles** are a pair of angles whose sum of measurements is 90° .
- **Supplementary angles** are a pair of angles whose sum of measurements is 180° .
- A **plane figure** is a figure that lies in a plane.
- A **polygon** is a closed plane figure that is formed by straight lines.




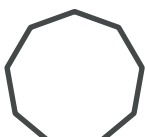
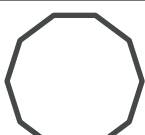
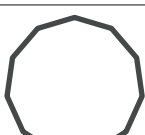
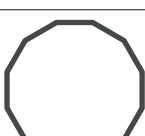


- A polygon is **convex** if all line segments connecting any pair of vertices do not lie in the exterior of the polygon. A polygon that is not convex is called **concave**.
- Polygons can also be classified according to the number of sides.

NUMBER OF SIDES	TYPE OF POLYGON	ILLUSTRATION
3	TRIANGLE	
4	QUADRILATERAL	
5	PENTAGON	
6	HEXAGON	
7	HEPTAGON	





NUMBER OF SIDES	TYPE OF POLYGON	ILLUSTRATION
8	OCTAGON	
9	NONAGON	
10	DECAGON	
11	UNDECAGON or HENDECAGON	
12	DODECAGON	

- An equilateral polygon is a polygon with congruent sides. An equiangular polygon is a polygon in which all interior angles are congruent. A regular polygon is a polygon which is both equilateral and equiangular.





- The measure of each interior angle of a regular/ equiangular polygon can be obtained using the formula

$$A = \frac{180(n - 2)}{n}$$

and the sum of the measures of the interior angles is

$$S = 180(n - 2)$$

where n is the number of sides.





MODULE 4

EXPLORE MORE

If you wish to study further, here are some additional materials you can refer to:

“Geometry Undefined Terms CCHS”

<https://www.youtube.com/watch?v=TXKM35oUli0>

“Types of Angle”

<https://www.youtube.com/watch?v=dqg1DQCJa-E>

“Parallel & perpendicular lines intro”

<https://www.khanacademy.org/math/basic-geo/basic-geo-lines/parallel-perp/v/parallel-and-perpendicular-lines-intro>

“Draw Angles – Plotting Program”

<https://rechneronline.de/winkel/angles.php>

“Parallel Lines, Transversals, and Angles”

https://www.youtube.com/watch?v=qTD_z47egHs

Angle graphing tool





<https://www.visnos.com/demos/basic-angles>



MODULE 4

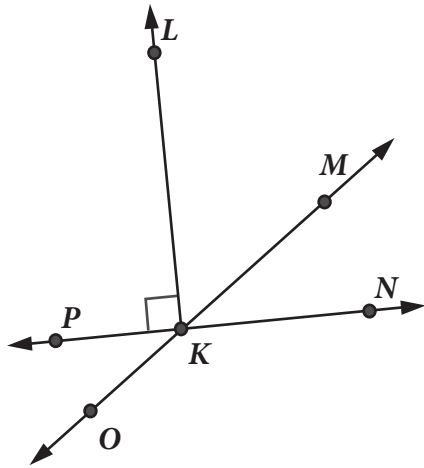
REACH THE TOP

Choose the letter of the correct answer by encircling it and write them on a separate sheet of paper.

- Which of the following is not an undefined term in geometry?
a. point b. line c. plane d. ray
- It refers to an undefined term in geometry which is an endless and boundless flat surface.
a. ray b. point c. line d. plane
- Which of the following is a line segment?
a.  c. 
b.  d. 
- What is the intersection of perpendicular lines?
a. point b. ray c. line segment d. line
- What pair of lines is represented by the given figure?
a. adjacent
b. perpendicular
c. parallel
d. vertical



For items 6–8, refer to the figure on the next page.



6. What is the intersection of lines PN and MO ?

- a. point N
- b. point K
- c. point M
- d. point O

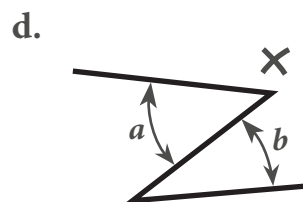
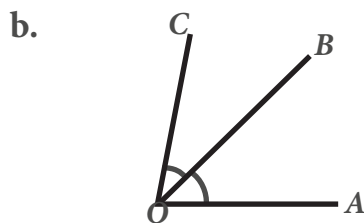
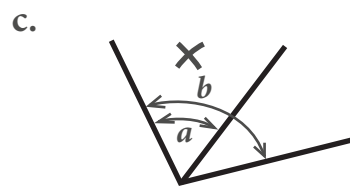
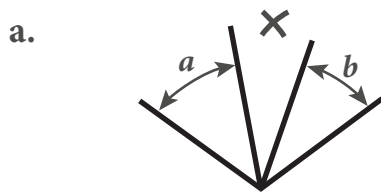
7. What is the intersection of lines PN and LK ?

- a. point N
- b. point K
- c. point L
- d. point P

8. What type of angle is PKM ?

- a. acute
- b. right
- c. obtuse
- d. reflex

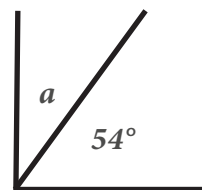
9. Which of the following is an example of adjacent angles?



MODULE 4

10. What is the complement of the given angle?

- a. 16°
- b. 36°
- c. 86°
- d. 126°



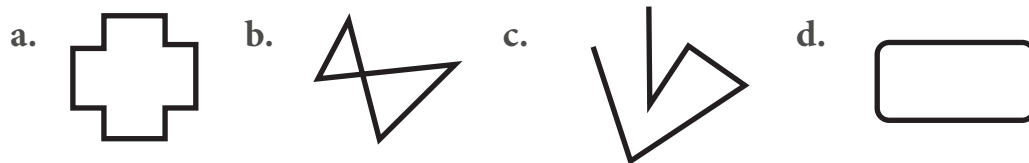
11. Find the supplement of 120° .

- a. 30°
- b. 45°
- c. 50°
- d. 60°

12. What is the measure of a full angle?

- a. 90°
- b. 45°
- c. 360°
- d. 180°

13. Which of the following is a polygon?



14. Which of the following best describes a regular polygon?

- a. both equiangular and equilateral
- b. equiangular
- c. equilateral
- d. flat

15. A table is shaped like a regular pentagon. Each side length is represented by $(2x + 6)$ inches and $(3x - 3)$ inches. Find the length of each side.

- a. 24 inches
- b. 18 inches
- c. 9 inches
- d. 6 inches

ANSWER KEY

PRE-ASSESSMENT

PAGE 2

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

LESSON 1: THE FOUNDATIONS OF SHAPES AND FIGURES

TRYING THIS OUT

PAGE 5

- The intersection of the two sticks can be represented with a point.
- The sides of a paper can be represented as line segments.
 - At point J, lines JK and JM meet.
At point K, lines JK and KL meet.
At point L, lines KL and LM meet.
At point M, lines JM and LM meet.
 - The sides of the paper that are across each other are the pairs JK & LM and JM & KL.
 - The sides of the paper will never cross.
- The edges of the box can be represented as line segments.
 - The faces of a box can be represented as planes.
 - The edges of the box is where the faces of the box meet.

SHARPENING YOUR SKILLS

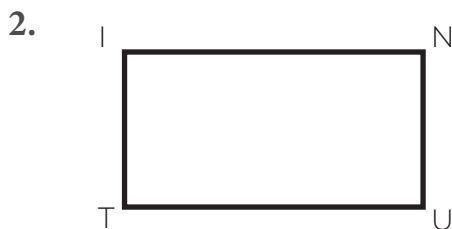
PAGE 17

ACTIVITY I

- ray CS
- plane $LOVE$
- line AM or line MA
- $PR \perp AT$
- $CR \parallel AT$
- line segment PR

ANSWER KEY

ACTIVITY II



ACTIVITY III

$ZY \perp XR$

$MN \perp RX$

$MN \perp PT$

$YZ \parallel MN$

$RX \parallel PT$

$VW \parallel SU$

TREADING THE ROAD TO MASTERY

PAGE 19

- (a) point E
(b) point C
(c) point C
(d) no intersection
- (a) point B
(b) point C
(c) no intersection
- (a) no intersection
(b) line p
(c) line q
- (a) line a , line FQ , or line FW
(b) point F
- (a) point J
(b) point J
(c) point J
(d) line MN

ANSWER KEY

LESSON 2: HOW OPEN IS IT

TRYING THIS OUT

PAGE 22

- A. 50°
- B. 80°
- C. 105°

SHARPENING YOUR SKILLS

PAGE 31

ACTIVITY I

- | | |
|-----------|-----------|
| 1. obtuse | 5. reflex |
| 2. reflex | 6. right |
| 3. acute | 7. reflex |
| 4. right | 8. acute |

ACTIVITY II

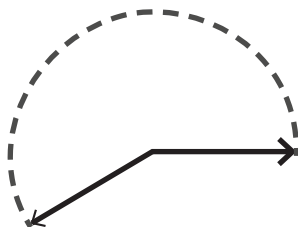
1.



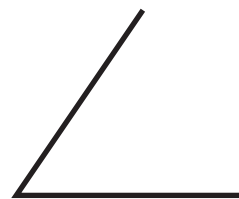
2.



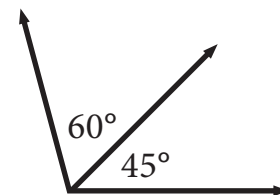
3.



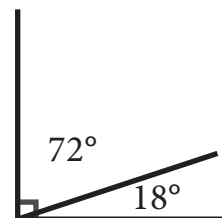
4.



5.



6.



ANSWER KEY

TREADING THE ROAD TO MASTERY

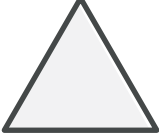

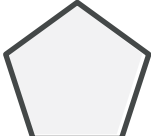

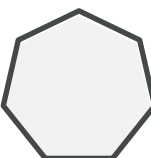
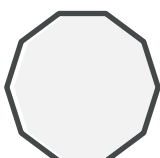
PAGE 33

- | | |
|-----------------------------------|------------------------------------|
| 1. measure of angle = 45° | measure of complement = 45° |
| 2. measure of angle = 60° | measure of complement = 30° |
| 3. measure of angle = 10° | measure of complement = 80° |
| 4. measure of angle = 125° | measure of supplement = 55° |
| 5. measure of angle = 115° | measure of supplement = 65° |
| 6. measure of angle = 145° | measure of supplement = 35° |

LESSON 3: MANY ANGLES

TRYING THIS OUT

PAGE 35

FIGURE	CORNERS	FIGURE	CORNERS
	3		4
	5		6
	7		10

SHARPENING YOUR SKILLS

PAGE 44

ACTIVITY I

1. polygon, convex
2. polygon, convex
3. polygon, concave because some pairs of vertices connects at the exterior
4. not a polygon because the bottom part is curved

ANSWER KEY

ACTIVITY II

1. octagon, regular
2. pentagon, regular
3. triangle, equiangular
4. triangle
5. quadrilateral, equilateral
6. quadrilateral, equiangular

TREADING THE ROAD TO MASTERY

PAGE 46

1. 156°
2. 1620°
3. 150

REACH THE TOP

PAGE 53

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

GLOSSARY

Acute Angle	An angle that measures greater than 0° but less than 90°
Adjacent Angles	A pair of angles that share the same vertex and a common side
Angle	A union of two rays sharing a common point
Complementary Angles	A pair of angles whose sum is 90°
Concave Polygon	A polygon that is not convex
Convex Polygon	A polygon whose line segments connecting any pair of vertices do not lie in the exterior of the polygon
Decagon	A polygon with exactly ten sides
Dodecagon	A polygon with exactly twelve sides
Equiangular Polygon	A polygon whose all interior angles are congruent
Equilateral Polygon	A polygon whose all sides are congruent

GLOSSARY

Full Angle		An angle that measures 360°
Heptagon		A polygon with exactly seven sides
Hexagon		A polygon with exactly six sides
Line		A straight path made up of connected points extending to both directions
Line Segment		A part of a line that has two end points
n -gon		A polygon with n number of sides
Nonagon		A polygon with exactly nine sides
Obtuse Angle		An angle measuring greater than 90° but less than 180°
Octagon		A polygon with exactly eight sides
Parallel Lines		Lines that do not intersect even when extended without end; symbolized by “ ”

GLOSSARY

Pentagon	A polygon with exactly five sides
Perpendicular Lines	Lines that intersect to form a right angle (exactly 90°); symbolized by “ \perp ”
Plane	A boundless flat surface that extends on all sides where points and lines lie on
Plane Figure	A figure that lies in a plane
Point	A location in space that has no dimensions and is represented by a dot (.)
Polygon	A closed plane figure that is formed by straight lines
Quadrilateral	A polygon with exactly four sides
Ray (half-line)	A part of a line that has one end point and extends on one direction
Reflex Angle	An angle that measures greater than 180° but less than 360°
Regular Polygon	A polygon that is both equiangular and equilatera.

GLOSSARY

Right Angle	An angle that measures exactly 90° made by two perpendicular lines
Straight Angle	An angle that measures exactly 180° whose rays form a straight line
Supplementary Angles	A pair of angles whose sum is 180°
Triangle	A polygon with exactly three sides
Undecagon	A polygon with exactly eleven sides
Undefined terms	Terms that cannot be defined using other figures; three undefined terms are points, lines, and planes
Vertex	A point of intersection of two rays forming an angle

REFERENCES

Diaz, Zenaida B., Manalo, Catalina B., Mojica, Maharlika P., Suzara, Josephine L., Mercado, Jesus P., Esparrago, Mirla S., Reyes, Nestor Jr. V. Next Century Mathematics 8. Phoenix Publishing House, Inc. 2013

Favila, Raymundo A., Villarmil, Ma. Mauricia L. Geometry Metric Edition. 1984

Carasco, Jester. Types of Angles, accessed August 25, 2019, <https://www.basic-mathematics.com/types-of-angles.html>.

Pierce, Rod. (2019). Angle Definition, accessed August 25, 2019, <https://www.mathsisfun.com/definitions/angle.html>.

Varsity Tutors. (2019). Parallel Lines and Proportionality, accessed August 25, 2019, https://www.varsitytutors.com/hotmath/hotmath_help/topics/parallel-lines-and-proportionality.

Yordan, Petrov. (2019). Types of Angle Pairs, accessed August 25, 2019, <https://www.math10.com/en/geometry/angles/angles.html>.

The development and printing of this learning resource was made possible with the cooperation of Asia Pacific College. This is a component of the project “Better Life for Out-of-School Girls to Fight Against Poverty and Injustice in the Philippines” implemented by UNESCO Office, Jakarta in partnership with the Department of Education. This initiative received a generous financial support from Korea International Cooperation Agency (KOICA).

For inquiries, please contact:

Department of Education, Bureau of Learning Resources (DepEd BLR)

Office Address : Ground Floor, Bonifacio Building, DepEd Complex,
Meralco Avenue, Pasig City, Philippines 1600
Telefax : +63-2-8631-1072; +63-2-8634-1054; +63-2-8631-4985
Email Address : blr.qad@deped.gov.ph; blr.lrp@deped.gov.ph