

### 9.9 Classwork: Similarity ratios, dilation, transformations, symmetry

I can solve problems using similarity criteria.

CCSS.HSG.SRT.B.5

1. Do Now: Given  $\triangle PQR \sim \triangle STU$ ,  $m\angle P = 37^\circ$ , and  $m\angle T = 46^\circ$ . Find  $m\angle Q$ .

$$\begin{aligned} m\angle P &= m\angle S = 37 \\ m\angle Q &= m\angle T = 46 \\ m\angle R &= m\angle U \end{aligned}$$

$46^\circ$

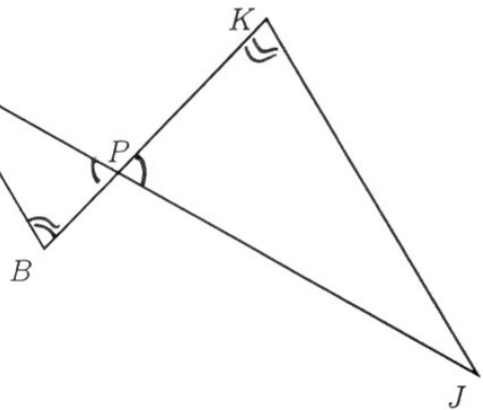
2. Two triangles are shown with  $P$  the intersection of  $\overline{AJ}$  and  $\overline{BK}$ .

- (a) Justify  $\angle APB \cong \angle JPK$ .

Vertical angles are  $\cong$

- (b) What angle must be congruent to  $\angle B$  to prove  $\triangle ABP \sim \triangle JKP$  by angle-angle similarity?

$\angle K$



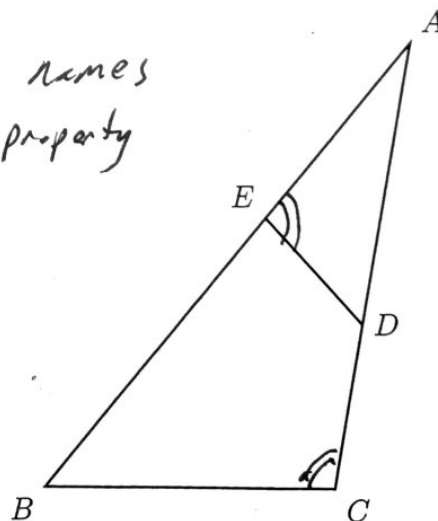
3. The diagram below shows  $\triangle ABC$ , with  $\overline{AEB}$  and  $\overline{ADC}$ .

- (a) Justify  $\angle BAC \cong \angle DAE$ .

Same angle, different names  
 $\angle A \cong \angle A$  reflexive property

- (b) What angle must be congruent to  $\angle AED$  to prove  $\triangle ABC \sim \triangle ADE$  by angle-angle similarity?

$\angle B \cong \angle D$   
 or  
 $\angle C \cong \angle E$



4. A dilation centered at the origin with scale factor  $k = \frac{4}{3}$  maps  $\overline{AB} \rightarrow \overline{A'B'}$ .

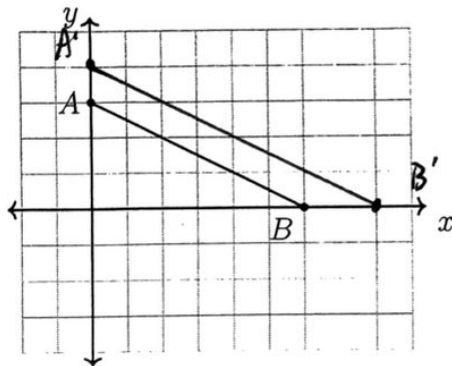
(a) Draw and label the image.

(b) What is the ratio of the length of  $\overline{A'B'}$  to  $\overline{AB}$ ?

4:3

(c) What is the relationship of the slope of  $\overline{A'B'}$  and  $\overline{AB}$ ?

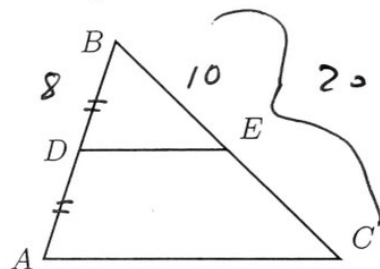
parallel,  
equal slopes



5. Given  $\triangle ABC$ ,  $D$  is the midpoint of  $\overline{BA}$ ,  $E$  is a point on  $\overline{BC}$ , and  $\overline{DE}$  is drawn. If  $BD = 8$  and  $BE = 10$ , what is the length of  $\overline{BC}$  so that  $\overline{AC} \parallel \overline{DE}$ ?

$$BC = 2(10) = 20$$

$$k = 2$$



6. In diagram below, each centimeter represents six inches. Find the length of each side in feet. (measure with a metric scale)

$$6 \text{ inches} = \frac{1}{2} \text{ foot}$$

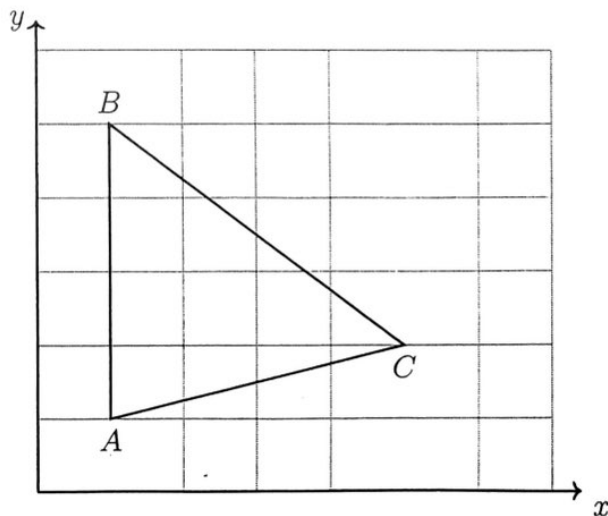
(a)  $AB = \frac{1}{2}(4) = 2 \text{ ft.}$

(b)  $BC = \frac{1}{2}(\sqrt{3^2 + 4^2})$   
 $= \frac{1}{2}(5) = 2\frac{1}{2} \text{ ft.}$

(c)  $AC = \frac{1}{2}(\sqrt{1^2 + 4^2})$   
 $= \frac{1}{2}\sqrt{17} \text{ ft.}$

- (d) Find the area of  $\triangle ABC$

$$A = \left(\frac{1}{2}\right)\frac{1}{2}(4 \times 4) = 2 \text{ sq. ft.}$$



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7. Given  $\triangle ABP \sim \triangle JKP$  as shown below.  $AB = 10.0$ ,  $AP = 9.0$ ,  $BP = 5$ , and  $AJ = 27.0$ . Find  $JK$ .

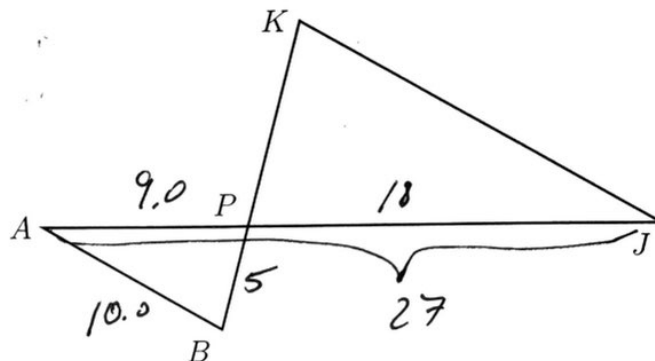
$$JP = 27 - 9 = 18$$

$$\overline{AP} \rightarrow \overline{JP}$$

$$9 \rightarrow 18$$

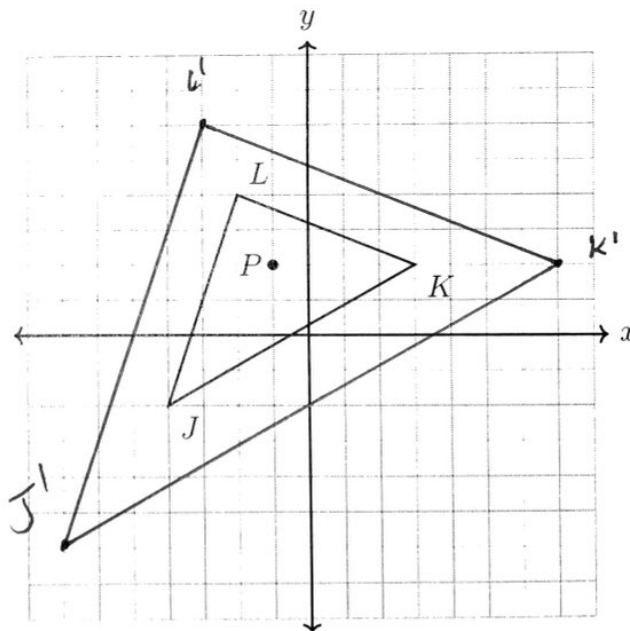
$$k = \frac{18}{9} = 2$$

$$JK = 2(10) = 20$$



8. The vertices of  $\triangle JKL$  have the coordinates  $J(-4, -2)$ ,  $K(3, 2)$ , and  $L(-2, 4)$ , as shown.

Apply a dilation to  $\triangle JKL \rightarrow \triangle J'K'L'$ , centered at  $P(-1, 2)$  and with a scale factor  $k = 2$ . Draw the image  $\triangle J'K'L'$  on the set of axes below, labeling the vertices.



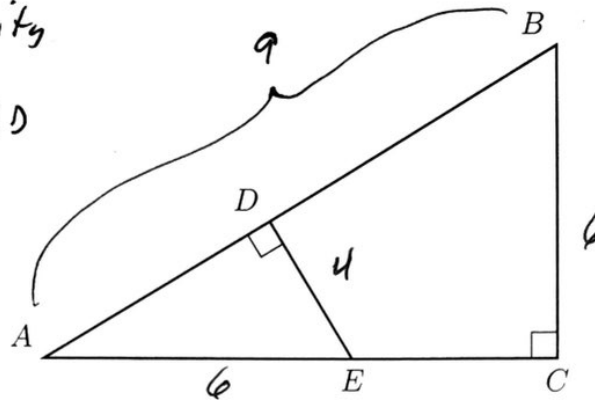
What is the ratio of the area of  $\triangle JKL$  to  $\triangle J'K'L'$ ?

$$\frac{1}{4}$$

$$k^2$$

9. In  $\triangle ABC$  shown below,  $\angle ACB$  is a right angle,  $E$  is a point on  $\overline{AC}$ , and  $\overline{ED}$  is drawn perpendicular to hypotenuse  $\overline{AB}$ .

AA Similarity  
 $\triangle ABC \sim \triangle AED$



If  $AB = 9$ ,  $BC = 6$ , and  $DE = 4$ , what is the length of  $\overline{AE}$ ?

$$BC \rightarrow DE$$

$$6 \rightarrow 4$$

$$k = \frac{4}{6} = \frac{2}{3}$$

$$AE = 9\left(\frac{2}{3}\right) = 6$$

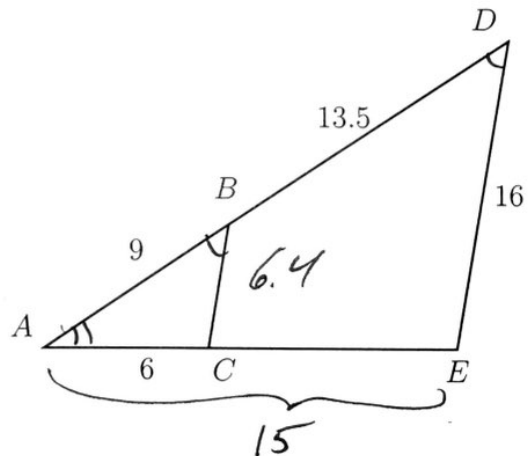
10. In the diagram below,  $\angle ABC \cong \angle ADE$ ,  $AB = 9$ ,  $AC = 6$ ,  $BD = 13.5$ , and  $DE = 16$ . Find  $AD$  and the scale factor  $k$ . Then find  $AE$  and  $BC$ .

(a)  $AD = 9 + 13.5 = 22.5$

(b)  $k = \frac{22.5}{9} = 2.5$

(c)  $AE = 2.5(6) = 15$

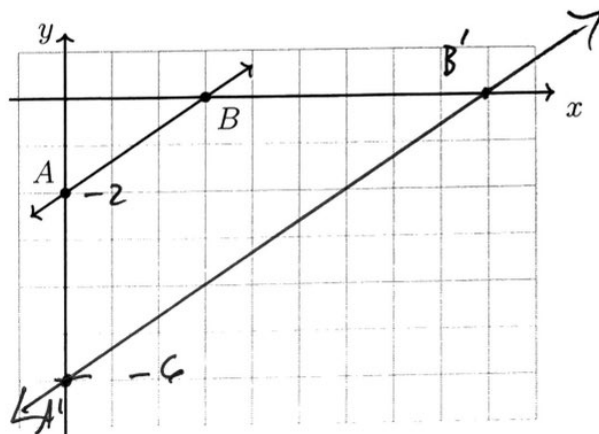
(d)  $BC = \frac{16}{2.5} = 6.4$



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11. The line  $\overleftrightarrow{AB}$  has the equation  $y = \frac{2}{3}x - 2$ . Apply a dilation mapping  $\overleftrightarrow{AB} \rightarrow \overleftrightarrow{A'B'}$  with a factor of  $k = 3$  centered at the origin. Draw and label the image on the grid. Write the equation of the line  $\overleftrightarrow{A'B'}$ .

$$y = \frac{2}{3}x - 6$$

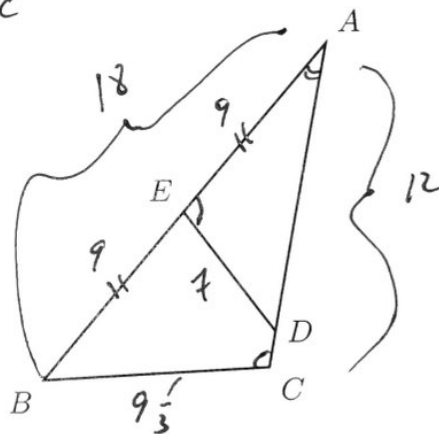


12. The diagram below shows  $\triangle ABC$ .  $E$  bisects  $\overline{AB}$ , and  $\angle ACB \cong \angle AED$ .  $AB = 18$ ,  $AC = 12$ , and  $DE = 7$ . Find the scale factor  $k$ ,  $BC$ , and  $AD$ .

(a)  $k = \frac{12}{9} = \frac{4}{3}$   $\overline{AE} \rightarrow \overline{AC}$

(b)  $BC = \frac{4}{3}(7) = \frac{28}{3}$

(c)  $AD = \frac{18}{\frac{4}{3}} = 13\frac{1}{2}$

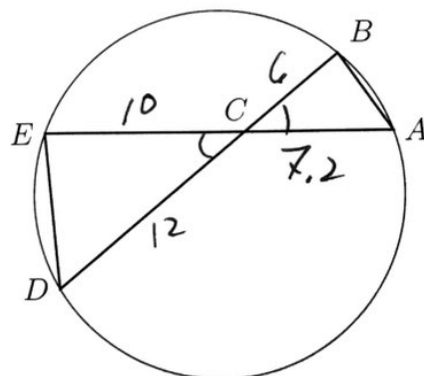


13. In the diagram below, the chords  $\overline{AE}$  and  $\overline{BD}$  intersect at  $C$ . Given  $\triangle ABC \sim \triangle DEC$ ,  $BC = 6$ ,  $CD = 12$ , and  $CE = 10$ . Determine the length of  $\overline{CA}$ .

$BC \rightarrow CE$

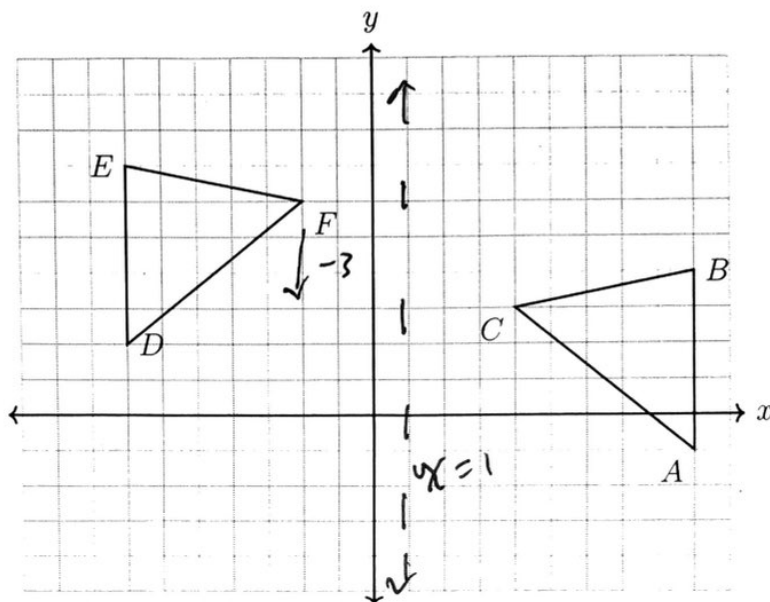
$$k = \frac{10}{6} = \frac{5}{3}$$

$$CA = \frac{12}{\frac{5}{3}} = 7.2$$



14. What transformation or series of transformations map  $\triangle ABC$  onto  $\triangle DEF$ , shown below? Fully specify the transformation(s).

Translate  
down 3  
reflect over  
 $x = 1$



15. Reflect  $\triangle ABC$  over the  $y$ -axis then dilate the resulting triangle by a factor of 2 centered at the origin.

