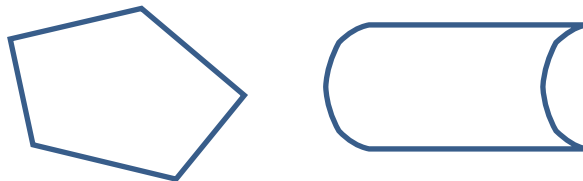Date: _____

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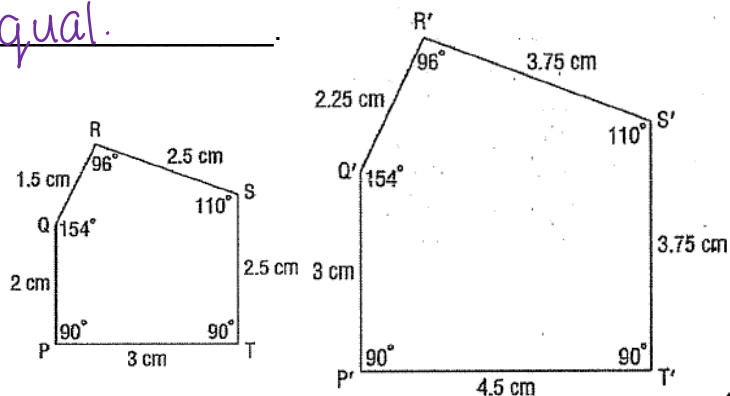
When one polygon is an enlargement or a reduction of another polygon, we say the polygons are similar. Similar polygons have the same shape but not the same size.

Two polygons are similar when:

1. __Corresponding sides have same proportion. (scale factor)__

2. __Matching angles are equal.__ .

Example 1

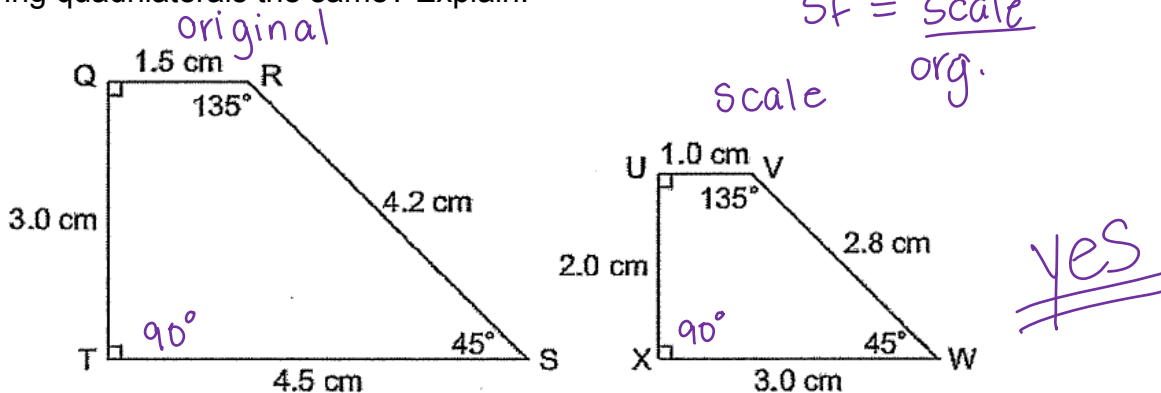List all the corresponding sides and angles for the following diagrams.

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

scale factor - must all be the same.

Example 2

Are the following quadrilaterals the same? Explain.

original

$SF = \dfrac{scale}{org.}$

1.5 cm
Q ⌐ R
135°
3.0 cm
4.2 cm
90°
T
4.5 cm
45° S

U 1.0 cm V
135°
2.0 cm
2.8 cm
90°
X
3.0 cm
45° W

$Scale$ $org.$

yes

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

Example 3

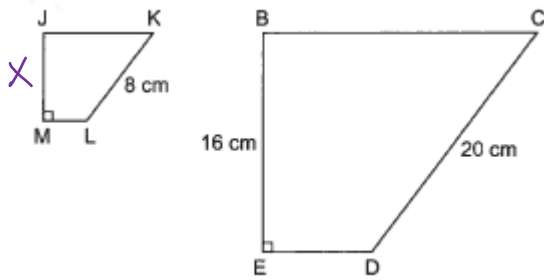These two polygons are similar. Find the corresponding lengths.

2.25 cm
A
1.5 cm
E
B
1.8 cm
1.8 cm
D   2.4 cm   C

original

F
K   G
2.7cm   2.7cm
J   3.6 cm   H

scale
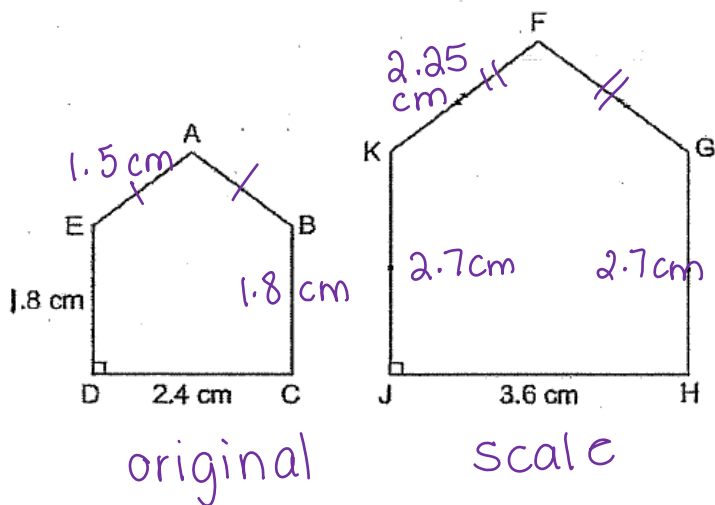
$SF = \dfrac{3.6 \, cm}{2.4 \, cm} = 1.5$

$KJ = 1.8cm \times 1.5 = 2.7 cm$

$EA = 2.25 \div 1.5 = 1.5 \, cm$

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Example 4

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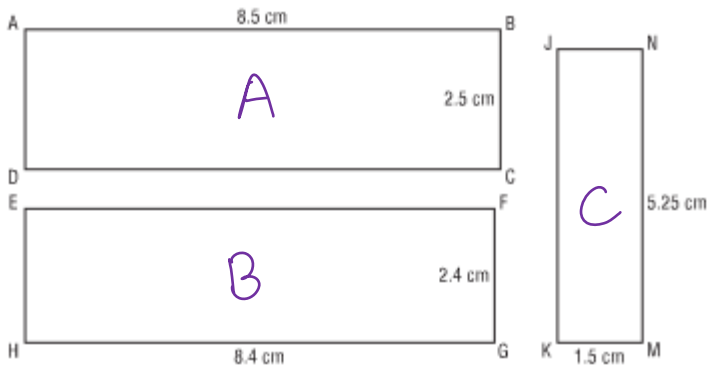

$SF = \dfrac{20}{8} = 2.5$

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

Example 5

Identify any pairs of similar rectangles.

$\underline{\underline{BC}}$ $SF = \dfrac{2.4}{1.5} = 1.6$ ✓

$5.25 \text{ cm} \times 1.6 = 8.4 \text{ cm}$
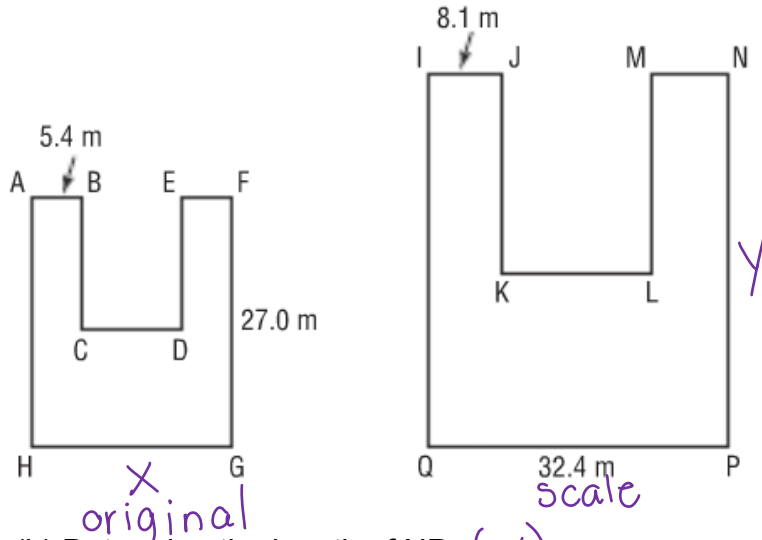
$\underline{\underline{AC}}$ $SF = \dfrac{2.5}{1.5}$

$= 1.\overline{6}$

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

Marsh

Example 6

The two octagonal garden plots are similar.

(a) Determine the length of GH. $\left(x\right)$

8.1 m

I J   M   N

5.4 m

A B   E   F

27.0 m

C   D

H   X   G   Q   32.4 m   P
original   scale

(b) Determine the length of NP. $\left(y\right)$

$\dfrac{8.1}{5.4} \nsim \dfrac{y}{27.0}$

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

$SF = \dfrac{8.1}{5.4} = \dfrac{scale}{original}$

$\dfrac{8.1}{5.4} \diagup\hspace{-0.6em}\diagdown \dfrac{32.4}{x}$

$\dfrac{8.1\,x}{8.1} = \dfrac{(5.4)(32.4)}{8.1}$

$x = 21.6\,m$

$y = 40.5\,m$

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