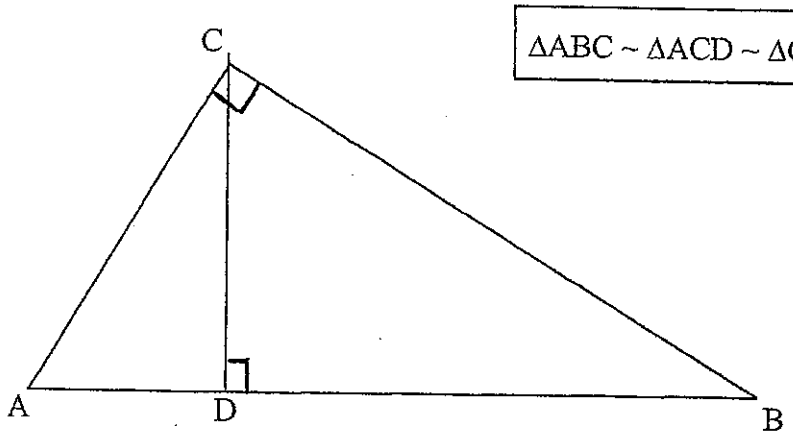
PROPORTIONS IN THE RIGHT TRIANGLE

$\Delta ABC \sim \Delta ACD \sim \Delta CBD$



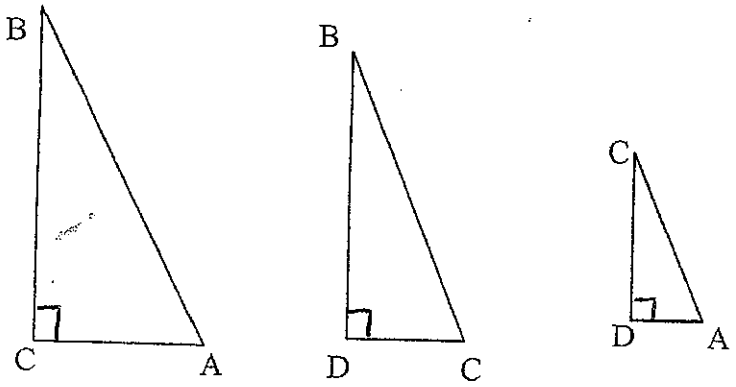
1.) Name the three triangles in the figure above.

2.) What do the three triangles have in common?

3.) Compare ΔABC to ΔACD
   a.) $\angle A = \angle A$
   b.) $\angle ACB = \angle ADC$ (both 90°)
   c.) Therefore $\angle ACD$ must be congruent to $\angle B$.
   d.) Therefore $\Delta ABC \sim \Delta ACD$.

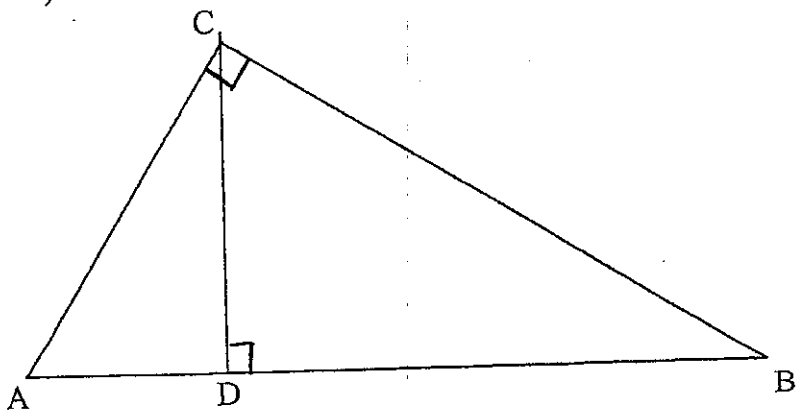
4.) Compare ΔABC to ΔCBD
   a.) $\angle B = \angle B$
   b.) $\angle ACB = \angle CDB$ (both 90°)
   c.) Therefore $\angle DCB$ must be congruent to $\angle A$.
   d.) Therefore $\Delta ABC \sim \Delta CBD$.

Let's look at the three triangles lined up, with corresponding angles and sides in the same position.



PROPORTIONS IN THE RIGHT TRIANGLE

(CONTINUED)



Well, breaking this figure up into three separate triangles gives me a headache, so I decided to look at it from a different perspective.

Each one of the three triangles has a **short leg**.
Each one of the three triangles has a **long leg**.
Each one of the three triangles has a **hypotenuse**.

So, when I do my comparisons, I look at ratios (comparisons of two numbers) like these:

$$\frac{\text{short leg}}{\text{long leg}} \quad \text{OR} \quad \frac{\text{short leg}}{\text{hypotenuse}} \quad \text{OR} \quad \frac{\text{long leg}}{\text{hypotenuse}}$$

Then I set up my PROPORTIONS (two equal ratios) like this:

$$\frac{\text{short leg of Triangle 1}}{\text{long leg of Triangle 1}} = \frac{\text{short leg of Triangle 2}}{\text{long leg of Triangle 2}}$$

OR

$$\frac{\text{short leg of Triangle 1}}{\text{hypotenuse of Triangle 1}} = \frac{\text{short leg of Triangle 2}}{\text{hypotenuse of Triangle 2}}$$

OR

$$\frac{\text{long leg of Triangle 1}}{\text{hypotenuse of Triangle 1}} = \frac{\text{long leg of Triangle 2}}{\text{hypotenuse of Triangle 2}}$$

There are even some "tricks" to help you set these proportions up quickly and easily.

Name _____ Date _____

Date _____
Period _____

Right Triangle Proportions

In your own words, write the meaning of each vocabulary term.

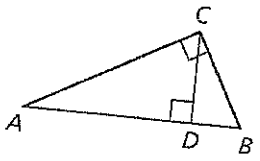
similar triangles

right triangles

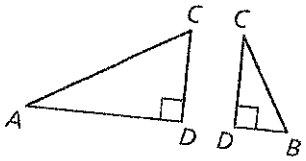
Theorems

Theorem 9.6 Right Triangle Similarity Theorem

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



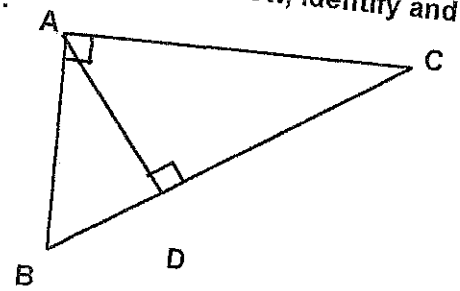
$\triangle CBD \sim \triangle ABC$, $\triangle ACD \sim \triangle ABC$, and $\triangle CBD \sim \triangle ACD$.



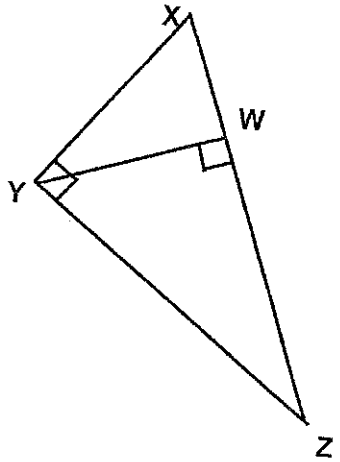
Notes:

In the problems below, identify and draw each of the similar right triangles.

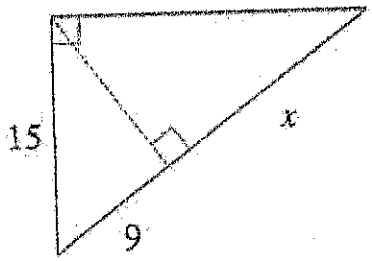
1.



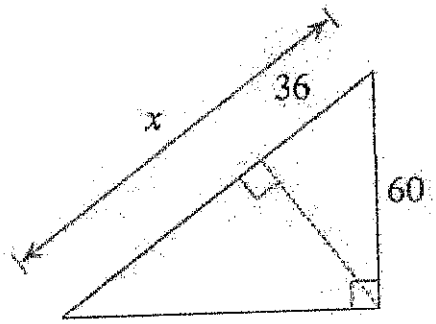
2.



5.



6.



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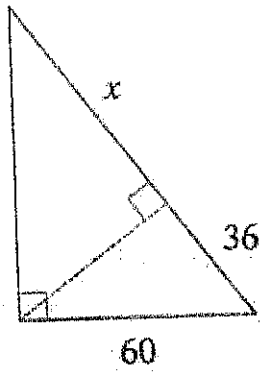
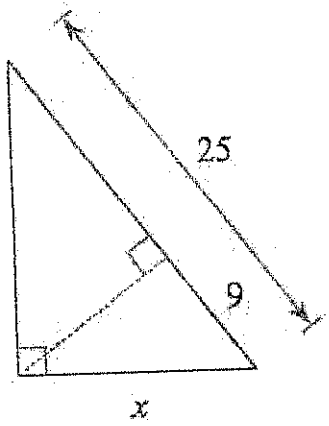


8.



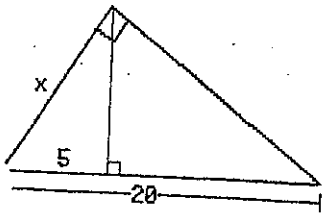
9. Explain why we are able to create proportions to find missing lengths of segments in triangles.

Right Triangle Proportions

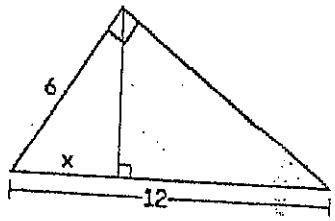
Notes/diagrams:

Examples:

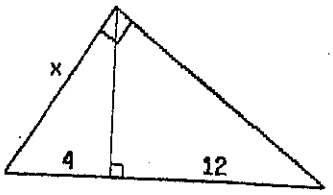
Solve for x:



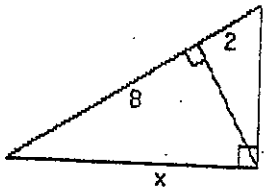
(2) Solve for x:



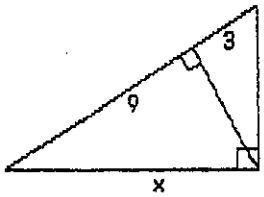
Solve for x:



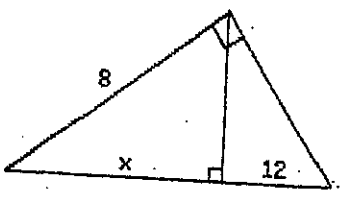
(4) Solve for x:



Solve for x:

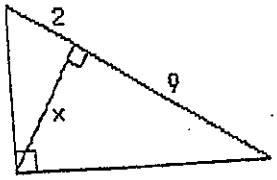


(6) Solve for x:

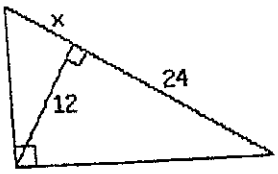


ther Type:

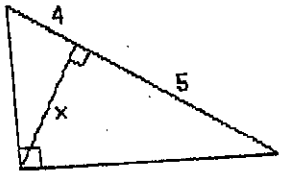
olve for x:



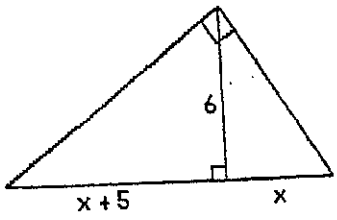
Solve for x:



Solve for x:

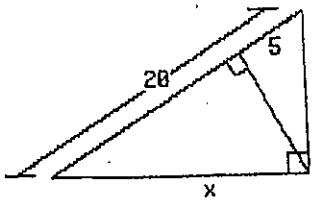


Solve for x:

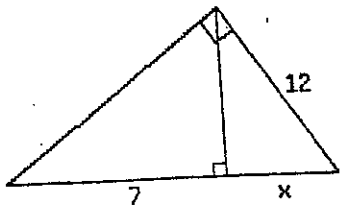


Mixed (Both Types)

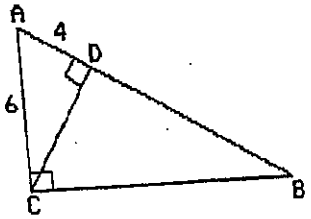
(5) Solve for x:



(6) Solve for x:



(7)



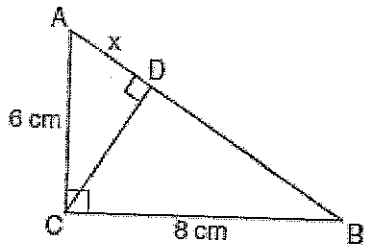
Find CD:

Find DB:

Name: _____ Date: _____

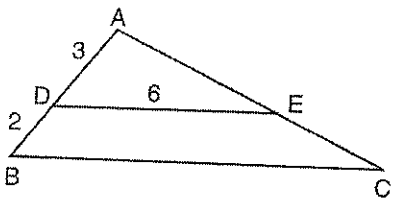
Right Triangle Proportions

1. In the diagram below, the length of the legs $\overline{AC}$ and $\overline{BC}$ of right triangle ABC are 6 cm and 8 cm, respectively. Altitude $\overline{CD}$ is drawn to the hypotenuse of $\triangle ABC$.



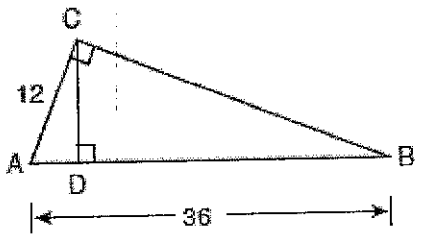
What is the length of $\overline{AD}$ to the *nearest tenth of a centimeter*?

2. In the diagram of $\triangle ABC$ below, $\overline{DE} \parallel \overline{BC}$, $AD = 3$, $DB = 2$, and $DE = 6$.



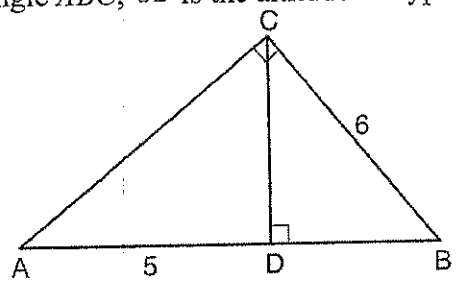
What is the length of $\overline{BC}$?

3. In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$.



If $AB = 36$ and $AC = 12$, what is the length of $\overline{AD}$?

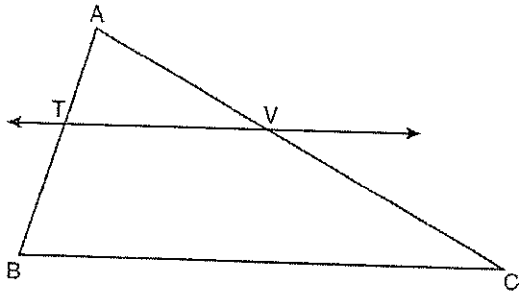
4. In the diagram below of right triangle ABC, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$, $CB = 6$, and $AD = 5$



What is the length of $\overline{BD}$?

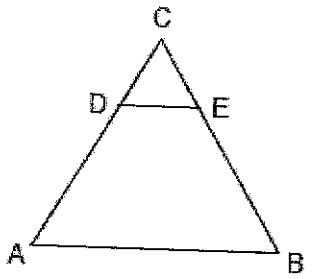
5. In $\triangle PQR$, $\angle PRQ$ is a right angle and $\overline{RT}$ is drawn perpendicular to hypotenuse $\overline{PQ}$. If $PT = x$, $RT = 6$, and $TQ = 4x$, what is the length of $\overline{PQ}$?

6. In the diagram below of ΔABC, $\overleftrightarrow{TV} \parallel \overline{BC}$, $AT = 5$, $TB = 7$, and $AV = 10$.



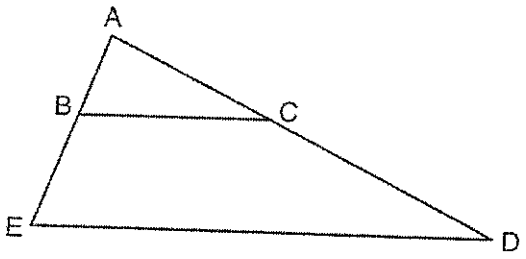
What is the length of $\overline{VC}$?

7. In the accompanying diagram of equilateral triangle ABC, $DE = 5$ and $\overline{DE} \parallel \overline{AB}$.

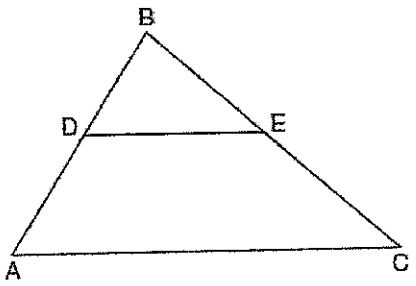


If AB is three times as long as DE, what is the perimeter of quadrilateral $ABED$?

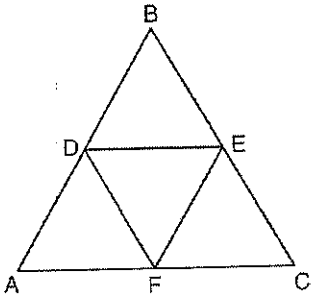
8. In the diagram below of ΔADE, B is a point on $\overline{AE}$ and C is a point on $\overline{AD}$ such that $\overline{BC} \parallel \overline{ED}$, $AC = x - 3$, $BE = 20$, $AB = 16$, and $AD = 2x + 2$. Find the length of $\overline{AC}$.



9. In the diagram below of $\triangle ABC$, $\overline{DE}$ is a midsegment of $\triangle ABC$, $DE = 7$, $AB = 10$, and $BC = 13$. Find the perimeter of $\triangle ABC$.

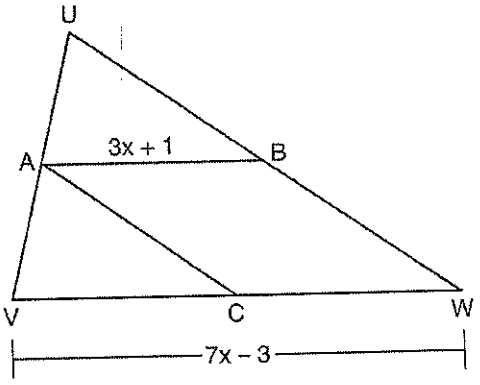


10. In the diagram below, the vertices of $\triangle DEF$ are the midpoints of the sides of equilateral triangle ABC, and the perimeter of $\triangle ABC$ is 36 cm.



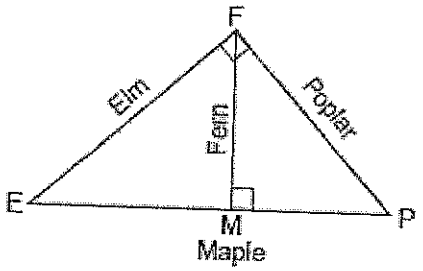
What is the length, in centimeters, of $\overline{EF}$?

11. In the diagram of $\triangle UVW$ below, A is the midpoint of $\overline{UV}$, B is the midpoint of $\overline{UW}$, C is the midpoint of $\overline{VW}$, and $\overline{AB}$ and $\overline{AC}$ are drawn.

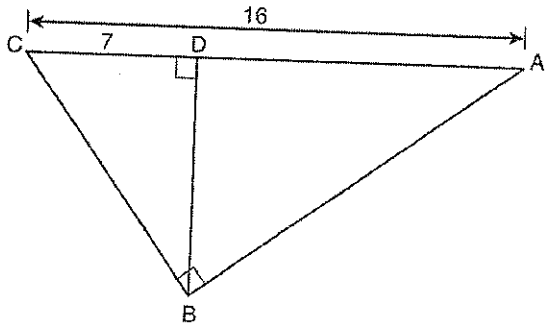


If $VW = 7x - 3$ and $AB = 3x + 1$, what is the length of $\overline{VC}$?

12. Four streets in a town are illustrated in the accompanying diagram. If the distance on Poplar Street from F to P is 12 miles and the distance on Maple Street from E to M is 10 miles, find the distance on Maple Street, in miles, from M to P.

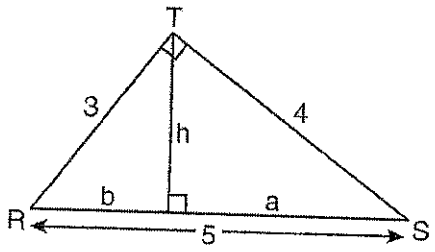


13. In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$, $AC = 16$, and $CD = 7$.

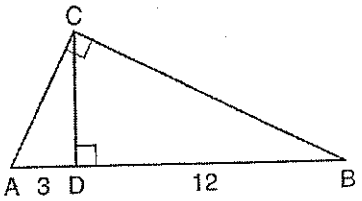


What is the length of $\overline{BD}$?

14. In the diagram below, ΔRST is a $3-4-5$ right triangle. The altitude, h, to the hypotenuse has been drawn. Determine the length of h.

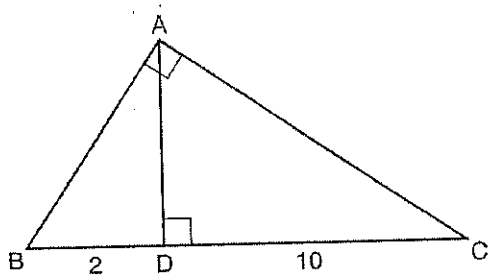


15. In the diagram below of right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$.



If $AD = 3$ and $DB = 12$, what is the length of altitude $\overline{CD}$?

16. Triangle ABC shown below is a right triangle with altitude $\overline{AD}$ drawn to the hypotenuse $\overline{BC}$.



If $BD = 2$ and $DC = 10$, what is the length of $\overline{AB}$?