

9.9 Exam: Congruence and similarity transformations, compositions

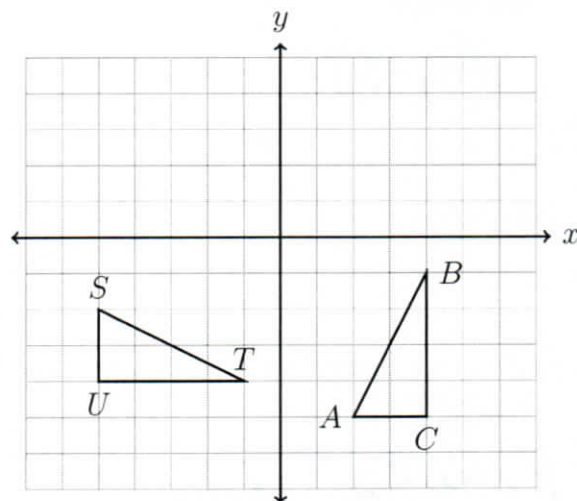
1. State the translation that would map $M(-2, 9)$ onto $M'(-1, 8)$.

$$T_{+1, -1}$$

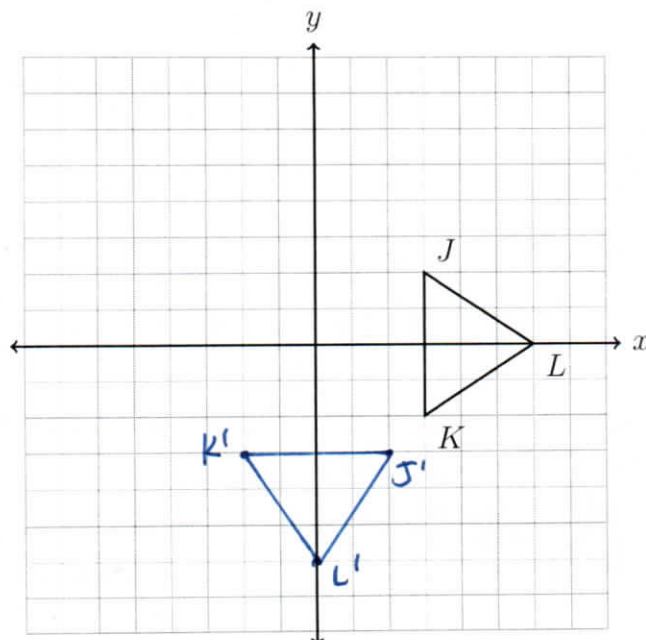
2. On the set of axes below, $\triangle ABC \cong \triangle STU$.

Describe the rigid motion that maps $\triangle ABC$ onto $\triangle STU$.

Rotate clockwise 90°
around origin

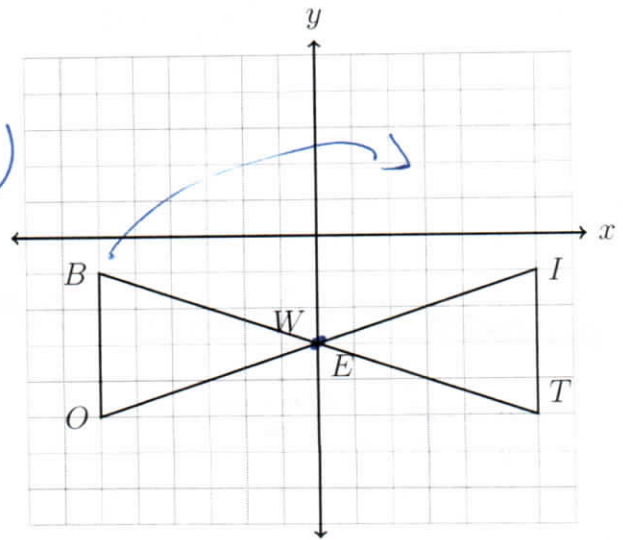


3. Rotate $\triangle JKL$ 90° clockwise around the origin on the axes below, labeling the image $\triangle J'K'L'$.



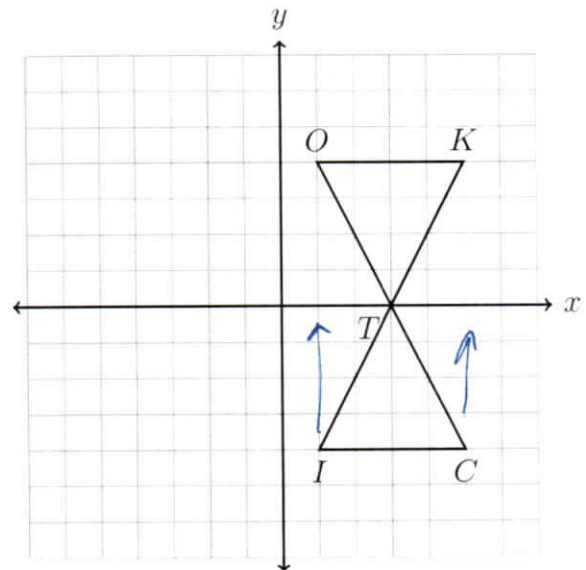
4. Determine and state the transformation mapping $\triangle BOW$ onto $\triangle TIE$.

Rotate
 180° clockwise
 (counterclockwise)
 around
 $(0, -3)$



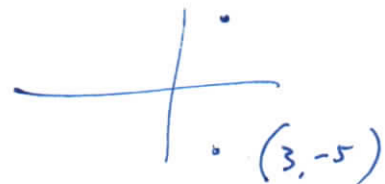
5. Describe a rigid motion that maps $\triangle TIC$ onto $\triangle TOK$.

Reflection across
 x -axis



6. Find the coordinates of the image of the point $D(3, 5)$ after a reflection across the x -axis.

$(3, -5)$



Name:

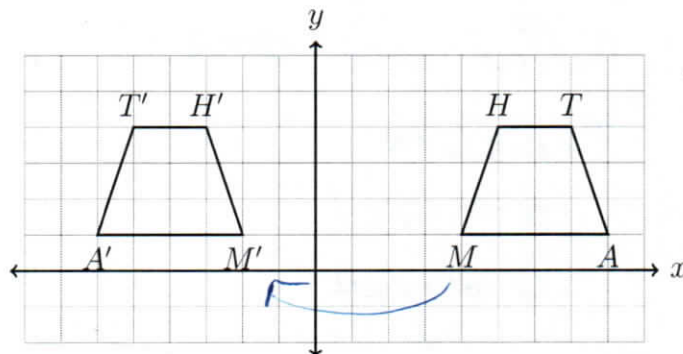
7. The quadrilateral $MATH$ is mapped to $M'A'T'H'$ by a rigid motion. What transformation has been applied?

(a) Dilation

(b) Reflection

(c) Rotation

(d) Translation

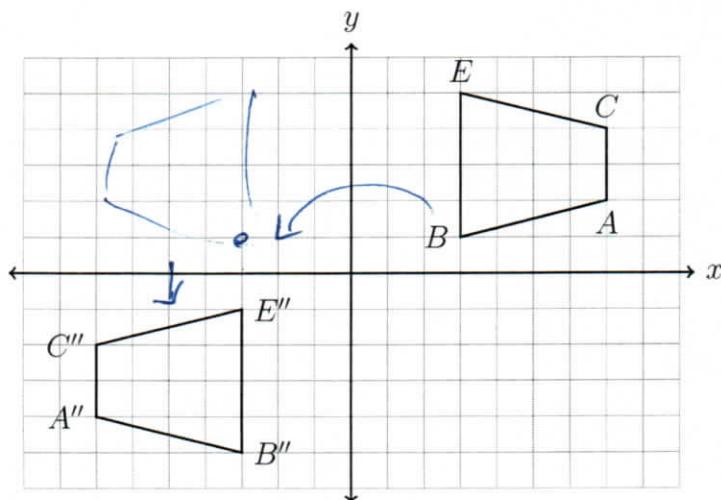


8. Determine and state the sequence of transformations applied to map $BECA$ to $B''E''C''A''$.

Reflect over
y-axis

Translate down 6

(Reverse order ok)



9. Which of the following would map $\triangle DOG \rightarrow \triangle D'O'G'$?

T ☒ F $(x, y) \rightarrow (x - 6, y + 0)$

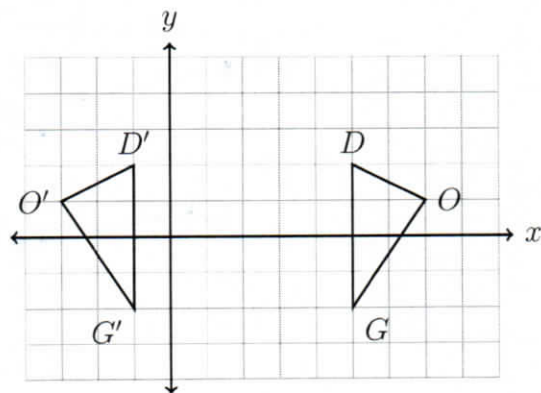
T ☒ F Rotated 90° clockwise around $(2, 0)$

T ☒ F Reflected across the y -axis

T ☒ F Translated six to the left, down zero

☒ T F Slid to the left four, then reflected across the y -axis

☒ T F Reflected across the line $x = 2$



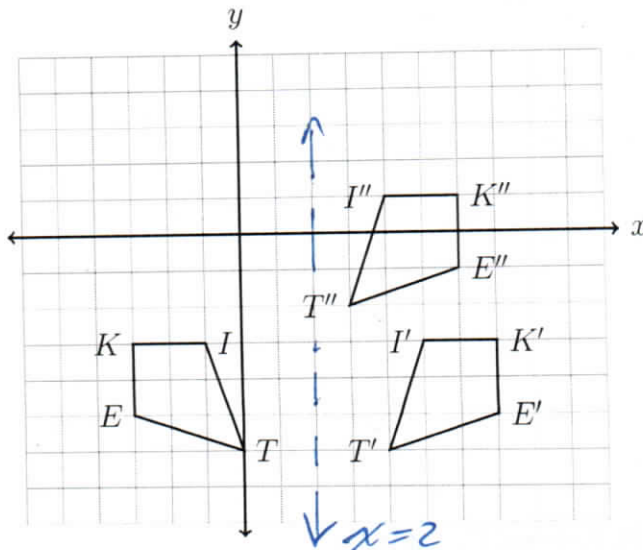
10. The quadrilateral $KITE$ undergoes rigid motions, shown below. Describe the sequence of transformations applied.

Reflect over $x=2$

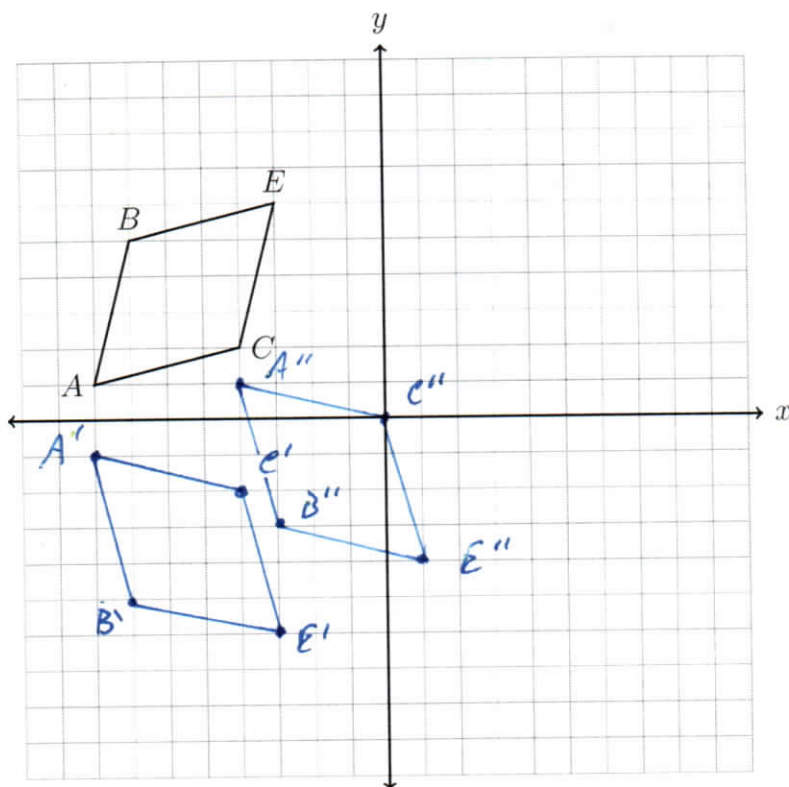
Translate

$$x \rightarrow x-1$$

$$y \rightarrow y+4$$



11. Reflect the rhombus $BECA$ across the x -axis, then translated $(x, y) \rightarrow (x+4, y+2)$. Label the images $B'E'C'A'$ and $B''E''C''A''$.



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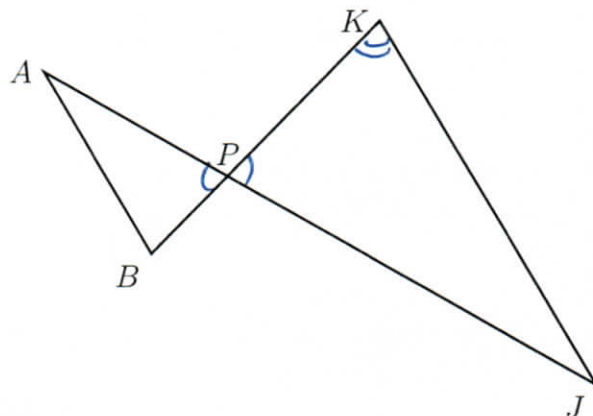
12. Two triangles are shown with P the intersection of \overline{AJ} and \overline{BK} .

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

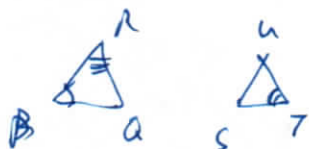
Vertical angles

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

$\angle B$



13. Given $\triangle PQR \sim \triangle STU$, $m\angle P = 37^\circ$, and $m\angle T = 46^\circ$. Find $m\angle R$.



$$37 + 46 + m\angle R = 180$$

$$m\angle R = 97^\circ$$

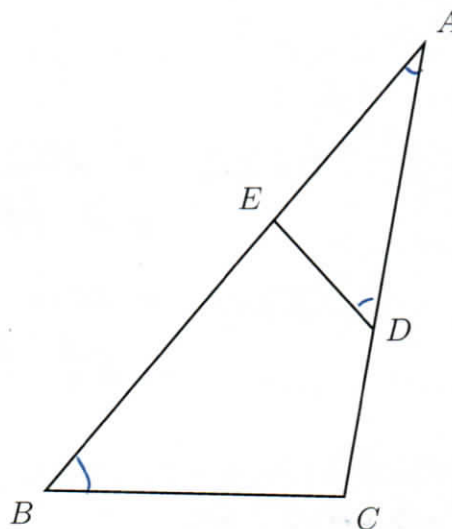
14. The diagram below shows $\triangle ABC$, with \overline{AEB} and \overline{ADC} .

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

Reflexive property

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

$\angle ADE$



15. A dilation centered at the origin with scale factor $k = \frac{1}{2}$ maps $\overline{AB} \rightarrow \overline{A'B'}$.

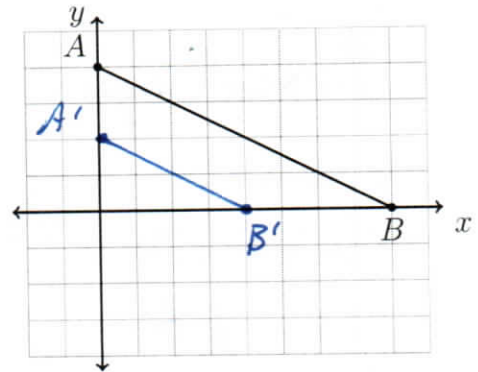
(a) Draw and label the image.

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

2:1

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

same slope

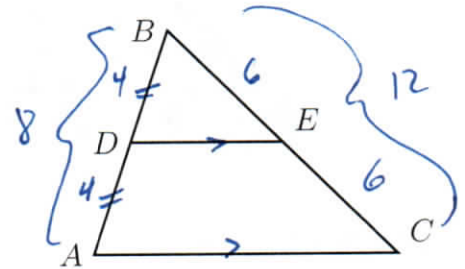


16. Given $\triangle ABC$, D is the midpoint of \overline{BA} , E is a point on \overline{BC} , and \overline{DE} is drawn. If $BA = 8$ and $BE = 6$, what is the length of \overline{BC} so that $\overline{AC} \parallel \overline{DE}$?

$$4 \rightarrow 8$$

$$k = \frac{8}{4} = 2$$

$$BC = 2 \times 6 = 12$$



17. In diagram below, each centimeter represents six inches. Find the value of each item below in feet.

(a) $AC = 4 \times 6 \text{ in} = 24 \text{ in}$
 $= 2 \text{ ft}$

(b) $BC = 5 \times 6 \text{ in} = 30 \text{ in}$
 $= 2 \frac{1}{2} \text{ ft}$

(c) Find the perimeter of $\triangle ABC$

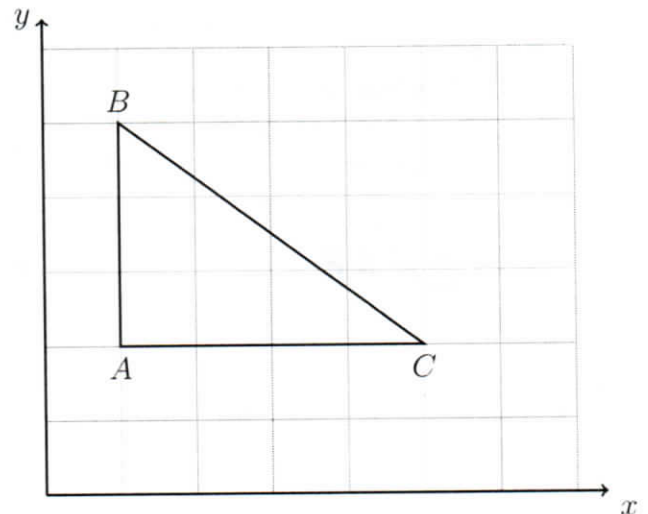
$$P = (3 + 4 + 5) \text{ cm}$$

$$= 12 \text{ cm} = 1 \text{ ft}$$

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

$$A = \frac{1}{2} (2 \text{ ft} \times 1 \frac{1}{2} \text{ ft})$$

$$= \frac{3}{2} \text{ sq. ft.} \quad (1.5 \text{ sq. ft.})$$



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18. Given $\triangle ABP \sim \triangle JKP$ as shown below. $AB = 9.0$, $AP = 10.0$, $BP = 5.5$, and $AJ = 25.0$. Find JK .

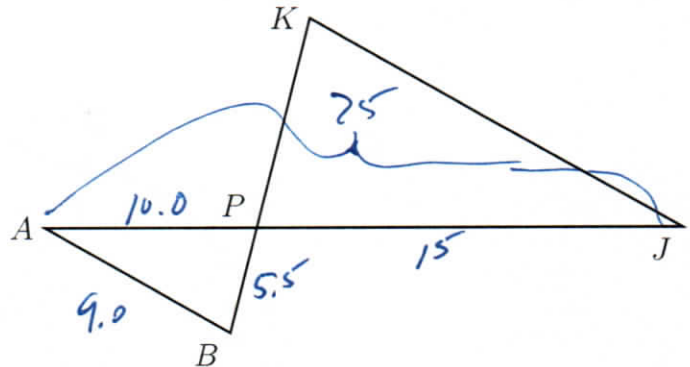
$$AP \rightarrow JP$$

$$10 \rightarrow 15$$

$$K = \frac{15}{10} = \frac{3}{2}$$

$$AB \rightarrow JK$$

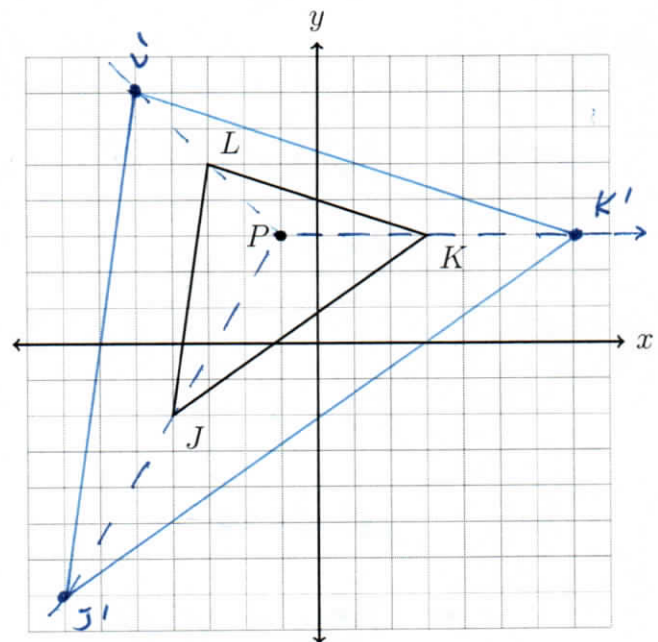
$$JK = \frac{3}{2} \times (9.0) = 13.5$$



19. The vertices of $\triangle JKL$ have the coordinates $J(-4, -2)$, $K(3, 3)$, and $L(-3, 5)$, as shown.

Apply a dilation to $\triangle JKL \rightarrow \triangle J'K'L'$, centered at $P(-1, 3)$ and with a scale factor $k = 2$. Draw the image $\triangle J'K'L'$ on the set of axes below, labeling the vertices, and make a table showing the correspondence of both triangles' coordinate pairs.

$$\begin{aligned} J(-4, -2) &\rightarrow J'(-7, -7) \\ K(3, 3) &\rightarrow K'(7, 3) \\ L(-3, 5) &\rightarrow L'(-5, 7) \end{aligned}$$



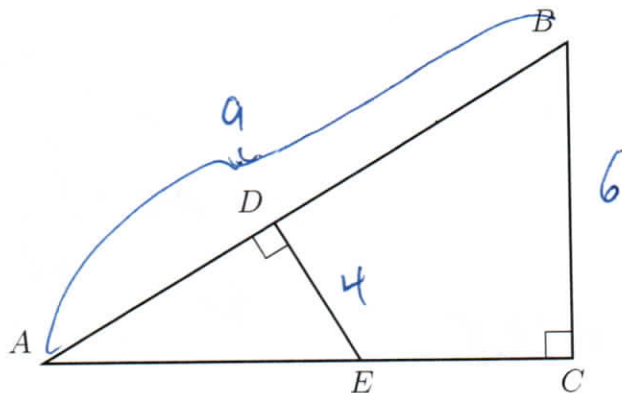
What is the ratio of the area of $\triangle JKL$ to $\triangle J'K'L'$?

$$K^2 = 2 \times 2 = 4$$

$$1:4$$

$$\text{or } \frac{1}{4}$$

20. 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} .



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

$$\overline{BC} \rightarrow \overline{DE}$$

$$6 \rightarrow 4$$

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

$$\overline{AB} \rightarrow \overline{AE}$$

$$AE = 9 \times \frac{2}{3} = 6$$

21. 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 .

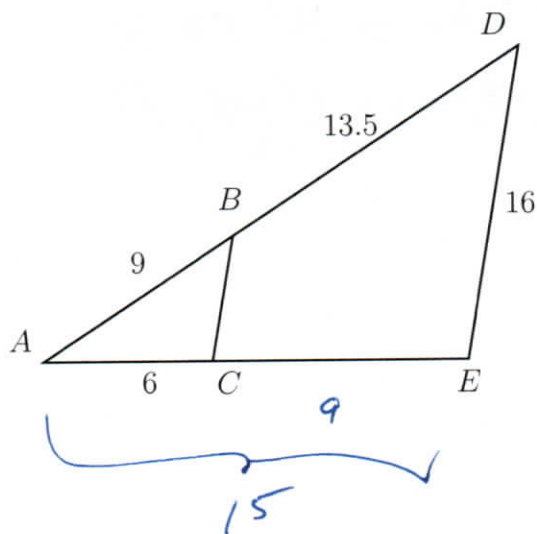
(a) $AD = 9 + 13.5 = 22.5$

(b) $k = \frac{22.5}{9} = 2\frac{1}{2}$

(c) $AE = 2\frac{1}{2} \times 6 = 15$

(d) $BC = \cancel{15} \cancel{6} = 9$

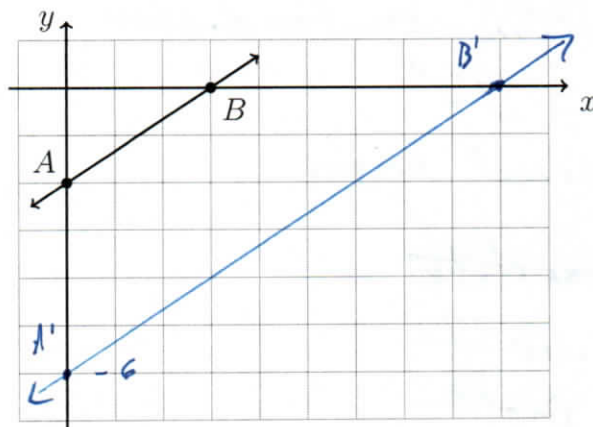
$$= \frac{16}{2.5} = 6.4$$



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22. 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 $\overleftrightarrow{A'B'}$.

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



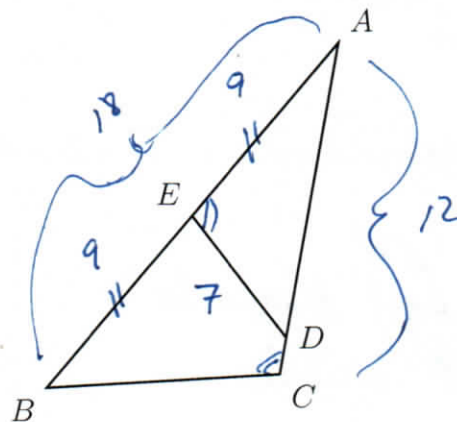
23. The diagram below shows $\triangle ABC$. E bisects \overline{AB} , and $\angle ACB \cong \angle AED$. $AB = 18$, $AC = 12$, and $DE = 7$. Find the scale factor k , BC , and AD .

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

(b) $BC = \frac{4}{3} \times 7 = \frac{28}{3} = 9\frac{1}{3}$

(c) $AD = \frac{3}{4} \times 18 = \frac{27}{2} = 13\frac{1}{2}$

$AD \rightarrow AB$



modified

24. 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} .

$CE \rightarrow BC$

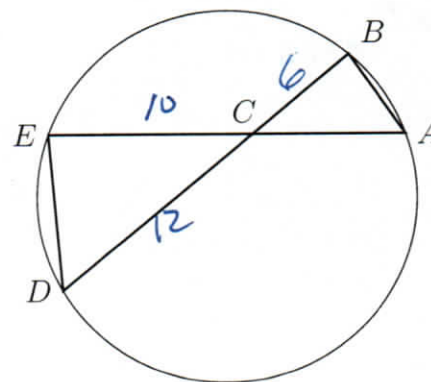
$10 \rightarrow 6$

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

$DC \rightarrow AC$

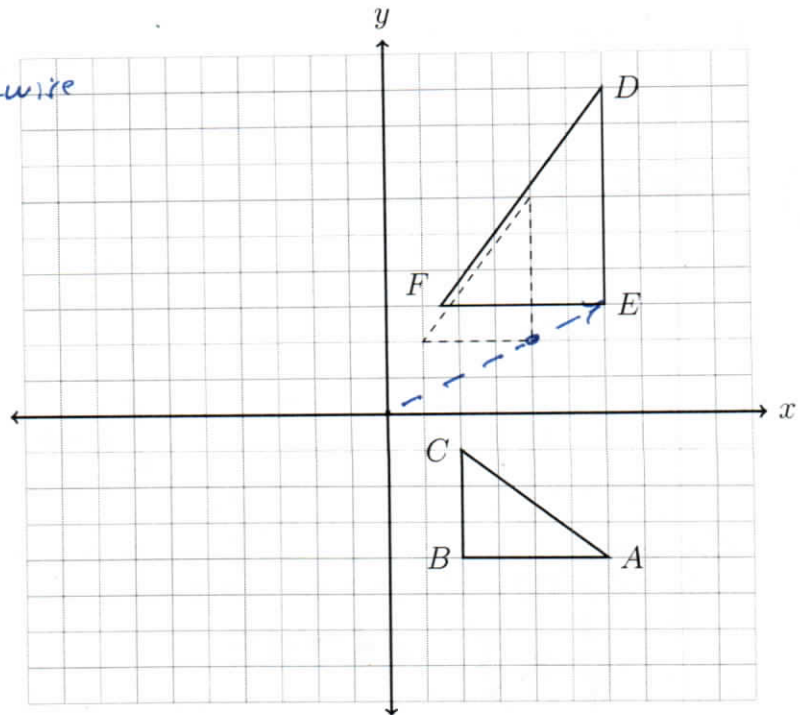
$CA = \frac{3}{5} \times 12$

$= \frac{36}{5} = 7\frac{1}{5}$



25. Determine and state the sequence of transformations applied to map $\triangle ABC \rightarrow \triangle DEF$.

Rotation counter clockwise
 90°
 around origin
~~Translate~~
 up 1
 right
 Dilate $\frac{3}{2}$
 from origin



26. What sequence of transformations would map $\triangle ABC$ onto $\triangle DEF$?

Rotate 180°
 (counter) clockwise
 around origin
 Dilate $k=2$
 centered
 at origin

