

10 January 2019

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

1. Given the following two linear equations:

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

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

Write down the slopes of the two lines.

$$m_1 =$$

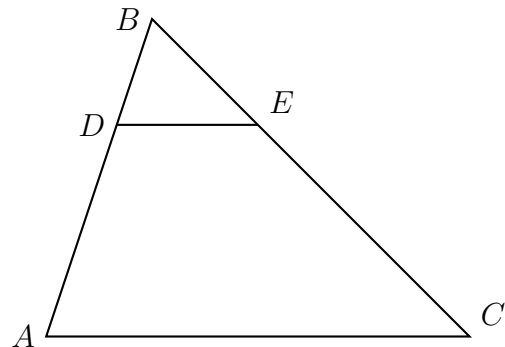
$$m_2 =$$

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

2. Given $\triangle ABC \sim \triangle DEF$. $m\angle A = 88^\circ$ and $m\angle F = 43^\circ$. Find the measure of $\angle C$.

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 $BD = 6.5$, $DA = 13$, and $BE = 8$, what is the length of \overline{BC} so that $\overline{AC} \parallel \overline{DE}$?



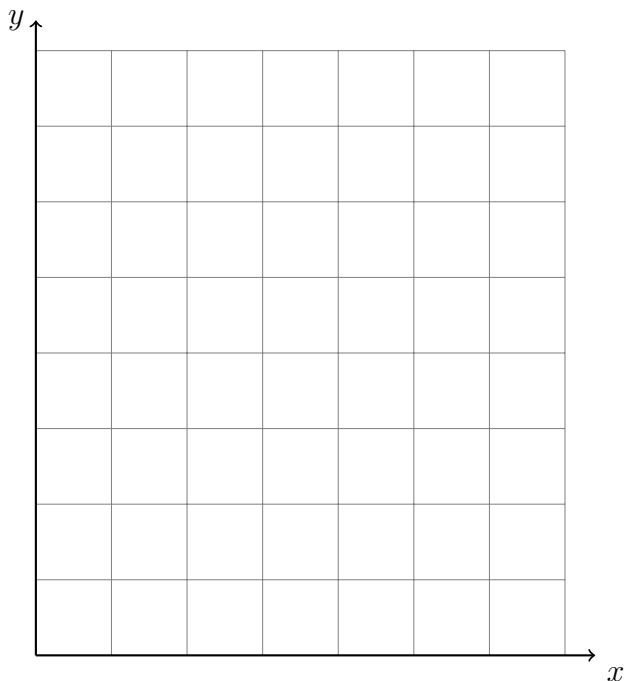
4. Find the image of $P(3, -5)$ after the translation $(x, y) \rightarrow (x - 5, y + 8)$.

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

i. $AC =$

ii. $BC =$

iii. $AB =$



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

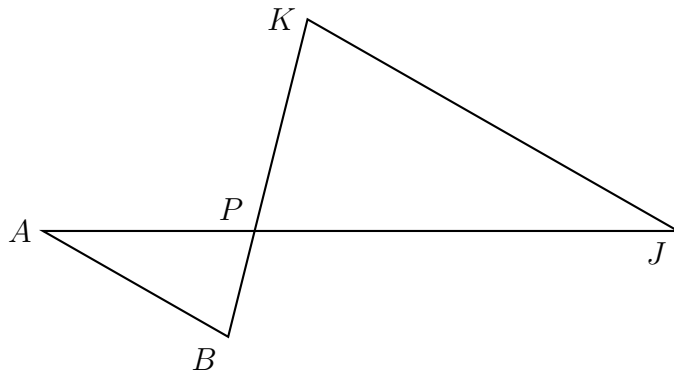
- (c) Write down the equation of the line \overleftrightarrow{AB} .

- (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.

$$\tan \angle BAC =$$

- (e) Find $m\angle A$ with a calculator's inverse tangent function, $m\angle BAC = \tan^{-1}\left(\frac{opp}{adj}\right)$, rounded to the *nearest whole degree*.

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



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.

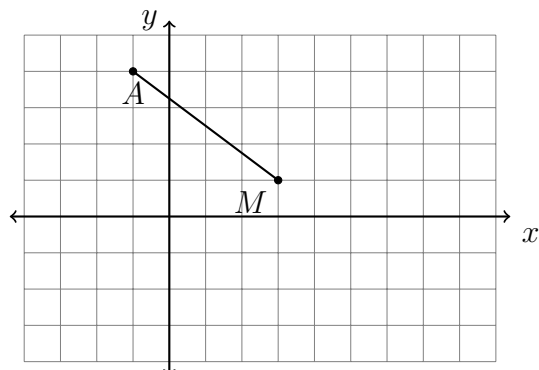
(a) parallel perpendicular neither $y = \frac{3}{2}x - 2$

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

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

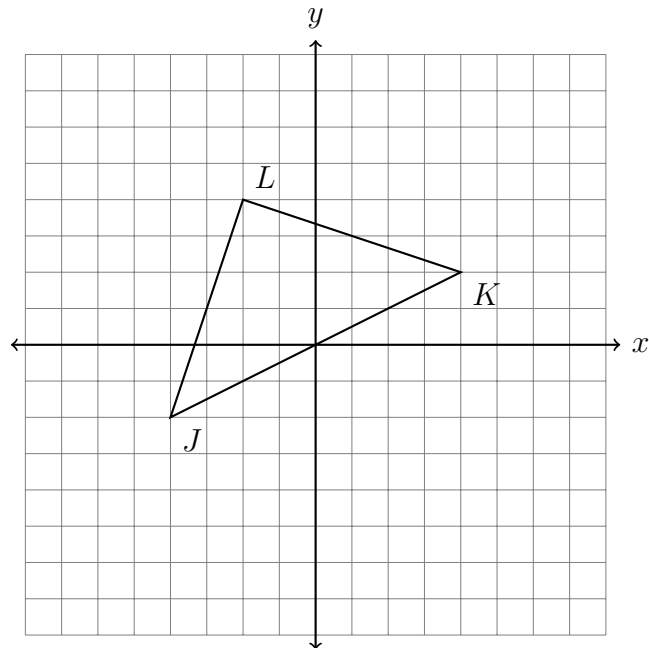
(d) parallel perpendicular neither $2x + 3y = 9$

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 .

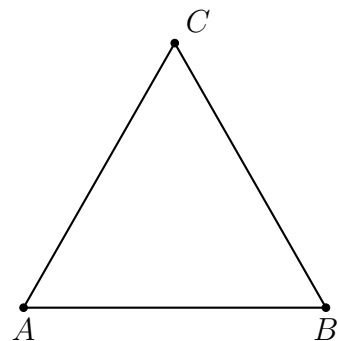


9. The vertices of $\triangle JKL$ have the coordinates $J(-4, -2)$, $K(4, 2)$, and $L(-2, 4)$, as shown.

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.



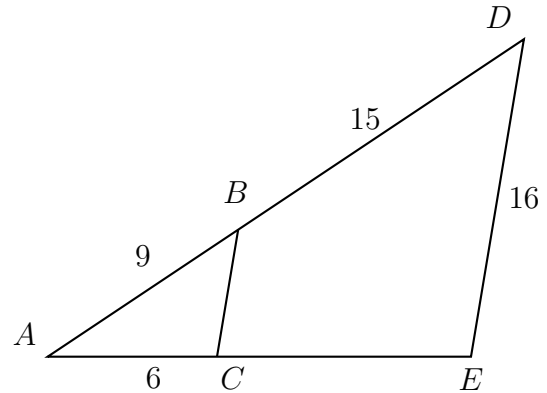
10. Given isosceles $\triangle ABC$ with $\overline{AB} \cong \overline{BC}$, $m\angle A = 53$. Mark and label the diagram, and then find $m\angle B$.
(the diagram is not to scale)



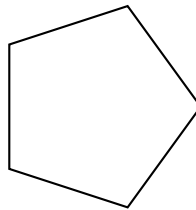
11. A translation maps $N(-3, 7) \rightarrow N'(-4, 1)$. What is the image of $M(0, -5)$ under the same translation?

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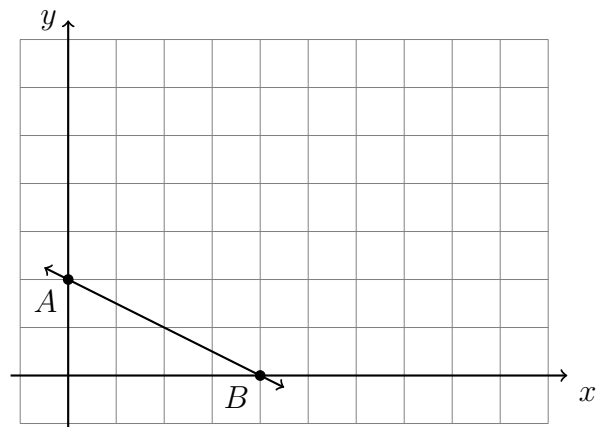
12. A dilation centered at A maps $\triangle ABC \rightarrow \triangle ADE$. Given $AB = 9$, $AC = 6$, $BD = 15$, and $DE = 16$. Find AD and the scale factor k . Then find AE and BC .

(a) $AD =$ (b) $k =$ (c) $AE =$ (d) $BC =$ 

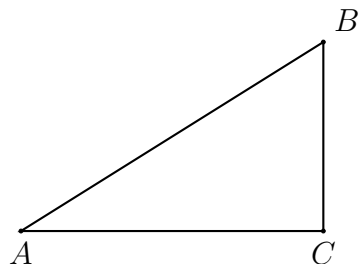
13. What is the smallest non-zero angle of rotation about its center that would map the pentagon onto itself?



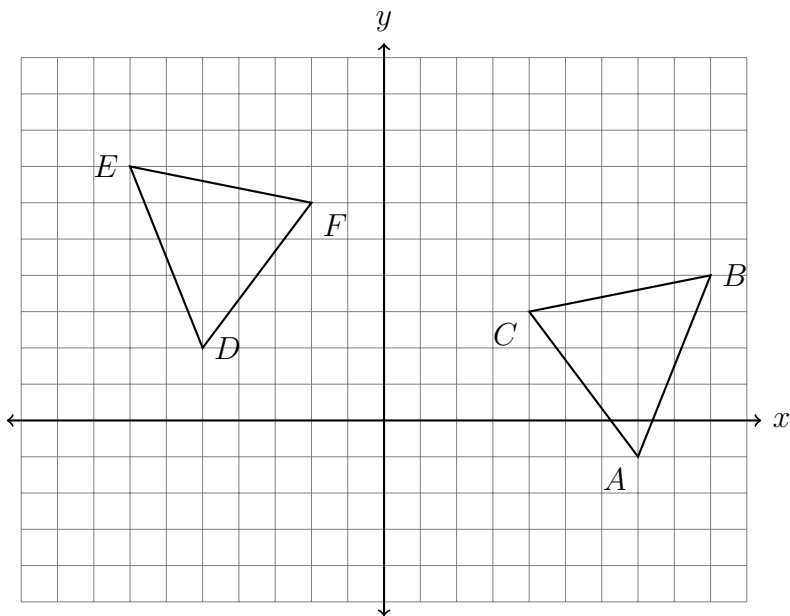
14. The line \overleftrightarrow{AB} has the equation $y = -\frac{1}{2}x + 2$. Apply a dilation mapping $\overleftrightarrow{AB} \rightarrow \overleftrightarrow{A'B'}$ with a factor of $k = 2$ centered at the origin. Draw and label the image on the grid. Write the equation of the line $\overleftrightarrow{A'B'}$.



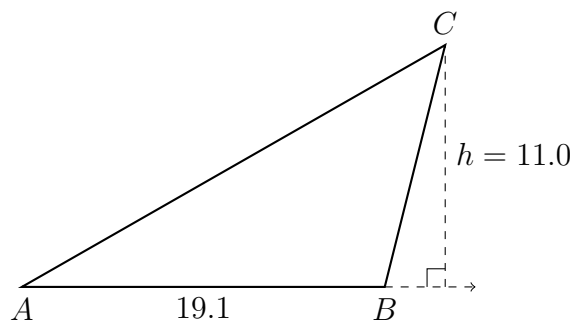
15. Given right $\triangle ABC$ with $m\angle C = 90^\circ$, $AC = 13$, $m\angle A = 35^\circ$. Find BC , rounded to the nearest tenth.



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

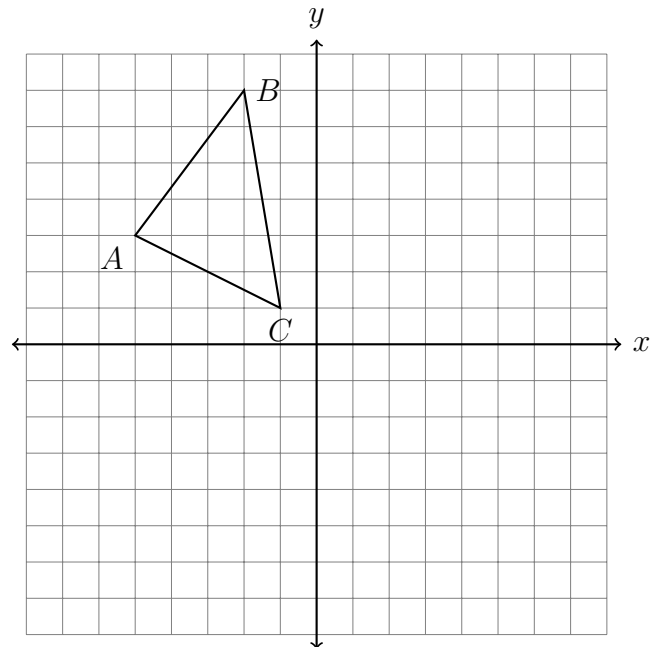


17. The side \overline{AB} of triangle ABC is extended and an altitude to the vertex C is drawn, as shown below. The triangle's height is $h = 11.0$ and its base measures $AB = 19.1$. Find the area of the triangle.



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18. Reflect $\triangle ABC$ over the y -axis. Make a table of the coordinates and plot and label the image on the axes.

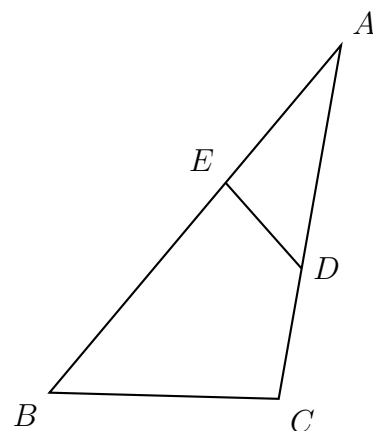


19. The diagram below shows $\triangle ABC$, with \overline{AEB} , \overline{ADC} , and $\angle ACB \cong \angle AED$. $AB = 18$, $AD = 12$, $AE = 9$, and $DE = 7$. Find the scale factor k , AC , and BC .

(a) $k =$

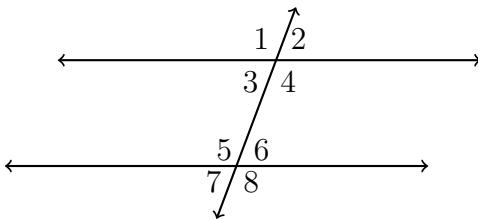
(b) $AC =$

(c) $BC =$

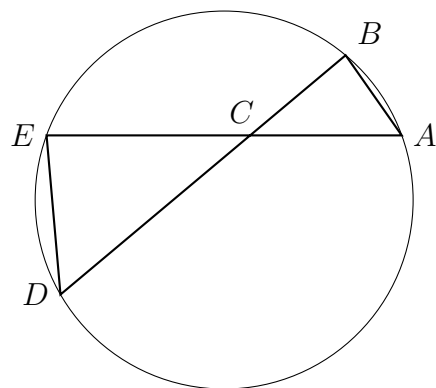


20. Find the midpoint M of \overline{AB} with coordinates $A(-3, 1)$ and $B(7, 4)$.

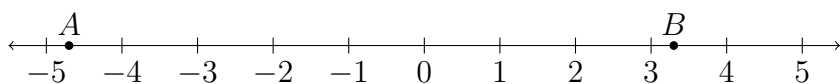
21. Given two parallel lines and a transversal, as shown below. Given $m\angle 1 = 108^\circ$.



- (a) Find the measure $m\angle 2$.
- (b) Find the measure $m\angle 8$.
- (c) Given $m\angle 5 = (6x - 12)^\circ$. Find x .
22. In the diagram below, the chords \overline{AE} and \overline{BD} intersect at C . Given $\triangle ABC \sim \triangle DEC$, $BC = 6$, $CD = 10$, and $CE = 8$. Determine the length of \overline{CA} .



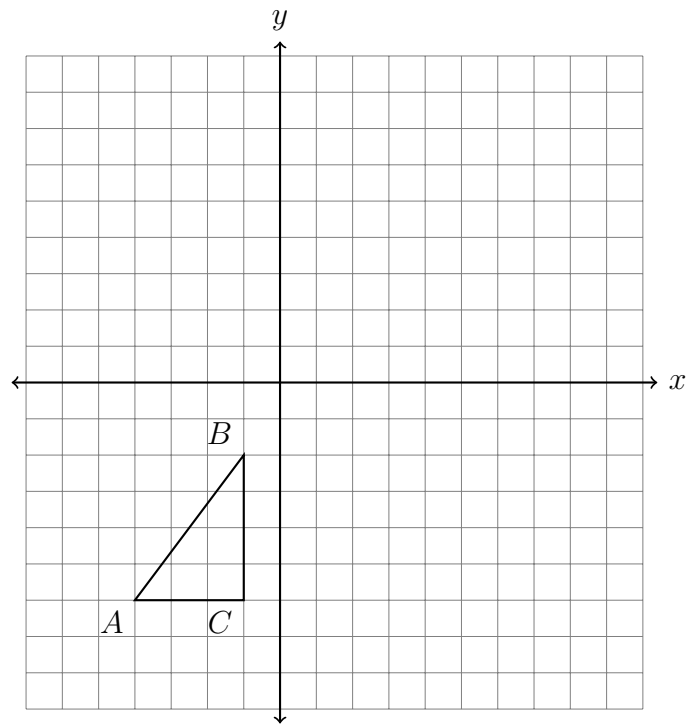
23. Given two points $A = -4.7$ and $B = 3.3$. Find the value of the midpoint M between A and B , and mark and label it on the numberline below.



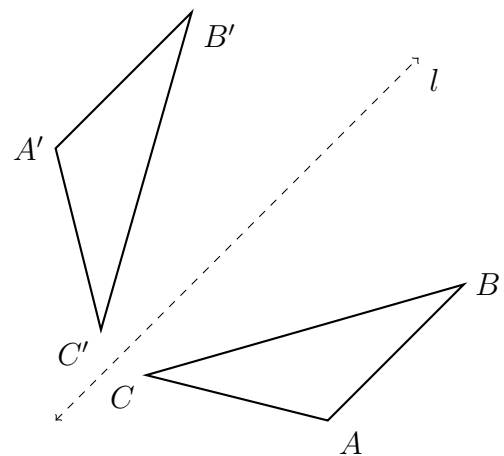
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24. Rotate $\triangle ABC$ 90° counterclockwise around the origin, yielding $\triangle A'B'C'$. Then translate it by $(x, y) \rightarrow (x + 2, y + 7)$. Make a table of the coordinates showing $\triangle ABC \rightarrow \triangle A'B'C' \rightarrow \triangle A''B''C''$ and plot and label the images on the axes.



25. The $\triangle ABC$ is reflected across l to yield $\triangle A'B'C'$. $AB = 4x + 4$, $A'B' = 7x - 8$, and $BC = 5x + 10$. Find the length $B'C'$.



Using the distance formula to prove an isosceles triangle

26. In this problem use the following theorem (copy it at the bottom of the page after your calculations):

A triangle is isosceles if and only two of its sides are congruent.

Shown below is triangle ABC , $A(-2, 2)$, $B(4, 5)$, and $C(1, -1)$.

Prove it is an isosceles triangle by

- (a) finding the length of each of the three sides,
- (b) stating which sides are congruent,
- (c) copying the theorem as your conclusion, adding *therefore $\triangle ABC$ is isosceles*.

