MAT 222

Chapter 7: Things To Know

Section 7.1 Ratios and Proportions

Objectives

1. Write Ratios as Fractions
2. Write Ratios in Simplest Form.
3. Understand and Work with Extended Ratios.
4. Solve Proportions.

Vocabulary

- ratio
- extended ratio
- proportion
- extremes
- means
- cross products

Definitions

A ______________________ is the quotient of two quantities.

The ratio of 1 to 2 can be written as:

These ratios are all read as: "____."

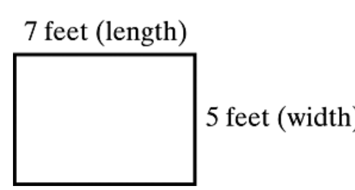
When we write a ratio as a fraction, the first number of the ratio is the _________________________________ and the second number of the ratio is the ____________________________________.

Example Writing a Ratio as a Fraction
Write the ratio of 12 to 17 using fractional notation.

Example Writing a Ratio as a Fraction in Simplest Form
Write each ratio as a fraction in simplest form.

a. \$15 to \$10   b. 4 ft to 24 in.   c. $\frac{500\text{cm}}{7\text{ m}}$

Example Using Ratios in Geometry
Given the rectangle shown:



a. Find the ratio of its width to its length.

b. Find the ratio of its length to its perimeter.

Definition

An ______________________________ compares three (or more) numbers.

In the extended ratio $a: b: c$, the ratio of the first two numbers is ____________, the ratio of the last two numbers is ____________, and the ratio of the first and last numbers is ____________.

Example Using an Extended Ratio

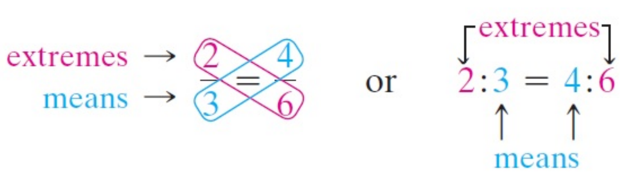
The lengths of the sides of a triangle are in the extended ratio 3: 5: 6. The perimeter of the triangle is 98 units. What is the length of each side?

Solving Proportions

An equation stating that two ratios are equal is called a _________________________.

The first and last numbers in a proportion are the _________________________.

The middle two numbers are the _____________________.



NOTE: A proportion is true if and only if the ratios have the same simplest form.

_________________________________ are the product of the means and also the product of the extremes.

Theorem Cross Products Property

If…

Then…

Example Solving a Proportion

Solve each proportion for the variable.

a. $\frac{6}{x} = \frac{5}{4}$

b. $\frac{y+4}{9} = \frac{y}{3}$

Section 7.2 Proportion Properties and Problem Solving

Objectives	**Vocabulary**
1. Use Properties of Proportions to Write Equivalent Proportions. 2. Solve Problems by Writing Proportions.	• No new vocabulary

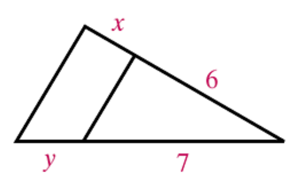
Properties of Proportions
$a, b, c,$ and d do not equal zero.

Try to figure out not just **HOW** these properties work, but **WHY** they work. We will talk more about the **WHY** question during class.

Property	***How to apply it***
(1)	
(2)	
(3)	

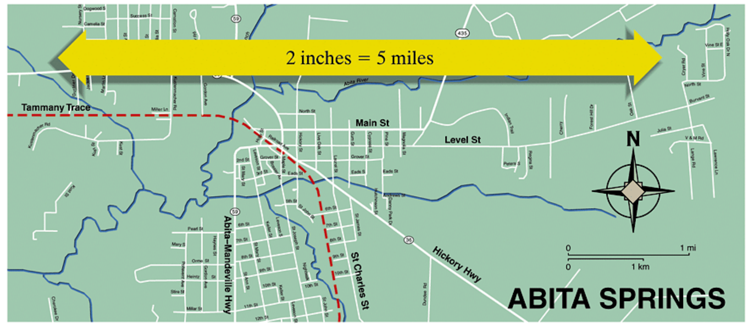
Example Using Properties of Proportions
Use the Properties of Proportions to write three proportions equivalent to $\frac{3}{x} = \frac{4}{y}$.

Example Writing Equivalent Proportions
In the diagram, $\frac{x}{6} = \frac{y}{7}$. What ratio completes the equivalent proportion $\frac{x}{y} = \frac{\square}{\square}$? Justify your answer.



Example Determining Distances from a Map

On a chamber of commerce map of Abita Springs, 5 miles corresponds to 2 inches. How many miles correspond to 7 inches?



Example Finding Medicine Dosage

The standard dose of an antibiotic is 4cc (cubic centimeters) for every 25 pounds (lb) of body weight. At this rate, find the standard dose for a 140-lb woman.

140-pound woman

Section 7.3 Similar Polygons

Objectives	**Vocabulary**
1. Identify Similar Polygons. 2. Use Similar Polygons to Solve Applications.	• similar figures • similar polygons • extended proportion • scale factor

____________________________have the same shape but not necessarily the same size.

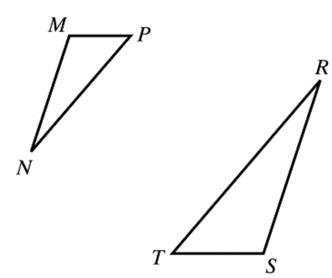
We will abbreviate "is similar to" with the _____________ symbol.

Define	***Diagram***	***Symbols***

When three or more ratios are equal, we can write an ____.

Example Understanding Similarity and Using Extended Proportions

$\Delta MNP \sim \Delta SRT$



a. What are the pairs of congruent angles?

b. What is the extended proportion for the ratios of corresponding sides?

Definition

A ____ is the ratio of corresponding linear measurements of two similar figures.

For example, if the ratio of the lengths of corresponding sides $\overline{BC}$ and $\overline{YZ}$ is 5 to 2, then the scale factor is:

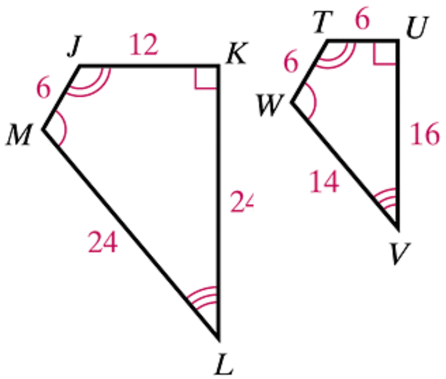
Example Determining Similarity Using Scale Factors

For the figures in **a** and **b**, answer Part 1 and Part 2:

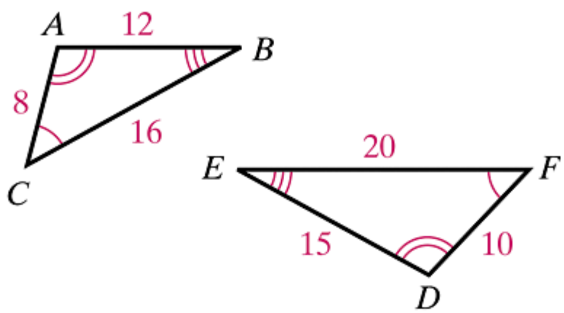
Part 1 Are the polygons similar?

Part 2 If they are, write a similarity statement and give the scale factor.

a.



b.

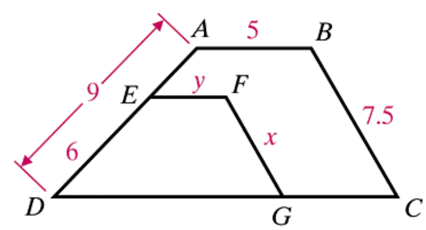


Example Using Similar Polygons to Find Unknown Values

MULTIPLE CHOICE: $ABCD \sim EFGD$. What is the value of x?

a. 4.5 b. 5

c. 7.2 d. 11.25



Example Using Similarity

Your class is making a rectangular poster for a rally. The poster's design is 6 in. in width by 10 in. in length. The space allowed for the poster is 4 ft in width by 8 ft in length. What are the dimensions of the largest poster that will still fit in the space?

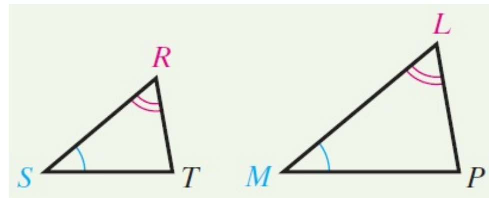
Section 7.4 Proving Triangles are Similar

Objectives	**Vocabulary**
1. Use the AA∼ Postulate and the SAS∼ and SSS∼ Theorems. 2. Use Similarity to Find Indirect Measurements.	• indirect measurement

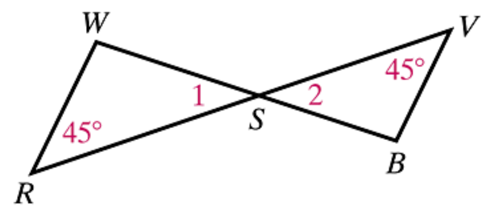
Angle-Angle Similarity (AA∼) Postulate

If…

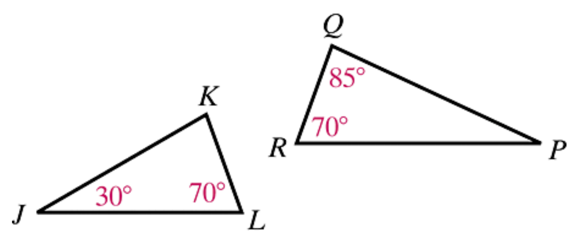
Then…



Example Using the AA∼ Postulate
Determine whether ΔRSW and ΔVSB are similar. Explain.



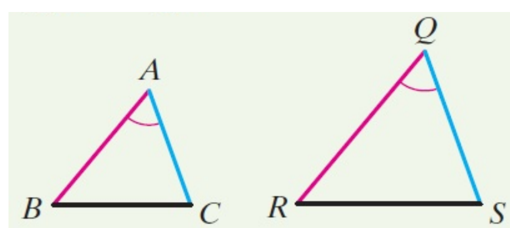
Example Using the AA∼ Postulate
Determine whether ΔJKL and ΔPQR are similar. Explain.



Theorem Side-Angle-Side Similarity (SAS∼) Theorem

If…

Then…



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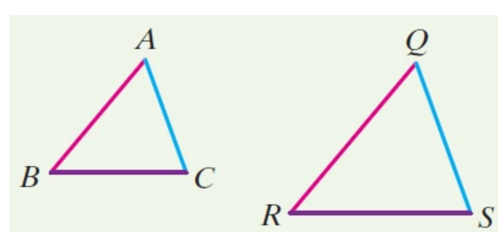
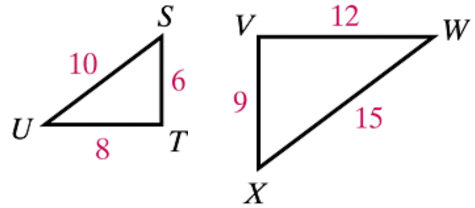
If…

Then…



Example Verifying Triangle Similarity

Determine whether the triangles are similar. If they are, write a similarity statement for the triangles. Use the AA~ Postulate, SAS~ Theorem, or SSS~ Theorem.



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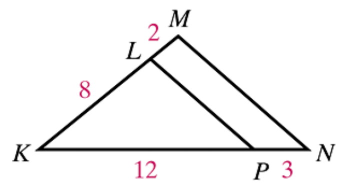
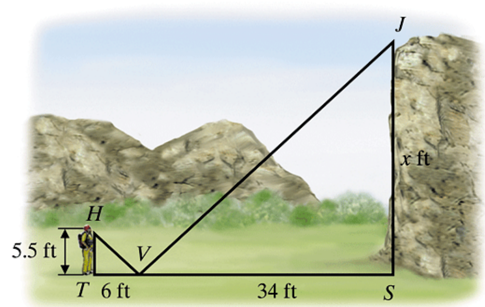


Similar triangles can sometimes be used to find lengths that cannot be easily found. This process is called

____.

Example Finding Lengths Using Similar Triangles

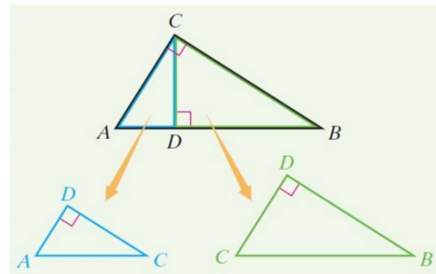
Before rock climbing, a student wants to know how high he will climb. He places a mirror on the ground and walks backward until he can see the top of the cliff in the mirror. What is the height of the cliff?



Section 7.5 Geometric Mean and Similarity in Right Triangles

Objectives	**Vocabulary**
1. Use Altitudes of Right Triangles to Prove Similarity. 2. Find the Geometric Mean of the Lengths of Segments in a Right Triangle. 3. Solve Applications Involving Right Triangles.	• geometric mean

Theorem Altitude of a Right Triangle

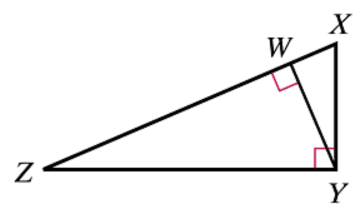


If…

Then…

Example Writing Similarity Statements

What similarity statement can you write relating the three triangles in the diagram?



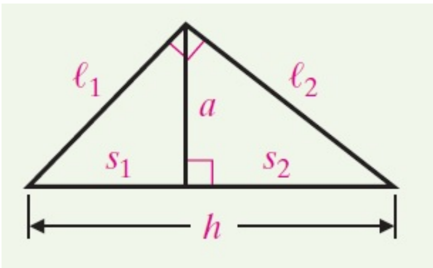
For any two positive numbers a and b, the ________________________________ of a and b is the positive number x such that:

Example Finding the Geometric Mean

What is the geometric mean of 6 and 15?

a. 90 b. $3\sqrt{10}$ c. $9\sqrt{10}$ d. 30

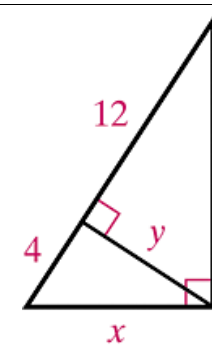
Corollary Geometric Mean in Similar Right Triangles



Summarize both Corollaries here with three proportions from this triangle!

Example Using Corollaries and Algebra

What are the values of x and y?



Example Finding a Distance

You are preparing for a robotics competition using the setup shown here. Points A, B, and C are located so that $AB = 20$ in. and $\overline{AB} \perp \overline{BC}$. Point D is located on segment $\overline{AC}$ so that $\overline{BD} \perp \overline{AC}$ and $DC = 9$ in. You program the robot to move from A to D and to pick up the plastic bottle at D. How far does the robot travel from A to D?