

7.7b Exam: Similarity ratios, dilation, the tangent function, transformations, symmetry

1. Given the following two linear equations:

$$l_1: y = \frac{5}{4}x - 3$$

$$l_2: 5x + 4y = 8$$

$$y = -\frac{5}{4}x + 2$$

Write down the slopes of the two lines.

$$m_1 = \frac{5}{4}$$

$$m_2 = -\frac{5}{4}$$

Are the lines parallel, perpendicular, or neither? Justify your answer using the slopes.

Neither. Their slopes are not equal. Nor are they negative reciprocals.

$$\frac{5}{4} \neq -\frac{5}{4} \quad \frac{5}{4} \times (-\frac{5}{4}) \neq -1$$

2. Given $\triangle ABC \sim \triangle DEF$. $m\angle A = 80^\circ$ and $m\angle F = 40^\circ$. Find the measure of $\angle C$.

$$m\angle C = 40^\circ$$

3. In the diagram below of $\triangle ABC$, D is a point on \overline{BA} , E is a point on \overline{BC} , and \overline{DE} is drawn.

If $BD = 7$, $BA = 21$, and $BE = 8$, what is the length of \overline{BC} so that $\overline{AC} \parallel \overline{DE}$?

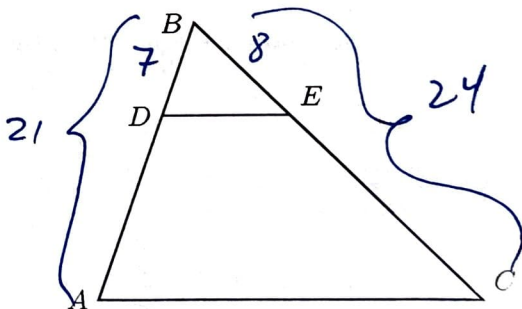
$$\overline{BD} \rightarrow \overline{BA}$$

$$7 \rightarrow 21$$

$$k = \frac{21}{7} = 3$$

$$\overline{BE} \rightarrow \overline{BC}$$

$$BC = 8 \times 3 = 24$$



4. Find the image of $P(3, -5)$ after the translation $(x, y) \rightarrow (x - 5, y + 8)$.

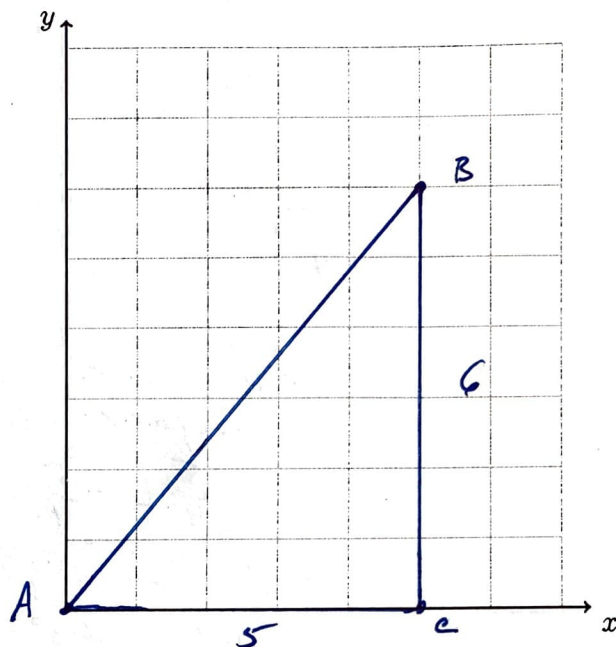
$$(-2, 3)$$

5. (a) Graph and label $\triangle ABC$ with $A(0, 0)$, $B(5, 6)$, and $C(5, 0)$. Calculate each length:

i. $AC = 5$

ii. $BC = 6$

iii. $AB = \sqrt{5^2 + 6^2}$
 $= \sqrt{41}$



- (b) Write down the equation of the line \overleftrightarrow{BC} .

$$x = 6$$

- (c) Write down the equation of the line \overleftrightarrow{AB} .

$$y = \frac{6}{5}x$$

- (d) The tangent of an angle is the ratio of the side lengths *opposite* over *adjacent* to the angle. Write down the value as a fraction.

$$\tan \angle BAC = \frac{6}{5}$$

- (e) Find $m\angle A$ with a calculator's inverse tangent function, $m\angle BAC = \tan^{-1}\left(\frac{\text{opp}}{\text{adj}}\right)$

$$m\angle A = 50.1944\dots$$

$$\approx 50^\circ$$

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6. Given $\triangle ABP \sim \triangle JKP$ as shown below. $AB = 13.5$, $AP = 10.0$, $BP = 9$, and $JP = 27.0$. Find JK .

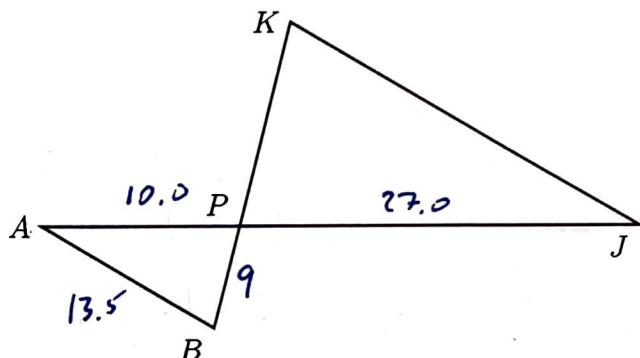
$$\overline{AP} \rightarrow \overline{JP}$$

$$10 \rightarrow 27$$

$$K = \frac{27}{10} = 2.7$$

$$\overline{AB} \rightarrow \overline{JK}$$

$$JK = 2.7 \times 13.5 \\ = 36.45$$



7. The line l has the equation $y = \frac{3}{2}x + 5$. To each line below, circle whether l is parallel, perpendicular, or neither.

(a) parallel perpendicular neither $y = \frac{3}{2}x - 2$

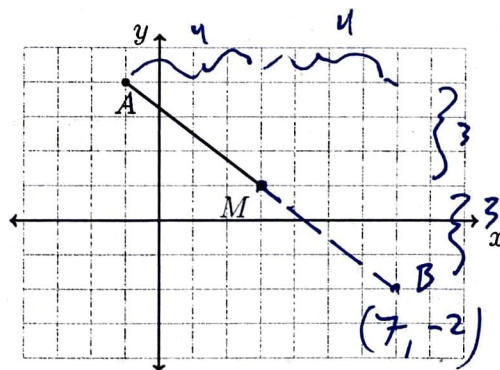
(b) parallel perpendicular neither $y = \frac{2}{3}x + 7$

(c) parallel perpendicular neither $3x - 2y = -6$

$$y = \frac{3}{2}x + 3$$

8. $A(-1, 4)$ is one endpoint of \overline{AB} . The segment's midpoint is $M(3, 1)$, as shown below. Find the coordinates of the other endpoint, B .

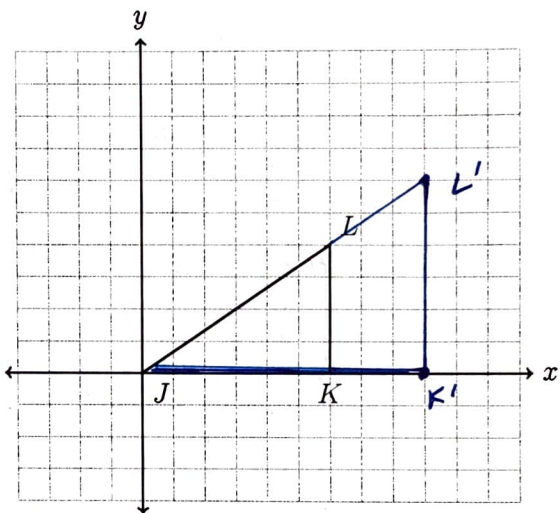
$$B(7, -2)$$



9. The vertices of $\triangle JKL$ have the coordinates $J(0,0)$, $K(6,0)$, and $L(6,4)$, as shown.

Apply a dilation to $\triangle JKL \rightarrow \triangle J'K'L'$, centered on the origin and with a scale factor $k = 1.5$. 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.

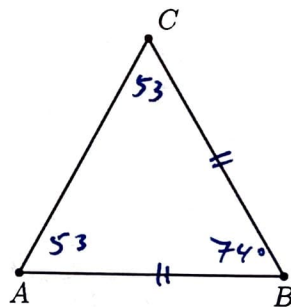
$$\begin{aligned} J(0,0) &\rightarrow J'(0,0) \\ K(6,0) &\rightarrow K'(9,0) \\ L(6,4) &\rightarrow L'(9,6) \end{aligned}$$



10. Given isosceles $\triangle ABC$ with $\overline{AB} \cong \overline{BC}$, $m\angle A = 53$. Mark and label the diagram, and then find $m\angle B$.
(the diagram is not to scale)

$$m\angle B + 2(53) = 180$$

$$m\angle B = 74$$



11. A translation maps $N(-3,7) \rightarrow N'(-4,1)$. What is the image of $M(0,-5)$ under the same translation?

$$T_{-1, -6}$$

$$M' = (-1, -11)$$

Name:

Solve each equation for x , rounding to the nearest hundredth.

12. $\tan 50^\circ = \frac{x}{10}$

$$\begin{aligned}x &= 10 \tan 50^\circ \\&= 11.91753\dots \\&\approx 11.92\end{aligned}$$

14. $\sin 35^\circ = \frac{x}{3.5}$

$$\begin{aligned}x &= 3.5 \sin 35^\circ \\&= 2.007517\dots \\&\approx 2.01\end{aligned}$$

13. $\tan 22^\circ = \frac{3}{x}$

$$\begin{aligned}x &= \frac{3}{\tan 22^\circ} \\&= 7.42526\dots \\&\approx 7.43\end{aligned}$$

15. $\cos 80^\circ = \frac{x}{20}$

$$\begin{aligned}x &= 20 \cos 80^\circ \\&= 3.47296\dots \\&\approx 3.47\end{aligned}$$

Solve for x , rounding to the nearest whole degree.

16. $x = \tan^{-1}\left(\frac{6}{10}\right)$

$$\begin{aligned}&= 30.91375\dots \\&\approx \cancel{30}^\circ \\&\quad 31^\circ\end{aligned}$$

17. $\tan x^\circ = \frac{4.2}{2.9}$

$$\begin{aligned}&= 55.3758\dots \\&\approx 55^\circ\end{aligned}$$

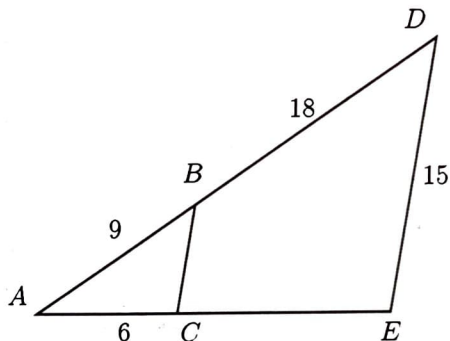
18. A dilation centered at A maps $\triangle ABC \rightarrow \triangle ADE$. Given $AB = 9$, $AC = 6$, $BD = 18$, and $DE = 15$. Find AD and the scale factor k . Then find AE and BC .

(a) $AD = 9 + 18 = 27$

(b) $k = \frac{27}{9} = 3$

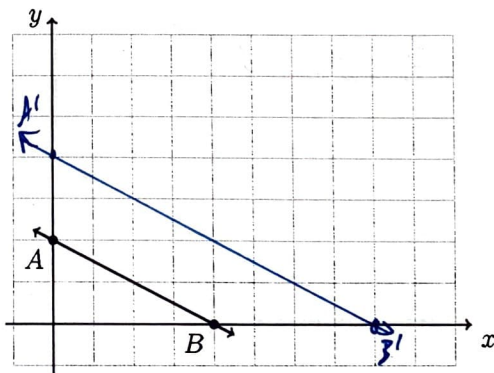
(c) $AE = 6 \times 3 = 18$

(d) $BC = \frac{15}{3} = 5$



19. The line \overleftrightarrow{AB} has points $A(0, 2)$ and $B(4, 0)$. Apply a dilation mapping $\overleftrightarrow{AB} \rightarrow \overleftrightarrow{A'B'}$ with a factor of $k = 2$ centered at the origin.

- (a) Draw and label the image on the grid.

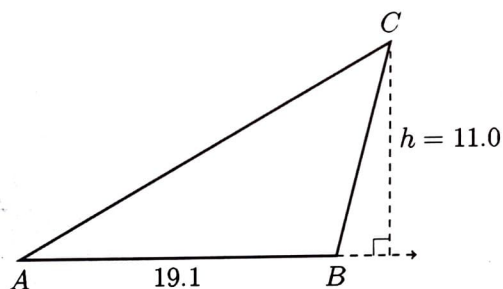


- (b) Write the coordinates of the points A' and B' .

$A'(0, 4)$
 $B'(8, 0)$

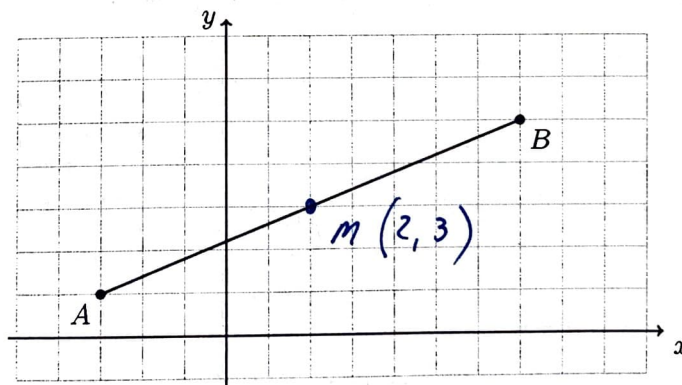
20. The side \overline{AB} of triangle ABC is extended and an altitude to the vertex C is drawn, as shown below. The triangle's height is $h = 11.0$ and its base measures $AB = 19.1$. Find the area of the triangle.

$$\begin{aligned} A &= \frac{1}{2}bh \\ &= \frac{1}{2}(19.1)(11.0) \\ &= 105.05 \end{aligned}$$

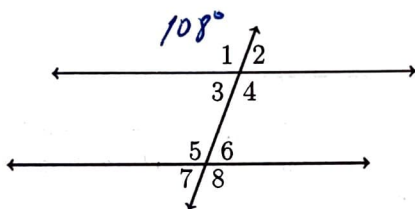


21. Find the midpoint M of \overline{AB} with coordinates $A(-3, 1)$ and $B(7, 5)$.

$$M(2, 3)$$



22. Given two parallel lines and a transversal, as shown below. Given $m\angle 1 = 108^\circ$.

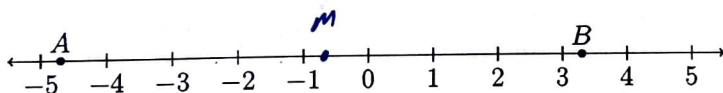


- (a) Find the measure $m\angle 2$. 72°
- (b) Find the measure $m\angle 8$. 108°
- (c) Given $m\angle 5 = (6x - 12)^\circ$. Find x .

$$108 = 6x - 12$$

$$x = \frac{120}{6} = 20$$

23. Given two points $A = -4.7$ and $B = 3.3$. Find the value of the midpoint M between A and B , and mark and label it on the numberline below.



$$M = \frac{-4.7 + 3.3}{2} = -0.7$$