# Curriculum Outcomes:

**(SS3) Demonstrate an understanding of similarity of polygons.**

**(SS4) Draw and interpret scale diagrams of 2-D shapes.**

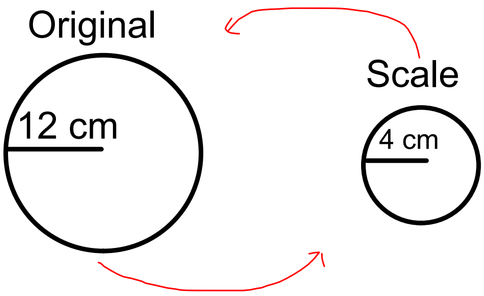
**(SS5) Demonstrate an understanding of line and rotation symmetry.**

Student Friendly:

How are diagrams related in size? To increase a length by a certain number be it a fraction or a whole number.

# Warm Up

1) Determine the scale factor of the following:




$SF = \frac{S}{O}$

$= \frac{4}{12}$

$SF = \frac{1}{3}$

2) Determine the unknown lengths for the following

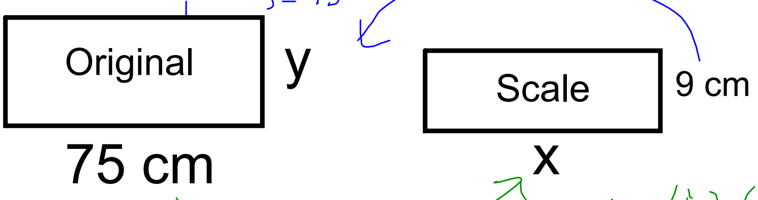
a) If the scale factor is 1/5

$SF = \frac{1}{5}$

$y = 9 \div \frac{1}{5}$

$= 9 \times \frac{5}{1}$

$y = 45$




$\times \frac{1}{5}$

$x = (\frac{1}{5})(75)$

$x = 15$

| x | y |
|---|---|
| $SF = \frac{S}{O}$ | $SF = \frac{S}{O}$ |
| $\frac{1}{5} = \frac{x}{75}$ | $\frac{1}{5} = \frac{9}{y}$ |
| $\frac{75}{5} = x$ | $1y = 9(5)$ |
| $15 = x$ | $y = 45$ |

3) Solve the following Ratios for the unknown variable:

$$\frac{4}{5} = \frac{x}{12.5}$$

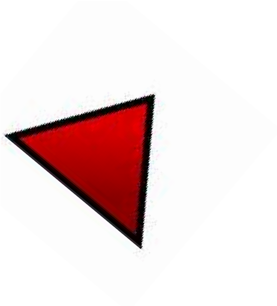
$$\frac{4(12.5)}{5} = x$$

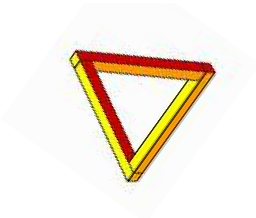
$$x = 10$$

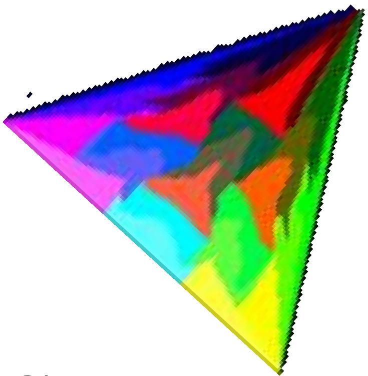
$$\frac{3}{8} = \frac{16}{y}$$

$$\frac{3y}{3} = \frac{8(16)}{3}$$

$$y = 42.7$$

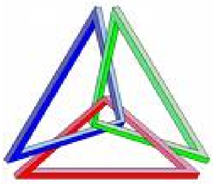




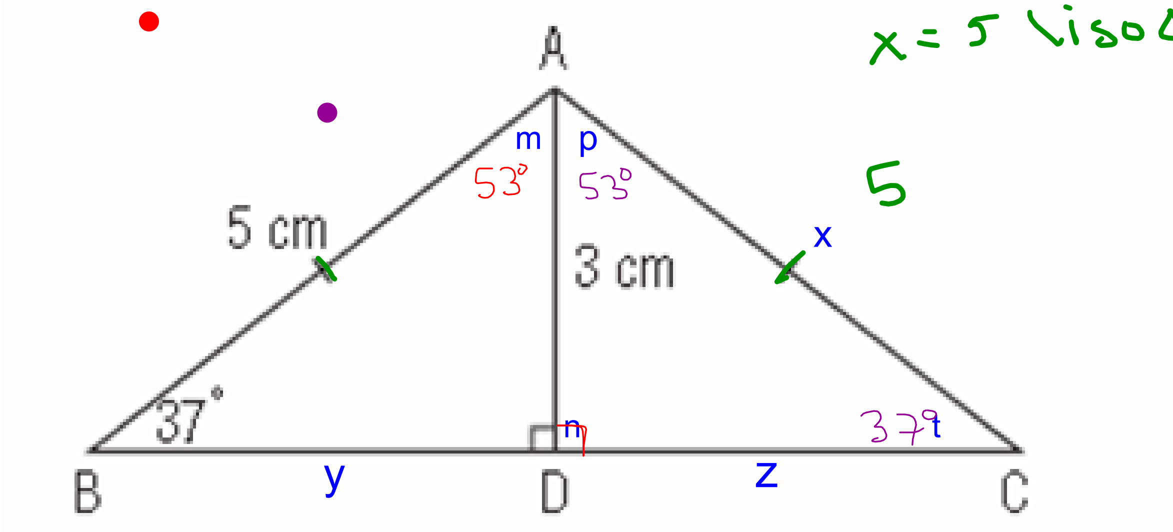


Section 7. 4

# Similar Triangles



$x = 5$ (iso Δ)



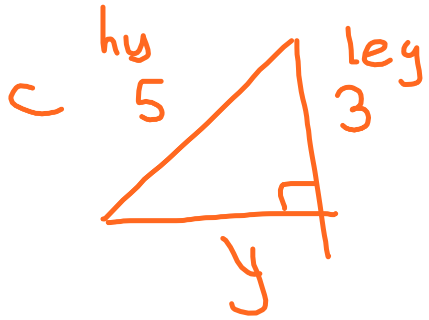

$n = 90°$

$m = 180° - 90° - 37°$

$m = 53°$

$t = 37°$ (iso Δ)

$p = 53°$




$a^2 + b^2 = c^2$

$b^2 = c^2 - a^2$

$b^2 = 5^2 - 3^2$

$b^2 = 25 - 9$

$\sqrt{b^2} = \sqrt{16}$

$b = 4$

$y = 4$

$z = 4$

**Start Where You Are**

## What Should I Recall?

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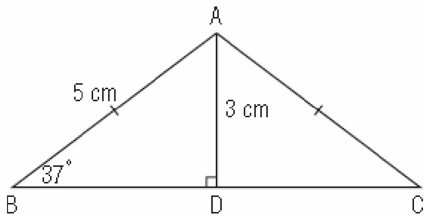
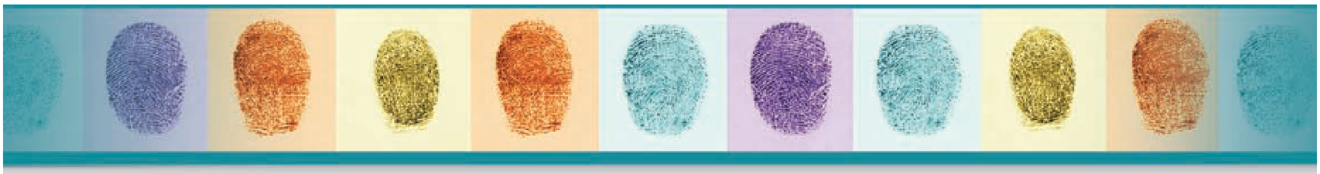
Suppose I have to solve this problem:
Determine the unknown measures of the angles and sides in ΔABC.
The given measures are rounded to the nearest whole number.



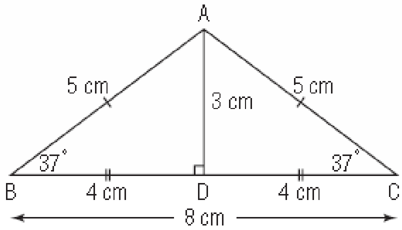

I know that a triangle with 2 equal sides is an isosceles triangle.
So, ΔABC is isosceles.
An isosceles triangle has 2 equal angles that are formed where the equal sides intersect the third side.

Since ΔABC is isosceles, the height AD is the perpendicular bisector of the base BC.
So, BD = DC and ∠ADB = 90°
I can use the Pythagorean Theorem in ΔABD to calculate the length of BD.



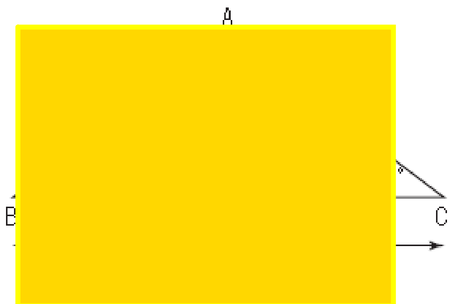
BD = 4 cm
So, BC = 2 × 4 cm
= 8 cm

I know that the sum of the angles in a triangle is 180°.
Sc C.
∠
74°




My friend Janelle showed me a different way to calculate.
She recalled that the line AD is a line of symmetry for an isosceles triangle.
So, ΔABD is congruent to ΔACD.

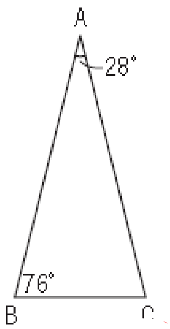
This means that ∠BAD = ∠CAD
Janelle calculated the measure of ∠BAD in ΔABD.
∠
∠BA °
Then

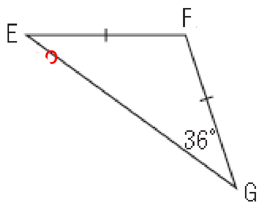


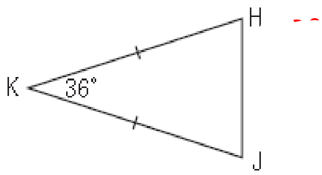

## Check

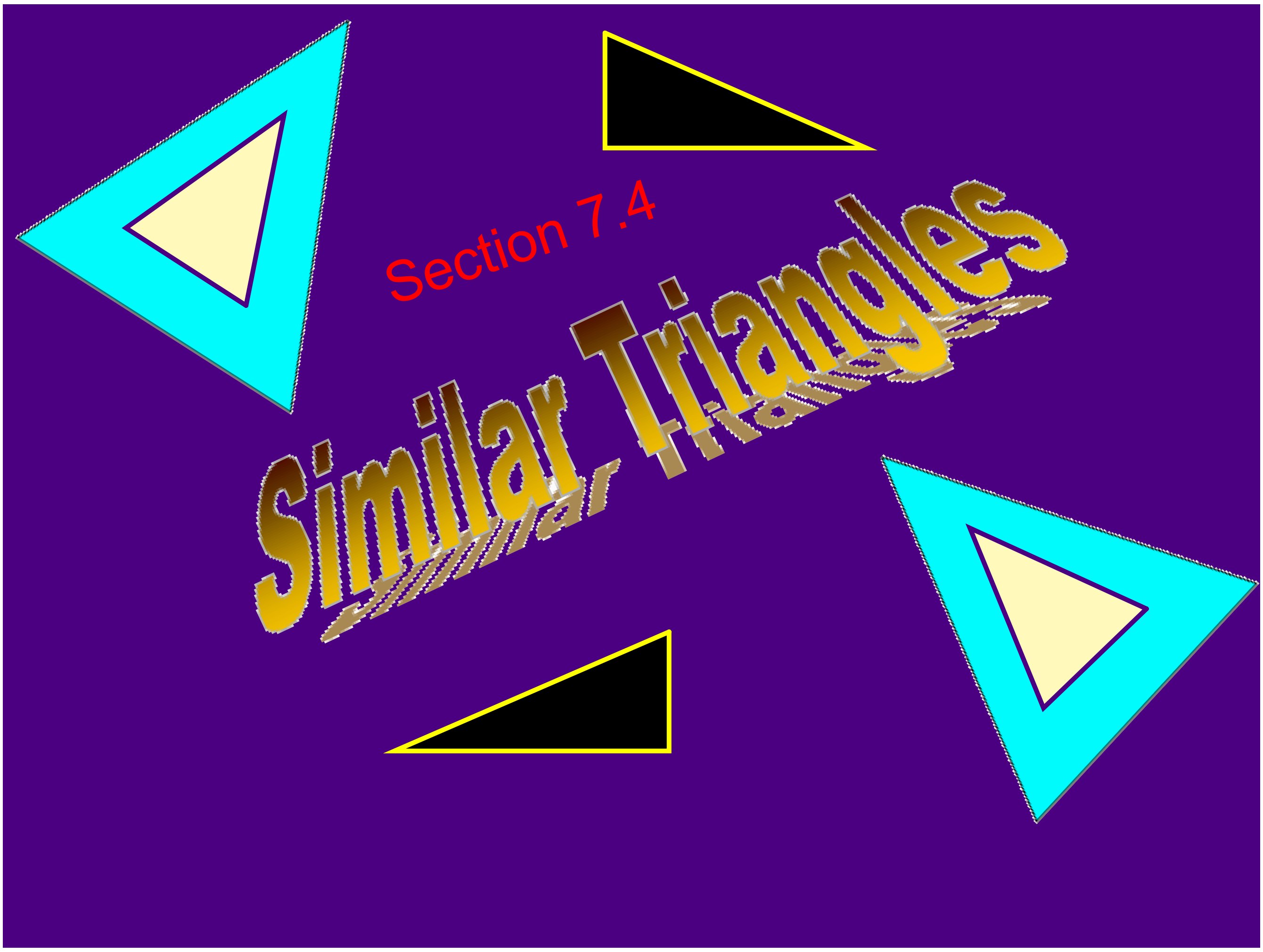
**1.** Calculate the measure of each angle.

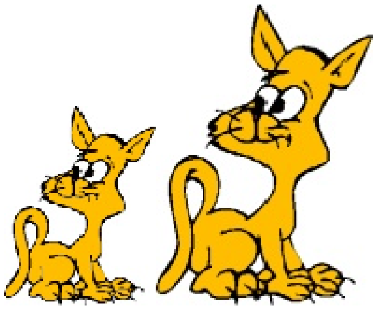
**a)** ∠ACB **b)** ∠GEF and ∠GFE **c)** ∠HJK and ∠KHJ




Section 7.4
Similar Triangles



The cat on the right is an enlargement of the cat on the left. They are exactly the same shape, but they are NOT the same size.

These cats are similar figures.

**Objects, such as these two cats, that have the same shape, but do not have the same size, are said to be "similar".**

The mathematical symbol used to denote similar is ~ .

Similar Symbol

~

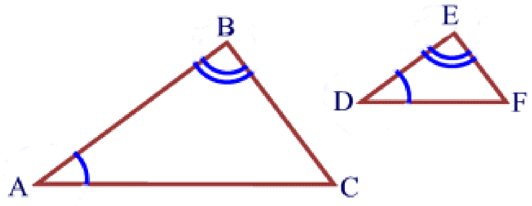
**Definition:** Two triangles are **similar** if and only if the corresponding sides are in proportion and the corresponding angles are congruent.

**There are three accepted methods of proving triangles similar:**

## AA

Angle. Angle

**Theorem:** If two angles of one triangle are congruent to two angles of another triangle, the triangles are similar.




If: $\measuredangle A \cong \measuredangle D$

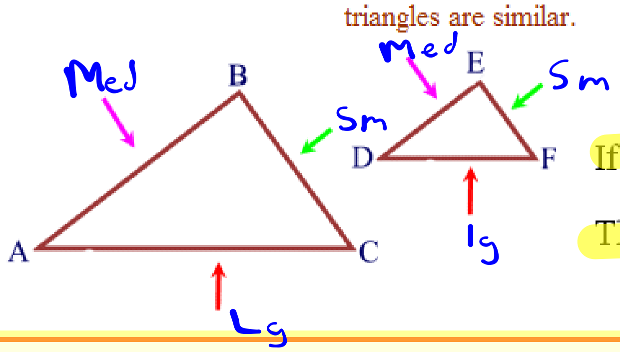
$\measuredangle B \cong \measuredangle E$

Then: $\Delta ABC \sim \Delta DEF$

## SSS for similarity

Side, side, side

**Theorem:** If the three sets of corresponding sides of two triangles are in proportion, the triangles are similar.



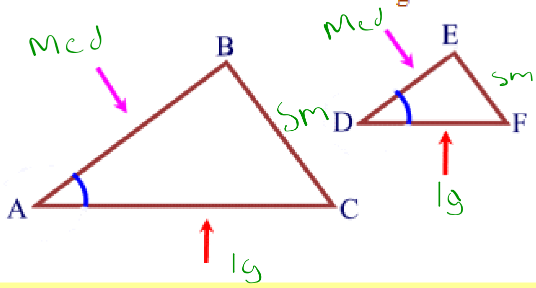

If: $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$

Then: $\Delta ABC \sim \Delta DEF$

## SAS for similarity

Side, Angle, Side

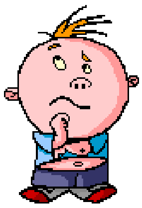
**Theorem:** If an angle of one triangle is congruent to the corresponding angle of another triangle and the lengths of the sides including these angles are in proportion, the triangles are similar.




If: $\measuredangle A \cong \measuredangle D$

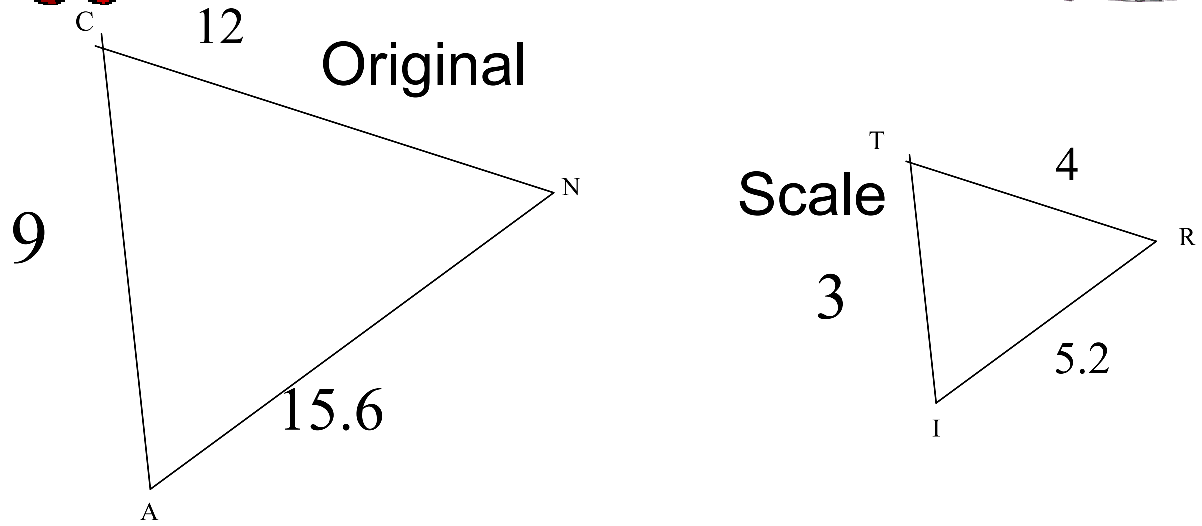
$\frac{AB}{DE} = \frac{AC}{DF}$

Then: $\Delta ABC \sim \Delta DEF$



# Are these triangles similar?

Triangles are just polygons

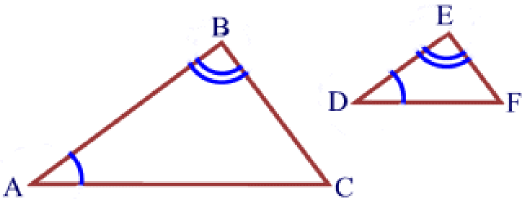



Let's Compare sides

## Set up ratios of sides

# Once the triangles are similar:

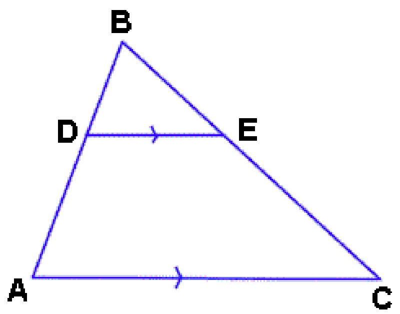
**Theorem:** The corresponding sides of similar triangles are in proportion.




$If: \ \Delta ABC \sim \Delta DEF$

$$Then: \ \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

# Dealing with overlapping triangles:




Many problems involving similar triangles have one triangle ON TOP OF (overlapping) another triangle. Since $\overline{DE}$ is marked to be parallel to $\overline{AC}$, we know that we have $\angle BDE$ congruent to $\angle DAC$ (by corresponding angles). $\angle B$ is shared by both triangles, so the two triangles are similar by AA.

There is an additional theorem that can be used when working with overlapping triangles:

**Additional Theorem:** If a line is parallel to one side of a triangle and intersects the other two sides of the triangle, the line divides these two sides proportionally.

$$If:\ \overline{DE} \parallel \overline{AC}$$

$$Then:\ \frac{BD}{DA} = \frac{BE}{EC}$$