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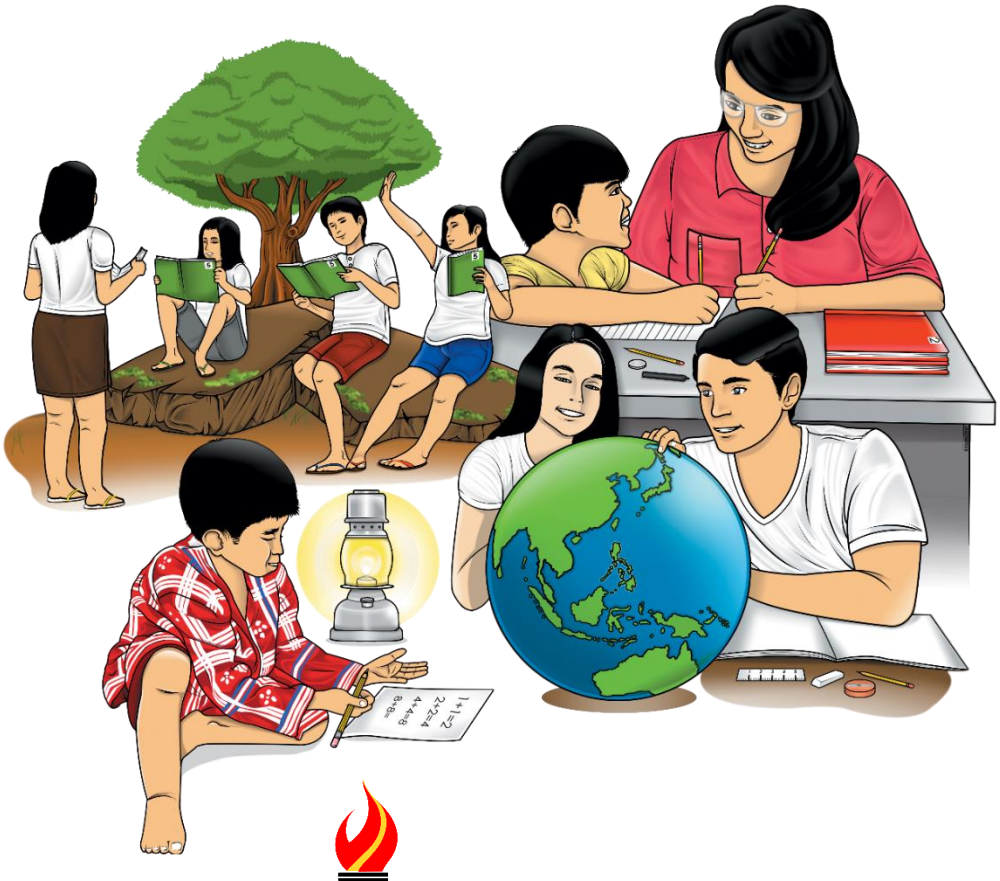
Mathematics

Quarter 3 – Module 3

Illustrating Triangle Congruence



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Mathematics

Quarter 3 – Module 3

Illustrating Triangle Congruence

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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 need to 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. And 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.

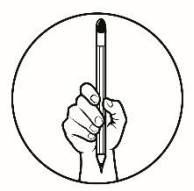
What I Need to Know

This module was designed and written with you in mind. It is here to help you illustrate triangle congruence. You are provided with varied activities to process the knowledge and skills learned and to deepen and transfer your understanding of the lesson. The scope of this module enables you to use it in many different learning situations. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module contains concepts on how to illustrate triangle congruence.

After going through this module, you are expected to:

1. define triangle congruence;
2. draw and label the corresponding parts of two congruent triangles;
3. identify corresponding parts of two congruent triangles; and
3. relate triangle congruence in real-life.



What I Know

Directions: Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following is a symbol used for congruence?
   A. $=$ C. $\approx$
   B. $\neq$ D. $\cong$

2. How many pairs of corresponding congruent angles are there in two congruent triangles?
   A. 1 C. 3
   B. 2 D. 4

3. Which of the symbols below is used to indicate correspondence?
   A. $\cong$ C. Δ
   B. $\angle$ D. $\leftrightarrow$

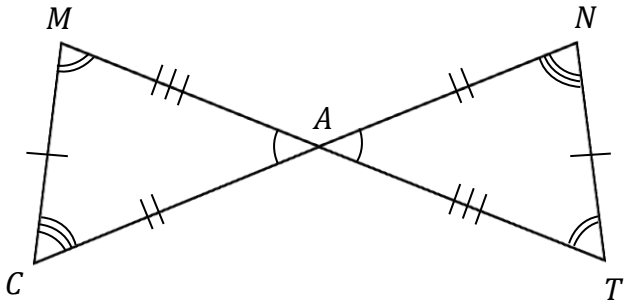
4. Which of the following statements best describe congruent triangles?
   I. They are similar.
   II. They have the same size.
   III. They have the same shape.
   IV. They are equilateral triangles.

   A. I only C. III and IV together
   B. III only D. II and III together

5. How many pairs of corresponding sides are there in two congruent triangles?
   A. 1 C. 3
   B. 2 D. 4

6. Which of the following statements best describe the corresponding parts of congruent triangles?
   A. They are not equal.
   B. They are congruent.
   C. They are supplementary.
   D. They are complementary.

For items 7 - 10, consider the figure below.



7. Which segment corresponds to $\overline{NT}$?
   A. $\overline{AT}$ C. $\overline{CM}$
   B. $\overline{AC}$ D. $\overline{MA}$

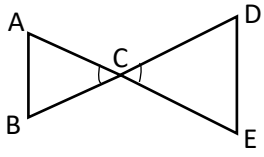
8. Which angle corresponds to $\angle T$?
   A. $\angle A$ C. $\angle M$
   B. $\angle C$ D. $\angle N$

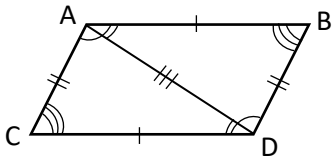
9. Which vertex corresponds to A?
   A. A C. N
   B. M D. T

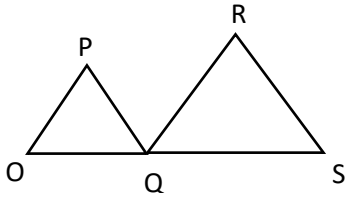
10. What conclusion can you make in the figure?
   A. $\Delta ANT \cong \Delta MAC$
   B. $\Delta ANT \cong \Delta CAM$
   C. $\Delta AMC \cong \Delta ATN$
   D. $\Delta AMC \cong \Delta TAN$

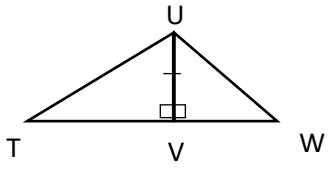
11. If $\Delta LMN \cong \Delta PRQ$, then what angle corresponds to $\angle Q$?
   A. $\angle L$ C. $\angle P$
   B. $\angle N$ D. $\angle R$

12. Which of the following figures illustrate pair of congruent triangles?

A. 

C. 

B. 

D. 

13. Which of the following correspondence is equivalent to $\angle JKL \cong \angle MNO$?
    A. $\angle KJL \leftrightarrow \angle MON$
    B. $\angle KJL \leftrightarrow \angle OMN$
    C. $\angle JLK \leftrightarrow \angle NMO$
    D. $\angle LKJ \leftrightarrow \angle ONM$

14. If $\Delta NAT \cong \Delta GEO$, then name the corresponding sides of the congruent triangles.

    A. $\overline{NA} \cong \overline{GE}$
       $\overline{AT} \cong \overline{EO}$
       $\overline{NT} \cong \overline{GO}$

    C. $\overline{AT} \cong \overline{EO}$
       $\overline{NT} \cong \overline{EG}$
       $\overline{NA} \cong \overline{OG}$

    B. $\overline{NA} \cong \overline{GO}$
       $\overline{AT} \cong \overline{EO}$
       $\overline{NT} \cong \overline{GE}$

    D. $\overline{AT} \cong \overline{GE}$
       $\overline{NA} \cong \overline{EO}$
       $\overline{NT} \cong \overline{GO}$

15. Lyka was asked by her Math teacher to give and write the corresponding sides of congruent triangles, ΔCAT and ΔDOG, on the board. Her answer is shown below.

$$\overline{AC} \leftrightarrow \overline{OD}$$
$$\overline{CT} \leftrightarrow \overline{DG}$$
$$\overline{AT} \leftrightarrow \overline{OD}$$

Is Lyka's answer correct?

A. Yes, because each side of ΔCAT is paired correctly to each side of ΔDOG.
B. Yes, because each angle of ΔCAT is paired correctly to each angle of ΔDOG.
C. No, because $\overline{AT}$ corresponds to $\overline{OG}$.
D. No, because $\overline{CT}$ corresponds to $\overline{OG}$.

Lesson 1 Illustrating Triangle Congruence

Designs and patterns having the same size and shape thrive in almost every place. These can be seen in bridges and condominiums, furniture and appliances, as well as in fabrics and crafts.

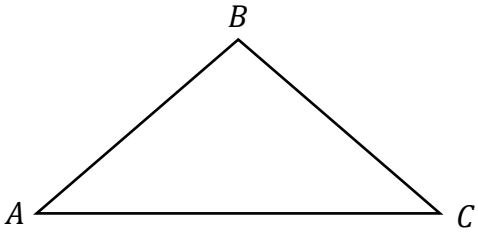
Triangle is one of the most important figures studied in Mathematics because of its many uses in the real-world.

Let us know more about triangles, particularly congruent triangles by performing the array of activities in this module. Have fun!

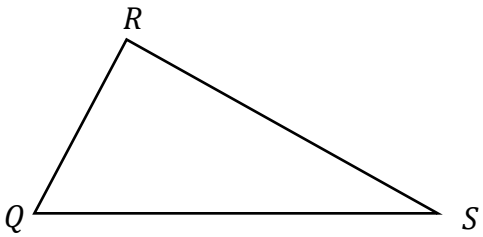
What's In

Activity: Identify V-A-S (Vertices – Angles – Sides)

Directions: Identify the vertices, angles, and sides of each triangle. Then, answer the questions below using complete sentences.



Vertices	Angles	Sides



Vertices	Angles	Sides

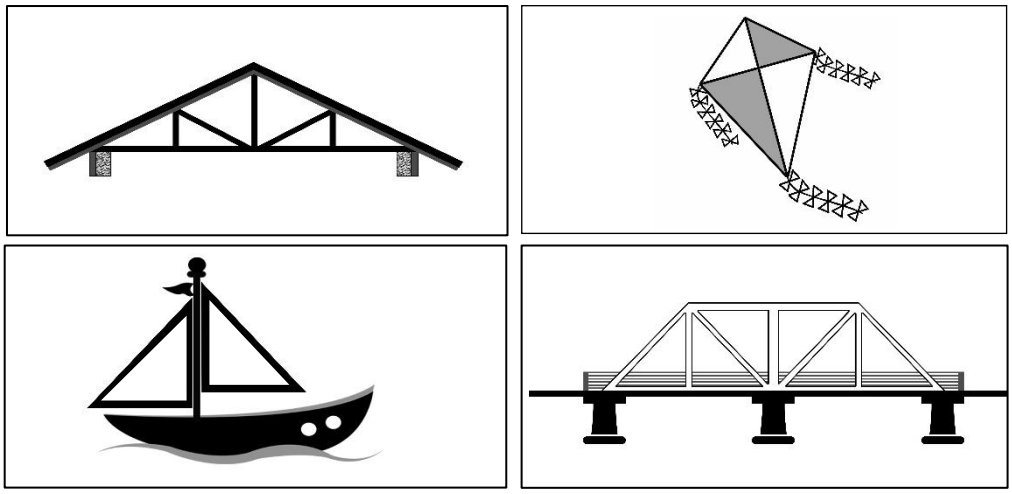
Questions:

1. How did you identify the vertices, angles, and sides of each triangle?
2. How would you define angle?
3. What about the definition of a vertex?
4. In geometry, what is meant by side?

What's New

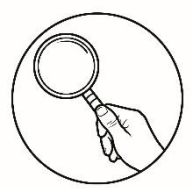
Activity: Four Pics – Two Words

Directions: Consider the figures below and answer the questions that follow.



Questions

1. What geometric figures were highlighted in the illustrations?
2. What have you observed with the size and shape of the geometric figures? Explain your answer.

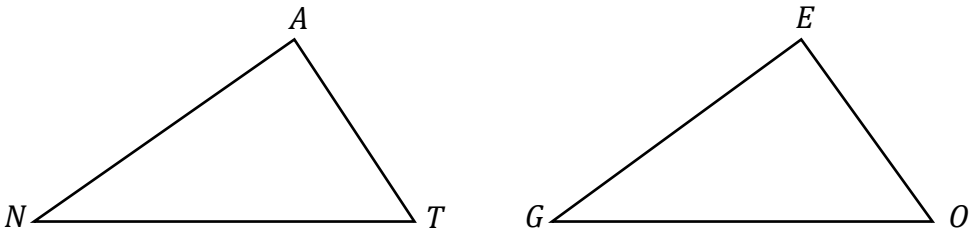


What is It

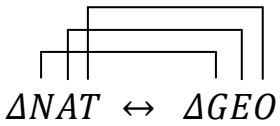
- Two line segments are congruent if their endpoints can be made to coincide.
- Two angles are congruent if their sides can be made to coincide.
- Two triangles are equal if they have the same size and shape.
- Two triangles are congruent if their corresponding parts are congruent.

Definition of Correspondence

Pairing the parts of one group to the parts of another group is called *correspondence*. Correspondence uses the notation "↔".



Assume ΔNAT coincides with ΔGEO, such that the vertices of ΔNAT fit exactly over the vertices of ΔGEO . The correspondence can be created between triangles.



$$\Delta NAT \leftrightarrow \Delta GEO$$

Note

In naming congruent triangles, the order of the letters representing the vertices of one triangle shall be written in the same order as their corresponding vertices in the other triangle.

In this correspondence, there are three pairs of corresponding vertices, angles, and sides.

Corresponding Vertices	Corresponding Angles	Corresponding Sides
$N \leftrightarrow G$	$\angle N \leftrightarrow \angle G$	$\overline{NA} \leftrightarrow \overline{GE}$
$A \leftrightarrow E$	$\angle A \leftrightarrow \angle E$	$\overline{AT} \leftrightarrow \overline{EO}$
$T \leftrightarrow O$	$\angle T \leftrightarrow \angle O$	$\overline{NT} \leftrightarrow \overline{GO}$

Since the vertices of ΔNAT fit exactly with the vertices of ΔGEO, therefore ΔNAT and ΔGEO are congruent. In symbols,

$$\Delta NAT \cong \Delta GEO$$

Definition of Congruent Triangles

Two triangles are congruent if and only if the corresponding sides and the corresponding angles are congruent.

($\Delta NAT \cong \Delta GEO$ is read as "triangle $N-A-T$ is congruent to triangle $G-E-O$")

It implies that the corresponding parts of congruent triangles are also congruent.

CPCTC

Corresponding **P**arts of **C**ongruent **T**riangles are **C**ongruent.

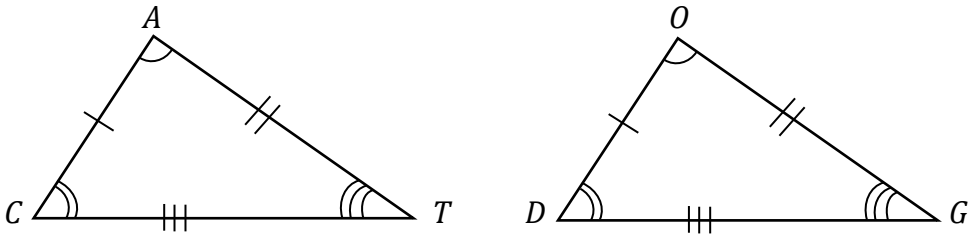
Congruent Angles
$\angle N \cong \angle G$
$\angle A \cong \angle E$
$\angle T \cong \angle O$

Congruent Sides
$\overline{NA} \cong \overline{GE}$
$\overline{AT} \cong \overline{EO}$
$\overline{NT} \cong \overline{GO}$

Conversely, if the corresponding parts of the two triangles are congruent, then the two triangles are congruent.

Example 1

$\Delta CAT \cong \Delta DOG$. Write down the pairs of corresponding parts.



Solution

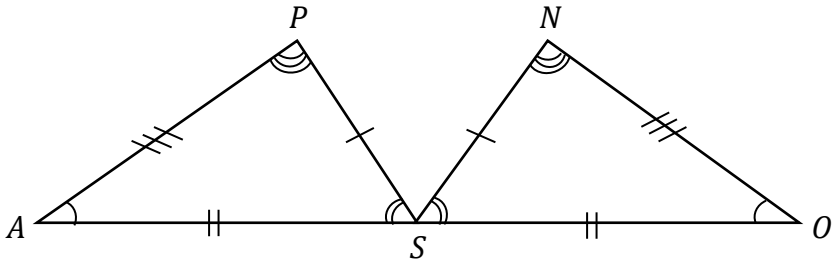
The congruent parts of congruent triangles can be determined with the help of arcs and tick-marks.

Corresponding Angles
$\angle C \leftrightarrow \angle D$
$\angle A \leftrightarrow \angle O$
$\angle T \leftrightarrow \angle G$

Corresponding Sides
$\overline{CA} \leftrightarrow \overline{DO}$
$\overline{CT} \leftrightarrow \overline{DG}$
$\overline{AT} \leftrightarrow \overline{OG}$

Example 2

Given that the two triangles below are congruent, list the pairs of congruent angles and congruent sides and then name the congruent triangles.



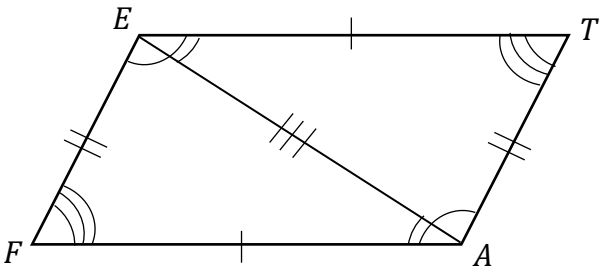
Solution

Congruent Angles	Congruent Sides
$\angle A \cong \angle O$	$\overline{PS} \cong \overline{NS}$
$\angle P \cong \angle N$	$\overline{PA} \cong \overline{NO}$
$\angle PSA \cong \angle NSO$	$\overline{SA} \cong \overline{SO}$

$$\Delta PSA \cong \Delta NSO$$

Example 3

Consider $\Delta FAE \cong \Delta TEA$. List down the pairs of congruent angles and congruent sides.



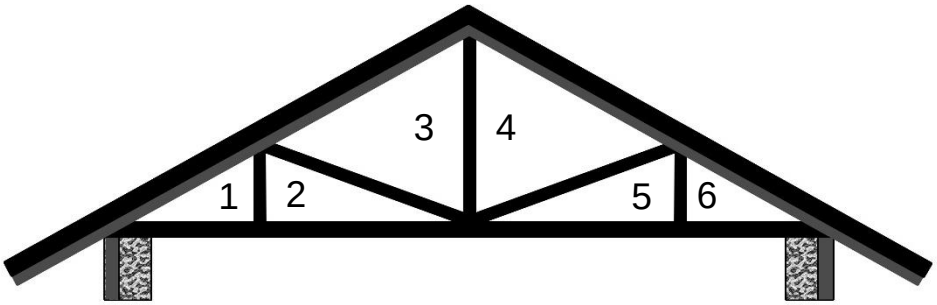
Solution

Again, the congruent parts of congruent triangles can be determined with the help of arcs and tick-marks. Since $\Delta FAE \cong \Delta TEA$, then the corresponding parts are as follows:

Corresponding Angles	Corresponding Sides
$\angle F \leftrightarrow \angle T$	$\overline{FA} \leftrightarrow \overline{TE}$
$\angle FEA \leftrightarrow \angle TAE$	$\overline{FE} \leftrightarrow \overline{TA}$
$\angle FAE \leftrightarrow \angle TEA$	$\overline{EA} \leftrightarrow \overline{AE}$

Example 4

Assume that segments and angles in the numbered triangles are congruent. Identify which triangles are congruent.

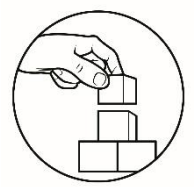


Solution

Looking at the figures, it can be deduced that $\Delta 1 \cong \Delta 6$, $\Delta 2 \cong \Delta 5$, and $\Delta 3 \cong \Delta 4$.

Remember:

- Triangles that have exactly the same size and shape are congruent.
- Two triangles are congruent if their corresponding sides and angles are congruent.
- Two triangles are congruent if they fit exactly or coincide when one triangle is put on top of the other.

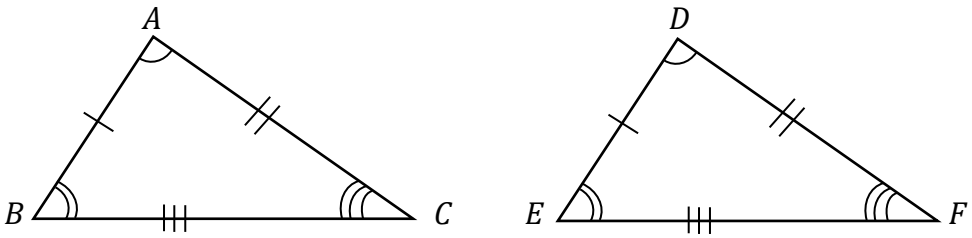


What's More

Activity 1: Find My PARTner

Description: In this activity, you will be pairing parts of one triangle to the parts of another triangle. Note that the notation "↔" shows corresponding parts.

Directions: Copy the table on your answer sheet and supply the missing part of the triangle that will make each correspondence complete. Answer the questions that follow.



Corresponding Vertices	Corresponding Angles	Corresponding Sides
$A \leftrightarrow$ ____ ____ $\leftrightarrow E$ $C \leftrightarrow F$	$\angle A \leftrightarrow$ ____ $\angle B \leftrightarrow$ ____ $\angle C \leftrightarrow$ ____	$\overline{AB} \leftrightarrow$ ____ ____ $\leftrightarrow \overline{DF}$ $\overline{BC} \leftrightarrow$ ____

Questions:

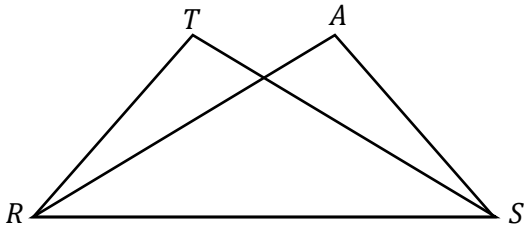
1. What have you noticed on the given triangles?
2. What does the mark of the angles and sides of the triangle indicate?
3. Are there angles and sides that have the same measure and length? Explain your answer.
4. Describe the relationship between ΔABC andΔDEF.

Activity 2: Draw and Name

Directions: Do what is asked. Use a separate sheet of paper.

1. Draw $\Delta ACT \cong \Delta NOW$. Put identical markings on corresponding congruent parts.

2. $\Delta STR \cong \Delta RAS$. Name the six pairs of corresponding congruent parts.



Congruent Angles	Congruent Sides

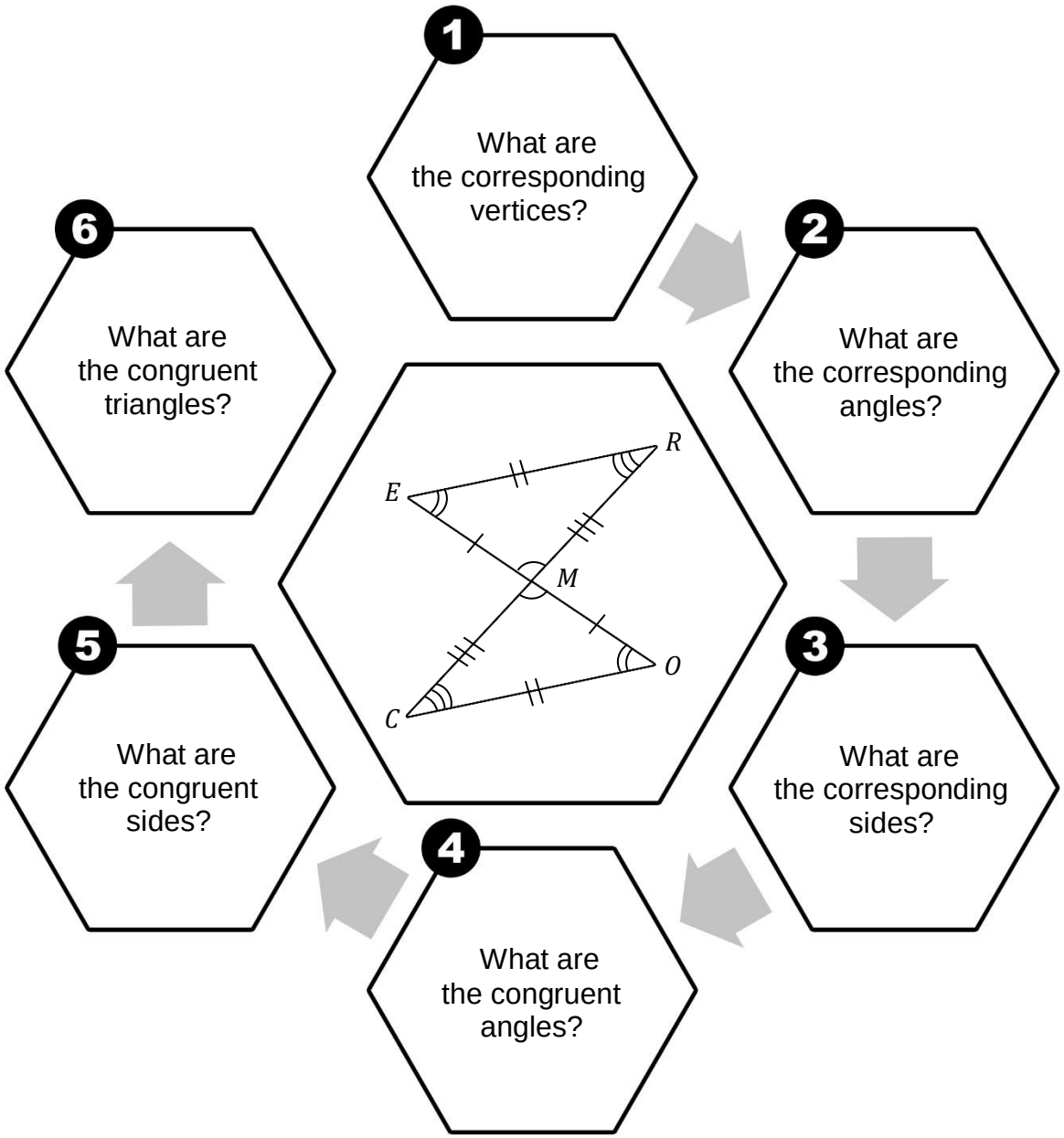
3. Listed below are the six pairs of corresponding parts of two congruent triangles. Name the two congruent triangles.

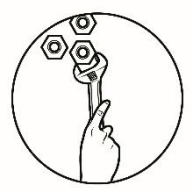
Congruent Angles	Congruent Sides
$\angle T \cong \angle E$ $\angle O \cong \angle O$ $\angle W \cong \angle N$	$\overline{TW} \cong \overline{EN}$ $\overline{OT} \cong \overline{OE}$ $\overline{WO} \cong \overline{NO}$

Congruent Triangles

What I Have Learned

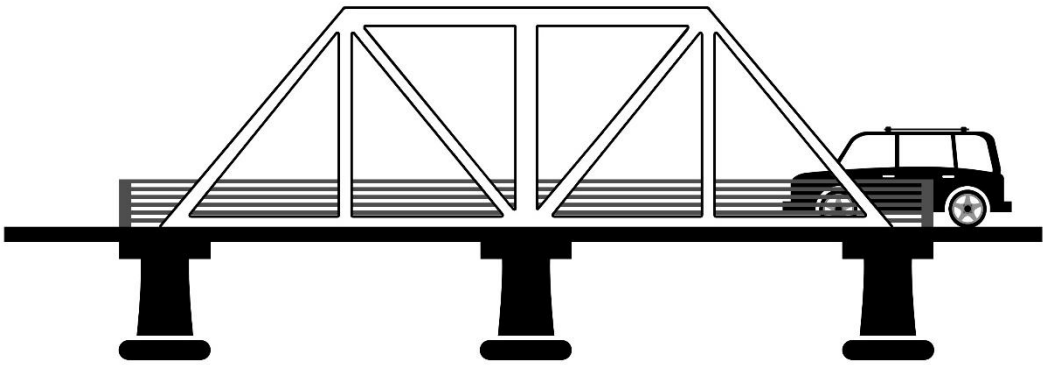
Let us see how far you have learned about congruent triangles by answering each question in the diagram below. Consider the figure at the center. Write your answers on a separate paper.





What I Can Do

One of the structural applications of triangles can be seen in bridges. In the illustration below, there are pairs of congruent triangles. Do what is asked below and write your answer on a separate paper.



Directions:

1. Select a pair of congruent triangles.
2. Label these triangles as ΔSAF and ΔEAF.
3. Put similar markings to show clearly the congruent sides and congruent angles.
4. List down the corresponding congruent parts of the congruent triangles.

Assessment

Directions: Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following statements is **not true** about congruent triangles?
   A. They are dissimilar.
   B. They are coinciding.
   C. They have the same size and shape.
   D. They have corresponding congruent parts.

2. How many pairs of corresponding congruent parts are there in two congruent triangles?
   A. 2 C. 4
   B. 3 D. 6

3. If $\Delta FRY \cong \Delta HOT$, which segment is congruent to $\overline{RY}$?
   A. $\overline{HT}$ C. $\overline{OT}$
   B. $\overline{FY}$ D. $\overline{RF}$

4. Which of the following is true about the corresponding parts of congruent triangles?
   A. They are unequal.
   B. They are congruent.
   C. They are supplementary.
   D. They are complementary.

5. If $\Delta SIT \cong \Delta HOP$, then what angle corresponds to $\angle T$?
   A. $\angle H$ C. $\angle P$
   B. $\angle I$ D. $\angle S$

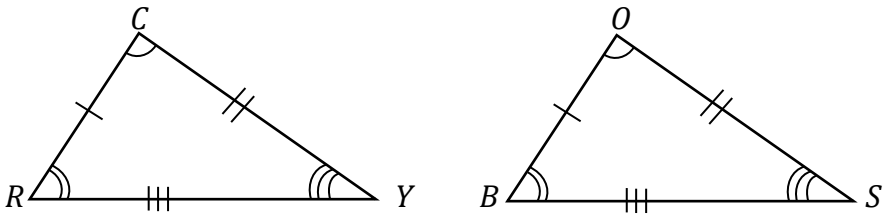
6. Name the congruent triangles whose pairs of corresponding parts are shown below.

   $\angle H \cong \angle S$ $\overline{RE} \cong \overline{NO}$
   $\angle R \cong \angle N$ $\overline{HE} \cong \overline{SO}$
   $\angle E \cong \angle O$ $\overline{HR} \cong \overline{SN}$

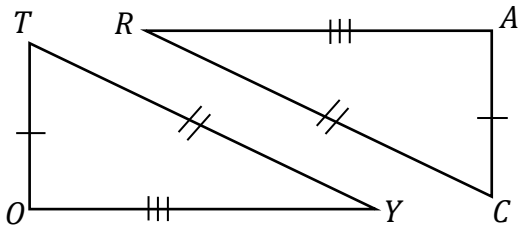
   A. $\Delta NOS \cong \Delta HER$ C. $\Delta SON \cong \Delta EHR$
   B. $\Delta NSO \cong \Delta ERH$ D. $\Delta SON \cong \Delta HER$

7. In the figure, $\Delta CRY \cong \Delta OBS$, what is the side corresponding to $\overline{SB}$?

A. $\overline{BC}$
B. $\overline{CR}$
C. $\overline{YC}$
D. $\overline{YR}$



8. Use the marked triangles in writing a correct congruence statement.



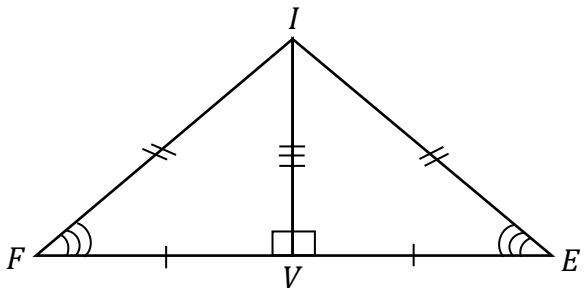
A. $\overline{CR} \cong \overline{TY}$
$\overline{OY} \cong \overline{CA}$
$\overline{RA} \cong \overline{OY}$
$\Delta TOY \cong \Delta CAR$

C. $\overline{TO} \cong \overline{CA}$
$\overline{TY} \cong \overline{RC}$
$\overline{OY} \cong \overline{AC}$
$\Delta TOY \cong \Delta CAR$

B. $\overline{CR} \cong \overline{TY}$
$\overline{OY} \cong \overline{AR}$
$\overline{TY} \cong \overline{RA}$
$\Delta TOY \cong \Delta CAR$

D. $\overline{OT} \cong \overline{AC}$
$\overline{TY} \cong \overline{CR}$
$\overline{OY} \cong \overline{AR}$
$\Delta TOY \cong \Delta CAR$

For items 9-12, refer to the figure shown below.



9. Which of the following shows a pair of congruent triangles?

A. $\Delta FIV \cong \Delta IVE$
B. $\Delta FIV \cong \Delta EIV$
C. $\Delta IFV \cong \Delta IVE$
D. $\Delta IFV \cong \Delta VIE$

10. What angle corresponds to $\angle FVI$?

A. $\angle E$ C. $\angle EIV$

B. $\angle F$ D. $\angle EVI$

11. Which segment is congruent to $\overline{EV}$?

A. $\overline{IE}$ C. $\overline{FV}$

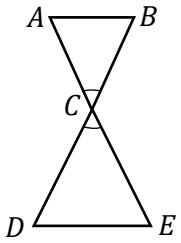
B. $\overline{IV}$ D. $\overline{VE}$

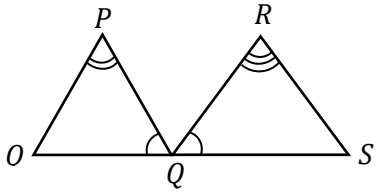
12. Which vertex corresponds to F?

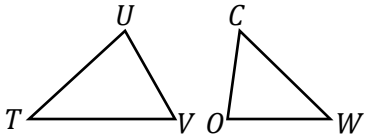
A. E C. F

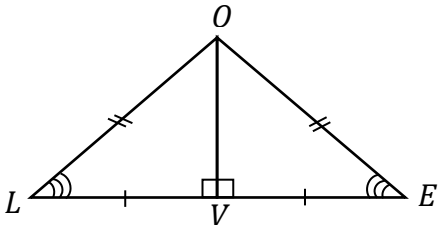
B. I D. V

13. Which of the following figures show congruent triangles?

A. 

C. 

B. 

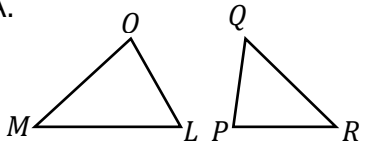
D. 

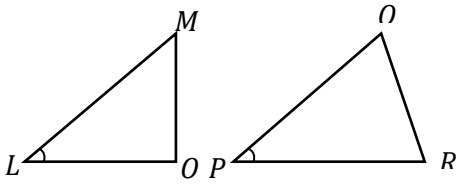
14. What would be the name of the congruent triangles given their corresponding sides: $\overline{LO} \cong \overline{RP}$, $\overline{MO} \cong \overline{QP}$, $\overline{LM} \cong \overline{RQ}$?

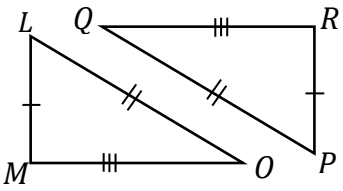
A. $\Delta LOM \cong \Delta QPR$ C. $\Delta MOL \cong \Delta RQP$

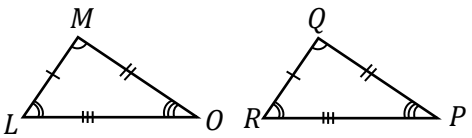
B. $\Delta OML \cong \Delta PQR$ D. $\Delta LMO \cong \Delta PQR$

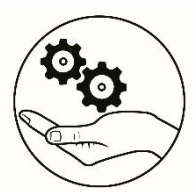
15. Which of the following illustrations below best describe the congruent triangle in item 14?

A. 

C. 

B. 

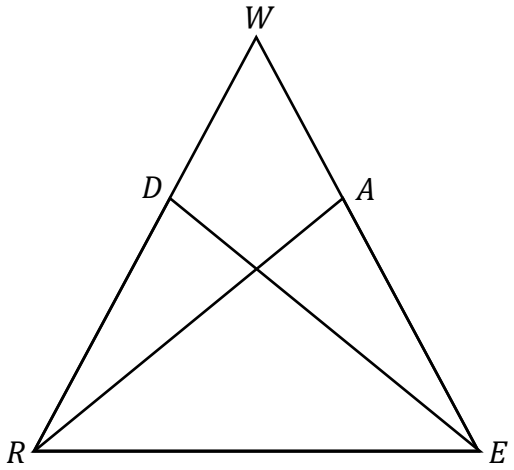
D. 



Additional Activities

Directions: Do what is asked. Use separate paper to draw your answers.

Given: $\Delta RED \cong \Delta ERA$



1. Separate the overlapping triangles.

2. Put identical/similar markings to show clearly the congruent sides and congruent angles.

Answer Key

Additional Activities

What's More

1. Corresponding Vertices
   $A \leftrightarrow D$
   $B \leftrightarrow E$

   Corresponding Angles
   $\angle A \leftrightarrow \angle D$
   $\angle B \leftrightarrow \angle E$
   $\angle C \leftrightarrow \angle F$

   Corresponding Sides
   $\overline{AB} \leftrightarrow \overline{DE}$
   $\overline{AC} \leftrightarrow \overline{DF}$
   $\overline{BC} \leftrightarrow \overline{EF}$

2. Note: Illustration varies however the congruent parts must be considered.

3. Congruent Angles
   $\angle S \cong \angle R$
   $\angle T \cong \angle A$
   $\angle R \cong \angle S$
   Congruent Sides
   $\overline{ST} \cong \overline{RA}$
   $\overline{TR} \cong \overline{AS}$
   $\overline{SR} \cong \overline{RS}$
4. $\Delta TOW \cong \Delta EON$

Assessment

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

What I Can Do

Congruent Angles
$\angle A \cong \angle A$
$\angle F \cong \angle F$
$\angle S \cong \angle E$

Congruent Sides
$\overline{AS} \cong \overline{AE}$
$\overline{SF} \cong \overline{EF}$
$\overline{AF} \cong \overline{AF}$

What I Have Learned

1. $\Delta MER \cong \Delta MOC$
2. $M \leftrightarrow M$
   $C \leftrightarrow R$
   $O \leftrightarrow E$
3. $\angle M \leftrightarrow \angle M$
   $\angle C \leftrightarrow \angle R$
   $\angle O \leftrightarrow \angle E$
4. $\overline{MO} \leftrightarrow \overline{ME}$
   $\overline{CO} \leftrightarrow \overline{RE}$
   $\overline{CM} \leftrightarrow \overline{RM}$
5. $\angle M \cong \angle M$
   $\angle C \cong \angle R$
   $\angle O \cong \angle E$
6. $\overline{MO} \cong \overline{ME}$
   $\overline{CO} \cong \overline{RE}$
   $\overline{CM} \cong \overline{RM}$

What's New

1. Triangles
2. The triangles have the same size and shape.
3. If we put these triangles one over the other, they would fit exactly or coincide.

What's In

For ΔABC
Vertices: A, B, C
Angles: $\angle A, \angle B, \angle C$
Sides: $\overline{AB}$, $\overline{AC}$, $\overline{BC}$

For ΔQRS
Vertices: Q, R, S
Angles: $\angle Q, \angle R, \angle S$
Sides: $\overline{QR}$, $\overline{QS}$, $\overline{RS}$

Angle - A pair of rays that have a common endpoint, provided that the rays do not lie on the line.

Vertex- In an angle, it is the common endpoint of two rays. In a polygon, it is the common endpoint of two sides.

Sides – In an angle, the sides are rays that form the angle. In a polygon, the sides are the segments that form a polygon.

What I Know

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

References

Abuzo, Emmanuel P., Bryant, Merden L., Cabrella, Jem Boy B. Caldez, Belen P., Callanta, Melvin M., Castro, Anastacia Preserfina I., Halabaso, Alicia R., Javier, Sonia P., Nocom, Roger T., and Ternida, Conception S. (2013). Grade 8 Mathematics Learners Module. pp. 352-353. Philippines. Book Media Press, Inc. and Printwell, Inc.

Bernabe, Julieta G., et.al. (2009). Revised Edition Geometry, pp. 88-90, Gregoria Araneta Avenue, Quezon City, Philippines. SD Publications, Inc.

Orines, Fernando B., et.al. (2008). Second Edition Next Century Mathematics, pp. 201-203, Quezon Avenue, Quezon City, Philippines. Phoenix Publishing House, Inc.

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