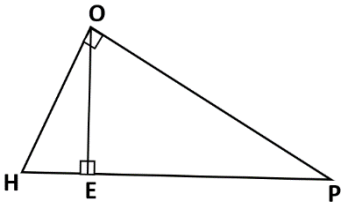
I. Expectations:

After going through this module, you are expected to:
1. apply the theorems to show that given triangles are similar ;
2. solve problems that involve triangle similarity and right triangle.

II. Pre – Test:

Directions: Choose the letter of the answer that you think best answers the questions.

1. In the figure, there are three similar right triangles by Right Triangle Similarity Theorem. Name the triangle that is missing in the statement: $\Delta HOP \sim$ ____ $\sim \Delta OEP$.



$A.\Delta HOE$ B. ΔHEO C. ΔHOP D. ΔPEO

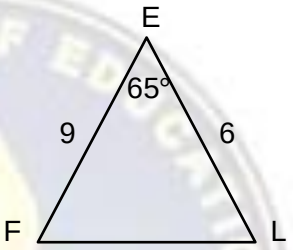
2. What similarity concept justifies that $\Delta FEL \sim \Delta QWN$?

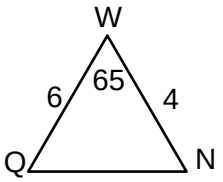
A. Right Triangle Proportionality Theorem

B. Triangle Proportionality Theorem

C. SSS Similarity Theorem

D. SAS Similarity Theorem





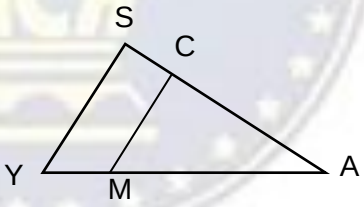
3. If $\frac{AC}{AS} = \frac{AM}{AY}$, which of the following data makes $\Delta CAM \sim \Delta SAY$ by SAS Similarity Theorem

$A.\angle CAM \cong \angle SAY$

$B.\angle ACM \cong \angle ASY$

$C.\angle AMC \cong \angle AYS$

$D.\angle SCM \cong \angle YMC$



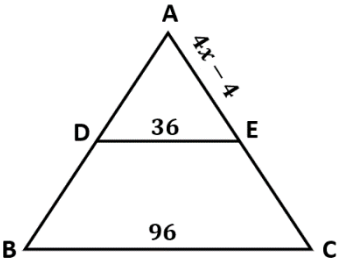
4. $\Delta ABC \sim \Delta DEF$. If $\overline{DE}$ = $12cm$, $\overline{AB}$ = 6 cm, and $\overline{BC}$ = 3 cm then $\overline{EF}$ is equal to _____.

A.1.5 cm B. 3 cm C. 6 cm D. 9 cm

5. In ΔDEW, $\overline{AB} \parallel \overline{EW}$, if $\overline{AD}$ = 4 cm, $\overline{DE}$ = 12 cm and $\overline{DW}$ = 24 cm then the value of $\overline{DB}$ = ___.

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

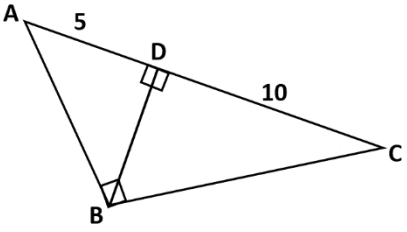
6. In ΔABC, $\overline{DE} \parallel \overline{BC}$ and $\overline{AC} = 64$, what is the value of x?



A. 24 B. 28 C. 4 D. 7

7. In the figure, find the value of $\overline{BD}$.

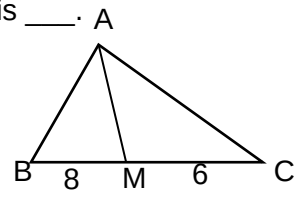
A. $2\sqrt{5}$ B. 5 C. 10 D. $5\sqrt{2}$



8. A 13-ft ladder is leaning against a wall. The base of the ladder is 5 feet from the wall. How high up the wall does the ladder reach?

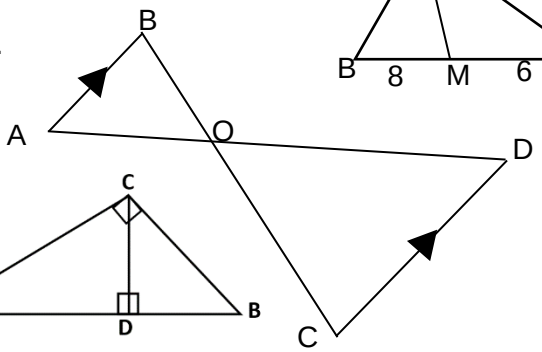
A. 11 ft B. 12 ft C. 13 ft D. 14 ft

9. In $\Delta ABC, \overline{AM}\ bisects\ \angle BAC,$ if $\overline{CM}$ = 6, $\overline{MB}$ = 8 and the perimeter of ΔABC is 42 then $\overline{AB}$ is ___.



A. 12 B. 14 C. 16 D. 18

10. In the figure, $\overline{AB} \parallel \overline{CD}$, if $\overline{BO}$ = 6, $\overline{OC}$ = 12 and $\overline{AB}$ = 9 find $\overline{CD}$.



A. 12 B. 14 C. 16 D. 18

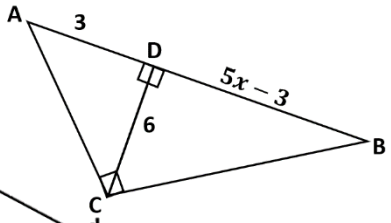
11. In right triangle ABC, $\overline{CD}$ is the altitude to base AB. If AB = 12 and DB = 3, how long is BC?

A. 6 B. 12 C. 18 D. 36

12. The sum of the non-right angles of a right triangle is _____.

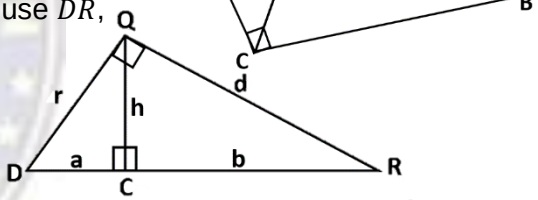
A. 90° B. 180° C. 270° D. 360°

13. ΔABC has a right angle at C. $\overline{CD}$ is the altitude to $\overline{AB}$. If $\overline{CD} = 6$ cm, $\overline{AD} = 3$ cm and $\overline{DB} = 5x - 3$ cm, find $\overline{AB}$.



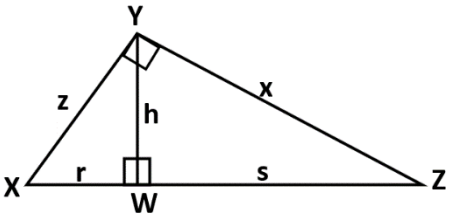
A. 3 cm B. 6 cm C. 15 cm D. 36 cm

14. In the figure, ΔDQR is a right Δ, $\overline{QC}$ is the altitude upon the hypotenuse $\overline{DR}$, if a = 6 and b=18, find r.



A.12 B. 17 C. 18 D. 14

15. In the figure, ΔXYZ is a right triangle with right $\angle Y$. $\overline{YW}$ is the altitude to the hypotenuse XZ. If r = $\sqrt{3}$ and s = $\sqrt{27}$ find h.



A. 3 B. 9 C. 27 D. 81

III. Looking Back

Directions: Fill in the blanks with the best answer.

1. If the three angles of one triangle are _____to three corresponding angles of another triangle, then the two triangles are similar.
2. If the sides of one triangle are _____ to the corresponding sides of a second triangle, then the triangles are similar.
3. If two sides of one triangle are proportional to the corresponding two sides of another triangle and their respective included angles are congruent, then the triangles are_____.
4. The _____to the hypotenuse of a right triangle separates the right triangle into two triangles which are similar to each other and to the original triangle.
5. The altitude to the hypotenuse is the _____between the segments into which it separates the hypotenuse.
6. Each _____ is a geometric mean of the hypotenuse and the segment of the hypotenuse adjacent to the leg.

III. Brief Introduction:

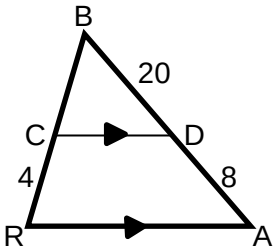
Having illustrated, proved, and verified all the theorems on similarity in the previous section, your goal now in this section is to take a closer look at some aspects of the topic. This entails you to tackle on more applications of similarity concepts.

Your goal in this section is to use the theorems in identifying unknown quantities involving similarity proportion.

Your success in this section makes you discover math-to-math connections and the role of mathematics, especially the concepts of similarity.

Examples:

1. In ΔBAR, $\overline{CD}$ // $\overline{RA}$. If $\overline{AD}$ = 8, $\overline{CR}$ = 4, and $\overline{BD}$ =20, find $\overline{BC}$.



Solution: Since $\overline{CD}$ // $\overline{RA}$, ΔBCD ~ ΔBRA

$\frac{\overline{BC}}{\overline{BR}} = \frac{\overline{BD}}{\overline{BA}}$ by the definition of ~ Δs

$\frac{\overline{BC}}{\overline{BC}+4} = \frac{20}{28}$

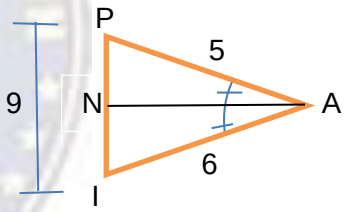
$28\overline{BC} = 20\overline{BC} + 80$ Cross- Product Property

$8\overline{BC} = 80$ Subtract $20\overline{BC}$ from each side

$\overline{BC} = 10$ Divide each side by 8

2. Find the value of $\overline{PN}$ in the figure.

Solution:



$\frac{\overline{AP}}{\overline{AI}} = \frac{\overline{PN}}{\overline{IN}}$

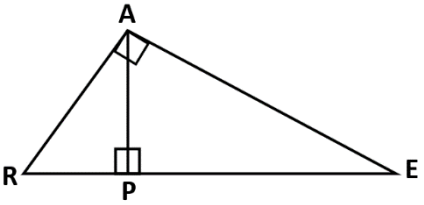
$\frac{5}{6} = \frac{\overline{PN}}{9-\overline{PN}}$

$6\overline{PN} = 45 - 5\overline{PN}$ Cross-Product Property

$11\overline{PN} = 45$ Add 5N to both sides

$\overline{PN} = \frac{45}{11}$ *or* $4\frac{1}{11}$ Divide each side by 11

3. Given right triangle RAE, WITH $\overline{AP}$ as an altitude.
   a. If $\overline{RP}$ = 4 and $\overline{PE}$ = 9, find $\overline{AP}$ and $\overline{AR}$.
   b. If $\overline{PE}$ = 40 and $\overline{RE}$ = 50, find $\overline{AP}$.



Solutions:

a. $\frac{\overline{RP}}{\overline{AP}} = \frac{\overline{AP}}{\overline{PE}}$ $\frac{\overline{RP}}{\overline{AR}} = \frac{\overline{AR}}{\overline{RE}}$

$\frac{4}{\overline{AP}} = \frac{\overline{AP}}{9}$ $\frac{4}{\overline{AR}} = \frac{\overline{AR}}{13}$

$(\overline{AP})^2 = 36$ $(\overline{AR})^2 = 52$

$\overline{AP} = 6$ $\overline{AR} = 2\sqrt{13}$

We can deduce that $\overline{RE} = \overline{RP} + \overline{PE} = 13$

b. $\frac{\overline{RP}}{\overline{AP}} = \frac{\overline{AP}}{\overline{PE}}$

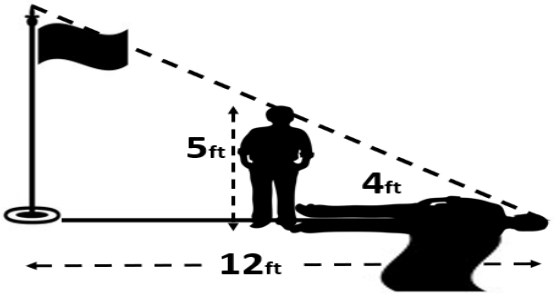
$\frac{10}{\overline{AP}} = \frac{\overline{AP}}{40}$

$(\overline{AP})^2 = 400$

$\overline{AP} = 20$

We can deduce that $\overline{RP} = \overline{RE} - \overline{PE} = 50 - 40 = 10$

4. If your classmate is 5 feet tall and casts a shadow of 4 feet at the same time that the flagpole casts a 12-foot shadow, what is the height of the flagpole?



Solution:

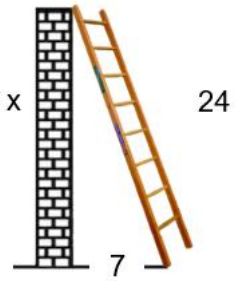
$\frac{5}{4} = \frac{x}{12}$

$4x = 60$ Cross-Product Property of Proportion

$x = 15$ Divide each side by 4

Therefore, the flagpole is about 15 feet tall.

5. A 24-feet ladder is leaning against a wall. The base of the ladder is 7 feet from the wall. How high up the wall does the ladder reach?



Solution: Use the Pythagorean theorem: $a^2 + b^2 = c^2$

$x^2 + (7)^2 = (24)^2$

$x^2 + 49 = 576$

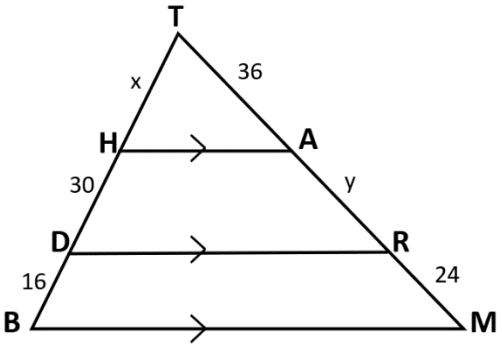
$x^2 = 527$

$x = 22.96$

Therefore, the top of the ladder is about 22.96 feet from the ground.

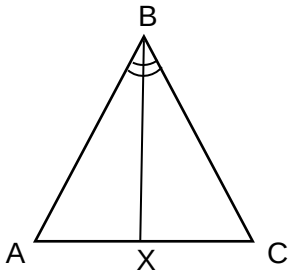
IV. Activities:

A. In the figure $\overline{HA} \parallel \overline{DA} \parallel \overline{BM}$, find:



1. x = _____ 2. y = _____

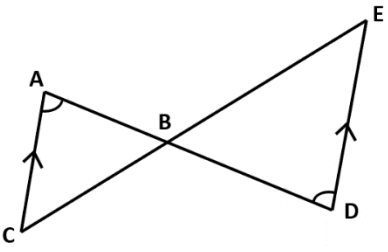
B. In ΔABC, $\overline{BX}$ bisects $\angle ABC$.



1. If $\overline{AX} = 7, \overline{XC} = 5, \overline{BC} = 9$, find $\overline{AB}$.

2. If $\overline{AX} = 8, \overline{BC} = 9$ and $\overline{AC} = 12$, find $\overline{AB}$.

C. In the figure, $\overline{AC} \parallel \overline{ED}$ *and* $\angle A \cong \angle D$.



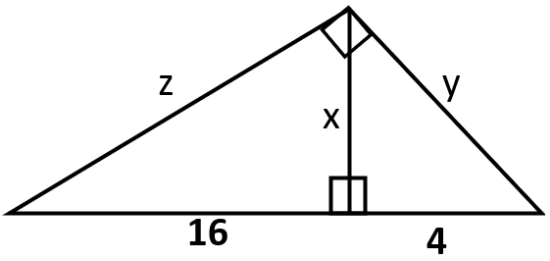
1. If $\overline{AC} = (x - 25), \overline{AB} = 44, \overline{ED} = 40,$ $\overline{BD} = 55$, find the value of x *and* $\overline{AC}$.

D. Find the value of each variable.

x = _____

y = _____

z = _____



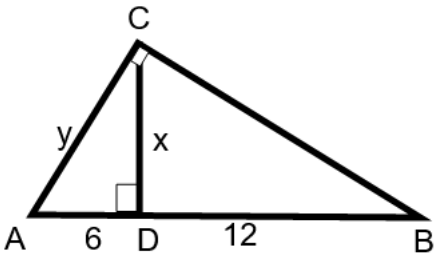
REMEMBER: Recalling the theorems on similar triangles and right triangles would be very helpful and important in order to solve the given problems precisely and easily.

V. Check Your Understanding:

A. In each of the triangle below, find x and y

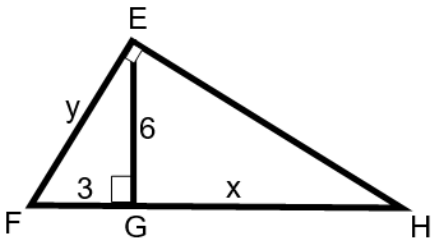
1. x = _____

y = _____

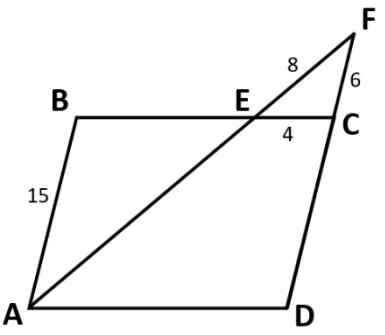


2. x = _____

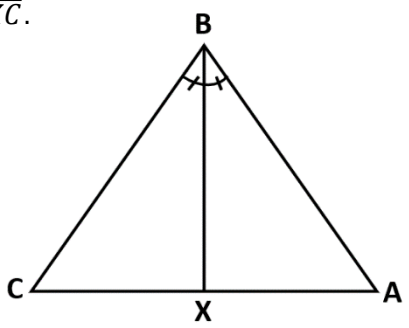
y = _____



B. In the figure, $\overline{DC} \parallel \overline{FE} \parallel \overline{AB}$. If $\Delta BEA \sim \Delta CEF$, find measure of $\overline{BE}$ and $\overline{AE}$.



C. In ΔABC, $\overline{BX}$ bisects $\angle ABC$. If $\overline{AB} = 10$, $\overline{BC} = 8$ and $\overline{AC} = 12$, find $\overline{AX}$ and $\overline{XC}$.



VI. Post-test

Direction: Read each item carefully. Choose the letter that you think best answers the question.

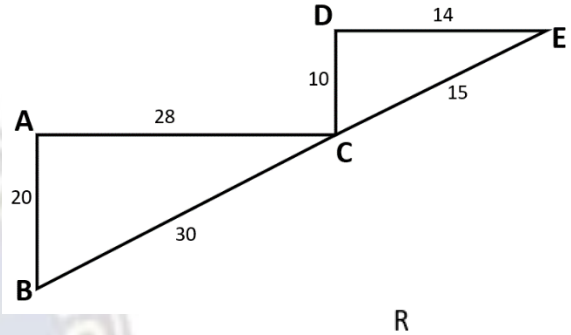
1. What similarity concept justifies that $\Delta FEL \sim \Delta QWN$?

   A. Right Triangle Proportionality Theorem

   B. Triangle Proportionality Theorem

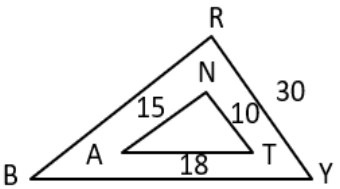
   C. SSS Similarity Theorem

   D. SAS Similarity Theorem



2. $\Delta BRY \sim \Delta ANT$. Which ratio of sides gives the scale factor?

   A. $\frac{\overline{NT}}{\overline{AN}}$ B. $\frac{\overline{NT}}{\overline{RY}}$ C. $\frac{\overline{AT}}{\overline{BY}}$ D. $\frac{\overline{NT}}{\overline{AT}}$



3. $\Delta RST \sim \Delta USV$. If $\overline{RT} = 15, \overline{UV} = 10, and\ \overline{RS} = 6$ then $\overline{US}$ is equal to _____.

   A. 25 cm B. 10 cm C. 9 cm D. 4 cm

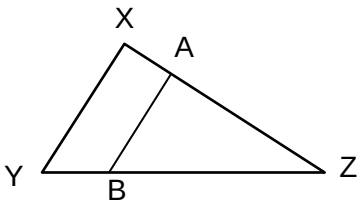
4. If $\frac{\overline{ZA}}{\overline{ZX}} = \frac{\overline{ZB}}{\overline{ZY}}$, which of the following data makes $\Delta AZB \sim \Delta XZY$ by SAS Similarity Theorem?

   A $\angle AZB \cong \angle XZY$

   B. $\angle ZAB \cong \angle ZXY$

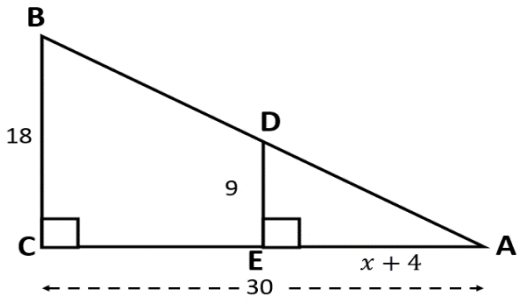
   C. $\angle ZBA \cong \angle ZYX$

   D. $\angle XAB \cong \angle YBA$



5. In $\Delta CAB, \overline{DE} \parallel \overline{BC}$, what is the value of x?

   A.10 B. 16 C. 15 D. 11



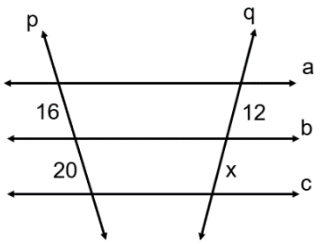
6. In $\Delta ADB, \overline{AB} \parallel \overline{EC}$, if $\overline{AB} = 49cm, \overline{CE} = 21cm, and\ \overline{AD} = 35cm$, find the value of $\overline{DE}$.

A.10 cm B. 15 cm C. 20 cm D. 42 cm

7. Heart wants to know the height of a street lamp. She discovers that when she is 12 feet from the lamp, her shadow is 6 feet long. If she is 5ft tall, find the height of the street lamp.?

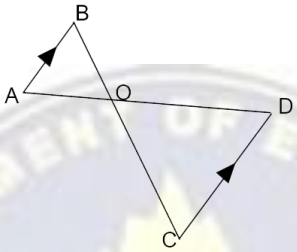
A. 16 ft B. 15 ft C. 14 ft D. 13 ft

8. If $a \parallel b\ and\ b \parallel c$ and p and q intersect a, b, c, find x.



A.15 B. 18 C. 20 D. 22

9. In the figure, $\overline{AB} \parallel \overline{CD}$, if $\overline{BA} = 27, \overline{CD} = 45, and\ \overline{CD} = 50$ find $\overline{BO}$.



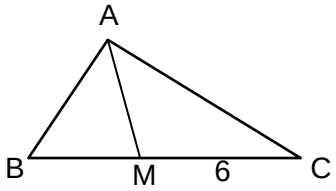
A. 60

B. 50

C. 45

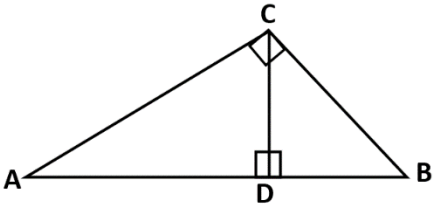
D. 30

10. In $\Delta ABC, \overline{AM}\ bisects \angle BAC,$ if $\overline{CM} = 6$, $\overline{MB} = 8$ and the perimeter of ΔABC is 42 then $\overline{AB}$ is equal to _____.



A.12 B. 14 C. 16 D. 18

11. In right triangle ABC, $\overline{CD}$ is the altitude to base $\overline{AB}$. If$\overline{AB} = 13\ and\ \overline{BD} = 4$, how long is $\overline{DC}$?

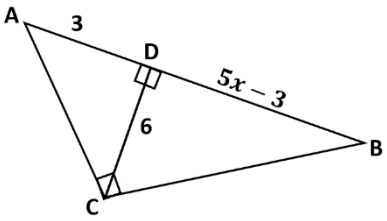


A.6 B. 9 C. 12 D. 15

12. The sum of the non-right angles of a right triangle is _____.

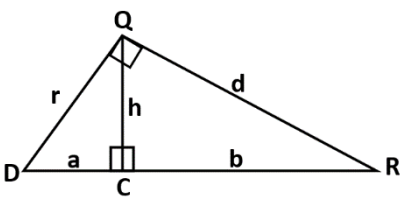
A.90° B. 180° C. 370° D. 360°

13. ΔABC has a right angle at C. $\overline{CD}$ is the altitude to $\overline{AB}$. If $\overline{CD} = 6$ cm, $\overline{AD} = 3$ cm and $\overline{DB} = 5x - 3$ cm, find $\overline{BD}$.



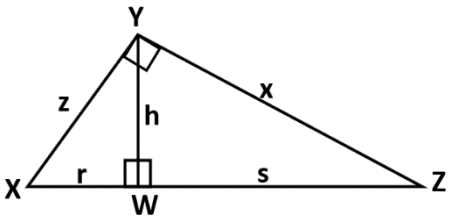
A. 6 cm B. 9 cm C. 12 cm D. 15 cm

14. In the figure, ΔDQR is a right Δ, $\overline{QC}$ is the altitude upon the hypotenuse $\overline{DR}$, if $a = 4\ and\ \overline{DR} = 20$, find r.



A. 8 B. 10 C. 12 D. 16

15. In the figure, ΔXYZ is a right triangle with right $\angle Y$. $\overline{YW}$ is the altitude to the hypotenuse $\overline{XZ}$. If r = 3 and s = 9 find h.



A. $3\sqrt{3}$ B. $3\sqrt{2}$ C. $3\sqrt{5}$ D. 27

ANSWER KEY:

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

Looking Back

1. congruent
2.proportional
3. similar
4. altitude
5. geometric mean
6. leg

Activities
A.

1. x = 24

2. y = 45

B.

1. AB = $\frac{63}{5}$ *or* 12.6

2. AB = 18

C.

1. $x = 57$

2. $\overline{AC} = 32$

D.

1. x = 8
2. y = $4\sqrt{5}$
3. z = $8\sqrt{5}$

Check Your Understanding

A.

1. x = $6\sqrt{2}$
   y = $6\sqrt{3}$
2. x = 12
   y = $3\sqrt{5}$

B.

1. $\overline{BE} = 10$ *and* $\overline{AE} = 20$

C.

1. AX = $\frac{20}{3}$ *or* $6\frac{2}{3}$

   CX = $\frac{16}{3} = 5\frac{1}{3}$

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