*Z*est for *P*rogress
*Z*eal of *P*artnership

8

MATHEMATICS
4th QUARTER – Module 5:
PARALLELISM AND PERPENDICULARITY

JANUARY
Makugihon

FEBRUARY
Mahigugmaon

MARCH
Matinabangon

APRIL
Matinahuron

MAY
Mahapsay og Malimpyo

JUNE
Maabtik og Masunod sa Ihsaktong Oras

JULY
Maantigo og Maabilidad

AUGUST
Maginhunahunaon para sa Uban

SEPTEMBER
Madaginoton

OCTOBER
Matinud-anon

NOVEMBER
Masaligan

DECEMBER
Maalampuon

Name of Learner: _____

Grade & Section: _____

Name of School: _____

Mathematics – Grade 8
Alternative Delivery Mode
Quarter 4 - Module 5: Parallelism and Perpendicularity
First Edition, 2020

Introductory Message

This Self – Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you can proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. Read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

You have learned the key concepts of measurement of angles formed by parallel lines cut by a transversal on the previous section. Your goal now is to understand and determine basic concepts about the conditions on under which lines and segments are parallel and perpendicular. Discussions on properties of parallelism and perpendicularity will also be done in this section. Towards the end of this lesson, you will be encouraged to learn the different ways of proving.

After going through this module, you are expected to determine the condition under which lines and segments are parallel or perpendicular (M8GE-IVe-1).

What I Know

Directions: Read each statement carefully. Write the letter of the correct answer on a separate sheet.

1. Which of the following statements is sometimes **TRUE**?
   Statement I: Intersecting lines are perpendicular.
   Statement II: Parallel lines have point of intersection.

   A. Statement I only   C. Statement II only
   B. Both Statements I and II   D. Neither Statement I nor II

2. Which of the following statements is **FALSE**?
   Statement I: Intersecting lines are parallel.
   Statement II: Perpendicular lines are intersecting lines.

   A. Statement II only   C. Statement I only
   B. Both Statements I and II   D. Neither Statement I nor II

3. Given two lines cut by a transversal, which of the following conditions would **NOT** guarantee that they are parallel?
   A. Corresponding angles are congruent.
   B. Same-side exterior angles are congruent.
   C. Alternate exterior angles are congruent.
   D. Same-side interior angle are complementary.

For numbers 4 & 5, refer to the figure below.
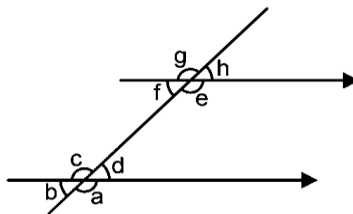
4. Based on the given figure, which of the choices would make the two lines parallel when cut by a transversal?
   A. Angle f is congruent to angle c   C. Angle g is congruent to angle h
   B. Angle a is congruent to angle g   D. Angle b is congruent to angle d

5. Based on the given figure, which of the choices would make the two lines parallel when cut by a transversal?
   A. m $\angle$g + m $\angle$h = 180^0 C. m $\angle$c + m $\angle$e = 180^0
   B. m $\angle$a + m $\angle$g = 180^0 D. m $\angle$c + m $\angle$f = 180^0

3

What's In

Directions: Name a pair of lines for which l is a transversal.
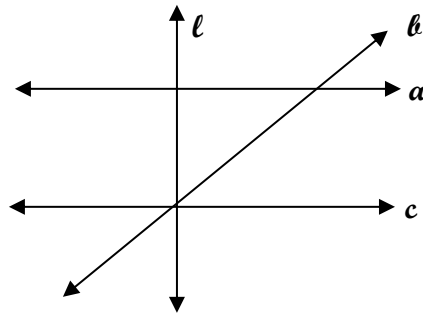
What's New

Directions: The figure below shows two parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ cut by a transversal $\overleftrightarrow{MN}$.

Given: $\overleftrightarrow{AB}$ // $\overleftrightarrow{CD}$; transversal $\overleftrightarrow{MN}$
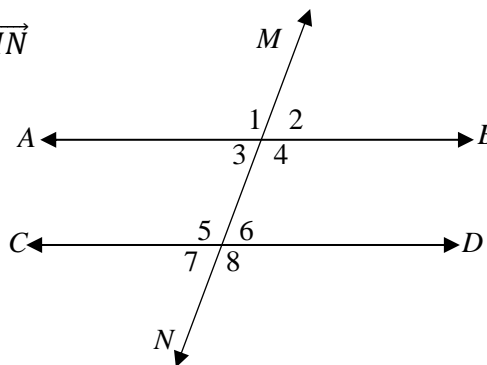
Give at least one example for each of the following:

1. Alternate Interior Angles
2. Alternate Exterior Angles
3. Corresponding Angles

What is It

In geometry, parallel lines are lines in a plane that do not meet; that is, two straight lines in a plane that do not intersect at any point are said to be parallel.

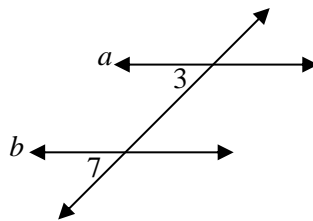The following are the conditions you need to show to say that two lines are parallel.

1 If two lines are cut by a transversal so that a pair of **corresponding angles** is congruent, then the lines are parallel.

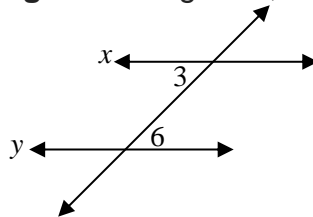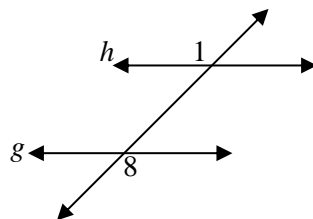If $\angle 3 \cong \angle 7$,
then $a \parallel b.$

2 If two lines are cut by a transversal so that a pair of **alternate interior angles** is congruent, then the lines are parallel.

If $\angle 3 \cong \angle 6$,
then $x \parallel y.$

3 If a pair of parallel lines are cut by a transversal, then the **alternate exterior angles** are congruent.

If $\angle 1 \cong \angle 8$,
then $g \parallel h.$

4

If two lines are cut by a transversal so that a pair of **same-side interior angles** is supplementary, then the lines are parallel.
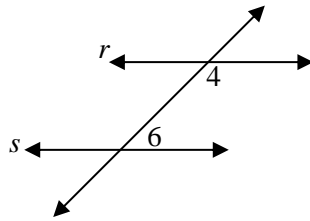
If ∠ 4 + ∠ 6 = 180°, then $r \parallel s$.

5

If a transversal intersects two parallel lines, then **same-side exterior angles** are supplementary.
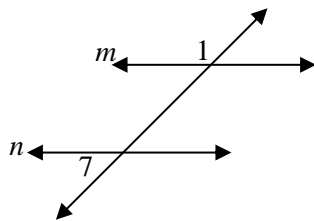
If ∠1 + ∠ 7 = 180°, then $m \parallel n$.

What's More

Directions: Read the problem below and write your answers on a separate sheet.

PROBLEM:

Based on the figure above and the information below, identify which lines is parallel.

1. If **m∠6 = 36°** and **m∠8 = 36°**, then _____.

2. If **m∠7 = 50°** and **m∠9 = 130°**, then _____.

What's New

Study the figures and answer the succeeding questions below on a separate sheet.
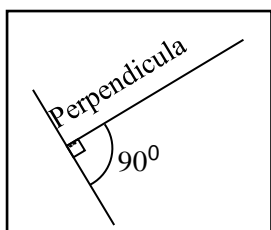
Figure 1
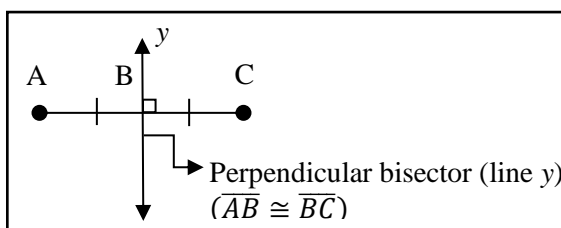
Figure 2

QUESTIONS:

1. When do we say that lines are perpendicular to another line?

2. Can line segments and rays be perpendicular?

3. What is a perpendicular bisector? Explain your answer based on figure 2.

What is It

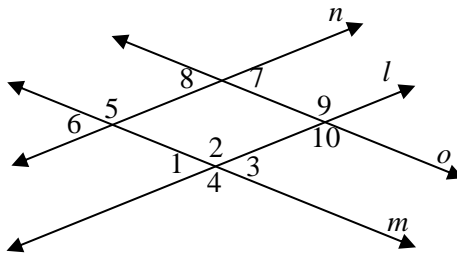Two lines that intersect to form right angles are said to be **perpendicular**. Line segments and rays can also be perpendicular. A **perpendicular bisector of a line segment** is a line or a ray or another line segment that is perpendicular to the line segment and intersects it at its midpoint. The distance between two parallel lines is the **perpendicular distance** between one of the lines and any point on the other line.

To prove that **two lines are perpendicular**, one of the following theorems must satisfy:

1

If two lines are perpendicular to each other, then they form four right angles.
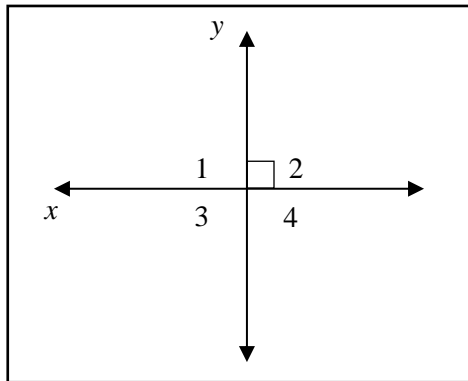
If $y \perp x$, then $\angle 1$, $\angle 2$, $\angle 3$ and $\angle 4$ are right angles.

2

If the angles in a linear pair are congruent, then the lines containing their sides are perpendicular.
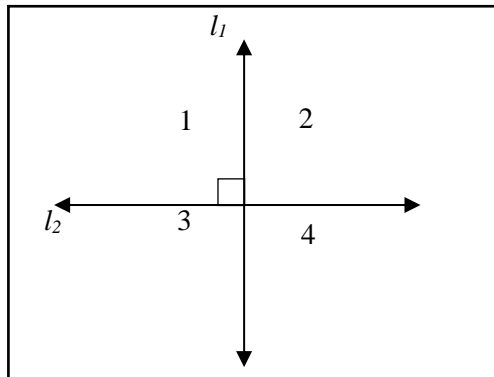
If $\angle 1$ and $\angle 2$ form a linear pair and $\angle 1 \cong \angle 2$, then $l_1 \perp l_2$.

3

If two angles are adjacent and complementary, the non-common sides are perpendicular.
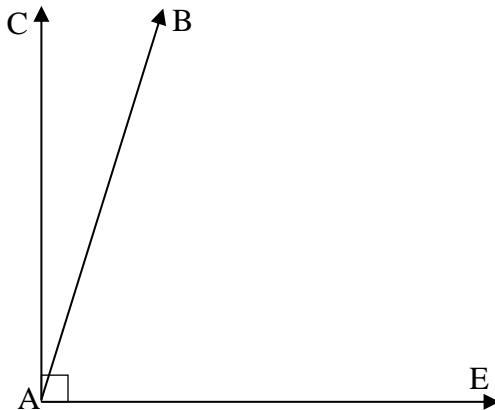
If $\angle CAB$ and $\angle EAB$ are complementary and adjacent, then $\overline{AC} \perp \overline{AE}$.

What's More

Directions: Identify whether *line h* **is perpendicular to** *line c* given the following conditions below by writing **YES** if the statement satisfies the condition on perpendicularity, and **NO** if it does not. Write your answers on a separate sheet.
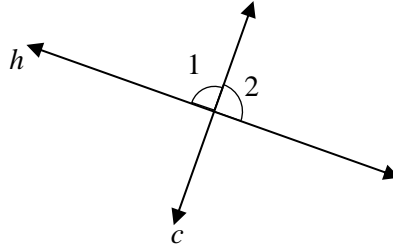
CONDITION	YES OR NO
1. $m\angle 1 + m\angle 2 = 180°$	
2. $\angle 1 \cong \angle 2$	
3. $\angle 1 = 90°$	
4. $\angle 2 = 100°$	
5. $m\angle 1 > m\angle 2$	

What I Have Learned

A. **Directions:** Given the figure below, determine which lines, if any, is parallel.
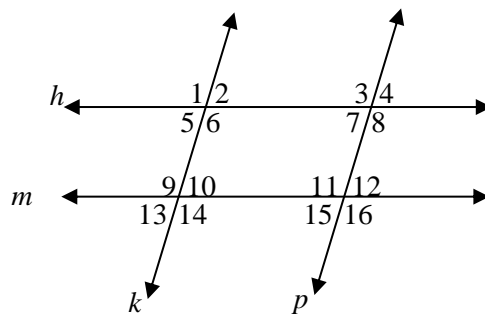
1. $\angle 1 \cong \angle 16$ _____

2. $\angle 7 \cong \angle 12$ _____

3. $\angle 5 \cong \angle 13$ _____

B. **Directions:** Write **TRUE** if the statement is correct and **FALSE** if not.
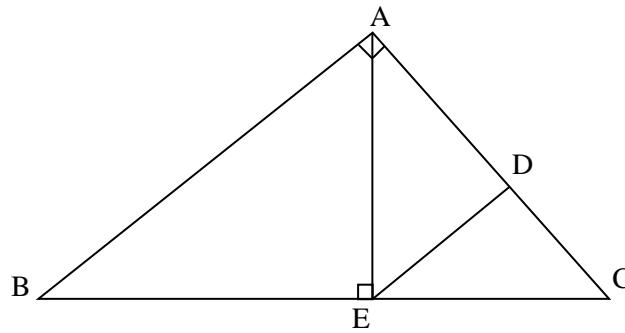
1. $\overline{BC} \perp \overline{EA}$
2. $\overline{BA} \perp \overline{AC}$
3. $\overline{AC} \perp \overline{BC}$
4. $\angle BAE$ and $\angle EAC$ are complementary angles.
5. $\overline{AC}$ is a perpendicular bisector of $\overline{AC}$.

What I Can Do

A. Directions: Read each statement carefully. Write **A** if the statement is true and **D** if false on a separate sheet.
1. Lines on the same plane that do not intersect are not parallel lines.
2. Transversal is a line that intersects two or more lines.
3. Perpendicular lines are intersecting lines.
4. If two lines are parallel to a third line, then they are parallel to each other.
5. In a plane, if two lines are perpendicular to the third line, then the two lines are parallel.

B. Directions: Give two (2) real-life examples that represent parallel lines.

Assessment

Directions: Read each statement carefully. Write the letter of the correct answer on a separate sheet.

1. Given two lines cut by a transversal, which of the following conditions would not guarantee that they are parallel?
   A. Corresponding angles are congruent.
   B. Same-side exterior angles are congruent.
   C. Alternate exterior angles are congruent.
   D. Same-side interior angle are complementary.

2. Which of the following statements is false?
   Statement I: Intersecting lines are parallel.
   Statement II: Perpendicular lines are intersecting lines.

   A. Statement II only   C. Statement I only
   B. Both Statements I and II   D. Neither Statement I nor II

3. Which of the following statements is sometimes true?
   Statement I: Intersecting lines are perpendicular.
   Statement II: Parallel lines have point of intersection.

   A. Statement I only   C. Statement II only
   B. Both Statements I and II   D. Neither Statement I nor II

For number 4 & 5, refer to the figure below.
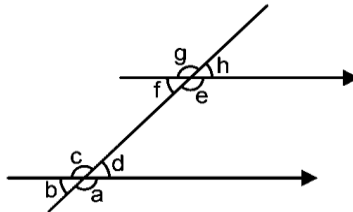
4. Based on the given figure, which of the choices would make the two lines cut by a transversal parallel?
   A. Angle f is congruent to angle c   C. Angle g is congruent to angle h
   B. Angle a is congruent to angle g   D. Angle b is congruent to angle d

5. Based on the given figure, which of the choices would make the two lines cut by a transversal parallel?
   A. m $\angle$g + m $\angle$h = 180^0 C. m $\angle$c + m $\angle$e = 180^0
   B. m $\angle$a + m $\angle$g = 180^0 D. m $\angle$c + m $\angle$f = 180^0

Answer Key

LESSON 1:

What's In:
1. line l is a transversal of lines a and b
2. line l is a transversal of lines a and c

What I Know:
1. A 2. C 3. D 4. B 5. A

What's More:
1. Lines **o** and **m** are parallel.
2. Lines **n** and **l** are parallel.

What's New:
1. ∠3 and ∠6 , ∠4 and ∠5
2. ∠1 and ∠8 , ∠2 and ∠7
3. ∠1 and ∠5, ∠2 and∠6, ∠3 and ∠7 , ∠4 and ∠8

LESSON 2:

What's New!
1. When the two lines that intersect and form right angles.
2. Yes, line segments and rays can be perpendicular.
3. A perpendicular bisector of a line segment is a line or a ray or another line segment that is perpendicular to the line segment and intersects it at its midpoint.

What's More!
1. No   2. Yes   3. Yes   4. No   5. No

What I Have Learned:
B
1. TRUE   2. TRUE   3. FALSE   4. TRUE   5. TRUE

What I have learned!
A
1. lines *k* and *p*
2. lines *h* and *m*
3. lines *h* and *m*

Assessment:

1. D   2. C   3. A   4. B   5. A

What I Can Do:

1. D   2. A   3. A   4. A   5. D

1. Rail road tracks, the edges of sidewalks, marking on the streets, staircase and railings, etc.

References:

Emmanuel P. Abuzo, et. al., *Mathematics Grade 8 (Learner's Module) First Edition*, Pasig City: Department of Education – Instructional Materials Council Secretariat (DepEd-IMCS), 2013.

Roy Carlo L. Advincula, et. al., *Global Mathematics 8 2015 Edition*, Quezon City: The Library Publishing House Inc., 2013, 386.

I AM A FILIPINO
by Carlos P. Romulo

I am a Filipino – inheritor of a glorious past, hostage to the uncertain future. As such, I must prove equal to a two-fold task – the task of meeting my responsibility to the past, and the task of performing my obligation to the future.

I am sprung from a hardy race – child many generations removed of ancient Malayan pioneers. Across the centuries, the memory comes rushing back to me: of brown-skinned men putting out to sea in ships that were as frail as their hearts were stout. Over the sea I see them come, borne upon the billowing wave and the whistling wind, carried upon the mighty swell of hope – hope in the free abundance of the new land that was to be their home and their children's forever.

This is the land they sought and found. Every inch of shore that their eyes first set upon, every hill and mountain that beckoned to them with a green and purple invitation, every mile of rolling plain that their view encompassed, every river and lake that promised a plentiful living and the fruitfulness of commerce, is a hollowed spot to me.

By the strength of their hearts and hands, by every right of law, human and divine, this land and all the appurtenances thereof – the black and fertile soil, the seas and lakes and rivers teeming with fish, the forests with their inexhaustible wealth in wild and timber, the mountains with their bowels swollen with minerals – the whole of this rich and happy land has been for centuries without number, the land of my fathers. This land I received in trust from them, and in trust will pass it to my children, and so on until the world is no more.

I am a Filipino. In my blood runs the immortal seed of heroes – seed that flowered down the centuries in deeds of courage and defiance. In my veins yet pulses the same hot blood that sent Lapulapu to battle against the alien foe, that drove Diego Silang and Dagohoy into rebellion against the foreign oppressor.

That seed is immortal. It is the self-same seed that flowered in the heart of Jose Rizal that morning in Bagumbayan when a volley of shots put an end to all that was mortal of him and made his spirit deathless forever; the same that flowered in the hearts of Bonifacio in Balintawak, of Gregorio del Pilar at Tirad Pass, of Antonio Luna at Calumpit, that bloomed in flowers of frustration in the sad heart of Emilio Aguinaldo at Palanan, and yet burst forth royally again in the proud heart of Manuel L. Quezon when he stood at last on the threshold of ancient Malacanang Palace, in the symbolic act of possession and racial vindication. The seed I bear within me is an immortal seed.

It is the mark of my manhood, the symbol of my dignity as a human being. Like the seeds that were once buried in the tomb of Tutankhamen many thousands of years ago, it shall grow and flower and bear fruit again. It is the insigne of my race, and my generation is but a stage in the unending search of my people for freedom and happiness.

I am a Filipino, child of the marriage of the East and the West. The East, with its languor and mysticism, its passivity and endurance, was my mother, and my sire was the West that came thundering across the seas with the Cross and Sword and the Machine. I am of the East, an eager participant in its struggles for liberation from the imperialist yoke. But I know also that the East must awake from its centuried sleep, shake off the lethargy that has bound its limbs, and start moving where destiny awaits.

For I, too, am of the West, and the vigorous peoples of the West have destroyed forever the peace and quiet that once were ours. I can no longer live, a being apart from those whose world now trembles to the roar of bomb and cannon shot. For no man and no nation is an island, but a part of the main, and there is no longer any East and West – only individuals and nations making those momentous choices that are the hinges upon which history revolves. At the vanguard of progress in this part of the world I stand – a forlorn figure in the eyes of some, but not one defeated and lost. For through the thick, interlacing branches of habit and custom above me I have seen the light of the sun, and I know that it is good. I have seen the light of justice and equality and freedom, my heart has been lifted by the vision of democracy, and I shall not rest until my land and my people shall have been blessed by these, beyond the power of any man or nation to subvert or destroy.

I am a Filipino, and this is my inheritance. What pledge shall I give that I may prove worthy of my inheritance? I shall give the pledge that has come ringing down the corridors of the centuries, and it shall be compounded of the joyous cries of my Malayan forebears when first they saw the contours of this land loom before their eyes, of the battle cries that have resounded in every field of combat from Mactan to Tirad Pass, of the voices of my people when they sing:

"I am a Filipino born to freedom, and I shall not rest until freedom shall have been added unto my inheritance—for myself and my children and my children's children— forever."