

## FREQUENTLY ASKED Questions

### Study Aid

- See Lesson 4.4, Examples 2 and 3.
- Try Chapter Review Questions 10 and 12.

**Q:** How does solving a linear relation for a variable compare to solving a linear equation?

**A:** The processes are the same, but the solution for a linear equation is a number. When solving for a variable, you get an equation equivalent to the original one. To isolate the variable, you must undo each operation in the reverse order. The operation must be done to both sides of the equation to keep the equivalence of the relation or formula.

### EXAMPLE

Rearrange the equation  $90x + 45y = 360$  to solve for  $y$  in terms of  $x$ .

### Solution

$$\begin{aligned} 90x + 45y &= 360 \\ 90x + 45y - 90x &= 360 - 90x \\ 45y &= 360 - 90x \\ \frac{45y}{45} &= \frac{360 - 90x}{45} \\ y &= \frac{360 - 90x}{45} \\ y &= 8 - 2x \end{aligned}$$

### Study Aid

- See Lesson 4.5, Example 1.
- Try Chapter Review Questions 14, 15, 16, and 17.

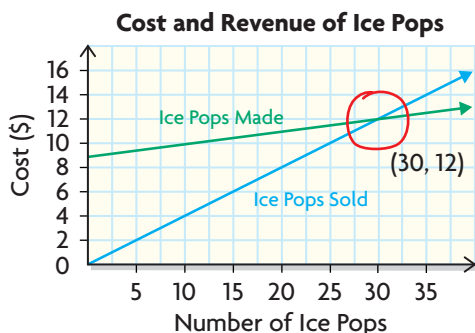
**Q:** How do you solve a problem that can be modelled by a system of linear relations?

**A1:** Use a hand-drawn graph to estimate the point of intersection.

### EXAMPLE

The cost to make ice pops is \$0.10 per ice pop, plus \$9.00 in supplies. Each ice pop sells for \$0.40. How many do you need to sell to break even?

### Solution



Create a table of values for each equation, then graph both equations on the same axes. Find the point of intersection. Then, interpret the point of intersection.

The break-even point is located at (30, 12).

You need to sell 30 ice pops to break even.

**A2:** Use graphing technology to determine more accurate coordinates of the point of intersection.

### EXAMPLE

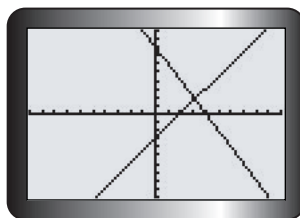
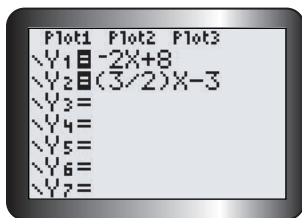
Determine the point of intersection of the graphs of  $2x + y = 8$  and  $3x - 2y = 6$ .

#### Solution

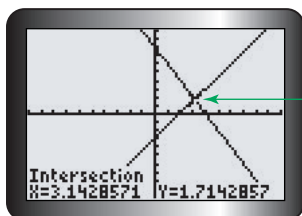
$$\begin{aligned} 2x + y &= 8 \\ 2x + y - 2x &= 8 - 2x \\ y &= -2x + 8 \end{aligned}$$

$$\begin{aligned} 3x - 2y &= 6 \\ 3x - 2y - 3x &= 6 - 3x \\ -2y &= -3x + 6 \\ \frac{-2y}{-2} &= \frac{-3x}{-2} + \frac{6}{-2} \\ y &= \frac{3}{2}x - 3 \end{aligned}$$

Solve for  $y$  in terms of  $x$  in both equations, so that they can be graphed on a graphing calculator.



Enter both equations into the equation editor of a graphing calculator and graph.



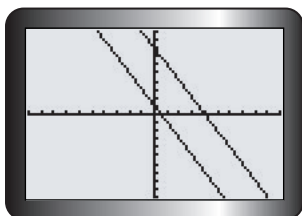
Determine the point of intersection using the Intersect operation.

The point of intersection is about  $(3.14, 1.71)$ .

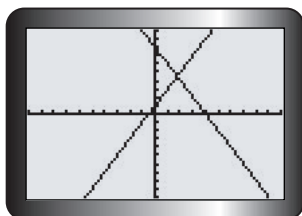
#### Q: In what ways can two lines intersect?

**A:** Two lines can intersect in one of three different ways.

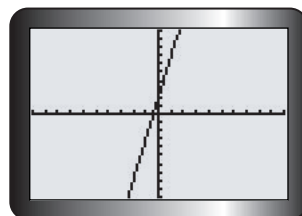
The lines could be parallel resulting in 0 points of intersection.



The lines could intersect at exactly one point of intersection.



The lines could be identical resulting in an infinite number of points of intersection.



## PRACTICE Questions

### Lesson 4.1

- Write the linear relation that corresponds to each equation. Estimate the solution graphically.
  - $4x - 5 = 3$
  - $\frac{1}{2}x + 3 = 5$
  - $-2(x - 3) = -4$
  - $\frac{1}{4}\left(x + \frac{2}{5}\right) = 0$
- Solve each equation using algebra.
  - $3x + 6 = 12$
  - $5 - 2x = 11$
  - $4x - 8 = 12$
  - $-6x + 8 = -10$
- Determine the  $x$ -intercept of each of the following.
  - $y = -5x + 20$
  - $2x + y = 10$
- A promoter is holding a video dance. Tickets cost \$15 per person, and he has given away 10 free tickets to radio stations.
  - Create the linear relation that models the money the promoter will earn in ticket sales in terms of the number of people attending the dance.
  - Graph the linear relation.
  - Write the equation you would solve to determine the money from tickets sales if 100 people attend. Solve the equation using the graph.
  - Write the equation you would use to determine how many people attended if ticket sales were only \$600. Estimate the solution using the graph.



### Lesson 4.2

- Solve each equation in question 1 using inverse operations.

- Erynn joins a CD club. The first 10 CDs are free, but after that she pays \$15.95 for each CD she orders.
  - Write an expression for the cost of  $x$  CDs.
  - How much would she pay for 15 CDs?
  - Erynn receives her first order of CDs with a bill for \$31.90. Create and solve an equation to determine how many she ordered.

### Lesson 4.3

- Solve and verify each equation.
  - $9x + 2 = 11x - 10$
  - $-\frac{4}{5}x + \frac{2}{3} = 1\frac{3}{4}x + 2$
  - $-3(x + 1) - 2 = 4x - 5(x - 3)$
  - $\frac{(4 + x)}{3} + 4 = \frac{(x - 6)}{2} - 6$
- To calculate the area of a trapezoid, you would use the expression:  $\frac{b}{2}(b_1 + b_2)$ . Determine the length of each base for the trapezoids below if they have the same area.
- Is  $x = 3$  the solution to  $5(3x - 2) = 4 - 10(x + 1)$ ? Explain how you know.

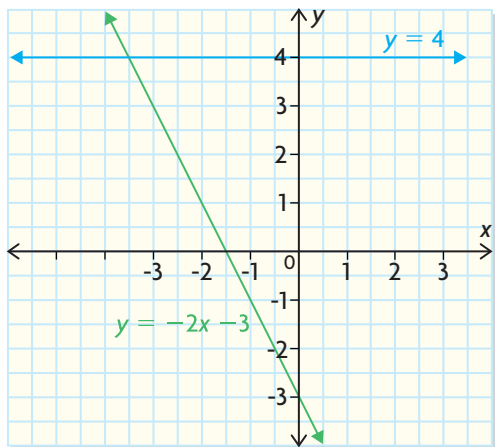
### Lesson 4.4

- Solve each equation for the variable indicated.
  - $P = 2l + 2w; l$
  - $A = P + Prt; t$
  - $V = \pi r^2 h; h$
  - $Ax + By = C; y$
- The formula  $C = \frac{5}{9}(F - 32)$  is used to convert Fahrenheit temperatures to Celsius.
  - Determine the Celsius temperature when  $F = 90$ .
  - Solve for  $F$  in terms of  $C$ .
  - Determine the Fahrenheit temperature when  $C = 25$ .

12. Solve for  $y$  in terms of  $x$ .
- $8x - 4y = 12$
  - $5x = 10y - 20$
  - $3x - 3y - 9 = 0$
  - $\frac{x}{4} + \frac{y}{8} = 2$
13. Josh has \$32.00 in loonies and toonies.
- Write a linear relation expressing the total amount of money in terms of the number of loonies and toonies.
  - Write an equation to express the number of toonies in terms of the number of loonies.
  - Use your equation to determine 4 different possible combinations of coins Josh could have.
  - Is it possible that Josh has 13 toonies and 5 loonies? Explain.

#### Lesson 4.5

14. John said, "To solve the equation  $4 = -2x - 3$ , I graphed  $y = -2x - 3$  and  $y = 4$ . The  $x$ -value where the two lines intersect is the solution."



- What is the solution to this equation based on the graph?
- Verify the solution using algebra.
- Why is John's strategy reasonable?
- How could you use this strategy to solve  $3x - 4 = 2x + 3$ ?

15. Solve each of the following systems of equations using a graph.
- $y = 3x - 1$  and  $y = -x + 5$
  - $y = -0.5x$  and  $y = 6.5x + 3$
  - $3x - 4y = -12$  and  $2x - 3y = 6$
16. Faster Fitness has a monthly membership fee of \$90. Members pay \$5 to take an aerobics class. At Drop-in Fitness, there is no membership fee, but clients pay \$10 per class.



- Write a linear relation for the monthly cost in terms of the number of aerobics classes.
  - Graph the equations on the same set of axes.
  - State the point of intersection.
  - What does the point of intersection mean in this case?
  - How would you advise someone who is trying to choose between the two fitness clubs?
17. The Video Vault rents DVDs for \$3.00 each and has no membership fee. Videorenters rents DVDs for \$2 each but has a \$15 membership fee.
- Write an equation for each situation.
  - Graph both equations on the same set of axes. Find the point of intersection.
  - What does the point of intersection mean in this case?
  - What advice would you give to someone who is deciding which video store to use?