Geometry

Chapter 7
Section 7-4

Geometric Means

An equation that states that two ratios are equal is called a **proportion.** The first and last numbers in a proportion are the **extremes.** The middle two numbers are the **means.**

Proportions in which the means are equal occur frequently in geometry. For any two positive numbers a and b, the **geometric mean** of a and b is the positive number x such that $\frac{a}{x} = \frac{x}{b}$.

Cross multiplication of a geometric mean:

$$ab = x^2$$

Finding a Geometric Mean

What is the geometric mean of the numbers:

4 and 36?

3 and 21?

1 and 25?

12

3*squareroot(7)

5

Altitude-Hypotenuse Similarity Theorem

take note

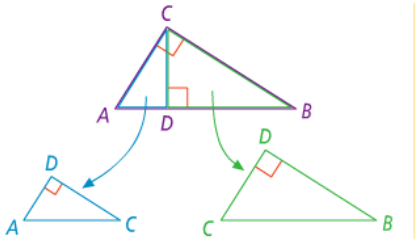
Theorem 7-3

Theorem

The altitude to the hypotenuse of a right triangle divides the triangle into two triangles that are similar to the original triangle and to each other.

If . . .

$\triangle ABC$ is a right triangle with right $\angle ACB$, and $\overline{CD}$ is the altitude to the hypotenuse



Then . . .

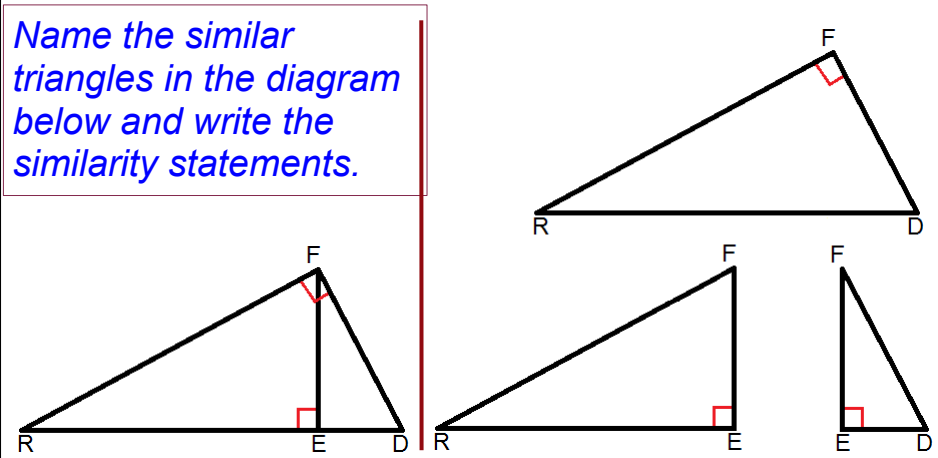
$\triangle ABC \sim \triangle ACD$

$\triangle ABC \sim \triangle CBD$

$\triangle ACD \sim \triangle CBD$

Similar Right Triangles

Name the similar triangles in the diagram below and write the similarity statements.



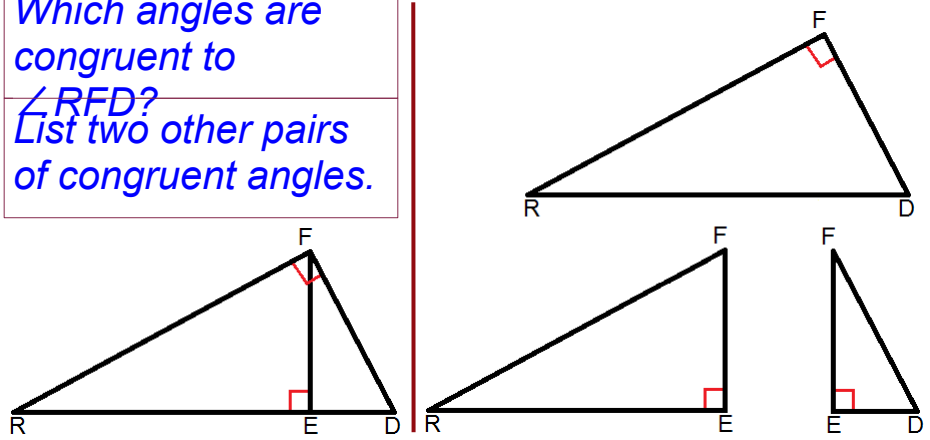
△ RFD △ REF △ FED

△ RFD~△ REF △ RFD~△ FED △ REF~△ FED

Similar Right Triangles

Which angles are congruent to ∠RFD?

List two other pairs of congruent angles.

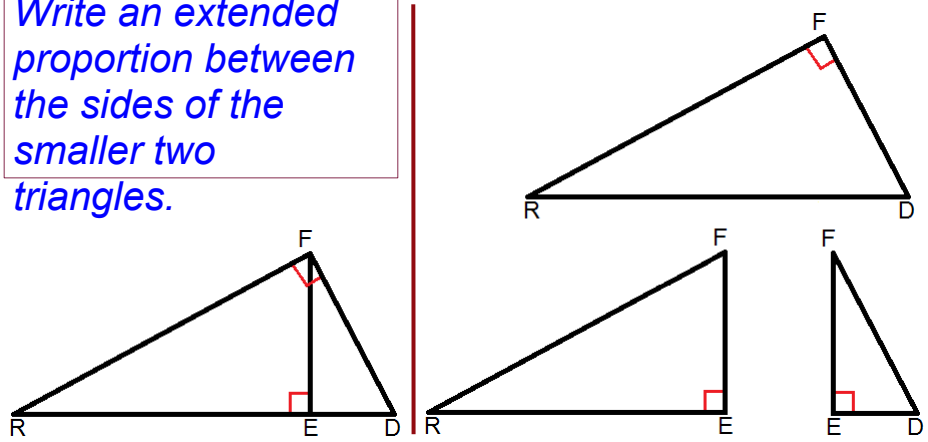


∠*FER* and ∠*FED*

∠*R* ≅ ∠*DFE*
∠*EFR* ≅ ∠*D*

Similar Right Triangles

Write an extended proportion between the sides of the smaller two triangles.



$$\frac{FE}{DE} = \frac{RE}{FE} = \frac{FR}{FD} =$$

Altitude Geometric Mean Theorem

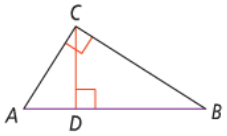
take note

Corollary 1 to Theorem 7-3

Corollary

The length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the segments of the hypotenuse.

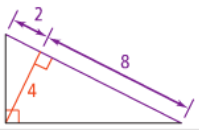
If . . .



Then . . .

$\frac{AD}{CD} = \frac{CD}{DB}$

Example

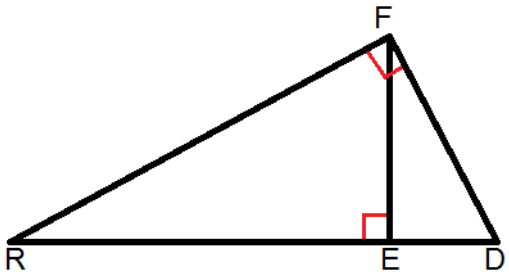


Segments of hypotenuse → 2 : 4 = 4 : 8 ← Altitude to hypotenuse

$(CD)^2 = (AD)(DB)$

Similar Right Triangles

$FE = 11$ $DE = 5$ $RE =$ ___	$FE =$ ___ $DE = 1$ $RE = 4$
$FE = 12$ $DF = 13$ $RE =$ ___	$FE =$ ___ $DE = 3.6$ $RE = 10$



RE = $^{121}/_{5}$ or 24.2

RE = $^{144}/_{5}$ or 28.8

FE = 2

FE = 6

Homework

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