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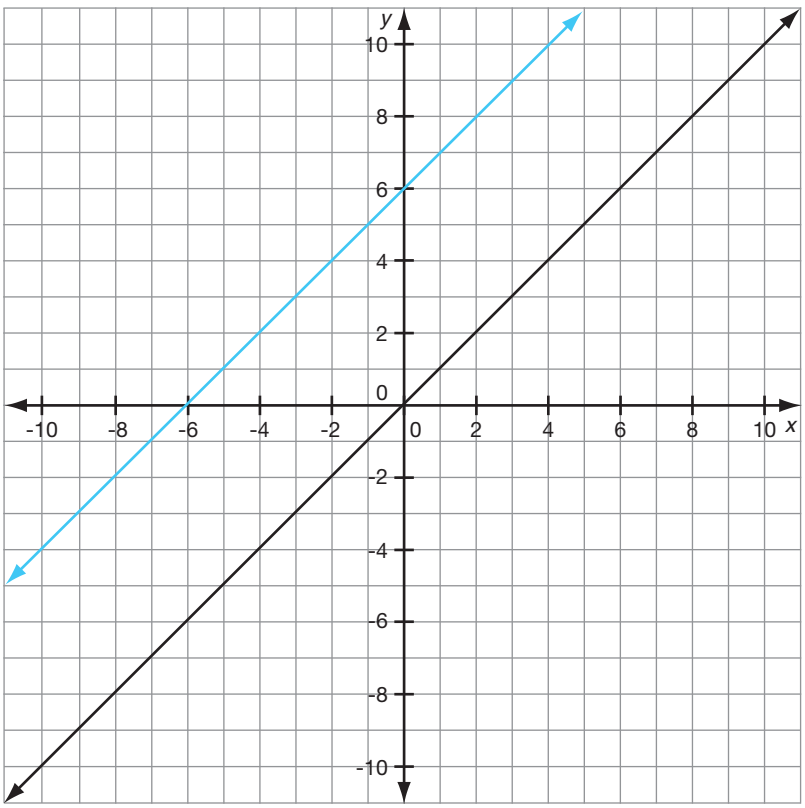
Sliding Lines
Translations of Linear Functions

Problem Set

Translate each graph. Graph the translation and write an equation to represent the translation.

1. Translate the graph of $y = x$ up 6 units. Graph the translation and write an equation to represent the translation.



$y = x + 6$ or $x = y - 6$

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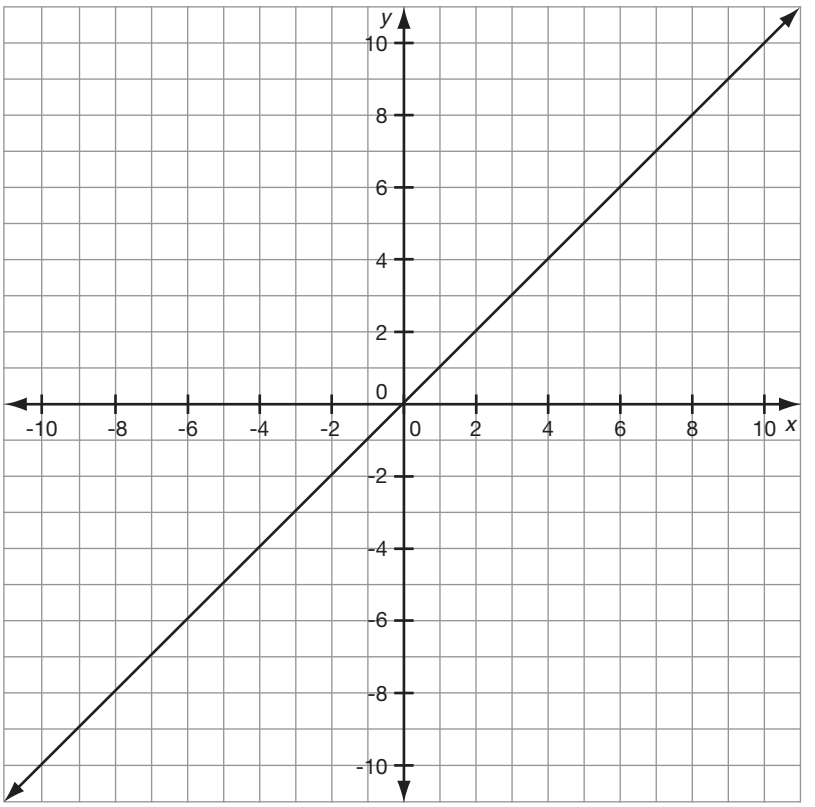
2. Translate the graph of $y = x$ down 2 units. Graph the translation and write an equation to represent the translation.



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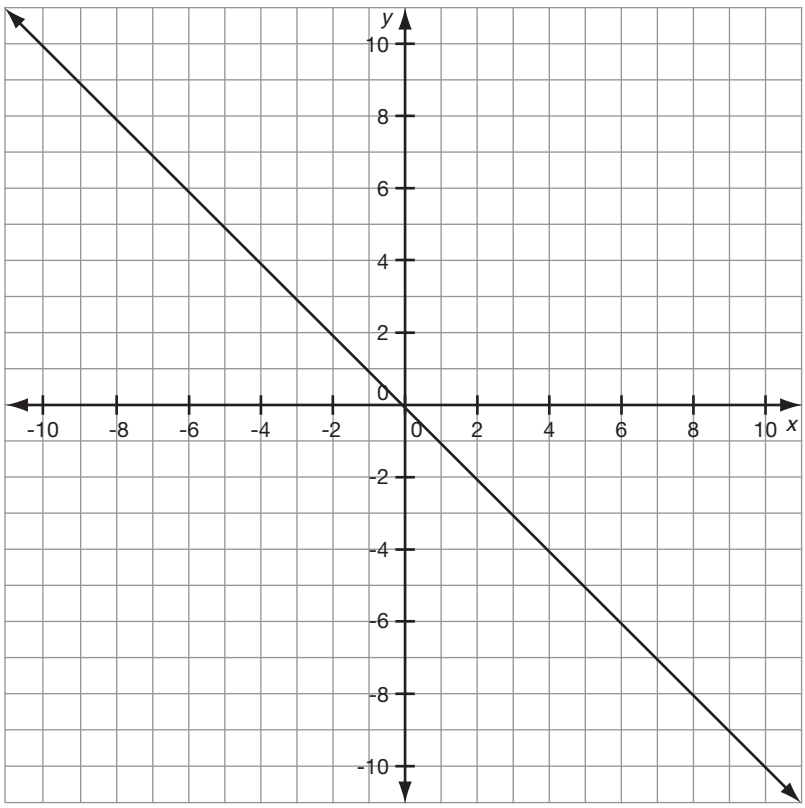
3. Translate the graph of $y = -x$ left 3 units. Graph the translation and write an equation to represent the translation.



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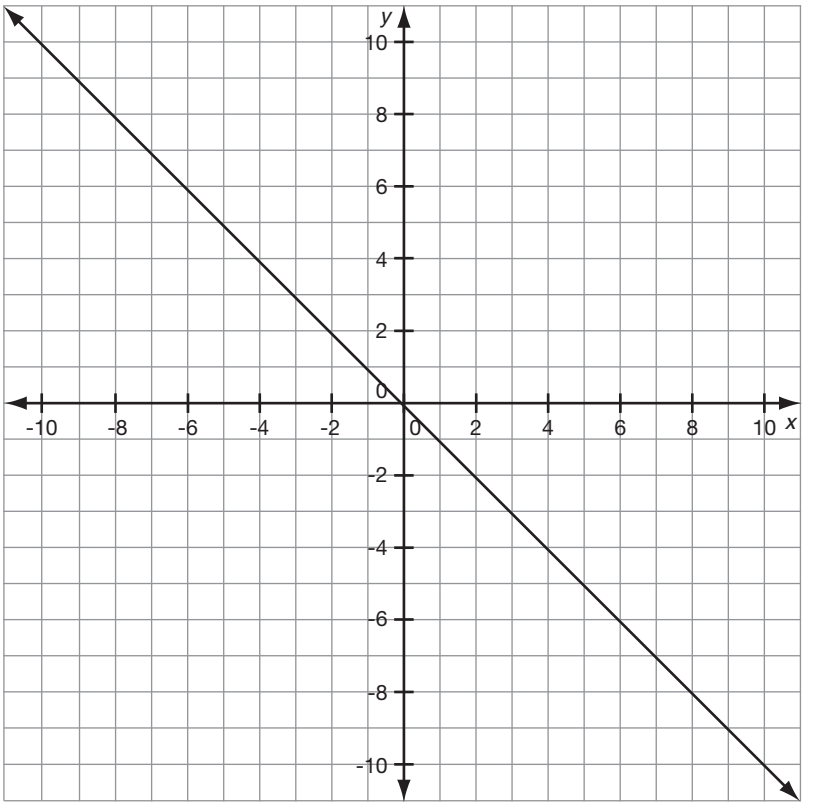
4. Translate the graph of $y = -x$ right 2 units. Graph the translation and write an equation to represent the translation.



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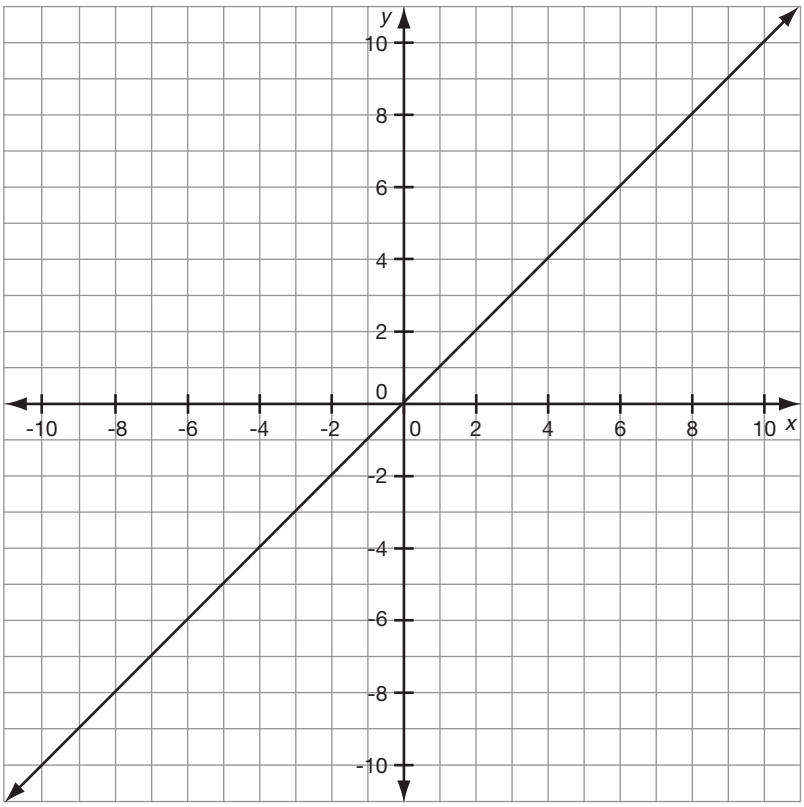
5. Translate the graph of $y = x$ left 5 units. Graph the translation and write an equation to represent the translation.



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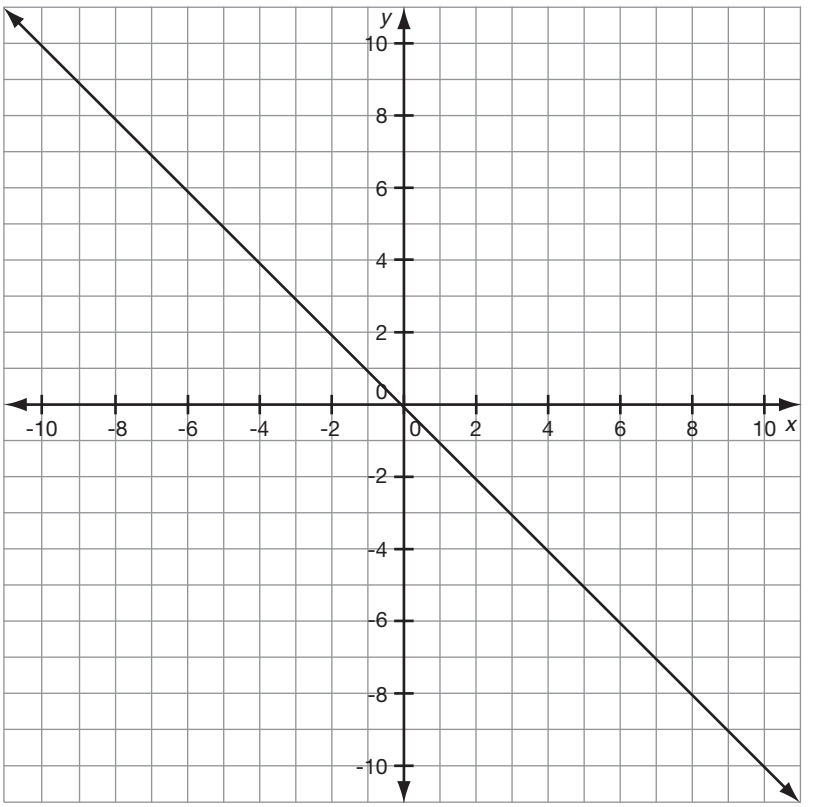
6. Translate the graph of $y = -x$ down 8 units. Graph the translation and write an equation to represent the translation.



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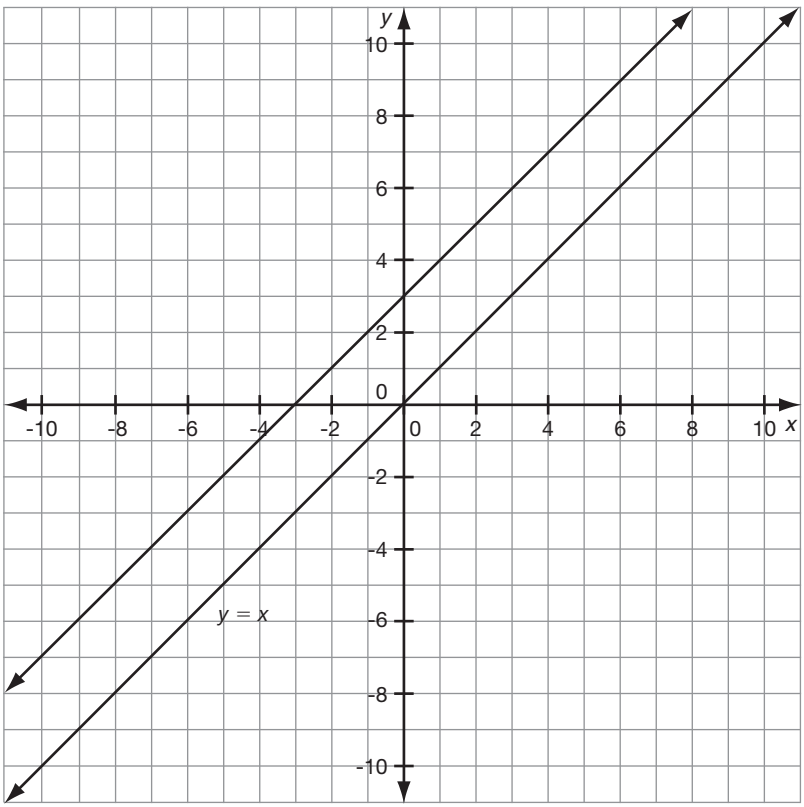
Describe each translation.

7. The graph shown is the result of a translation performed on the equation $y = x$.



The translation is either a slide up 3 units or a slide left 3 units.

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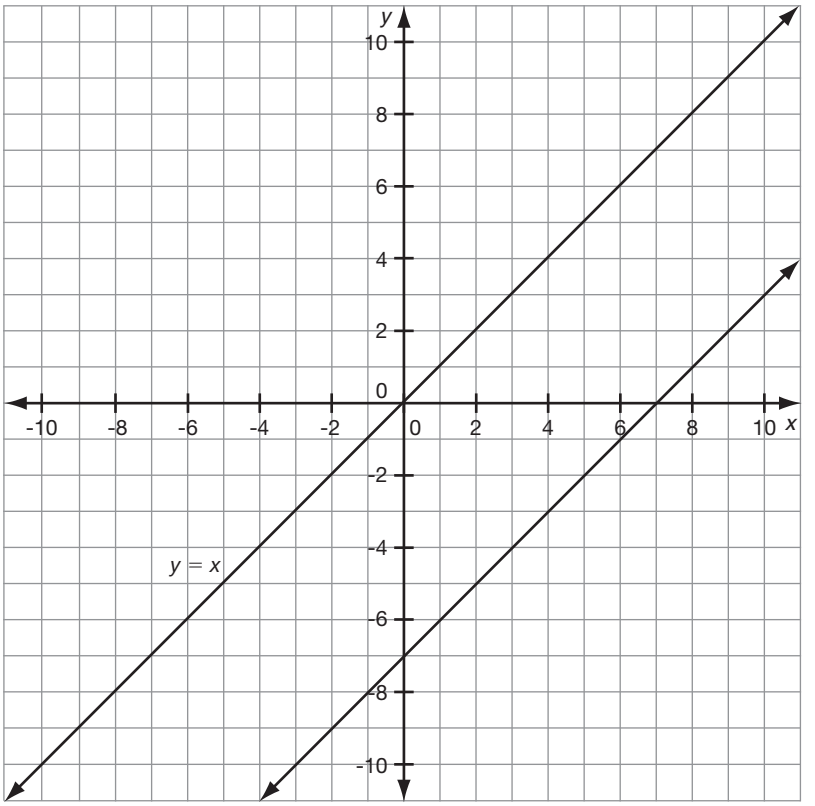
8. The graph shown is the result of a translation performed on the equation $y = x$.



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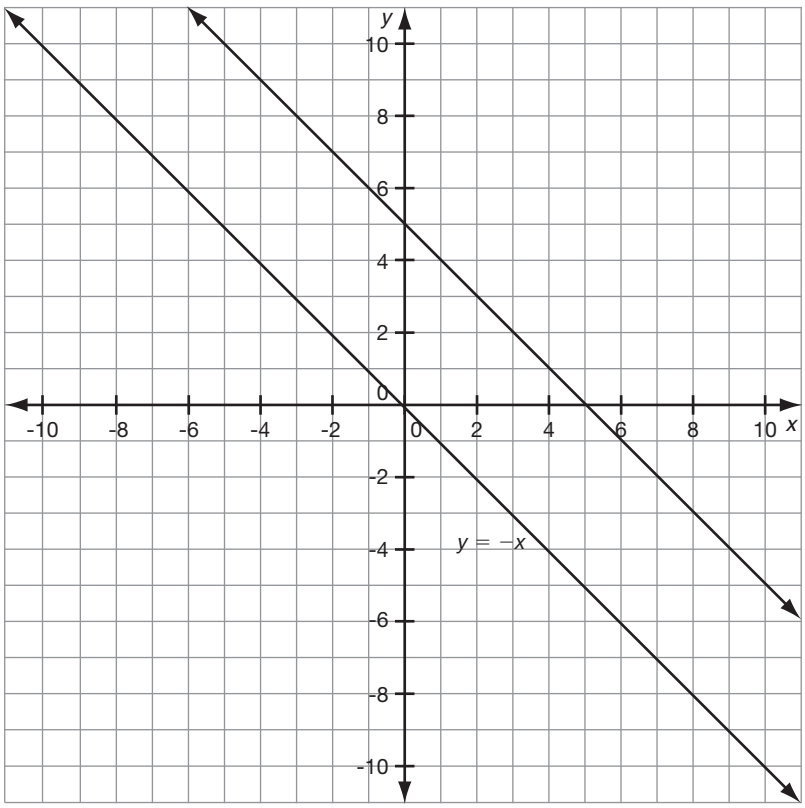
9. The graph shown is the result of a translation performed on the equation $y = -x$.



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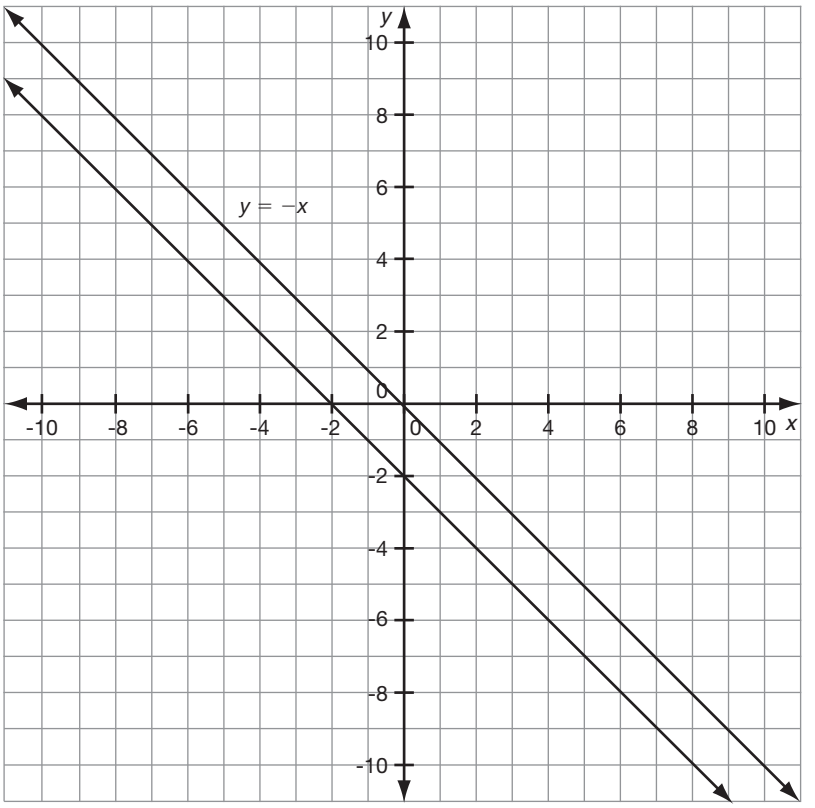
10. The graph shown is the result of a translation performed on the equation $y = -x$.



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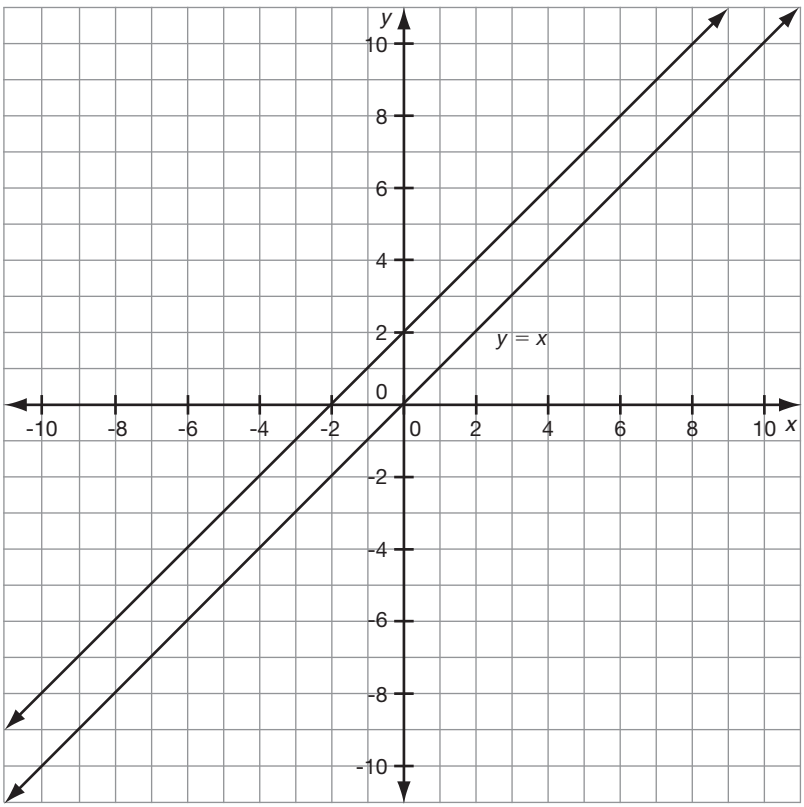
11. The graph shown is the result of a translation performed on the equation $y = x$.



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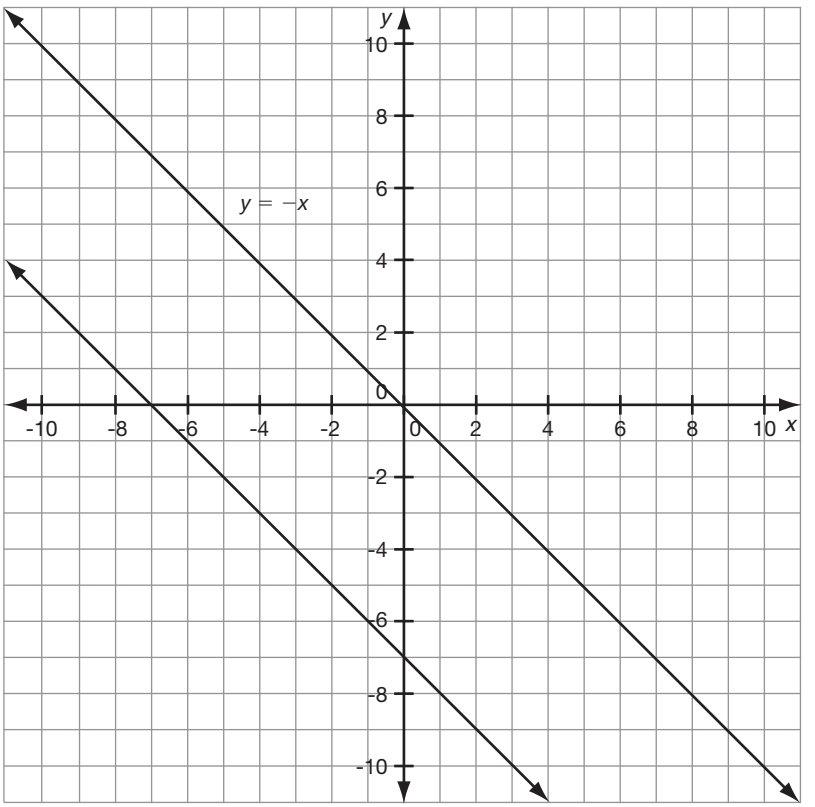
12. The graph shown is the result of a translation performed on the equation $y = -x$.



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Describe each translation.

13. The equation $y = x + 4.5$ is the result of a translation performed on the equation $y = x$.

The translation is either a slide up 4.5 units or a slide left 4.5 units.

14. The equation $y = -x + 2.1$ is the result of a translation performed on the equation $y = -x$.

15. The equation $y = x + 6.2$ is the result of a translation performed on the equation $y = x$.

16. The equation $y = -x - 12$ is the result of a translation performed on the equation $y = -x$.

17. The equation $y = x - 3.8$ is the result of a translation performed on the equation $y = x$.

18. The equation $y = -x - 1.5$ is the result of a translation performed on the equation $y = -x$.

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Parallel or Perpendicular?
Slopes of Parallel and Perpendicular Lines

Vocabulary

Define each term in your own words.

1. Reciprocal

2. Negative reciprocal

Problem Set

Determine the slope of a line parallel to the given line represented by each equation.

1. $y = 6x + 12$

   The slope of the line is 6, so the slope of a line parallel to it is 6.

2. $y = \frac{2}{3}x - 5$

3. $y = 8 - 5x$

4. $y = 14 - \frac{1}{4}x$

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5. $3x + 4y = 24$

6. $15x - 5y = 40$

Identify the slope of the line represented by each equation to determine which equations represent parallel lines.

18

7. a. $y = 8x - 5$

slope = 8

b. $y = 7 - 8x$

slope = −8

c. $y = 4 + 8x$

slope = 8

The equations (a) and (c) represent parallel lines.

8. a. $y = 6 - 3x$

b. $y = -3x - 8$

c. $y = 3x + 10$

9. a. $5y = -20x - 45$

b. $2y = 4x + 6$

c. $4y = 32 - 16x$

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10. a. $4y = 4x - 16$ **b.** $2y = 8 + 4x$ **c.** $3y = 6x + 18$

11. a. $3x + 5y = 60$ **b.** $6x + 10y = -40$ **c.** $15x + 9y = 18$

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12. **a.** $-x + 8y = 24$ **b.** $-32x + 4y = 12$ **c.** $-40x + 5y = 10$

Determine the negative reciprocal of each number.

13. 5

$-\frac{1}{5}$

14. -7

15. $\frac{3}{4}$

16. $-\frac{5}{8}$

17. $\frac{1}{7}$

18. $-\frac{2}{5}$

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Determine the slope of a line perpendicular to the given line represented by each equation.

19. $y = 13x + 22$

The slope of the line is 13, so the slope of a line perpendicular to it is $-\frac{1}{13}$.

20. $y = 5x - 17$

21. $y = \frac{1}{6}x + 4$

22. $y = 9 - \frac{1}{3}x$

23. $5x + 6y = 36$

24. $4x - 3y = 21$

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Identify the slope of the line represented by each equation to determine which equations represent perpendicular lines.

25. **a.** $y = \frac{2}{3}x - 8$ **b.** $y = \frac{3}{2}x - 1$ **c.** $y = -\frac{3}{2}x + 14$

slope $= \frac{2}{3}$ slope $= \frac{3}{2}$ slope $= -\frac{3}{2}$

The equations (a) and (c) represent perpendicular lines.

26. **a.** $y = -5x - 23$ **b.** $y = 18 + \frac{1}{5}x$ **c.** $y = 5x + 31$

27. **a.** $-6y = -4x + 12$ **b.** $2y = 3x + 8$ **c.** $-9y = 6x + 9$

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28. a. $-5y = 25x + 55$ **b.** $5y = x + 15$ **c.** $4y = 20x - 24$

29. a. $-6x + 2y = 20$ **b.** $-9x - 3y = -18$ **c.** $x + 3y = 15$

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30. a. $3x + 18y = -72$ **b.** $30x + 5y = 25$ **c.** $-2x + 12y = -24$

18

Determine whether the lines described by the equations are parallel, perpendicular, or neither.

31. $y = 5x + 8$ $y = 4 + 5x$

slope = 5 slope = 5

The slopes are equal, so the lines are parallel.

32. $y = 15 - 2x$ $y = \frac{1}{2}x + 17$

33. $y = \frac{1}{3}x + 5$ $y = 3x - 2$

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34. $3x + 12y = 24$ $-20x + 5y = 40$

35. $3x + 2y = 2$ $2x + 3y = 3$

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36. $10y = 6x + 80$ $-12x + 20y = 160$

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Up, Down, and All Around
Line Transformations

Vocabulary

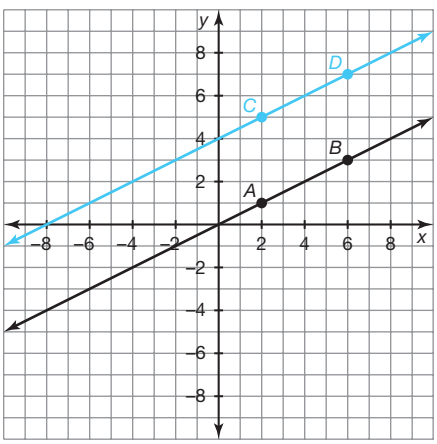
Write a definition for the term in your own words.

1. Triangle Sum Theorem

Problem Set

Sketch the translation for each line.

1. Vertically translate line *AB* 4 units to create line *CD*. Calculate the slope of each line to determine if the lines are parallel.



line *AB*: $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{3 - 1}{6 - 2}$

$= \frac{2}{4}$

line *CD*: $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{7 - 5}{6 - 2}$

$= \frac{2}{4}$

Line *AB* is parallel to line *CD*.

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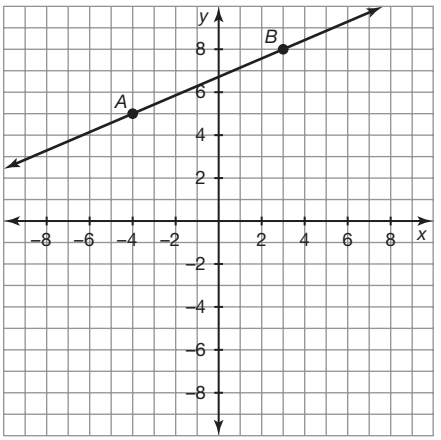
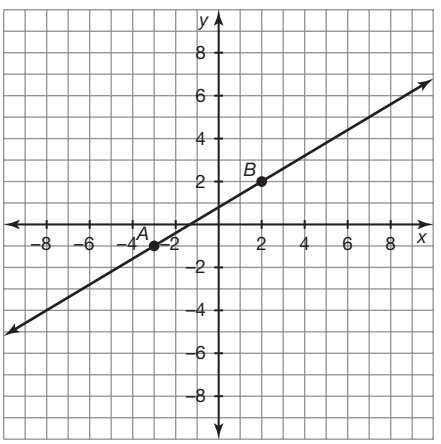
2. Vertically translate line *AB* −8 units to create line *CD*. Calculate the slope of each line to determine if the lines are parallel.



3. Horizontally translate line *AB* −5 units to create line *CD*. Calculate the slope of each line to determine if the lines are parallel.



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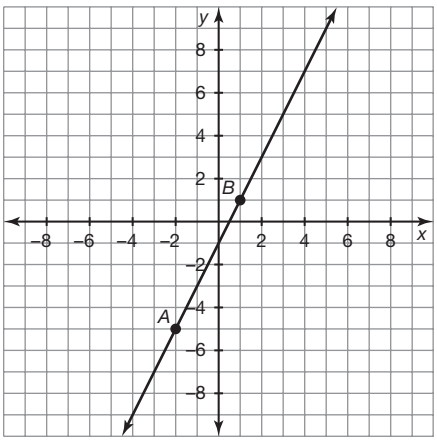
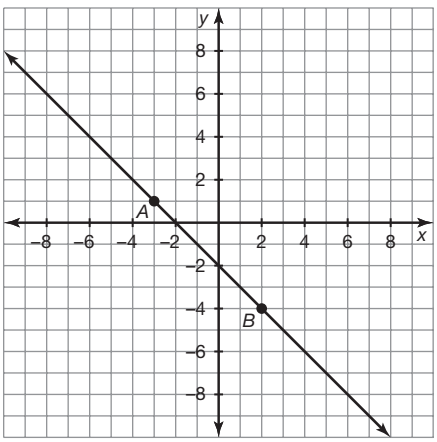
4. Horizontally translate line *AB* 6 units to create line *CD*. Calculate the slope of each line to determine if the lines are parallel.



5. Vertically translate line *AB* 7 units to create line *CD*. Calculate the slope of each line to determine if the lines are parallel.



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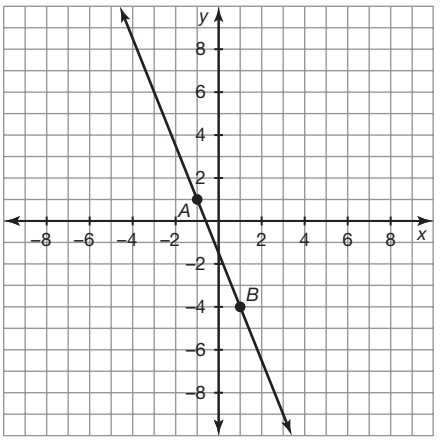
6. Horizontally translate line *AB* −3 units to create line *CD*. Calculate the slope of each line to determine if the lines are parallel.



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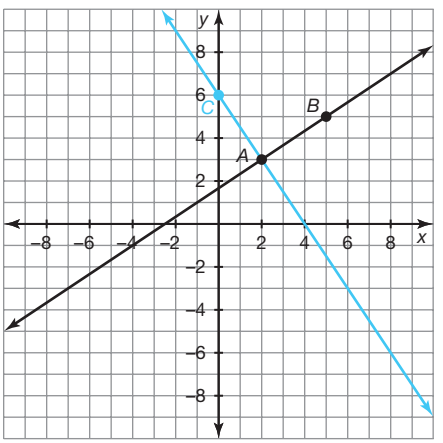
Sketch the rotation for each line.

7. Use point *A* as the point of rotation and rotate line *AB* 90° counterclockwise to form line *AC*. Calculate the slope of each line to determine if the lines are perpendicular. Explain how you determined your answer.



line *AB*: $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{5 - 3}{5 - 2}$

$= \frac{2}{3}$

line *AC*: $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{6 - 3}{0 - 2}$

$= -\frac{3}{2}$

Line *AB* is perpendicular to line *AC* because the slopes are negative reciprocals of each other.

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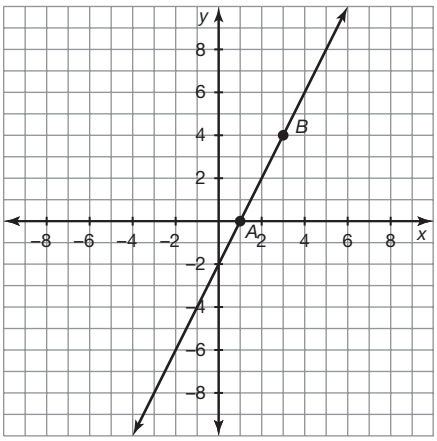
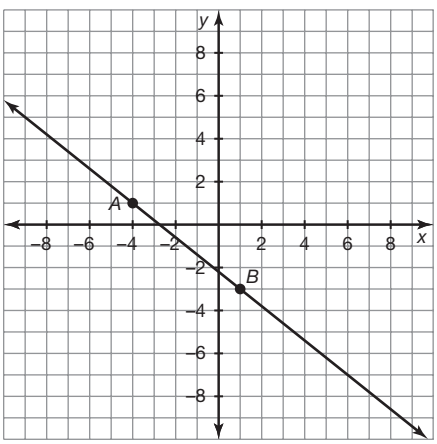
8. Use point *B* as the point of rotation and rotate line *AB* 90° clockwise to form line *BC*. Calculate the slope of each line to determine if the lines are perpendicular. Explain how you determined your answer.



9. Use point *A* as the point of rotation and rotate line *AB* 90° counterclockwise to form line *AC*. Calculate the slope of each line to determine if the lines are perpendicular. Explain how you determined your answer.



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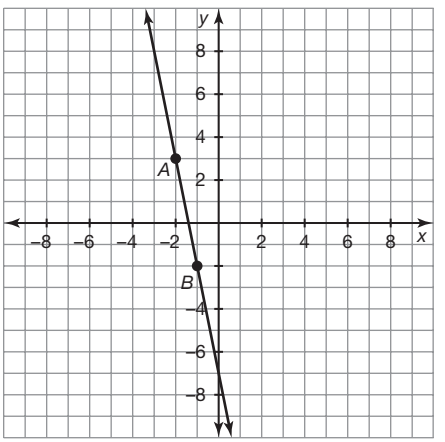
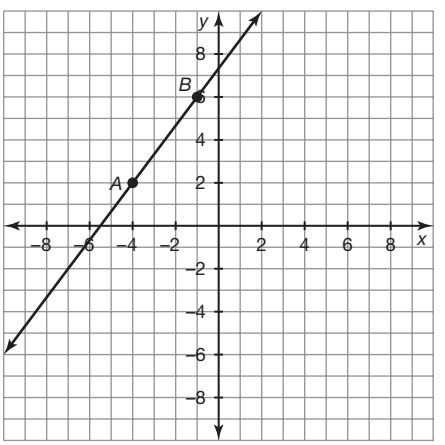
10. Use point *B* as the point of rotation and rotate line *AB* 90° clockwise to form line *BC*. Calculate the slope of each line to determine if the lines are perpendicular. Explain how you determined your answer.



11. Use point *A* as the point of rotation and rotate line *AB* 90° clockwise to form line *AC*. Calculate the slope of each line to determine if the lines are perpendicular. Explain how you determined your answer.



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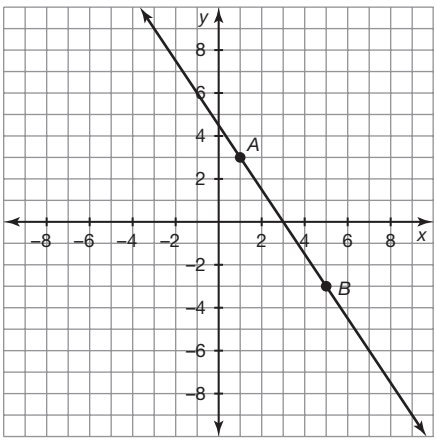
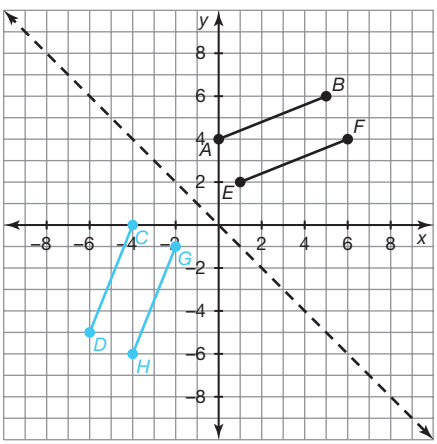
12. Use point *B* as the point of rotation and rotate line *AB* 90° counterclockwise to form line *BC*. Calculate the slope of each line to determine if the lines are perpendicular. Explain how you determined your answer.



Reflect line segment *AB* over the reflection line to form line segment *CD*. Reflect line segment *EF* over the reflection line to form line segment *GH*. Calculate the slopes of all line segments to prove that the line segments are parallel.

13.



slope of $\overline{AB} = \frac{2}{5}$

slope of $\overline{EF} = \frac{2}{5}$

$\overline{AB} \parallel \overline{EF}$

slope of $\overline{CD} = \frac{5}{2}$

slope of $\overline{GH} = \frac{5}{2}$

$\overline{CD} \parallel \overline{GH}$

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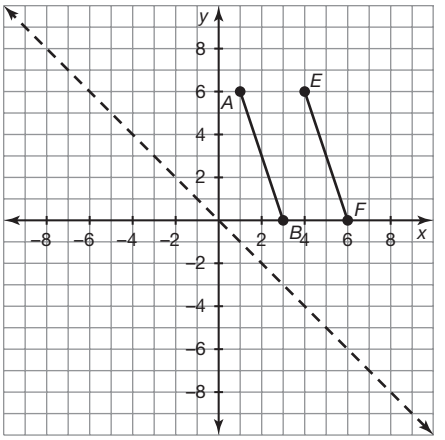
14.



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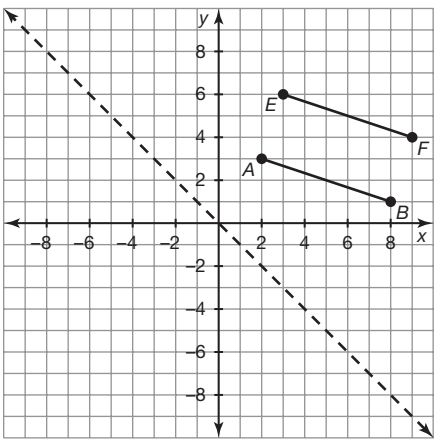

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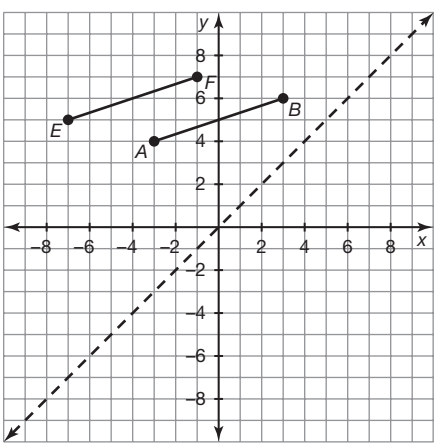

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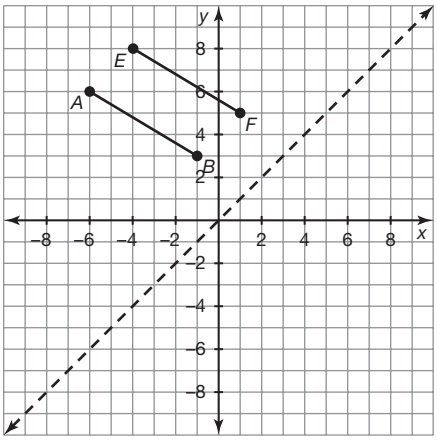

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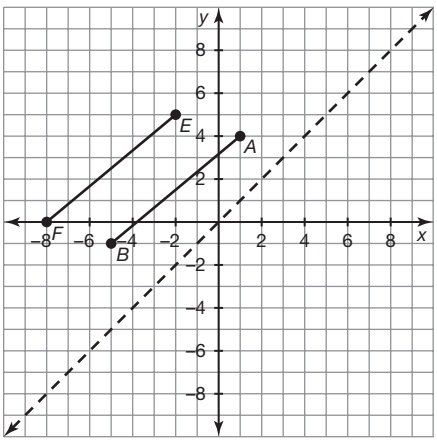

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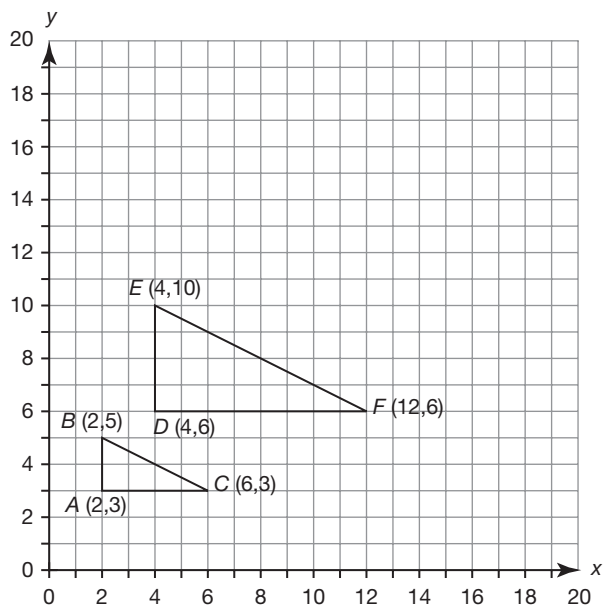
Back on the Grid
Similar Triangles on the Coordinate Plane

Problem Set

Verify that the triangles in each are similar.

1. Triangle *DEF* is the image that resulted from a dilation of △*ABC*. Use the SAS Similarity Theorem to determine whether △*ABC* is similar to △*DEF*.



Corresponding Sides $\overline{AB}$ and $\overline{DE}$:

$AB = 2$

$DE = 4$

$\frac{DE}{AB} = \frac{4}{2}$

$= 2$

Corresponding Sides $\overline{AC}$ and $\overline{DF}$:

$AC = 4$

$DF = 8$

$\frac{DF}{AC} = \frac{8}{4}$

$= 2$

$\frac{DE}{AB} = \frac{DF}{AC} = 2$

Corresponding Angles $\angle A$ and $\angle D$:
Angle *A* and $\angle D$ are both right angles.
The measures of $\angle A$ and $\angle D$ are equal.

The two triangles are similar by the SAS Similarity Theorem.

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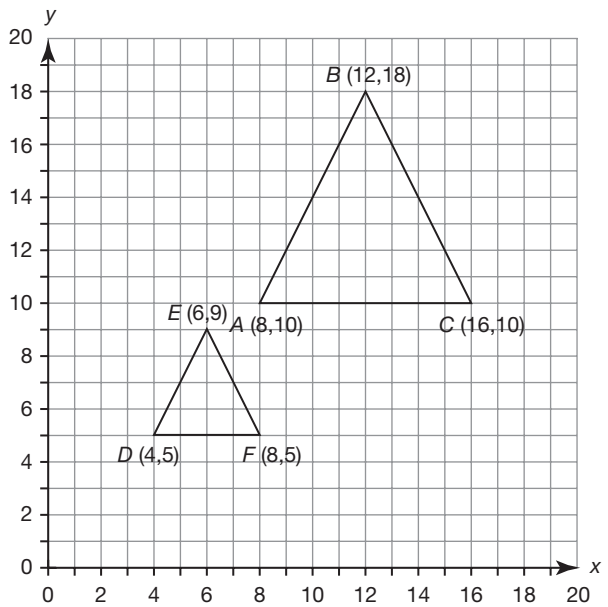
2. Triangle *DEF* is the image that resulted from a dilation of △*ABC*. Use the SAS Similarity Theorem and a protractor to determine whether △*ABC* is similar to △*DEF*.



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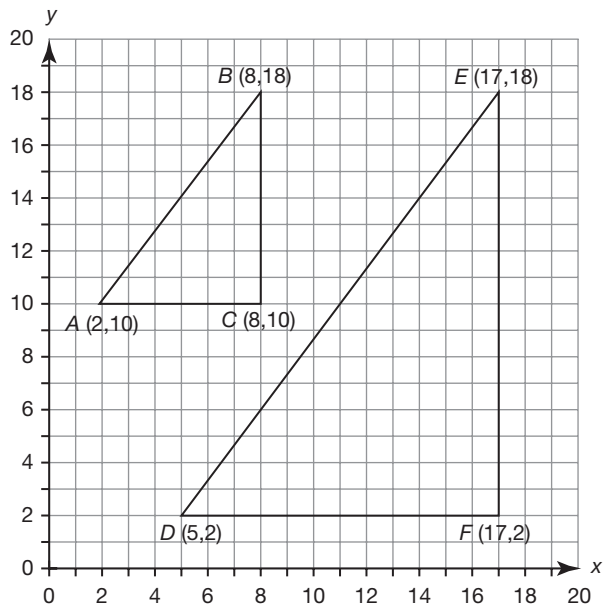
3. Triangle *DEF* is the image that resulted from a dilation of △*ABC*. Use the SSS Similarity Theorem to determine whether △*ABC* is similar to △*DEF*.



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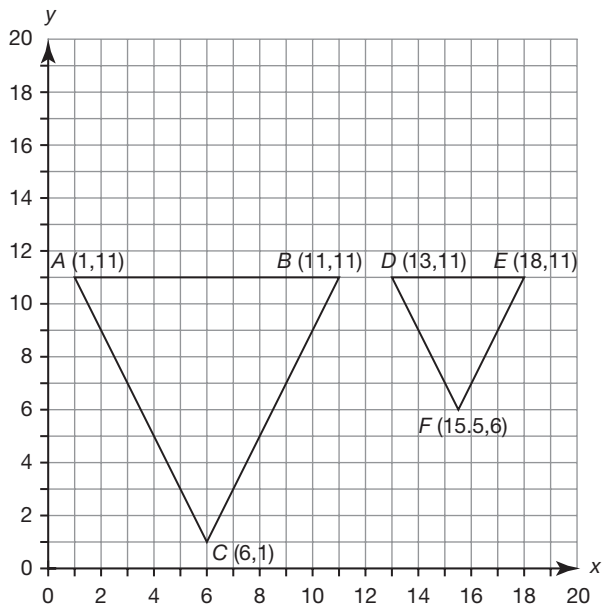
4. Triangle *DEF* is the image that resulted from a dilation of △*ABC*. Use the SSS Similarity Theorem to determine whether △*ABC* is similar to △*DEF*.



18

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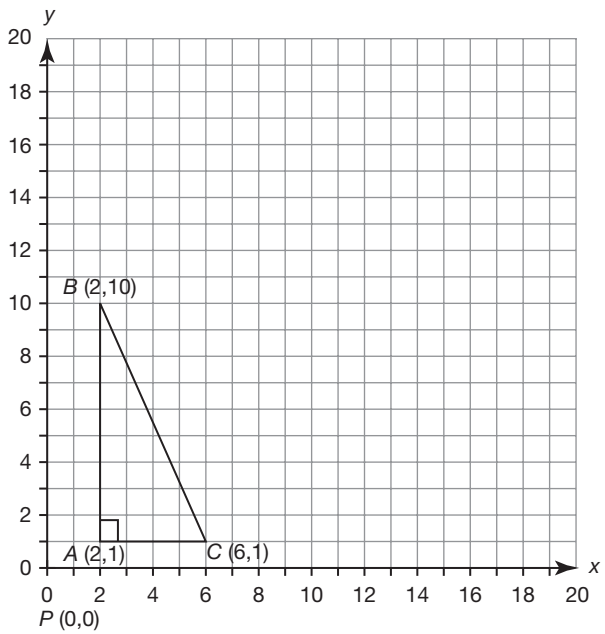
5. Dilate $\triangle ABC$ to form $\triangle DEF$ using point P (0, 0) as the center of dilation and a scale factor of 2. Use the AA Similarity Theorem and a protractor to determine whether $\triangle ABC$ is similar to $\triangle DEF$.



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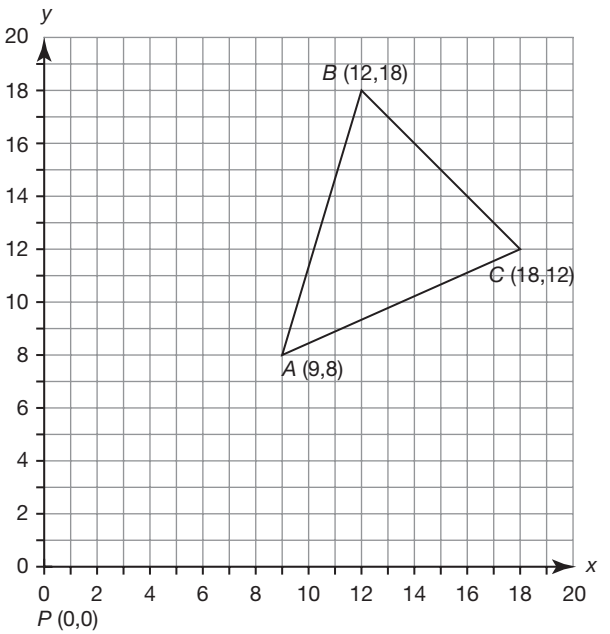
6. Dilate $\triangle ABC$ to form $\triangle DEF$ using point P (0, 0) as the center of dilation and a scale factor of $\frac{1}{2}$. Use the AA Similarity Theorem and a protractor to determine whether $\triangle ABC$ is similar to $\triangle DEF$.



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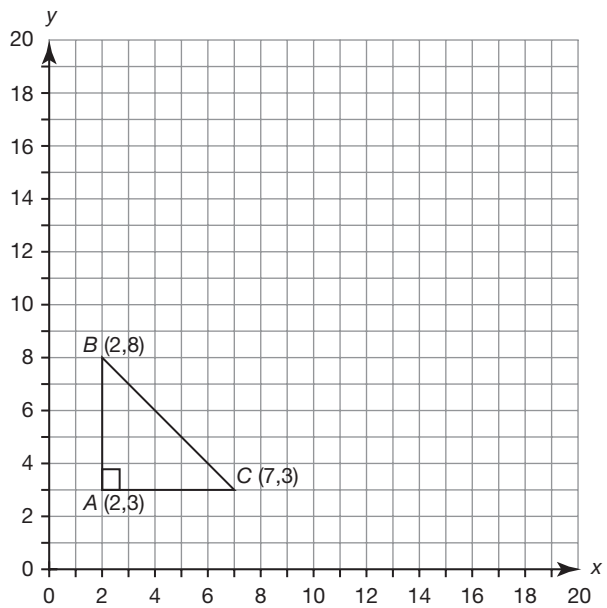
7. Dilate ΔABC to form $\triangle DEF$ using point A (2, 3) as the center of dilation and a scale factor of 3. Use the SAS Similarity Theorem to determine whether $\triangle ABC$ is similar to $\triangle DEF$.



18

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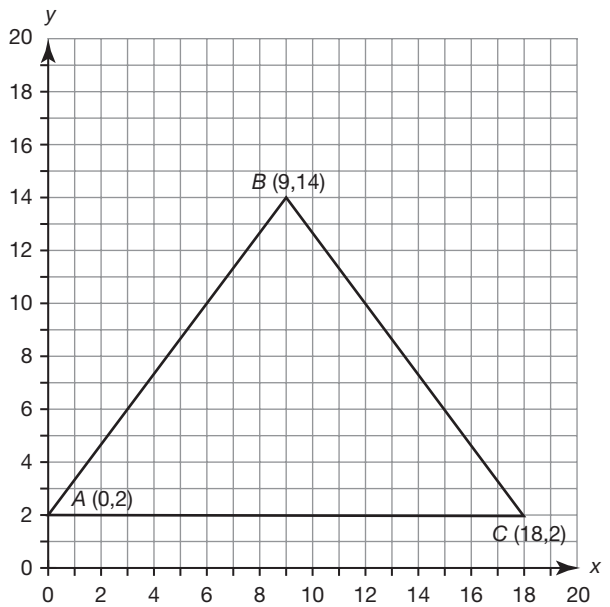
8. Dilate $\triangle ABC$ to form $\triangle DEF$ using point A (0, 2) as the center of dilation and a scale factor of $\frac{1}{3}$. Use the SAS Similarity Theorem to determine whether $\triangle ABC$ is similar to $\triangle DEF$.



18

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