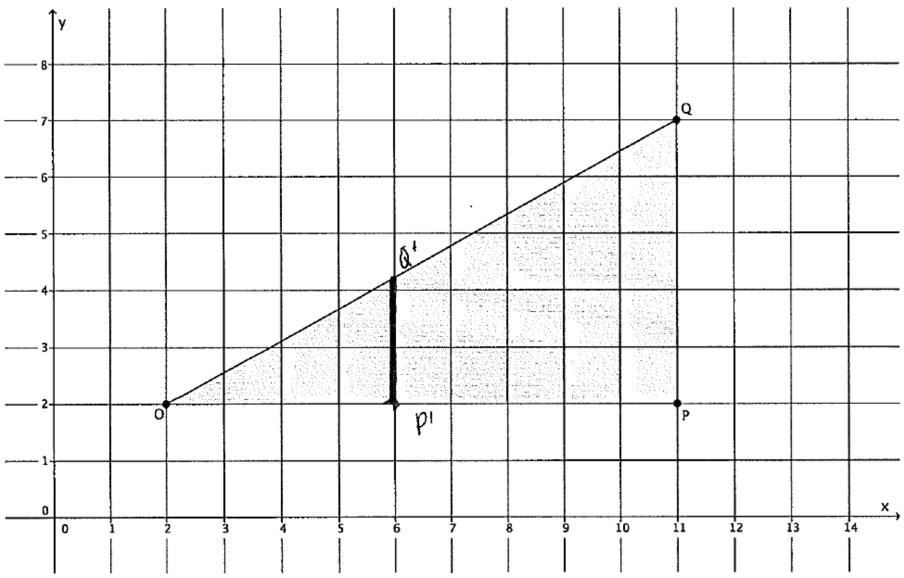
Name ______________________ Date ______________

1. Use the diagram below to answer the questions that follow.



a. Dilate triangle ΔOPQ from center O and scale factor $r = \frac{4}{9}$. Label the image $\Delta OP'Q'$.

b. Find the coordinates of P' and Q'.

$P' = (6, 2)$

$Q' = \left(6, \frac{38}{9}\right)$

$\frac{|P'Q'|}{|PQ|} = \frac{4}{9}$

$\frac{|P'Q'|}{5} = \frac{4}{9}$

$|P'Q'| = \frac{20}{9}$

$\frac{20}{9} + 2 = \frac{20}{9} + \frac{18}{9}$

$= \frac{38}{9}$

c. Are $\angle OQP$ and $\angle OQ'P'$ equal in measure? Explain.

YES $\angle OQP = \angle OQ'P'$. SINCE $D(\Delta OQP) = \Delta OQ'P'$ AND DILATIONS ARE DEGREE PRESERVING, THEN $\angle OQP = \angle OQ'P'$.

$\angle OQP$ & $\angle OQ'P'$ ARE CORRESPONDING ANGLES OF PARALLEL LINES PQ & P'Q', THEREFORE $\angle OQP = \angle OQ'P'$.

d. What is the relationship between the lines PQ and $P'Q'$? Explain in terms of similar triangles.

THE LINES PQ AND P'Q' ARE PARALLEL. $\triangle OPQ \sim \triangle OP'Q'$ BY THE AA CRITERION ($\angle O = \angle O$, $\angle OPQ = \angle OP'Q'$), THEREFORE BY THE FUNDAMENTAL THEOREM OF SIMILARITY $PQ \parallel P'Q'$.

e. If the length of segment $|OQ| = 9.8$ units, what is the length of segment $|OQ'|$? Explain in terms of similar triangles.

SINCE $\triangle OPQ \sim \triangle OP'Q'$, THEN THE RATIOS OF LENGTHS OF CORRESPONDING SIDES WILL BE EQUAL TO THE SCALE FACTOR. THEN

$$\frac{|OP'|}{|OP|} = \frac{|OQ'|}{|OQ|} = \frac{4}{9}$$

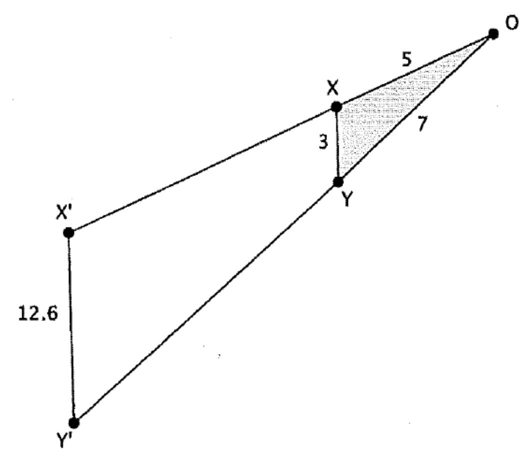
$$\frac{4}{9} = \frac{|OQ'|}{9.8}$$

$$39.2 = 9(|OQ'|)$$

$$4.36 = |OQ'|$$

THE LENGTH OF $|OQ'|$ IS APPROXIMATELY 4.4 UNITS.

2. Use the diagram below to answer the questions that follow. The length of each segment is as shown: segment OX is 5 units, segment OY is 7 units, segment XY is 3 units, and segment $X'Y'$ is 12.6 units.



a. Suppose XY is parallel to $X'Y'$. Is triangle ΔOXY similar to triangle $\Delta OX'Y'$? Explain.

YES, $\Delta OXY \sim OX'Y'$. SINCE $XY \parallel X'Y'$ THEN $\angle OXY = \angle OX'Y'$ AND $\angle OYX = \angle OY'X'$ BECAUSE CORRESPONDING ANGLES OF PARALLEL LINES ARE EQUAL, BY AA $\Delta OXY \sim \Delta OX'Y'$.

b. What is the length of segment OX'? Show your work.

$$\frac{12.6}{3} = \frac{|OX'|}{5}$$

$5(12.6) = 3(|OX'|)$
$63 = 3(|OX'|)$
$21 = |OX'|$

THE LENGTH OF $|OX'|$ IS 21 UNITS.

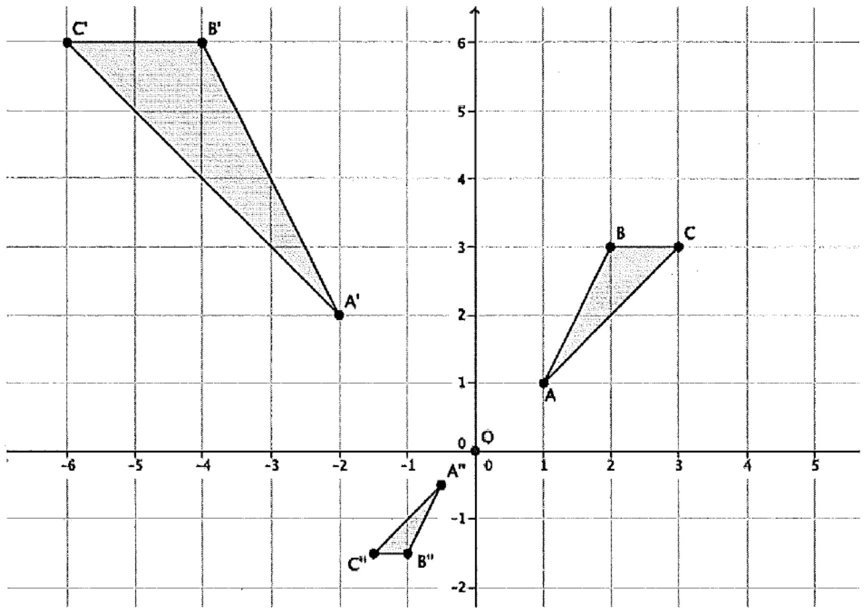
c. What is the length of segment OY'? Show your work.

$$\frac{12.6}{3} = \frac{|OY'|}{7}$$

$12.6(7) = 3(|OY'|)$
$88.2 = 3(|OY'|)$
$29.4 = |OY'|$

THE LENGTH OF $|OY'|$ IS 29.4 UNITS.

3. Given $\Delta ABC \sim \Delta A'B'C'$ and $\Delta ABC \sim \Delta A''B''C''$ in the diagram below, answer parts (a)-(c).



a. Describe the sequence that shows the similarity for ΔABC and $\Delta A'B'C'$. $\frac{B'C'}{BC} = \frac{2}{1} = 2 = r$

LET D BE THE DILATION FROM CENTER O AND SCALE FACTOR r=2. LET THERE BE A REFLECTION ACROSS THE Y-AXIS. THEN THE DILATION FOLLOWED BY THE REFLECTION MAPS ΔABC ONTO $\Delta A'B'C'$.

b. Describe the sequence that shows the similarity for ΔABC and $\Delta A''B''C''$.

LET D BE THE DILATION FROM CENTER O AND SCALE FACTOR $0<r<1$. LET THERE BE A ROTATION OF 180° AROUND CENTER O. THEN THE DILATION FOLLOWED BY THE ROTATION MAPS ΔABC ONTO $\Delta A''B''C''$.

c. Is $\Delta A'B'C'$ similar to $\Delta A''B''C''$? How do you know?

YES. $\Delta A'B'C' \sim \Delta A''B''C''$. DILATIONS PRESERVE ANGLE MEASURES AND SINCE $\Delta ABC \sim \Delta A'B'C'$ AND $\Delta ABC \sim \Delta A''B''C''$, WE KNOW $\angle A = \angle A' = \angle A''$, $\angle B = \angle B' = \angle B''$. BY AA CRITERION FOR SIMILARITY $\Delta A'B'C' \sim \Delta A''B''C''$. ALSO, SIMILARITY IS TRANSITIVE.