

Music

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6.1

Words to Know

x-intercept: the point where the line of a linear equation crosses the x -axis.

Math in History

Although Pythagoras was known for his math discoveries, he also extensively studied relationships in music. He discovered the fundamental mathematics of stringed instruments—a pitch's frequency increases as the length of the string decreases.

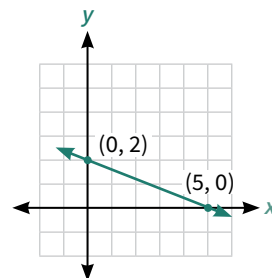
Graphing from the x - and y -Intercepts

Linear equations can be graphed without being in slope-intercept form if x - and y -intercepts are found.

The point on a graph where a line crosses the x -axis is called the **x -intercept**. For all x -intercepts the y -value is 0. The point where the line crosses the y -axis is called the y -intercept. For all y -intercepts the x -value is 0.

When a line crosses the x -axis at 5, the y -value of that point is 0. Similarly, when the line crosses the y -axis at 2, the x -value of the ordered pair is 0.

This characteristic of x - and y -intercepts can be used to graph an equation. First find the y -intercept by substituting 0 for x and solving the equation. The solution is the point where the line intercepts the y -axis. Then find the x -intercept by substituting 0 for y and solving the equation again. To graph the equation, plot the x - and y -intercepts on a coordinate plane and draw a line through the points.



Example 1 Graph the equation $3x + 2y = 6$ using x - and y -intercepts.

$$3x + 2y = 6 \quad \text{Original equation.}$$

$$3(0) + 2y = 6 \quad 0 \text{ substituted for } x.$$

$$y = 3 \quad \text{Equation solved for } y.$$

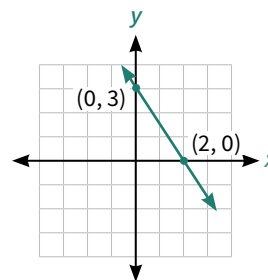
The y -intercept = $(0, 3)$.

$$3x + 2y = 6 \quad \text{Original equation.}$$

$$3x + 2(0) = 6 \quad 0 \text{ substituted for } y.$$

$$x = 2 \quad \text{Equation solved for } x.$$

The x -intercept = $(2, 0)$.



Steps Graphing for the x - and y -intercept

- Substitute 0 for x in the equation to find the y -intercept.
- Substitute 0 for y in the equation and solve to find the x -intercept.
- Plot the x -intercept and the y -intercept on a coordinate plane.
- Draw a line through the two points.

Sometimes the x - or y -intercept is not a whole number. When this occurs, the plotting of the point of interception must be estimated.

Example 2 Graph the equation $3x - 4y = 6$ by finding the x - and y -intercepts.

$$3x - 4y = 6 \quad \text{Original equation.}$$

$$3(0) - 4y = 6 \quad 0 \text{ substituted for } x.$$

$$y = -\frac{3}{2} \quad \text{Equation solved for } y.$$

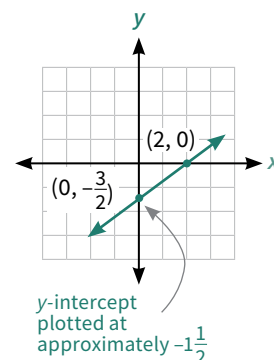
$$\text{The } y\text{-intercept} = (0, -\frac{3}{2}).$$

$$3x - 4y = 6 \quad \text{Original equation.}$$

$$3x - 4(0) = 6 \quad 0 \text{ substituted for } y.$$

$$x = 2 \quad \text{Equation solved for } x.$$

$$\text{The } x\text{-intercept} = (2, 0).$$



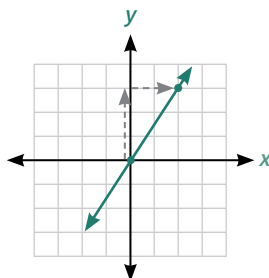
If an equation has no constant term, both the x - and y -intercepts are 0. Its graph passes through the origin. This type of equation cannot be graphed using x - and y -intercepts. To graph them, the equation must be transformed to slope-intercept form and the origin used as one point and the slope used to find a second point for the line.

Example 3 Graph the equation $2y = 3x$ using origin and slope.

$$2y = 3x \quad \text{Original equation.}$$

$$\frac{2y}{2} = \frac{3x}{2} \quad \text{Both sides divided by 2}$$

$$y = \frac{3}{2}x \quad \text{Slope-intercept form.} \quad \left. \begin{array}{l} \text{Equation transformed} \\ \text{to slope-intercept form.} \end{array} \right\}$$



$$b = 0 \quad \text{Origin.}$$

$$m = \frac{3}{2} \quad \text{Slope.}$$

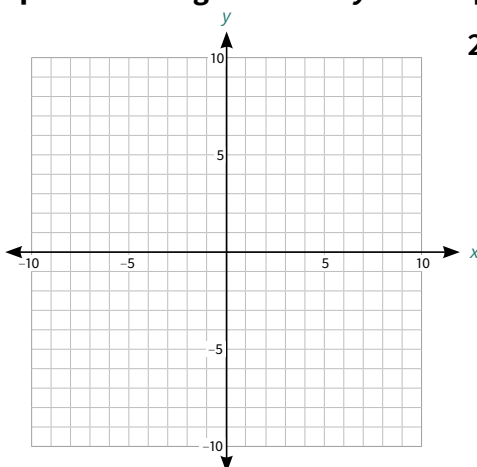
Math in History

Listening to a blacksmith striking an anvil, Pythagoras heard the different weights of hammers producing different notes. He experimented with strings and weights, discovering the intervals of the octave, fifth, and fourth. With this knowledge, he invented the monochord, an instrument with pegs, bridges, and a string.

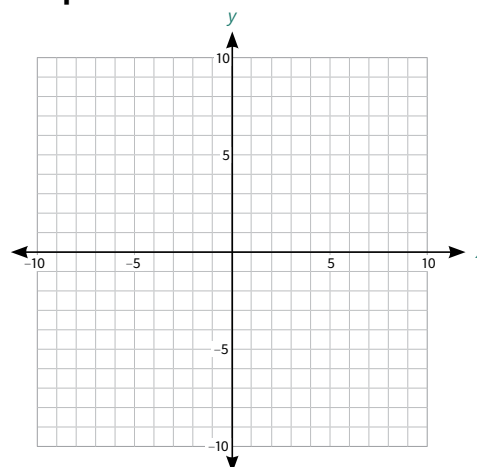
Today's Lesson

Graph each of the equations using the x - and y -intercepts or origin and slope.

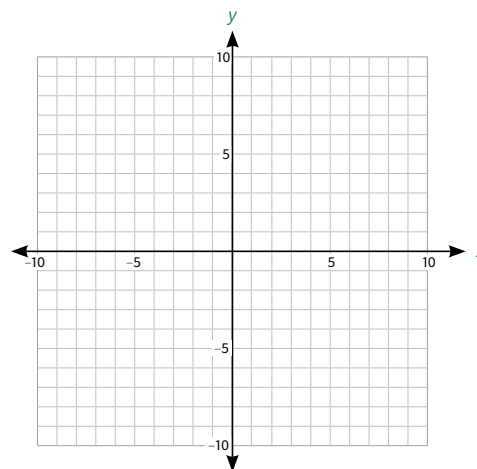
1. $x - 2y = 6$



2. $9x + 4y = -18$



3. $3y = 12x$



REVIEW

Factor the binomials when possible. 5.14

4. $x^2 - 25$

5. $y^2 + 36$

6. $9x^2 - 49$

Simplify. 5.3

7. $4\sqrt{5} \cdot 2\sqrt{5}$

8. $5\sqrt{32} \cdot 6\sqrt{2}$

9. $3\sqrt[3]{2} \cdot 2\sqrt[3]{4}$

10. $5\sqrt[3]{3} \cdot 2\sqrt[3]{3}$

Multiply the sum and difference binomials. 5.11

11. $(3x - 3y)(3x + 3y)$

12. $(2xy - 9)(2xy + 9)$

13. $(\sqrt{2} - 2x)(\sqrt{2} + 2x)$

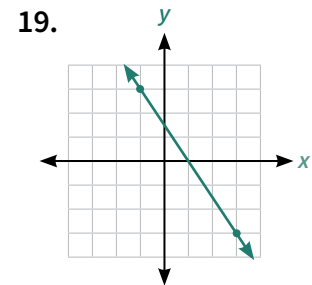
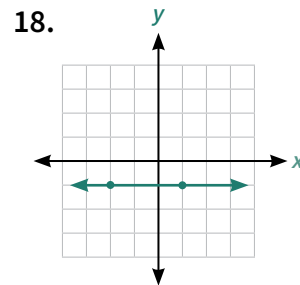
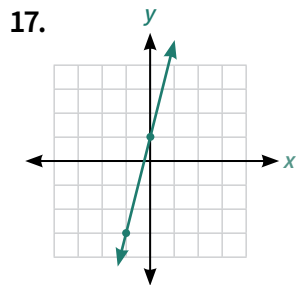
Solve the inequalities. 5.7

14. $6x + 2 > -7$

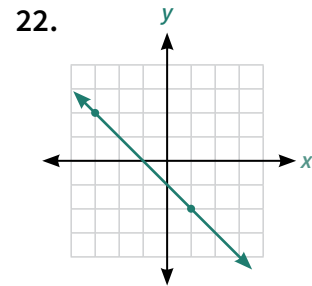
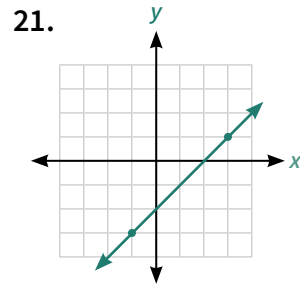
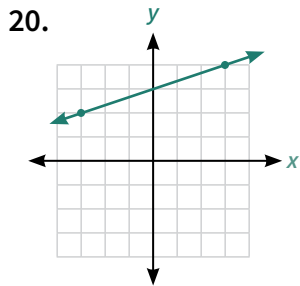
15. $-2x + 1 < 2x - 19$

16. $3x < 33 - 8x$

Determine the slopes of the lines. 4.13



Write an equation for each graph. 5.12



Solve. 1.4, 1.7

23. $\frac{25}{12} + \frac{1}{4}$

24. $3\frac{1}{3} - \frac{5}{6}$

25. $\frac{5}{8} \cdot \frac{3}{5} \cdot \frac{8}{9}$

26. $8\frac{1}{6} \div 14$

Lesson 6.1

Use the five steps to set up and solve the equations.

27. Jim began filling a 400-gallon tank with a water pump that pumps 10 gallons per minute. It took 50 minutes, which was longer than usual, and Jim discovered that the drain had been open. At what rate did the drain let out water? 5.13
28. Steve needs to mix oil with 2 gallons of gas for his weed trimmer. How much oil (rounded to the nearest $\frac{1}{2}$ oz) should he put in with the 2 gallons of gas to obtain a 2.5% solution? (Note: Change gallons to ounces.) 5.13
29. Miller's Deli sold meat and cheese platters for special occasions. A platter with 3 pounds of honey roasted turkey breast, 2 pounds of roast beef, and 4 pounds of mini-colby cheese sold for \$41.51. The roast beef costs \$1.30 more than the turkey breast, while the cheese costs \$1.50 less than the turkey breast. What was the cost per pound for each meat and cheese? 5.8

Find the mean, median, and mode. 5.6

30. At a pet store, a survey was taken asking how many pets each person had. The results: {2, 5, 3, 1, 0, 4, 2, 7, 0, 2, 7, 3}.

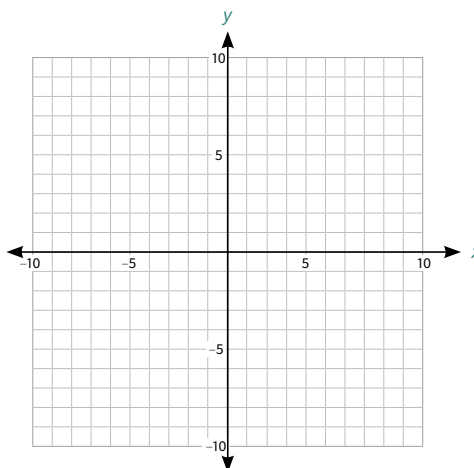
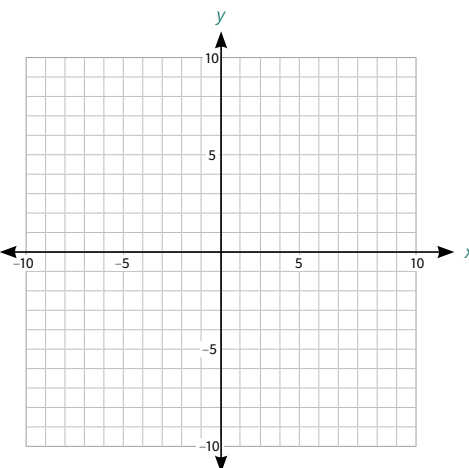
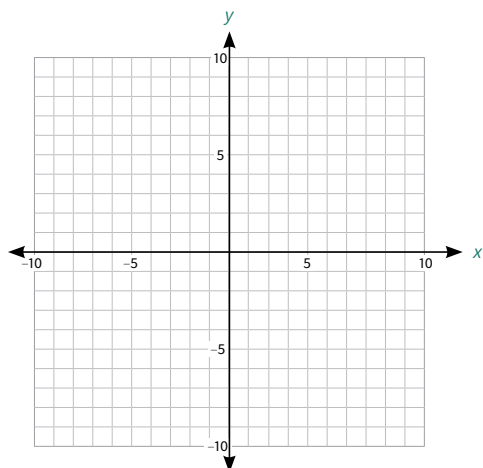
Today's Lesson

Graph each of the equations using the x - and y -intercepts or origin and slope.

31. $7x + 2y = 14$

32. $y = 2x$

33. $3x - 5y = 15$



Extra Practice

Graph each of the equations using the x - and y -intercepts or origin and slope.

34. $7x - 2y = -14$

35. $y - x = 3$

36. $6y = 15x$

