7

Mathematics

Quarter 3 – Module 2:
Relationships among Geometric Figures

SELF-LEARNING MODULE

Mathematics – Grade 7
Quarter 3 – Module 2: Relationships among Geometric Figures
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Mathematics

Quarter 3 – Module 2: Relationships among Geometric Figures

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Introductory Message

For the facilitator:

As a facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning at home. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

As a learner, you must learn to become responsible of your own learning. Take time to read, understand, and perform the different activities in the module.

As you go through the different activities of this module be reminded of the following:

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 *Let Us Try* before moving on to the other activities.
3. Read the instructions 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 teacher/facilitator once you are done.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or 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!

Let Us Learn

Good day leaners! Today, you are going to learn and discover new concepts and skills in Mathematics. To be specific, today you are expected to:

derive relationships of geometric figures using measurements and by inductive reasoning; supplementary angles, complementary angles, congruent angles, vertical angles, adjacent angles, linear pairs, perpendicular lines, and parallel lines. **(M7GE-IIIb-1)**

Let Us Try

Choose the letter that best answers the question. Write your answer on the space provided before each number.

_____ 1. What do you call the relationship formed by two angles whose sum is 90^o?
a. Supplementary Angles b. Complementary Angles
b. Congruent Angles d. Vertical Angles

_____ 2. What do you call the relationship formed by two angles whose sum is 180^o?
a. Supplementary Angles b. Complementary Angles
b. Congruent Angles d. Vertical Angles

_____ 3. What do you call angles with the same measurement?
a. Vertical Angles b. Adjacent Angles
c. Supplementary Angles d. Congruent Angles

_____ 4. What do you call the two lines that intersect to a form right angle?
a. Perpendicular Lines b. Parallel Lines
c. Line Segment d. Skew Lines

_____ 5. What do you call the two straight lines on the same plane that do not intersect at any point?
a. Perpendicular Lines b. Parallel Lines
c. Line Segment d. Skew Lines

Let Us Study

From the previous module, you have learned about angles and its different kinds. Now, we will discuss about the different angle relationships formed.

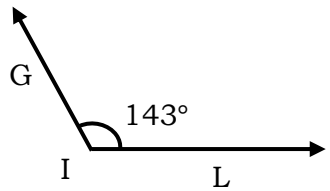
NOTE: All the angle measures stated here are approximated only.

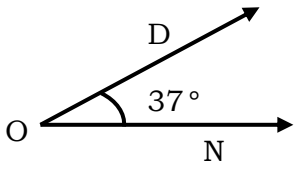
SUPPLEMENTARY ANGLES

When the sum of the measurement of two angles is equal to 180°, then these angles are called **supplementary angles.**

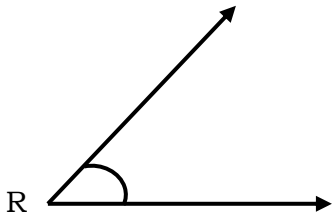
Examples

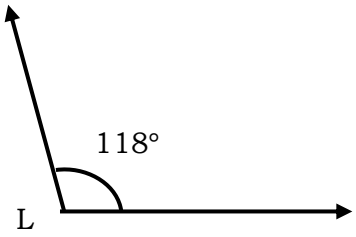
1. ∠GIL and ∠DON are supplementary angles since m∠GIL + m∠DON = 180°.





2. From the figure below, ∠R and ∠L are supplementary angles. Solve for the measurement of ∠R.





Solution:

From the given problem above, we are asked to solve for m∠*R*. Since ∠R and ∠L are supplementary angles, then

m∠R + m∠L	= 180°	
m∠R + 118°	= 180°	**Substitute m∠L = 118°**
m∠R + 118° – 118°	= 180° – 118°	**Subtract 118° from both sides**
m∠R	= 62°	

Therefore, the measurement of ∠R is 62°.

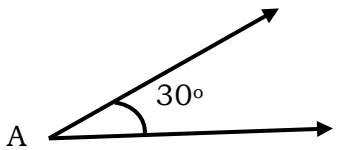
COMPLEMENTARY ANGLES

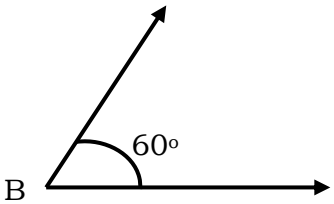
When the sum of the measurement of two angles is equal to 90°, then these angles are called **complementary angles.**

Examples.

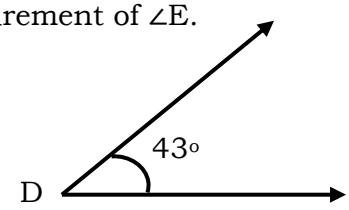
1. ∠A and ∠B are complementary angles since m∠A + m∠B = 90°.

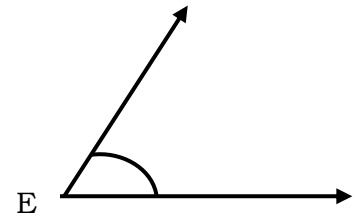
Note: m∠A is read as "measurement of angle A".





2. From the figure below, ∠D and ∠E are complementary angles. Solve for the measurement of ∠E.





Solution:

From the given problem above, we are asked to solve for m∠E. Since ∠D and ∠E are complementary angles, then

$m\angle D + m\angle E$	$= 90^o$	
$43^o + m\angle E$	$= 90^o$	**Substitute $m\angle D = 43^o$**
$43^o - 43^o + m\angle E$	$= 90^o - 43^o$	**Subtract 43^o from both sides.**
$m\angle E$	$= 47^o$	

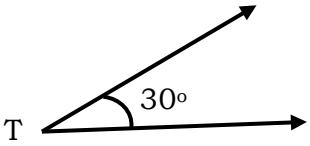
Therefore, the measurement of ∠E is 47^o.

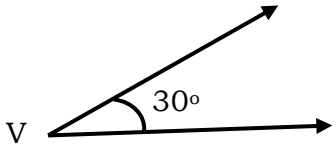
CONGRUENT ANGLES

Two angles are congruent if they have the same angle measurement.

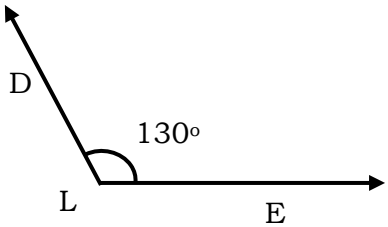
Examples.

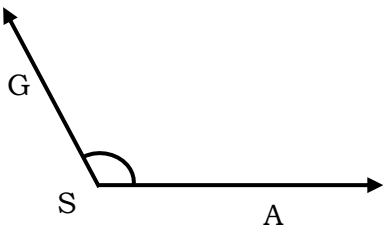
1. ∠T and ∠V are congruent angles since m∠T = m∠V. This can be written as ∠T ≅ ∠V (Read as ∠T is congruent to ∠V).





2. ∠DLE and ∠GSA are congruent angles. Solve for m∠GSA.





Solution:

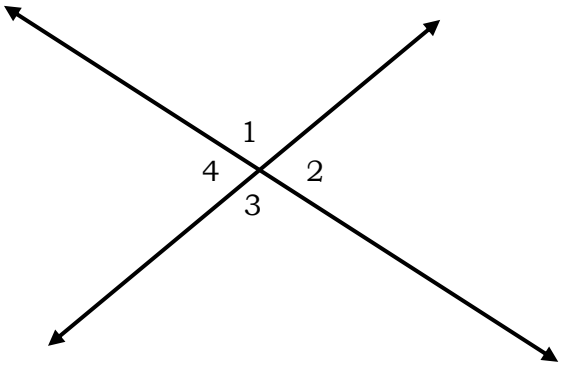
∠DLE	≅ ∠GSA	
m∠DLE	= m∠GSA	**Definition of Congruent Angles**
130^o	= m∠GSA	

Therefore, m∠GSA is 130^o.

VERTICAL ANGLES

Vertical angles are pair of two non-adjacent angles formed by two intersecting lines.

Illustration.



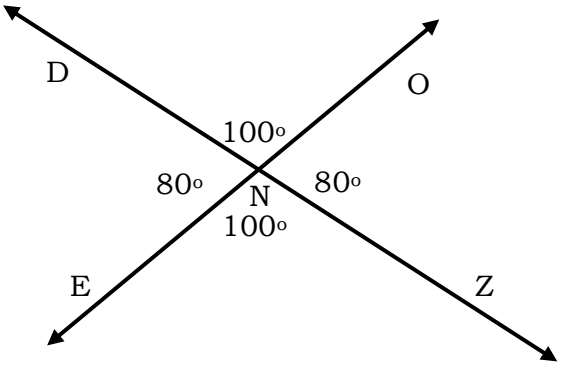
From the illustration above, ∠1 and ∠3 are vertical angles; and ∠2 and ∠4 are vertical angles. In addition, vertical angles are congruent. The congruence of Vertical angles are stated in the Vertical Angle Theorem.

VERTICAL ANGLE THEOREM (VAT)

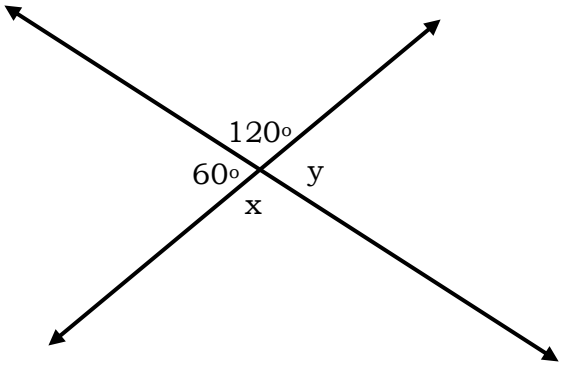
Vertical angles are congruent.

Examples.

1. Observe that ∠DNO and ∠ENZ are congruent, and ∠DNE and ∠ONZ are also congruent.



2. Solve for x and y.



Solution:

First, we solve for x. To solve for x, we consider the fact that intersecting lines form vertical angles. Hence,

$x = 120^o$

The same reasoning can also be applied to solve for y. Hence,

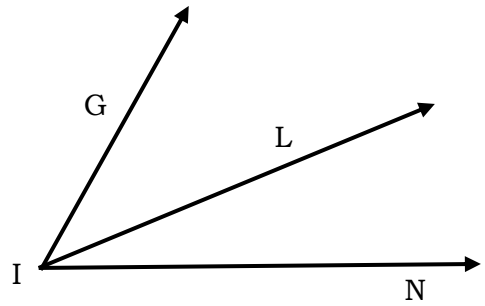
$y = 60^o$.

ADJACENT ANGLES

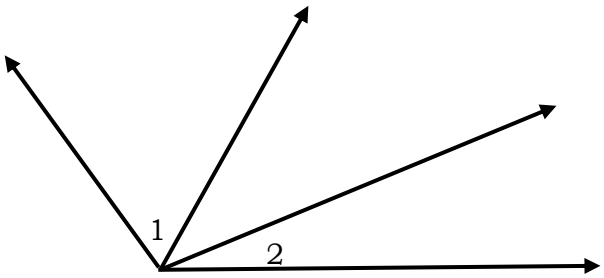
Adjacent angles are two angles that share a common side and a common vertex. Also, adjacent angles do not overlap.

Examples.

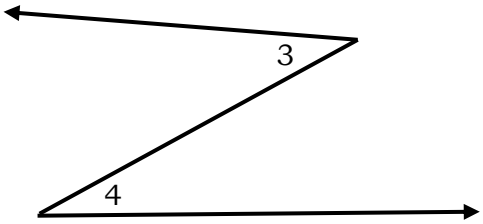
1. ∠GIL and ∠LIN are adjacent angles.



2. ∠1 and ∠2 are NOT adjacent angles since they do not share a common side.



3. ∠3 and ∠4 are NOT adjacent angles since they do not share a common vertex

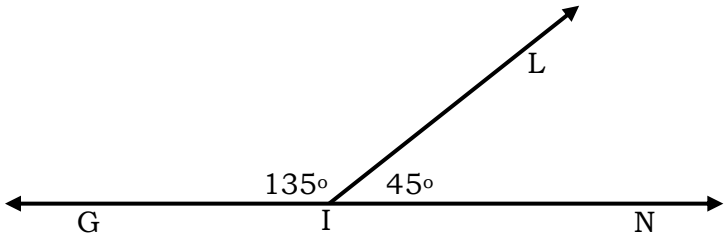


LINEAR PAIRS

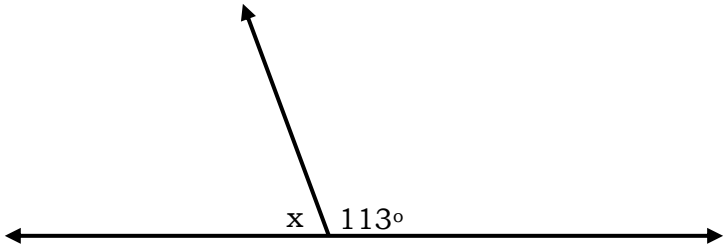
Linear pairs are adjacent angles and are supplementary. This means that the sum of the measurement of the angles add up to 180^o.

Examples.

1. ∠GIL and ∠LIN are linear pairs since they are adjacent, and the sum of their measurement is 180^o.



2. Let the given figure below be a linear pair. Solve for x



Solution:

Since the given example is a linear pair, we know by its definition that the sum of the measurement is 180°. Hence,

$x + 113^o = 180^o$

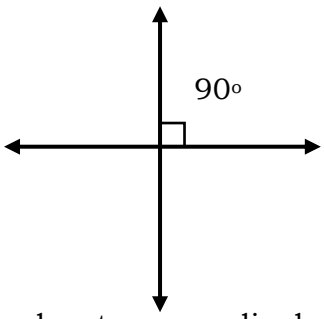
$x + 113^o - 113^o = 180^o - 113^o$ **Subtracting 113° to**

$x = 67^o$ **both sides**

Therefore, x is 67°.

PERPENDICULAR LINES

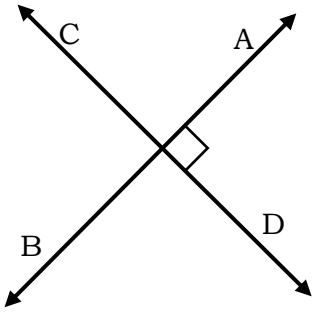
Perpendicular lines are two intersecting lines that form a right angle.



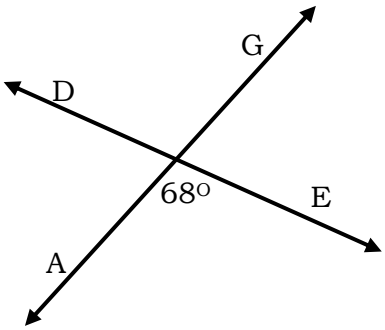
The symbol used to denote perpendicularity is ⊥. Hence, the statement $l \perp m$ is read as "line l is perpendicular to line m".

Examples.

1. line AB is perpendicular to line CD, written $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$.

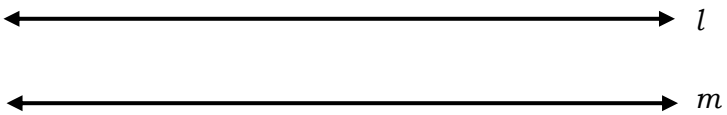


2. line DE and line GA are NOT perpendicular lines, since they do not form a right angle.



PARALLEL LINES

Parallel lines are two lines on the same plane that will never meet and are at equal distance from each other.



The symbol used to denote that two lines are parallel is ∥. Hence, the statement $l \parallel m$ is read as "line l is parallel to line m".

Let Us Practice

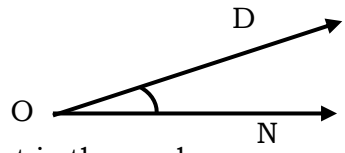
I. Identify the following geometric terms. Write your answers on the space provided before the number.

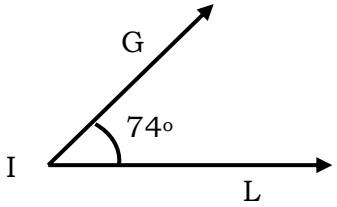
_____ 1. Pair of angles whose sum degree measure adds up to 180o.
_____ 2. Pair of angles that are adjacent and the degree measure adds up to 180o.
_____ 3. Pair of angles whose degree measure adds up to 90o
_____ 4. Pair of angles that share common side and vertex and does not overlap.
_____ 5. Symbol used to denote that two lines are parallel
_____ 6. Lines that intersect to form a right angle.
_____ 7. Pair of two non-adjacent angles formed by intersecting lines.
_____ 8. Lines that will never meet.
_____ 9. Symbol used to denote that two lines are perpendicular.
_____ 10. Angles that have the same measurement.

Let Us Practice More

Study the given problem below. Solve for what is required and show your complete work. Consider the rubric.

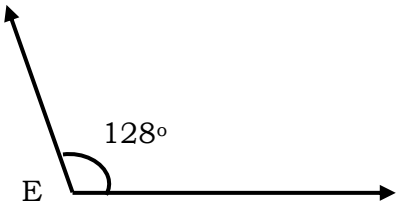
1. If ∠DON and ∠GIL are complementary angles, then solve for $m\angle DON$.

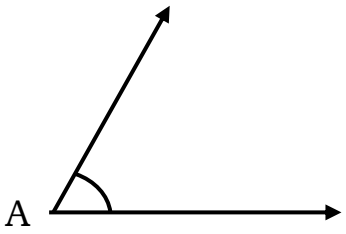




- What is the angle measure of ∠DON?

2. If ∠E and ∠A are supplementary angles, then solve for $m\angle A$.





- What is the angle measure of ∠A?

Rubric

5	3	1
The student showed his/her complete work and arrived at a correct answer.	The student's work is partly correct. There are errors on the computation as the student progressed in his/her solution.	The student attempted to answer the problem but did not finish it.

Let Us Remember

Let us summarize the terms you have encountered for this module:

1. When the sum of the measurement of two angles is equal to 180°, then these angles are called supplementary angles.

2. When the sum of the measurement of two angles is equal to 90°, then these angles are called complementary angles.

3. Congruent angles are angles that have the same degree measure.

4. Vertical angles are pair of two non-adjacent angles formed by two intersecting lines.

5. Adjacent angles are two angles that share a common side and a common vertex and do not overlap.

6. Linear pairs are adjacent angles and are supplementary. This means that the sum of the measurement of the angles is equal to 180^o.

7. Perpendicular lines are intersecting lines that form a right angle.

8. Parallel lines are lines on the same plane that will never meet. In addition, they have the same distance apart.

Let Us Assess

Choose the letter that best answers the question. Write your answer on the space provided before each number.

_____ 1. What do you call the relationship formed by two angles if the sum of their degree measure is equal to 90^o?

a. Supplementary Angles b. Complementary Angles
b. Congruent Angles d. Vertical Angles

_____ 2. What do you call the relationship formed by two angles if the sum of their degree measure is equal to 180^o?

a. Supplementary Angles b. Complementary Angles
b. Congruent Angles d. Vertical Angles

_____ 3. What do you call angles with the same measurement?

a. Vertical Angles b. Adjacent Angles
c. Supplementary Angles d. Congruent Angles

_____ 4. What do you call the two lines that intersect to form a right angle?

a. Perpendicular Lines b. Parallel Lines
c. Line Segment d. Skew Lines

_____ 5. What do you call the two lines that are equidistant from each other and will never intersect?

a. Perpendicular Lines b. Parallel Lines
c. Line Segment d. Skew Lines

_____ 6. What do you call the angles that share a common side and a common vertex and does not overlap?

a. Adjacent Lines b. Vertical Angles
c. Linear Pair d. Adjacent Angles

_____ 7. What do you call the angles that are formed by intersecting lines and are non-adjacent?

a. Perpendicular Lines b. Adjacent Angles
c. Vertical Angles c. Linear Pair

_____ 8. What do you call the angles that are adjacent and are supplementary?

a. Complementary Angles b. Vertical Angles
c. Linear Pair d. Adjacent Angles

_____ 9. What is measurement of ∠ABC if the measurement of ∠DEF is 18^o and ∠ABC and ∠DEF are complementary?

a. 72^o b. 162^o c. 18^o d. 182^o

_____ 10. What is measurement of ∠D if the measurement of ∠G is 115^o and ∠D and ∠G are supplementary?

a. 75^o b. 115^o c. 85^o d. 65^o

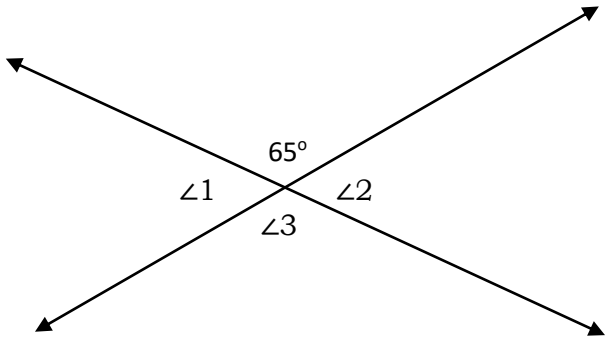
_____ 11. What is measurement of ∠L if the measurement of ∠J is 53° and ∠L and ∠J are vertical angles?

a. 53° b. 37° c. 127° d. 217°

_____ 12. What is measurement of ∠EFG if the measurement of ∠LMN is 81° and ∠EFG and ∠LMN are linear pair?

a. 9° b. 81° c. 189° d. 99°

For numbers 13-14 refer to the figure below.



_____ 13. What is the measurement of ∠1?

a. 115° b. 65° c. 25° d. 135°

_____ 14. What is the measurement of ∠3?

a. 65° b. 25° c. 115° d. 135°

_____ 15. John had stated that ALL adjacent angles are linear pairs. Is he correct? Why or why not?

a. No, he is incorrect. It does not necessarily imply that if angles are adjacent angles then they are also linear pairs.

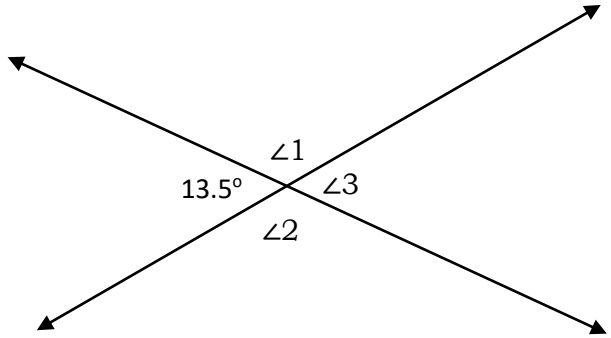
b. Yes, he is correct. Adjacent angles are also supplementary angles.

c. No, he is incorrect. The correct statement should be ALL vertical angles are linear pairs.

d. There is insufficient information.

Let Us Enhance

Solve for what is asked. Consider the rubric below. Show your complete work.



Hint: Review the discussion about Vertical Angles and Linear Pairs to solve each problem.

1. Solve for ∠1
2. Solve for ∠2
3. Solve for ∠3

Rubric

5	3	1
The student showed his/her complete work and arrived at a correct answer.	The student's work is partly correct. There are errors on the computation as the student progressed in his/her solution.	The student attempted to answer the problem but did not finish it.

Let Us Reflect

This module had discussed different relationships among geometric figures. These concepts are very important as you move up on the next discussion in geometry. These are basic concepts that are embedded in almost every geometric figures. In order to construct a figure, lines are needed and as lines are constructed angles were then created. Angle measurements are very important in construction. It makes building livable and sturdy.

Further, in this module, you have encountered problems that you need to solve. Connecting this to real-life, have you ever encountered problems that you found difficult to solve? How did you find resolution to these problems you encountered?

Answer Key

Let Us Practice

1. Supplementary Angles
2. Linear Pair
3. Complementary Angles
4. Adjacent Angles
5. ∥
6. Perpendicular Lines
7. Vertical Angles
8. Parallel Lines
9. ⊥
10. Congruent Angles

Let Us Assess

1. b
2. a
3. d
4. a
5. b
6. d
7. c
8. c
9. a
10. d
11. a
12. d
13. a
14. a
15. a

Let Us Practice More

1. 166.5°
2. 166.5°
3. 13.5°

Note: Students are scored according to the rubric

Let Us Practice More

1. 16°
2. 52°

Note: Students are scored according to the rubric

Let Us Try

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

References

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