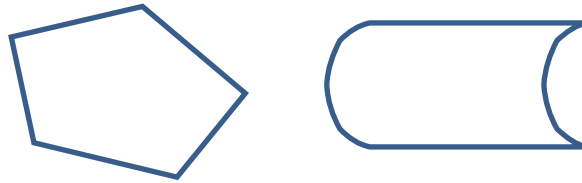


## Section 8.3: Similar Polygons

A polygon is a closed shape that consists of line segments. For example, triangles, quadrilaterals, and octagons are all polygons.



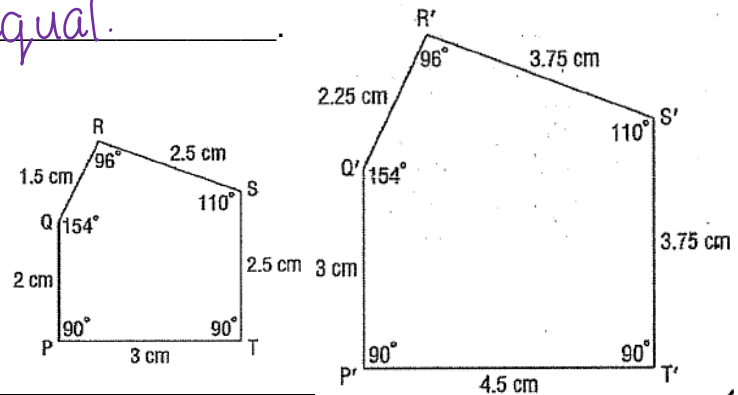
When one polygon is an enlargement or a reduction of another polygon, we say the polygons are similar. Similar polygons have the same shape but not the same size.

Two polygons are similar when:

1. Corresponding sides have same proportion. (scale factor)
2. Matching angles are equal.

## Example 1

List all the corresponding sides and angles for the following diagrams.

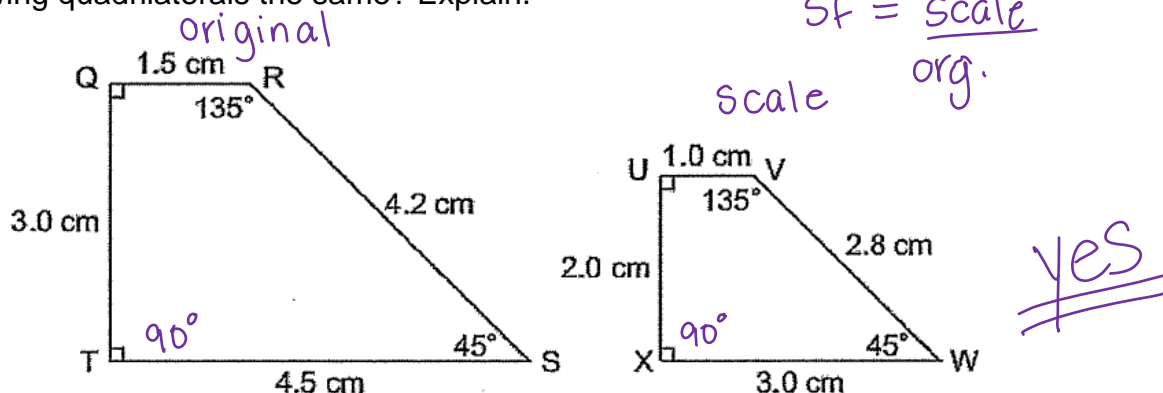


Corresponding Side			Corresponding Angle	
PQ = 2 cm	P'Q' = 3 cm	$\frac{P'Q'}{PQ} = \frac{3}{2} = 1.5$ (SF)	$\angle P = 90^\circ$	$\angle P' = 90^\circ$
QR = 1.5 cm	Q'R' = 2.25 cm	$\frac{2.25}{1.5} = 1.5$	$\angle Q = 154^\circ$	$\angle Q' = 154^\circ$
RS = 2.5 cm	R'S' = 3.75 cm	$\frac{3.75}{2.5} = 1.5$	$\angle R = 96^\circ$	$\angle R' = 96^\circ$
ST = 2.5 cm	S'T' = 3.75 cm	$\frac{3.75}{2.5} = 1.5$	$\angle S = 110^\circ$	$\angle S' = 110^\circ$
TP = 3 cm	T'P' = 4.5 cm	$\frac{4.5}{3} = 1.5$	$\angle T = 90^\circ$	$\angle T' = 90^\circ$

↑ scale factor - must all be the same.

## Example 2

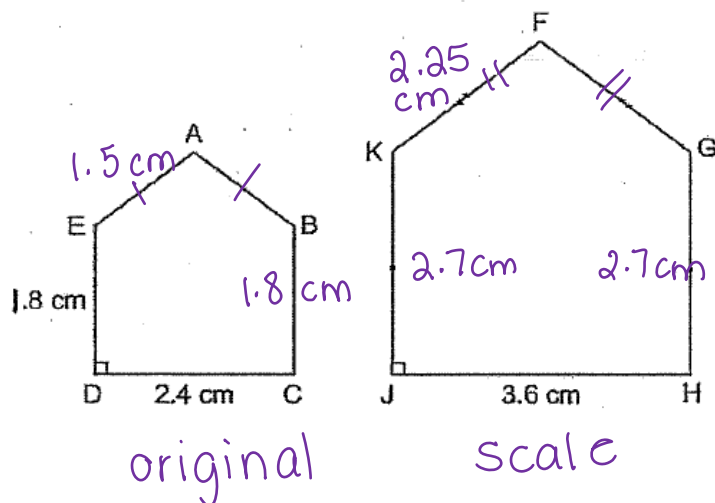
Are the following quadrilaterals the same? Explain.



Corresponding Side			Corresponding Angle	
TQ = 3.0 cm	XU = 2.0 cm	$\frac{XU}{TQ} = \frac{2}{3}$	$\angle T$	$\angle X = 90^\circ$
QR = 1.5 cm	UV = 1.0 cm	$\frac{1}{1.5} = \frac{2}{3}$	$\angle Q$	$\angle U = 90^\circ$
RS = 4.2 cm	VW = 2.8 cm	$\frac{2.8}{4.2} = \frac{2}{3}$	$\angle R$	$\angle V = 135^\circ$
ST = 4.5 cm	WX = 3.0	$\frac{3}{4.5} = \frac{2}{3}$	$\angle S$	$\angle W = 45^\circ$

## Example 3

These two polygons are similar. Find the corresponding lengths.



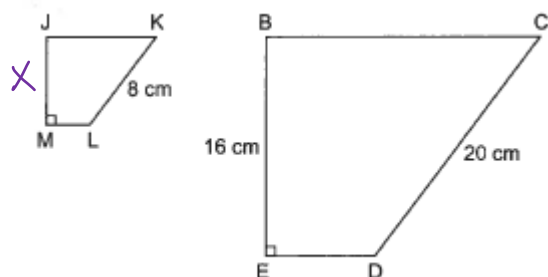
$$SF = \frac{3.6 \text{ cm}}{2.4 \text{ cm}} = 1.5$$

$$KJ = 1.8 \text{ cm} \times 1.5 = 2.7 \text{ cm}$$

$$EA = 2.25 \div 1.5 = 1.5 \text{ cm}$$

### Example 4

These two quadrilaterals are similar. Find the length of JM.

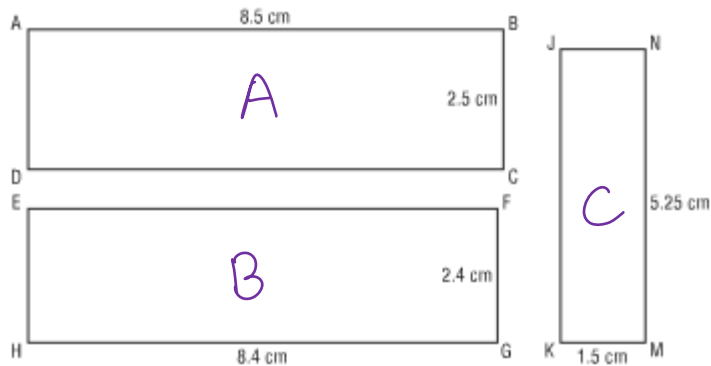


$$SF = \frac{20}{8} = 2.5$$

$$JM = \frac{16}{2.5} = 6.4 \text{ cm}$$

### Example 5

Identify any pairs of similar rectangles.



$$\underline{\underline{BC}} \quad SF = \frac{2.4}{1.5} = 1.6 \quad \checkmark$$

$$5.25 \text{ cm} \times 1.6 = 8.4 \text{ cm}$$

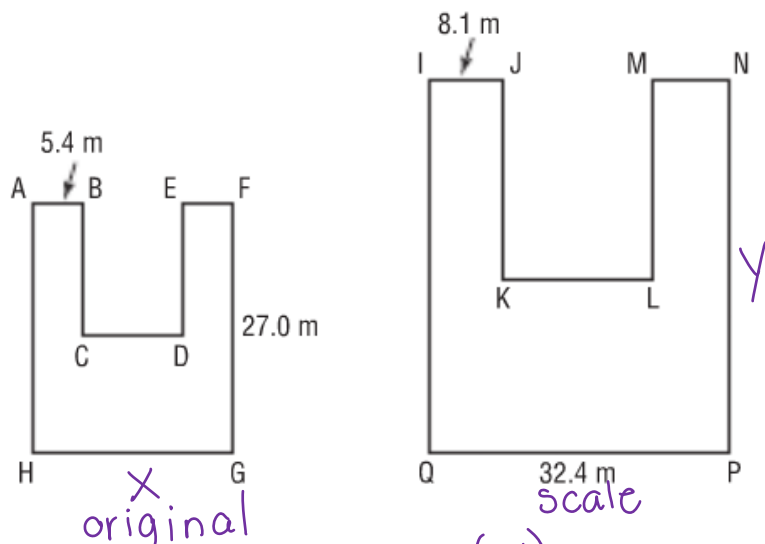
$$\underline{\underline{AC}} \quad SF = \frac{2.5}{1.5} = 1.\overline{6}$$

$$5.25 \times 1.\overline{6} = 8.74 \times$$

## Example 6

The two octagonal garden plots are similar.

(a) Determine the length of GH. (x)



$$SF = \frac{8.1}{5.4} = \frac{\text{scale}}{\text{original}}$$

$$\frac{8.1}{5.4} \neq \frac{32.4}{x}$$

(b) Determine the length of NP. (y)

$$\frac{8.1}{5.4} \neq \frac{y}{27.0}$$

$$\frac{8.1x}{8.1} = \frac{(5.4)(32.4)}{8.1}$$

$$x = 21.6 \text{ m}$$

$$\frac{(27)(81)}{5.4} = y$$

$$y = 40.5 \text{ m}$$

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