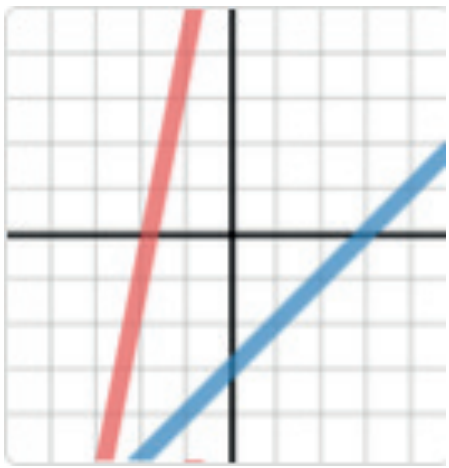
LESSON 18

Types of Solutions in Linear Systems

LEARNING OBJECTIVES

- Today I am: playing *Polygraph: Linear Systems* on Desmos with a partner.
- So that I can: graph linear equations in any form.
- I'll know I have it when I can: graph vertical and horizontal lines.

Opening Exploration

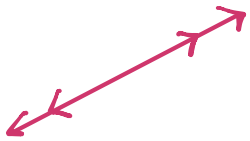


You will need: a Chrome book and the Desmos class code

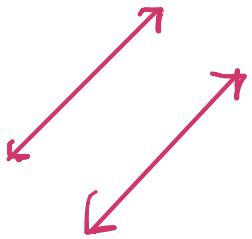
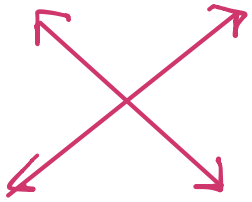
1. Go to student.desmos.com and type in your class code: _____ to play *Polygraph: Linear Systems*. First, you'll play a practice round against the computer to learn how the game works. Next, you'll be randomly paired up with someone from your class to play *Polygraph*. One person chooses a graph and their partner asks yes/no questions in order to narrow a field of suspects down to one. Between rounds, you'll answer questions about the strategies you used and the vocabulary that helped you find the correct graph.

2. What are some of the words you or your partner used to determine the correct graph?

Infinite Solutions



3. Draw a picture to represent each type of solution you could get with a linear system. Then describe how you would get that type of solution.

No Solution	One Solution
	

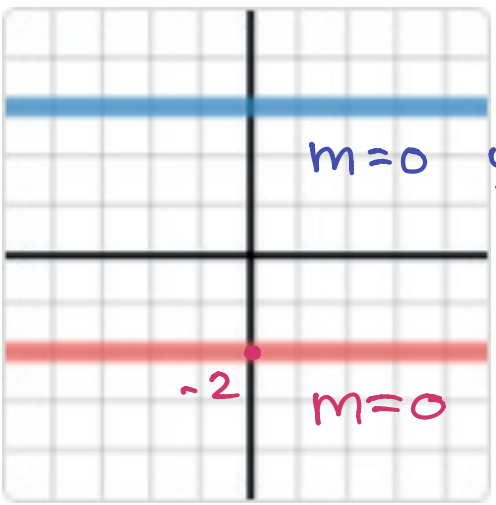
4. Troy says you can have infinitely many solutions in a linear system. Explain Troy's reasoning. Then draw a picture of a system with infinitely many solutions.

Vertical & Horizontal Lines

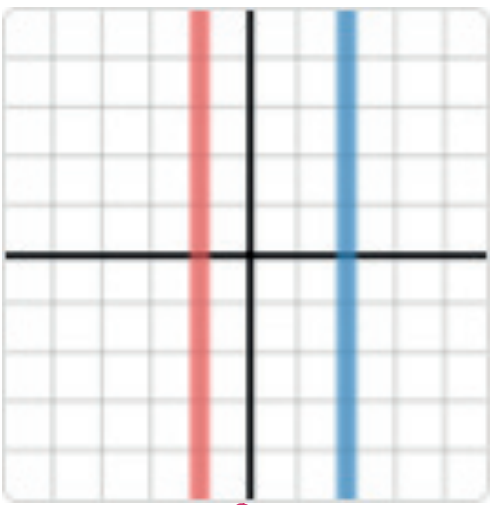
5. **Discussion** How would you describe the system of lines below? Would slope, *y*-intercept or the equation be the most helpful with these graphs?

m=undefined

A.

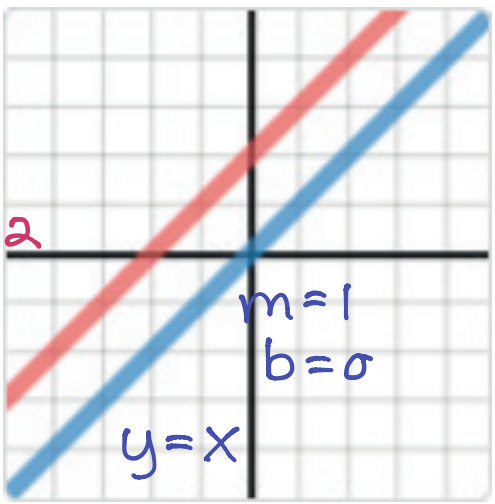


B.

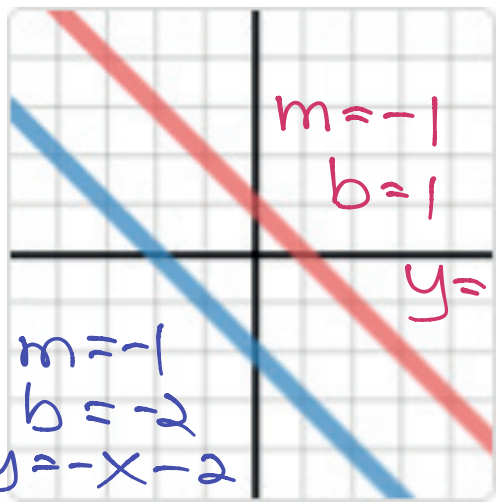


6. How are the systems below similar to those in Exercise 5? How would you describe them so that your partner could identify each one?

A.

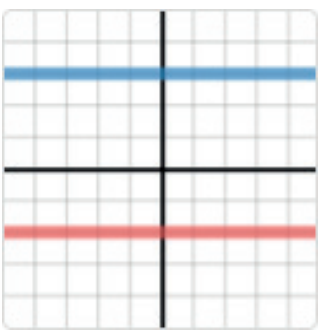


B.

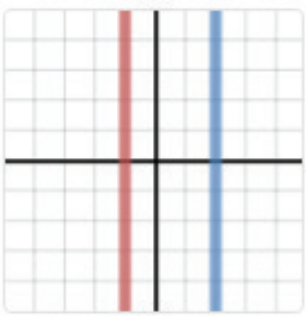


7. Write the system of equations for each of the graphs in Exercises 5 and 6.

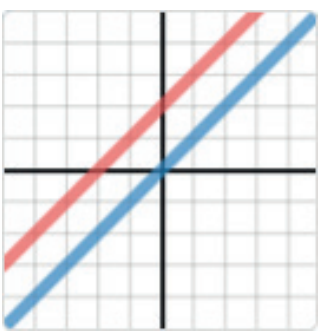
5A.



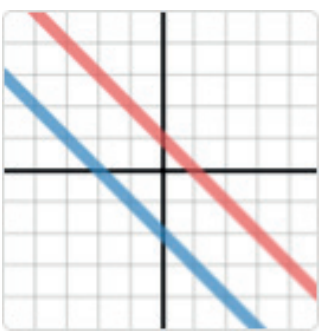
5B.



6A.



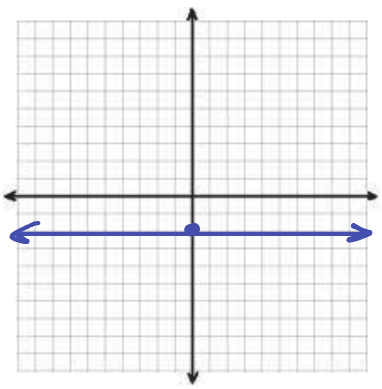
6B.



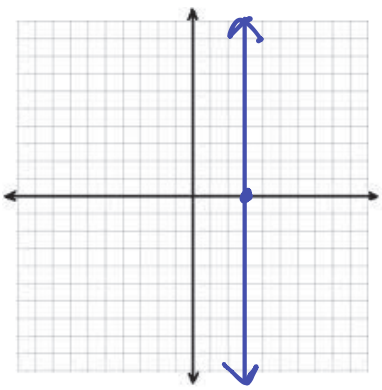
Practice Graphing Vertical & Horizontal Lines

8. Graph each of the following equations.

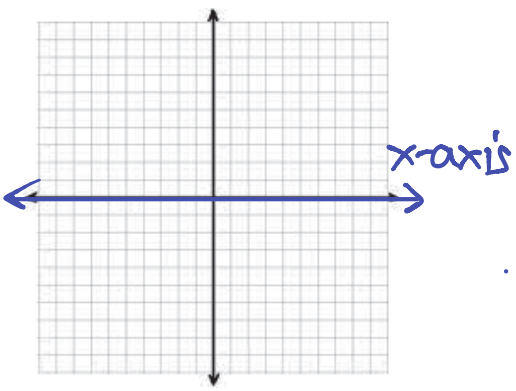
A. $y = -2$



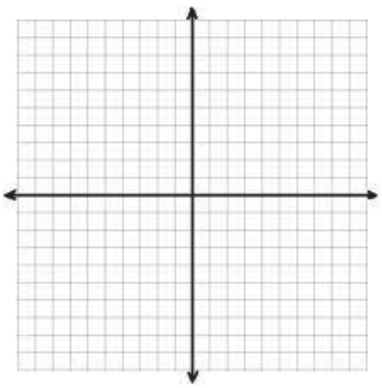
B. $x = 3$



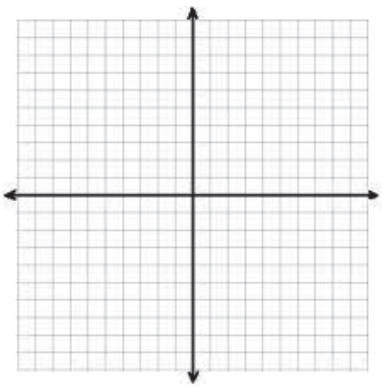
C. $y = 0$



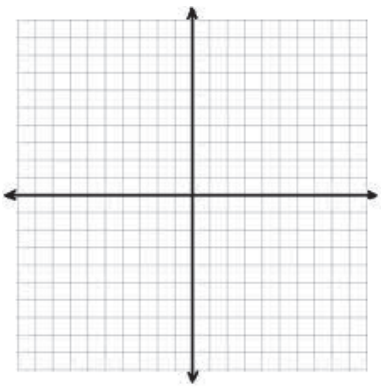
D. $x = -2$



E. $y = 3$



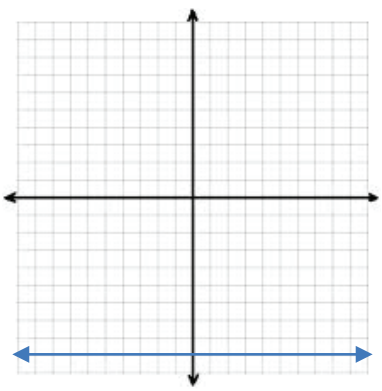
F. $x = 0$



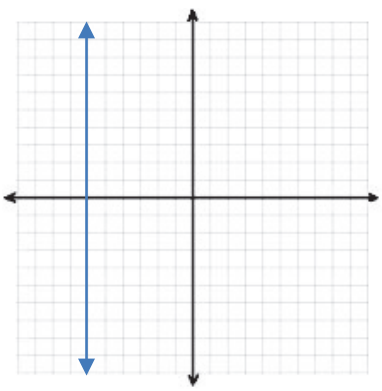
Practice Writing Equations of Vertical & Horizontal Lines

9. Write an equation for each line below.

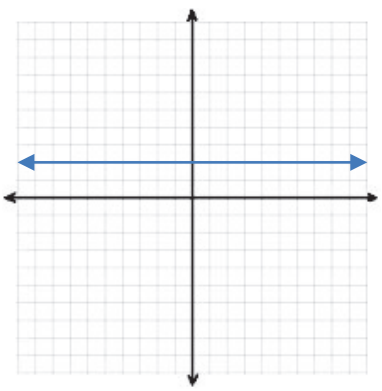
A. $y = -9$



B. $x = -6$



C. $y = 2$

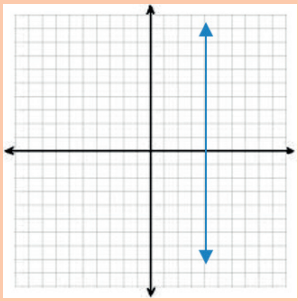
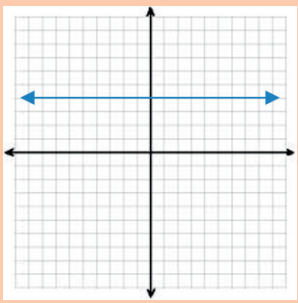


Lesson Summary

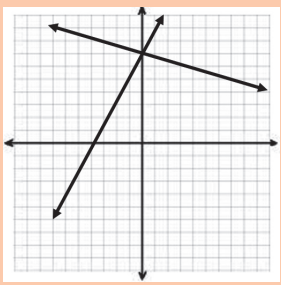
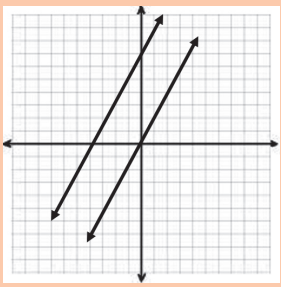
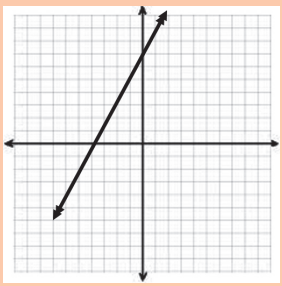
Discrete Versus Continuous Data—Discrete data can be numeric—like numbers of apples—but it can also be categorical—like red, white or blue, or good or bad. **Continuous data** are not restricted to defined separate values, but can be any value over a continuous range.

Source: StackExchange Cross Validated

Vertical and Horizontal Lines

	Graph	Equation	Characteristics
Vertical Lines		x = number	• No y-value • Slope is undefined
Horizontal Lines		y = number	• No x-value • Slope is 0

The **number of solutions** of a linear system of equations depends on the slope and y-intercept of the equations.

One Solution	No Solutions	Infinite Number of Solutions
Slopes are different.	Slopes are the same and y-intercepts are different.	Slopes are the same and y-intercepts are the same.
		

NAME: _____ PERIOD: _____ DATE: _____

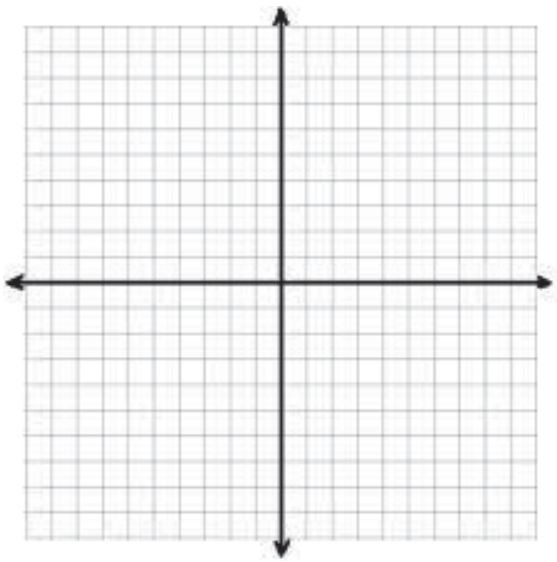
Homework Problem Set

1. Alexis realized that she could use linear equations to graph the first letter of her name. She came up with the following three equations.

$$y = 2x + 1$$

$$y = -2x + 9$$

$$y = 2$$

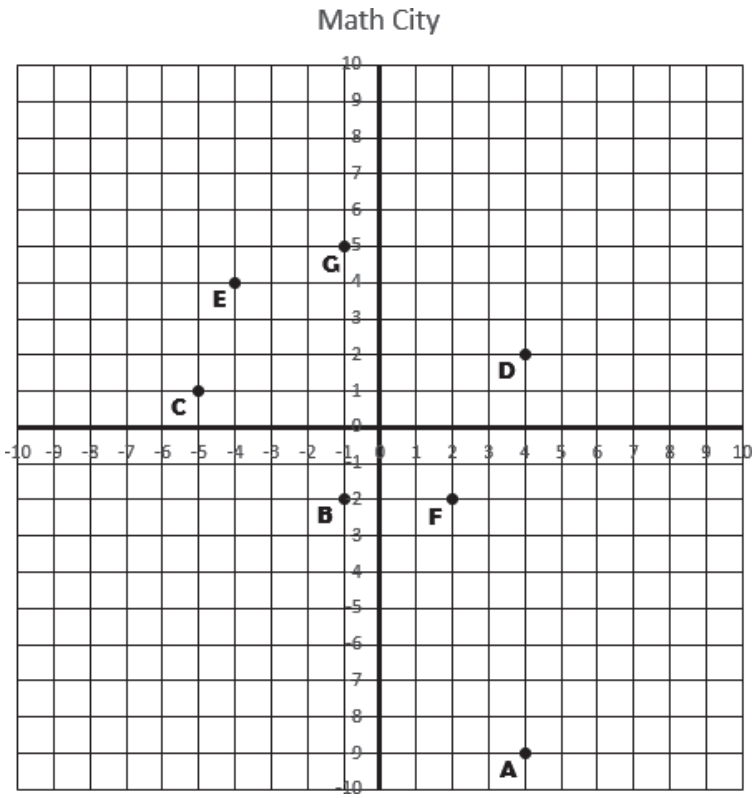


   A. Graph her three equations and then highlight the "A".

   B. What should she add to her description so that only a part of each line is drawn?

2. **Treasure Hunt!** Below is a map of Math City. Choose a location on the map and then write two or more equations that would help someone determine your location.

© cosmaa/Shutterstock.com



Legend

A = Algebra Airport

B = Binomial Bank

C = Coefficient Café

D = Delta the Dog Doctor

E = Ellipse Eye Exams

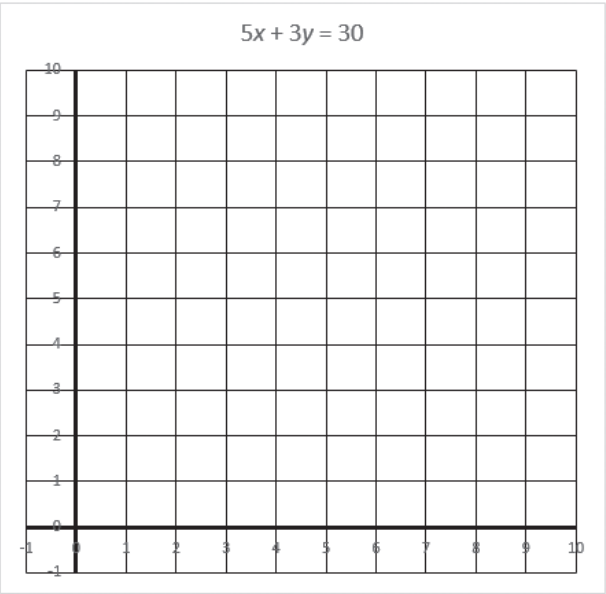
F = Flipping for Fish Store

G = GCF Groceries

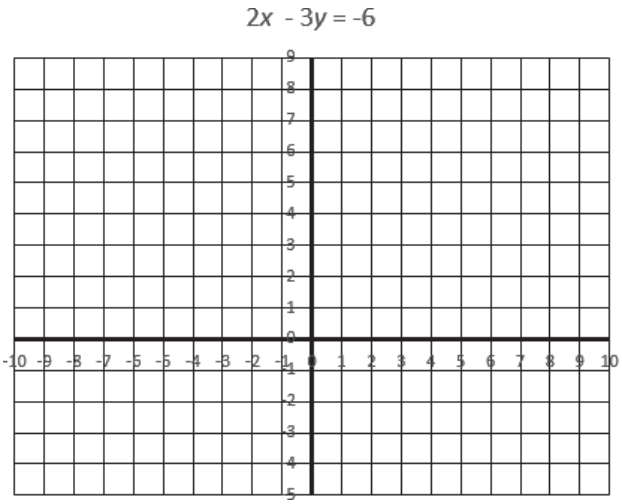
Spiral REVIEW—Graphing Lines

Graph the solution set in the coordinate plane. Label at least two ordered pairs that are solutions on your graph.

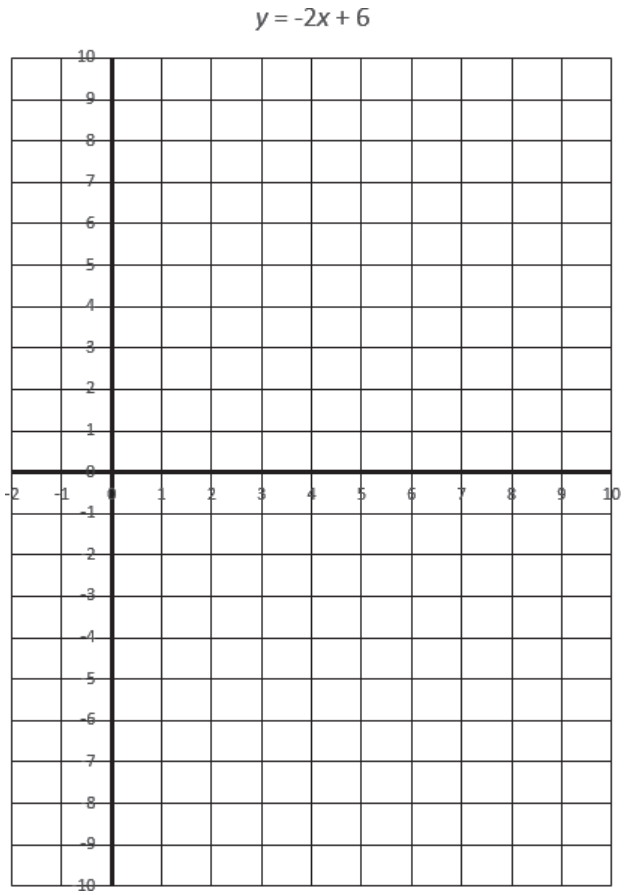
3. $5x + 3y = 30$



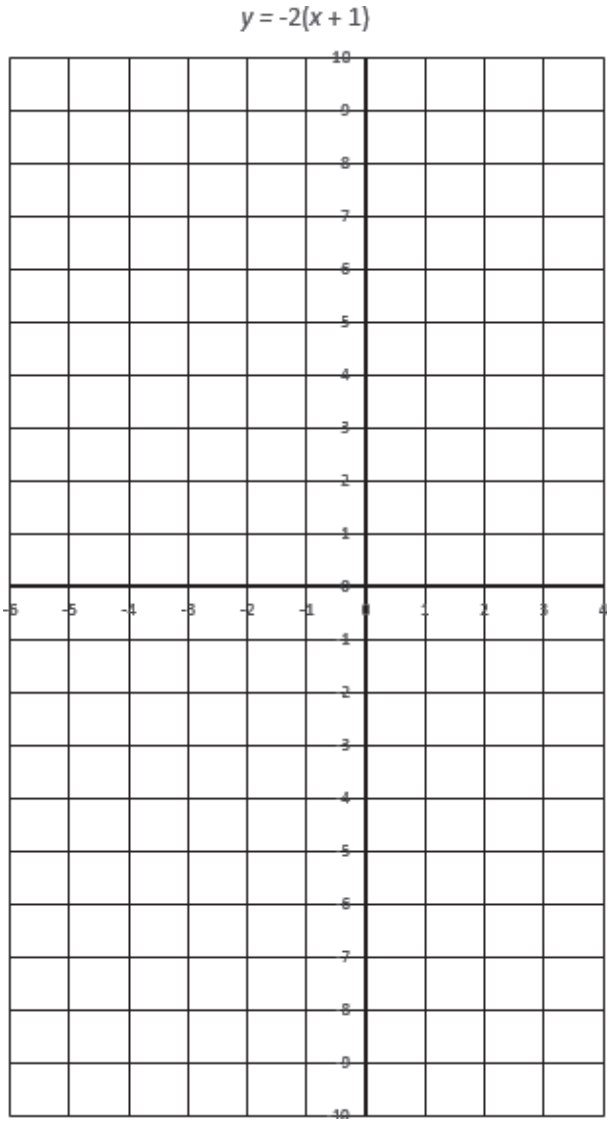
4. $2x - 3y = -6$



5. $y = -2x + 6$



6. $y = -2(x + 1)$

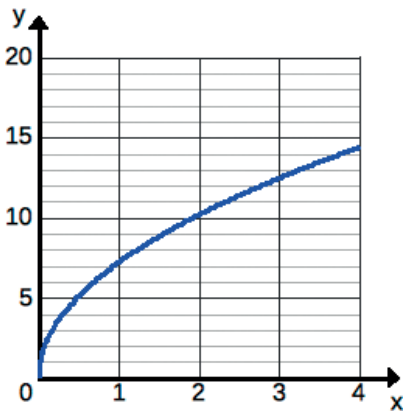


Spiral REVIEW—Non-linear Equations

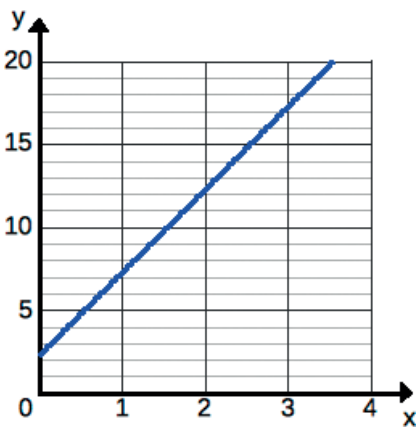
7. Mari and Lori are starting a business to make gourmet toffee. They gather the following information from another business about prices for different amounts of toffee. Which equation and which graph are most likely to model the price, p, for x pounds of toffee? Justify your reasoning.

Pounds x	Price, p, for x pounds
0.25	\$3.60
0.81	\$6.48
1	\$7.20
1.44	\$8.64

Graph 1



Graph 2



Equation A: $p = 5x + 2.2$

Equation B: $p = 7.2\sqrt{x}$

Spiral REVIEW—Rearranging Equations

8. Solve for m.

   $t = \frac{ms}{n}$

9. Solve for u.

   $\frac{1}{u} = \frac{1}{f}$

10. Solve for s.

    $A = s + 3A$

11. Solve for h.

    $V = \pi r^2 h$

12. Solve for m.

    $T = 4m + 7$

13. Solve for d.

    $F = G\frac{mn}{d}$

14. Solve for y.

    $ax + by = c$

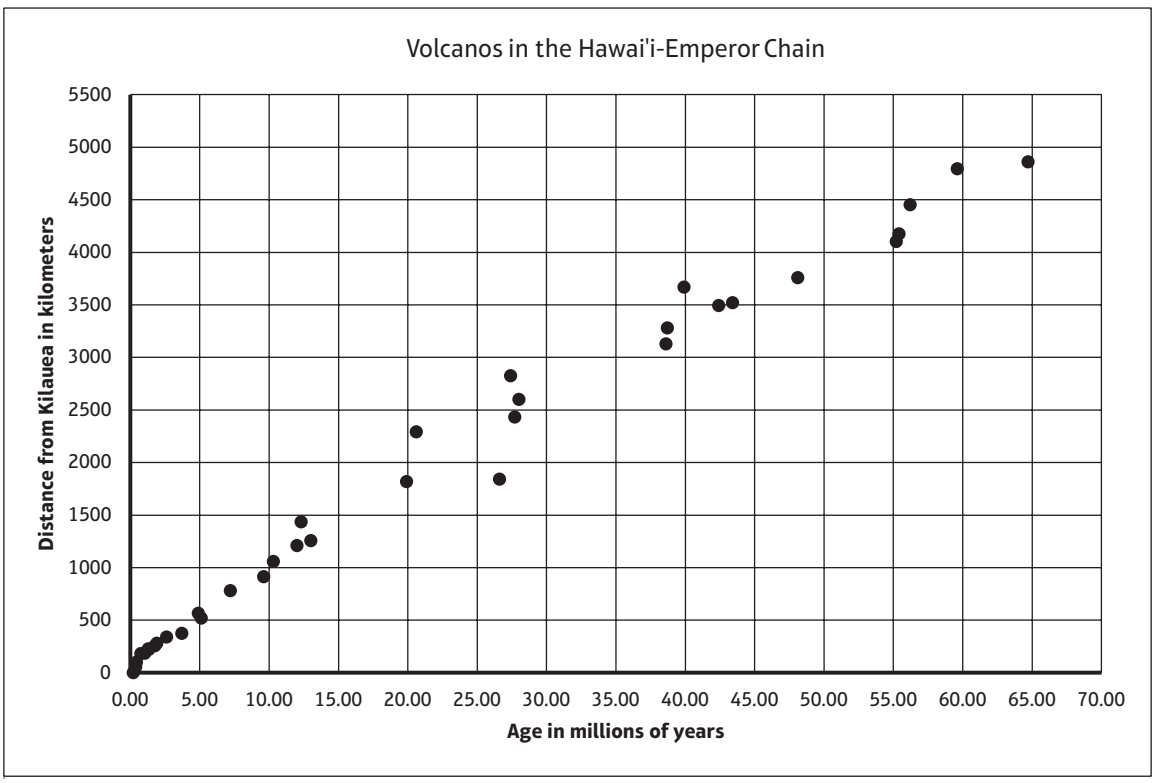
15. Solve for h.

    $A = \frac{1}{2}h(b_1 + b_2)$

Spiral REVIEW—Scatterplots and Lines of Best Fit

© Catmando/Shutterstock.com

16. Draw a line of best fit on the graph below.



17. Use your line to estimate the age of a volcano that is 2000 km from Kilauea.

18. Use your line to estimate the distance from Kilauea a 35 million year old volcano would be.