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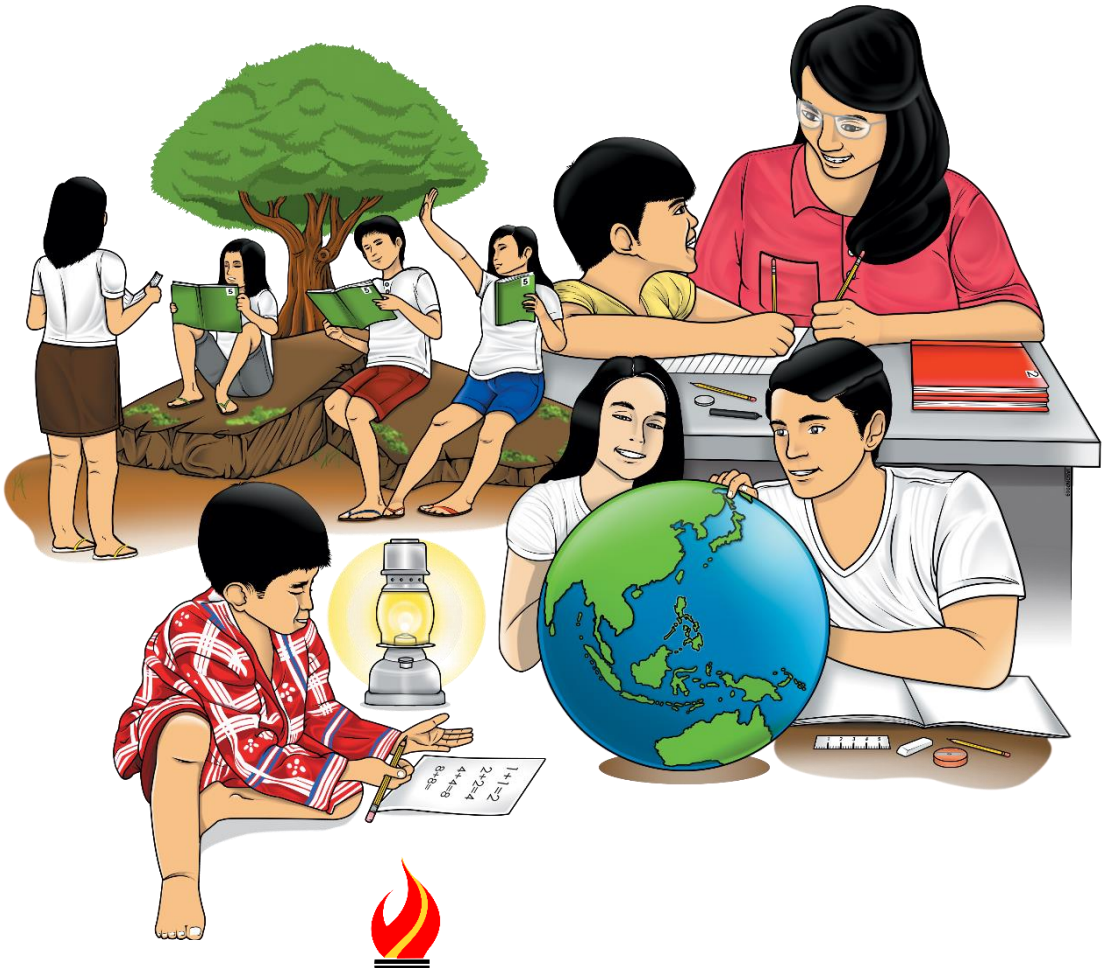
Mathematics

Quarter 3 – Module 12: Right Triangle Similarity Theorems



ALTERNATIVE DELIVERY MODE
ADM

Mathematics – Grade 9
Alternative Delivery Mode
Quarter 3 – Module 12: Right Triangle Similarity Theorems
First Edition, 2020

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

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Printed in the Philippines by _____

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9

Mathematics

Quarter 3 – Module 12: Right Triangle Similarity Theorems

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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

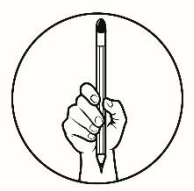
This module was designed and written with you in mind. It is here to help you master the **Right Triangle Similarity Theorems**. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are 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.

The module is comprised only of one lesson:

- Right Triangle Similarity Theorems

After going through this module, you are expected to:

- prove the conditions for similarity of right triangles. **M9GE-IIIg-h-1**



What I Know

Find out how much you already know about the module. Write the letter that you think is the best answer to each question on a sheet of paper. Answer all items. After taking and checking this short test, take note of the items that you were not able to answer correctly and look for the right answers as you go through this module. Write your answers on your answer sheet.

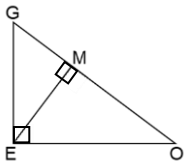
1. Which is not true about corresponding sides/angles in similar triangles?
   A. Sides are congruent. C. Angles are congruent.
   B. Sides are proportional . D. Angles are proportional.

2. The altitude of a triangle is a segment from a vertex _____ to the line containing the opposite side.
   A. skew C. coplanar
   B. parallel D. perpendicular

3. If an altitude from the vertex of the right angle of a right triangle is drawn to the hypotenuse, how many similar triangles are there?.
   A. one C. three
   B. two D. none

4. The length of the altitude drawn from the vertex of the right angle to the hypotenuse of a right triangle is the _____ mean of the lengths of the two segments along the hypotenuse.
   A. arithmetic C. harmonic
   B. geometric D. weighted

For numbers 5 to 11, base your answers on the right ΔGEO at the right.



5. $\overline{GE}$ is the _____ of ΔGME.
   A. altitude C. hypotenuse
   B. leg D. base

6. Which of the following triangle similarities is written with correct correspondence?
   A. $\Delta GEM \sim \Delta MEO$ C. $\Delta GEM \sim \Delta EOM$
   B. $\Delta GEM \sim \Delta GEO$ D. $\Delta GEM \sim \Delta EMO$

7. Complete the proportion, $\frac{|GO|}{|EO|} = \frac{|EO|}{?}$.
   A. |GE| C. |ME|
   B. |GM| D. |MO|

8. Which of the following proportions is correct?

A. $\frac{|GM|}{|GE|} = \frac{|OE|}{|OM|}$

C. $\frac{|GM|}{|GE|} = \frac{|GM|}{|MO|}$

B. $\frac{|GM|}{|ME|} = \frac{|ME|}{|OM|}$

D. $\frac{|GM|}{|ME|} = \frac{|ME|}{|EO|}$

9. If $m\angle MEG = 27°$, what is $m\angle MOE$?

A. 27°

C. 90°

B. 53°

D. 117°

10. If $|GM| = 4$ cm and $|MO| = 9$ cm, what is the length of $\overline{ME}$?

A. 5 cm

C. 7 cm

B. 6 cm

D. 8 cm

11. If $|GE| = 6$cm and $|GM| = 2$cm, what is the length of $\overline{MO}$?

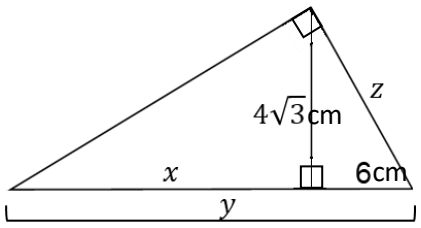
A. 16 cm

C. 20 cm

B. 18 cm

D. 22 cm

For numbers 12 to 15, base your answers on this figure.



12. Which of the following is true?

A. $y = \sqrt{6x}$ cm

C. $4\sqrt{3}\ cm = \sqrt{6x}$ cm

B. $y = \sqrt{6z}$ cm

D. $4\sqrt{3}\ cm = \sqrt{6y}$ cm

13. Find the value of x in the figure.

A. 4cm

C. 12cm

B. 8cm

D. 16cm

14. Find the value of y in the figure.

A. 10cm

C. 18cm

B. 14cm

D. 20cm

15. Find the value of z in the figure?

A. $7\sqrt{6}$ cm

C. $2\sqrt{21}$ cm

B. $14\sqrt{6}$ cm

D. $4\sqrt{21}$ cm

Lesson 1 Right Triangle Similarity Theorems

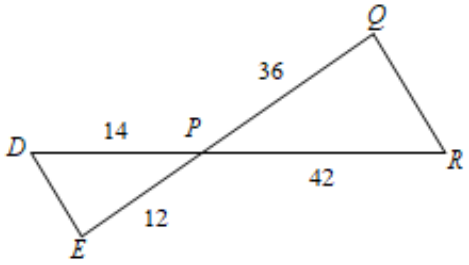
Two triangles are similar if their corresponding angles are congruent. In effect, the corresponding sides of similar triangles are proportional. So far, you have learned three triangle similarity theorems: AA similarity postulate, SSS and SAS similarity theorems.

What's In

Collaboration and Critical Thinking

Before going further, let us recall how triangles can be similar. Determine if the following pairs of triangles are similar. If so, state which triangle similarity theorem applies and name the similar triangles.

1.



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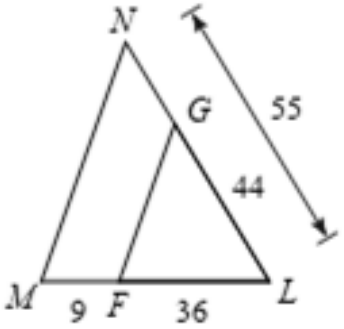

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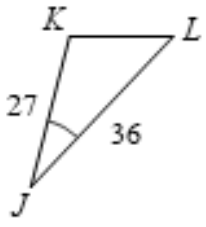

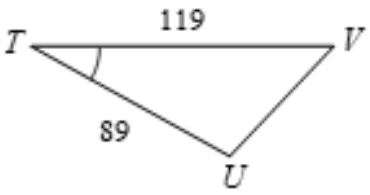

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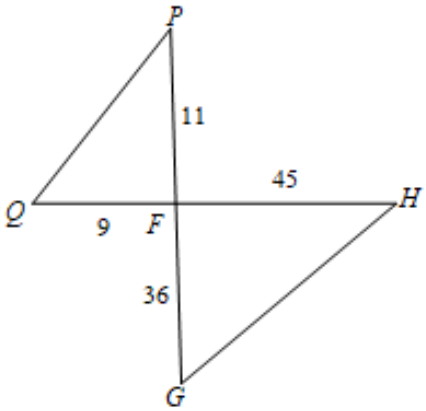

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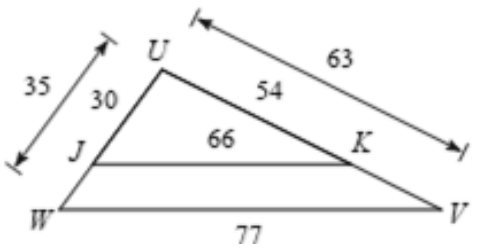

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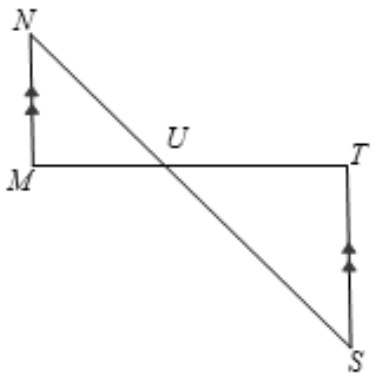


What's New

Communication, Critical Thinking, and Collaboration

Read the selection below.

SAILING IN BALANGAYS

The Philippines has a rich history of seafaring. The first wooden boat discovered in South East Asia is the *balangay*. It is believed that the first Filipino families and communities travel in these boats to find lands for settlement. They were also used for cargo and trading merchandise across different islands.

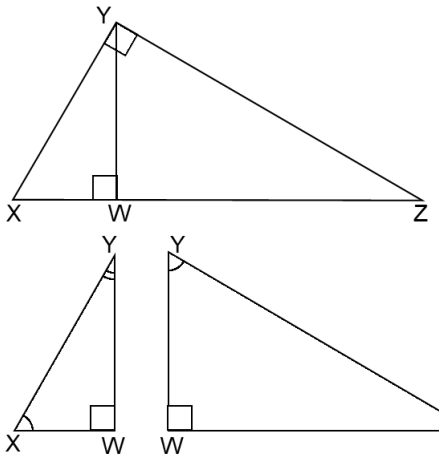
To navigate the *balangay*, the seafarers catch the wind to move using sails. The sails come in different shapes and sizes, and the most common for small wooden boats are triangle-shaped since those are easy to set up and do not take a lot of space and preparation. Some of them also use multiple sails to balance the amount of wind to speed up or slow down the boat. One of the common features of these sails is they are cut in similar forms of right triangles of varying scales. What concepts in geometry are applied in making these sails? How can the sails be more efficient? How can this knowledge help you?

Intuitively, some shipwrights apply the concept of similarity in right triangles to create balanced and efficient sails. The concepts of triangle similarity or proportions play an important role in architecture, engineering, and other sciences.

Right Triangle Similarity Theorem

If the altitude of a right triangle is drawn to the hypotenuse, then the two triangles formed are similar with each other and to the original right triangle.

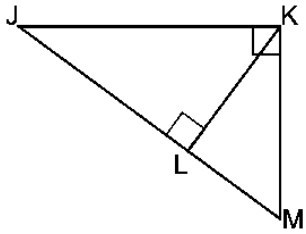
One way to prove this theorem is by illustrating the right triangles separately and showing that the corresponding angles are congruent. So, let ΔXYZ be a right triangle where $\angle XYZ$ the right angle, and $\overline{YW}$ is an altitude to the hypotenuse $\overline{XZ}$.



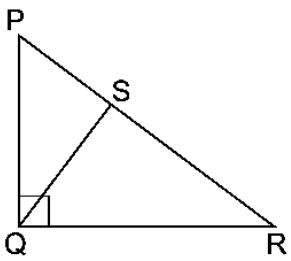
Since $\angle XYZ$ is a right angle and $\overline{YW}$ is an altitude, we can say that $\angle X$ and $\angle Z$ are complementary. Now, splitting the right triangle into two, we form new angles $\angle XYW$ and $\angle WYZ$ which are complements of $\angle X$ and $\angle Z$ respectively. With these conditions, we can say that $\angle X \cong \angle WYZ$ and $\angle Z \cong \angle XYW$, also $\angle XWY \cong \angle YWZ$ because they are right angles. Hence, all corresponding angles are congruent. Therefore $\boldsymbol{\Delta XYZ \sim \Delta XWY \sim \Delta YWZ}$.

Example 1 – Name all similar right triangles. Make sure that the corresponding angles are congruent.

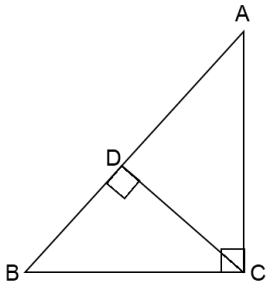
a.



b.



c.

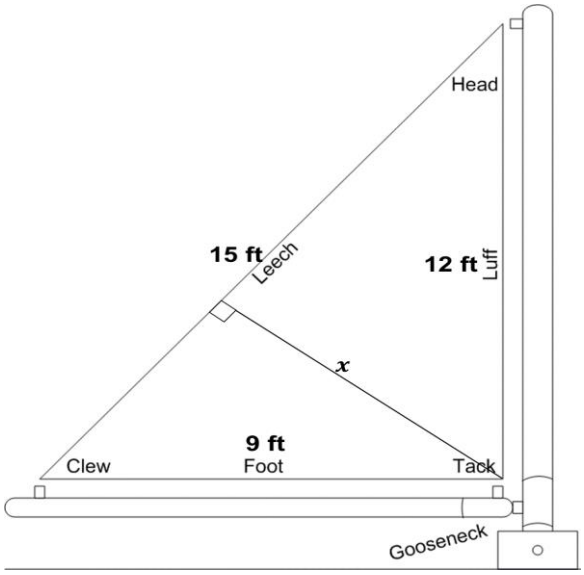


Solution:

a. $\Delta JKM \sim \Delta JLK \sim \Delta KLM$

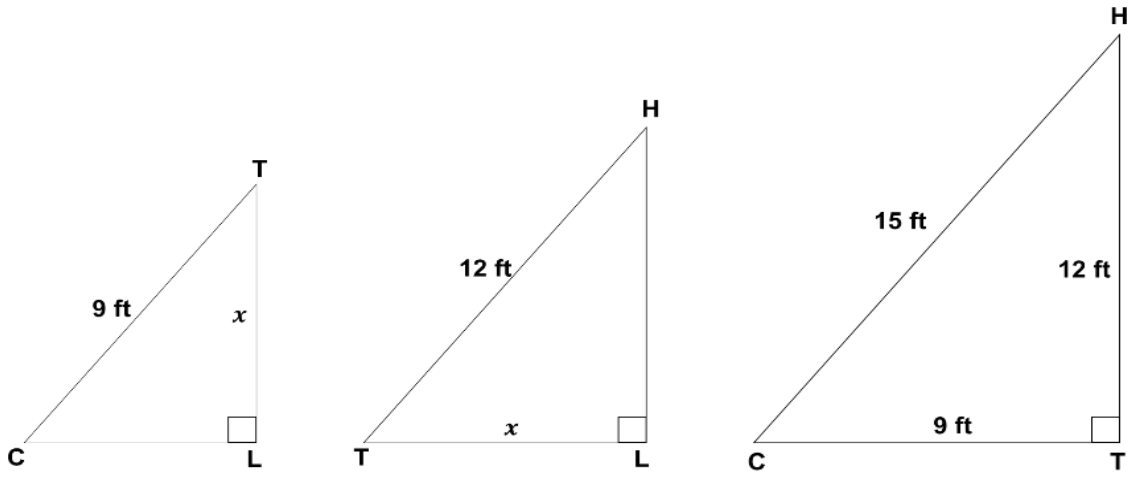
b. $\Delta PQR \sim \Delta PSQ \sim \Delta QSR$

c. $\Delta ABC \sim \Delta CBD \sim \Delta ACD$



Consider the illustration of the parts of a right triangular sail. The height of the sail is called the *luff*, the base of the sail is called the *foot*, the *tack* is found at the vertex of the right angle, while the hypotenuse of the triangular sail is called the *leech*.

If the luff is 12 ft. long and the foot measures 9 ft., how far is the tack from the leech. Remember that the shortest distance from the vertex of the right angle to the hypotenuse is an altitude of the right triangle. Hence, we have three similar triangles, ΔTLC, $\Delta HLT, and\, \Delta HTC$, and are shown separately below.



Since they are similar by the Right Triangle Similarity Theorem, their corresponding sides are proportional, $\frac{|TL|}{|TC|} = \frac{|HT|}{|HC|}$.

$\frac{x}{9} = \frac{12}{15}$ Substitute terms of the proportion by the lengths of the sides

$x = \frac{108}{15}$ Solve for the value of x.

$x = 7.2\ ft$ Divide.

Therefore, the distance from the tack to the leech is 7.2 ft.

We can actually manipulate the variables and arrive with the following proportions:

$$\frac{\text{shorter leg of } \Delta TLC}{\text{longer leg of } \Delta TLC} \rightarrow \frac{|LC|}{|LT|} = \frac{|LT|}{|LH|} \leftarrow \frac{\text{shorter leg of } \Delta HLT}{\text{longer leg of } \Delta HLT}$$

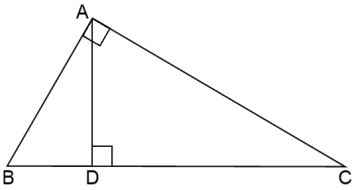
$$\frac{\text{shorter leg of } \Delta TLC}{\text{hypotenuse of } \Delta TLC} \rightarrow \frac{|LC|}{|TC|} = \frac{|TC|}{|HC|} \leftarrow \frac{\text{shorter leg of } \Delta HTC}{\text{hypotenuse of } \Delta HTC}$$

$$\frac{\text{longer leg of } \Delta HLT}{\text{hypotenuse of } \Delta HLT} \rightarrow \frac{|HL|}{|HT|} = \frac{|HT|}{|HC|} \leftarrow \frac{\text{longer leg of } \Delta HTC}{\text{hypotenuse of } \Delta HTC}$$

What is It

Geometric Means Theorem

In a right triangle, the altitude drawn from the vertex of the right angle to the hypotenuse divides the hypotenuse in two segments:



- The length of the altitude is the geometric mean of the lengths of the two segments.

$$\frac{|AD|}{|BD|} = \frac{|CD|}{|AD|} \rightarrow |AD|^2 = |BD||CD| \rightarrow |AD| = \sqrt{|BD||CD|}$$

- The length of each leg of the right triangle is the geometric mean of the lengths of the hypotenuse and the segment of the hypotenuse adjacent to the leg.

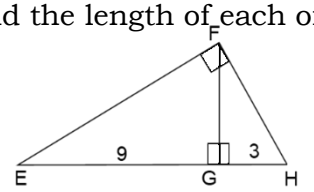
$$\frac{|AB|}{|BD|} = \frac{|BC|}{|AB|} \rightarrow |AB|^2 = |BD||BC| \rightarrow |AB| = \sqrt{|BD||BC|}$$

and

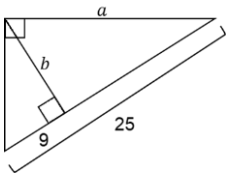
$$\frac{|AC|}{|CD|} = \frac{|BC|}{|AC|} \rightarrow |AC|^2 = |BC||CD| \rightarrow |AC| = \sqrt{|BC||CD|}$$

Example 2 – Find the length of each of the indicated sides.

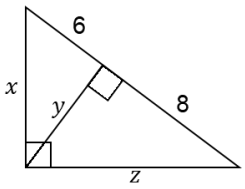
a. $|FG|$



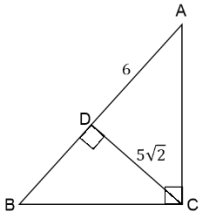
c. a, b



b. x, y, z

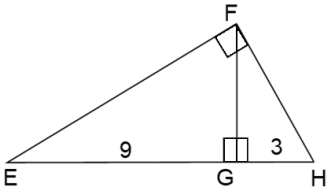


d. $|BD|, |AC|$



Solution

a.



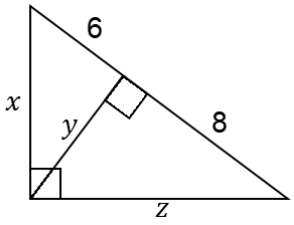
Note that $\Delta EFG \sim \Delta FHG$, so $\frac{|FG|}{|EG|} = \frac{|HG|}{|FG|}$

$$\frac{|FG|}{9} = \frac{3}{|FG|}$$

$$(|FG|)^2 = 27$$

$$|FG| = \sqrt{27} = \mathbf{3\sqrt{3}}$$

b.



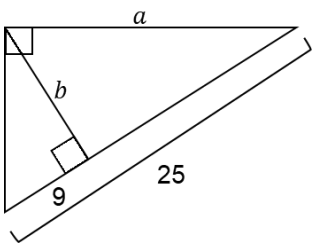
$$\frac{x}{6} = \frac{6+8}{x} \qquad \frac{y}{6} = \frac{8}{y} \qquad \frac{z}{8} = \frac{6+8}{z}$$

$$x^2 = 6(14) \qquad y^2 = 48 \qquad z^2 = 8(14)$$

$$x = \sqrt{84} \qquad \mathbf{y = 4\sqrt{3}} \qquad z = \sqrt{112}$$

$$\mathbf{x = 2\sqrt{21}} \qquad\qquad \mathbf{z = 4\sqrt{7}}$$

c.

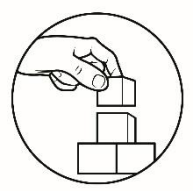


$$\frac{a}{25-9} = \frac{25}{a} \qquad \frac{b}{9} = \frac{25-9}{b}$$

$$a^2 = 16(25) \qquad b^2 = 9(16)$$

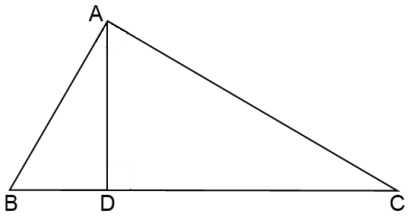
$$a = \sqrt{400} \qquad b = \sqrt{144}$$

$$\mathbf{a = 20} \qquad \mathbf{b = 12}$$



What's More

Activity 1: Prove the Right Triangle Similarity Theorem. Complete the proof by supplying reasons to the following statements from the word pool. Use your answer sheet.



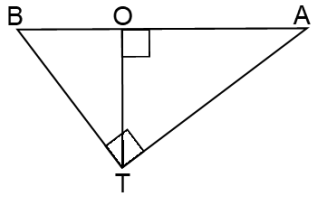
Given: ΔABC is a right triangle with $\angle BAC$ as its right angle, and hypotenuse $\overline{BC}$. $\overline{AD}$ is the altitude to the hypotenuse of ΔABC.

Statements	Reasons
1. ΔABC is a right triangle with $\angle BAC$ as its right angle and hypotenuse $\overline{BC}$.	a. Given
2. $\overline{AD}$ is the altitude to the hypotenuse of ΔABC	b. Given
3. $\overline{AD} \perp \overline{BC}$	c.
4. $\angle ADB$ and $\angle ADC$ are right angles	d.
5. $\angle ADB \cong \angle ADC \cong \angle BAC$.	e.
6. $\angle ABD \cong \angle CBA$ $\angle ACD \cong \angle BCA$	f.
7. $\Delta ADB \sim \Delta CAB$ $\Delta ACD \sim \Delta BCA$	g.
8. $\Delta ADB \sim \Delta ABC \sim \Delta ACD$	h.

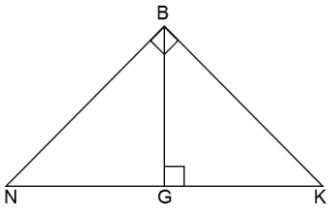
Reflexive Property	Symmetric Property
Transitive Property	AA Similarity Postulate
SAS Similarity Theorem	Right angles are congruent
Right angles are supplementary.	Definition of altitude
Definition of midline	Definition of perpendicular segments

Activity 2: Name the other two triangles that are similar to the given triangle based on the given figure for each item.

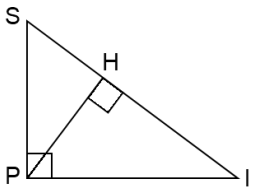
1. $\Delta BAT \sim$ ____ $\sim$ ____



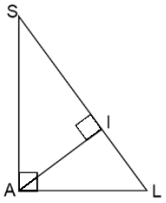
2. $\Delta BNK \sim$ ____ $\sim$ ____



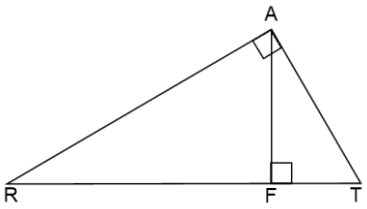
3. $\Delta SIP \sim$ ____ $\sim$ ____



4. $\Delta SIA \sim$ ____ $\sim$ ____

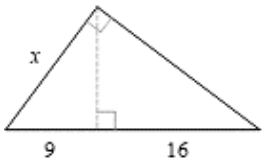


5. $\Delta TAF \sim$ ____ $\sim$ ____

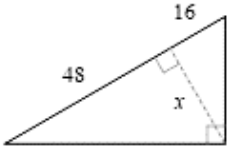


Activity 3: The unit measure of the lengths of the sides of the given triangles are in cm. Find the length of the indicated side.

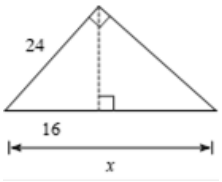
1.



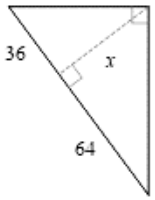
2.



3.



4.



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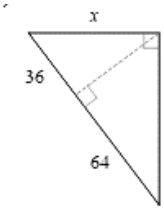

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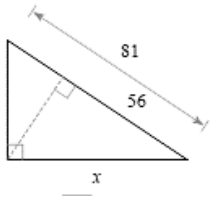

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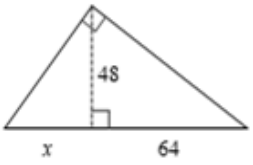
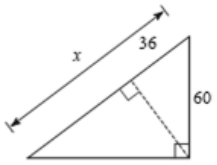


8.



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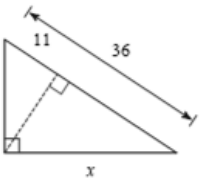
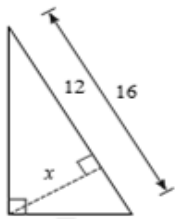


10.



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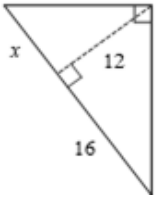

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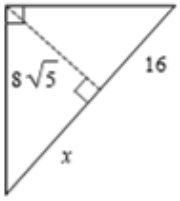
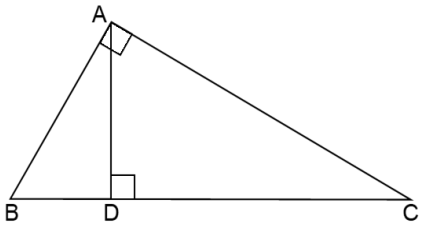


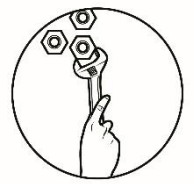
What I Have Learned

The **Right Triangle Similarity Theorem** states that if an altitude is drawn from the vertex of the right angle to the hypotenuse of a right triangle, all triangles formed are similar to each other. It also follows that these similar triangles have proportional corresponding sides whose lengths can be found by solving for the **geometric means** of the said sides.

Given is a right triangle ΔABC with $\angle BAC$ as its right angle, and hypotenuse $\overline{BC}$. $\overline{AD}$ is the altitude to the hypotenuse of ΔABC, the following statements are true:

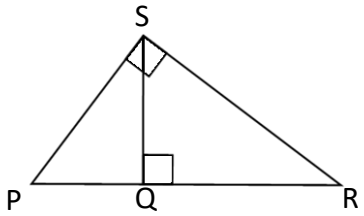
- $\Delta ABC \sim \Delta DAC \sim \Delta DBA$
- $\frac{|AD|}{|BD|} = \frac{|CD|}{|AD|}$
- $\frac{|AB|}{|BD|} = \frac{|BC|}{|AB|}$
- $\frac{|AC|}{|CD|} = \frac{|BC|}{|AC|}$





What I Can Do

Answer the following questions using the figure below. Write your answer on your answer sheet.



1. In the diagram, $\overline{QS}$ is the _____ of Δ _____ from the vertex of the right angle.
2. By the Right Triangle Similarity Theorem $\Delta PRS \sim \Delta$ _____ $\sim \Delta$ _____.
3. The hypotenuse of the said triangles are _____, _____, and _____ respectively.
4. Complete the following proportions:
   a. $\frac{|QS|}{|PQ|} = \frac{|RQ|}{?}$ b. $\frac{|QS|}{|PQ|} = \frac{?}{|PS|}$ c. $\frac{|RS|}{|PR|} = \frac{?}{|RS|}$ d. $\frac{|PS|}{|RS|} = \frac{|QS|}{?}$
5. Find the measure of each of the following sides given $|QR| = 5$ and $|RS| = 2\sqrt{10}$.
   a. $\overline{PR}$ b. $\overline{PQ}$ c. $\overline{QS}$ d. $\overline{PS}$

Assessment

Read and answer each of the following questions accurately. Write the letter of the correct answer on your answer sheet.

1. Which of the following is not a triangle similarity theorem?

   A. Right Triangle Similarity Theorem
   B. SSS Similarity
   C. SAS Similarity
   D. ASA Similarity

2. The _____ of a triangle is a segment drawn from a vertex that forms right angles with the line containing the opposite side of the triangle.

   A. altitude B. base C. leg D. midline

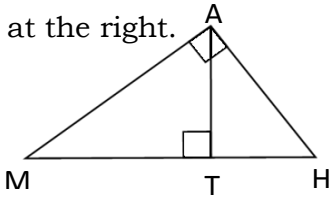
3. If an altitude from the vertex of the right angle to the hypotenuse of a right triangle is drawn, how many similar triangles are there?

   A. none B. one C. two D. three

4. Which proportion is correct based on the geometric mean similarity theorem?

   A. $\frac{\text{longer leg of } \Delta 1}{\text{shorter leg of } \Delta 1} = \frac{\text{shorter leg of } \Delta 2}{\text{longer leg of } \Delta 2}$
   C. $\frac{\text{longer leg of } \Delta 1}{\text{shorter leg of } \Delta 1} = \frac{\text{longer leg of } \Delta 2}{\text{shorter leg of } \Delta 2}$
   B. $\frac{\text{hypotenuse of } \Delta 1}{\text{shorter leg of } \Delta 1} = \frac{\text{shorter leg of } \Delta 2}{\text{hypotenuse of } \Delta 2}$
   D. $\frac{\text{longer leg of } \Delta 1}{\text{hypotenuse of } \Delta 1} = \frac{\text{shorter leg of } \Delta 2}{\text{hypotenuse of } \Delta 2}$

For numbers 5 to 11, base your answers on the figure at the right.



5. In the figure, $\overline{AT}$ is the _____ of ΔMAH.

   A. altitude
   B. leg
   C. hypotenuse
   D. base

6. Which of the following triangles is similar to ΔTAM?

   A. ΔAHT
   B. ΔATH
   C. ΔTAH
   D. ΔTHA

7. Complete the proportion, $\frac{|MA|}{|MT|} = \frac{?}{|MA|}$.

A. $|AH|$ B. $|AT|$ C. $|MH|$ D. $|MT|$

8. Which of the following proportions is correct?

A. $\frac{|AH|}{|AT|} = \frac{|MA|}{|MH|}$ B. $\frac{|AH|}{|AT|} = \frac{|MA|}{|MT|}$ C. $\frac{|AH|}{|TH|} = \frac{|MH|}{|MA|}$ D. $\frac{|AH|}{|AT|} = \frac{|MT|}{|MA|}$

9. If $m\angle H = 58°$, what is $m\angle MAT$?

A. $22°$ B. $58°$ C. $90°$ D. $117°$

10. If $|MT| = 10$ cm and $|TH| = 5$ cm, what is the length of $\overline{AT}$?

A. 5 cm B. $5\sqrt{2}$ cm C. 15 cm D. $15\sqrt{2}$ cm

11. If $|MT| = 3$ and $|MA| = 2\sqrt{6}$, what is the length of $\overline{TH}$?

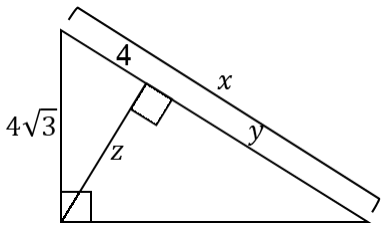
A. 5 B. 8 C. 11 D. 14

For numbers 12 to 15, base your answers on the figure at the right.

12. Which of the following is true?

A. $x = \sqrt{4y}$ C. $y = \sqrt{4z}$

B. $y = \sqrt{4x}$ D. $z = \sqrt{4y}$



13. Find the value of x in the figure.

A. 4 B. 8 C. 12 D. 16

14. Find the value of y in the figure.

A. 4 B. 8 C. 12 D. 16

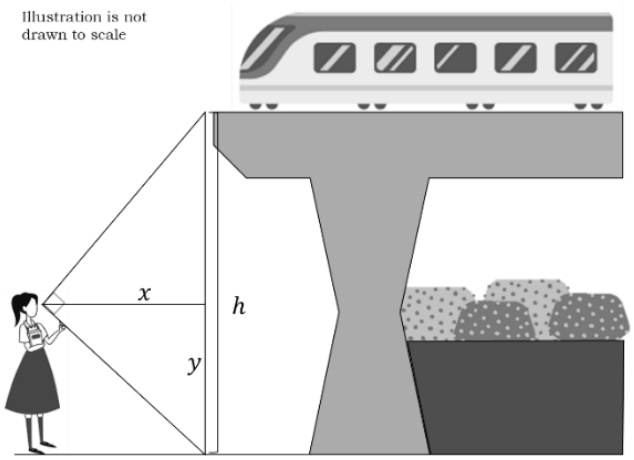
15. Find the value of z in the figure?

A. 4 B. $4\sqrt{2}$ C. 8 D. $8\sqrt{2}$

Additional Activities

Critical Thinking and Creativity

Consider the given situation and answer the following questions below. Write your answers on your answer sheet.



You can estimate the height of the tracks on the Light Rail System (LRT) or any vertical structure using your knowledge in right triangle. You just need the measurements for x, the shortest horizontal distance from the structure in which you can see the top and bottom without tilting your head; and y, the vertical distance from the ground to your eye level.

a. What is your eye height?

b. Write the needed proportion/s to solve for the height of the tracks.

c. If the observer is 16 ft from the bottom of the tracks and has an eye level of 5.75 ft from the ground, what is the approximate height of the tracks?

d. Should the height of the tracks be constant through its course? Why?

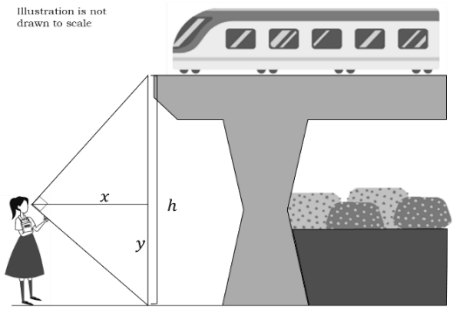
e. Try to do the experiment on a school building with a partner or group. Record all necessary measurements and determine the approximate height of the school building you chose.

PROBLEM – BASED LEARNING WORKSHEET

Trains All Above Us

The Light Rail Transit in Metro Manila is the first elevated railway system in the country, operating since 1984. The LRT Line-1 connects 5 large cities, Manila, Caloocan, Quezon, Pasay, and Parañaque. It has stations that act as central hubs for workers and tourists alike. The line from Baclaran to Roosevelt Station is nearly 20 km long, cruising through the concrete landscapes of Manila. Due to the different land composition or ground levels, the construction of any elevated railway depends on its foundation or legs. The railway should be leveled and does not have sudden ups or downs to avoid accidents. Engineers measure and estimate the height of the tracks from the ground to ensure the angles are correct, adjusting the height of the foundations for the trains have a smooth ride.

Imagine an observer x meters from the bottom of the LRT railway. The observer's eye level from the ground is y meters, and the tracks of the LRT is h meters high. If the observer's view to the top of the track is perpendicular to her view to the bottom, how can she solve for the approximate distance of the train to the ground?



Let's Analyze

Use another sheet of paper for your answers.

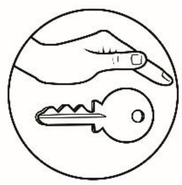
1. What is the title of the story? _____
2. For how long is the Light Rail Transit operating as of today?

   _____
3. What cities does the LRT Line-1 pass through?

   _____
4. How do engineers keep the tracks as leveled as possible?

   _____

   _____
5. Write an equation or proportion that describes the observer's lines of sight.
6. If the observer's eye height is 1.5 meters, and she is 10 meters always from the bottom of the track, how high is the track from the ground? _____



Answer Key

WHAT I KNOW

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

WHAT'S IN

1. $\Delta DPE \sim \Delta RPQ$ by SAS Similarity Theorem
2. $\Delta LGF \sim \Delta LNM$by SAS Similarity Theorem
3. Not similar
4. Not similar
5. $\Delta UJK \sim \Delta UWV$by SSS or SAS Similarity Theorem
6. $\Delta NUM \sim \Delta SUT$by AA Similarity Postulate

WHAT'S MORE

Activity 1

c) Definition of altitude
d) Definition of perpendicular segments/lines
e) Right angles are congruent
f) Reflexive Property
g) AA Similarity Postulate
h) Transitive Property

Activity 2

1. ΔBTO
2. ΔGNB
3. ΔPIH
4. ΔAIL
5. ΔARF

Activity 3

1. 15	7. 36
2. $16\sqrt{3}$	8. 100
3. 36	9. 30
4. 48	10. $4\sqrt{3}$
5. 60	11. 9
6. $18\sqrt{14}$	12. 20

WHAT I HAVE LEARNED

6. altitude ΔPSR
7. ΔPSQ ΔSRQ
8. $\overline{PR}$, $\overline{PS}$, $\overline{SR}$
9. a. QS b. RS c. QR d. QR
10. a. 8 b. 3 c. $\sqrt{15}$ d. $2\sqrt{6}$

ASSESSMENT

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

PROBLEM-BASED LEARNING WORKSHEET

1. Trains All Above Us
2. 36
3. Manila, Caloocan, Quezon City, Pasay, Parañaque
4. By adjusting the height of the post/foundations
5. $\frac{x}{y} = \frac{h-y}{x}$ or $h = \frac{x^2+y^2}{y}$
6. 68.17 meters

References

Pedrosa, Carmen N. (2019), *Balangay boat as symbol of ancient Filipino ingenuity* (The Philippine Star – Global)

Roque, N. (2018), *All aboard the LRT! (* Manila Times)

Oronce, O., Mendoza, M. (2018), *E-Math 9 Worktext in Mathematics, (*REX Printing Company Inc.)

Larson, R., Boswell, L., et al (2007). *Geometry (Student Edition)*, McDougal Littell.

E-Search

You may also check the following link for your reference and further learnings on solving quadratic equation using completing square.

- Using Similar Right Triangles – cK-12. https://www.ck12.org/book/ck-12-geometry-second-edition/section/8.3/
- Similar Right Triangles – Calc Workshop. https://calcworkshop.com/triangle-trig/similar-right-triangles/
- Similarity in Right Triangles. DMSFlippedMath. https://www.youtube.com/watch?v=TPWVrTYkwBU
- Triangles: Similar Right Triangles, Geometric Mean. FerrenteMath. https://www.youtube.com/watch?v=QluMKpTtzLQ

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