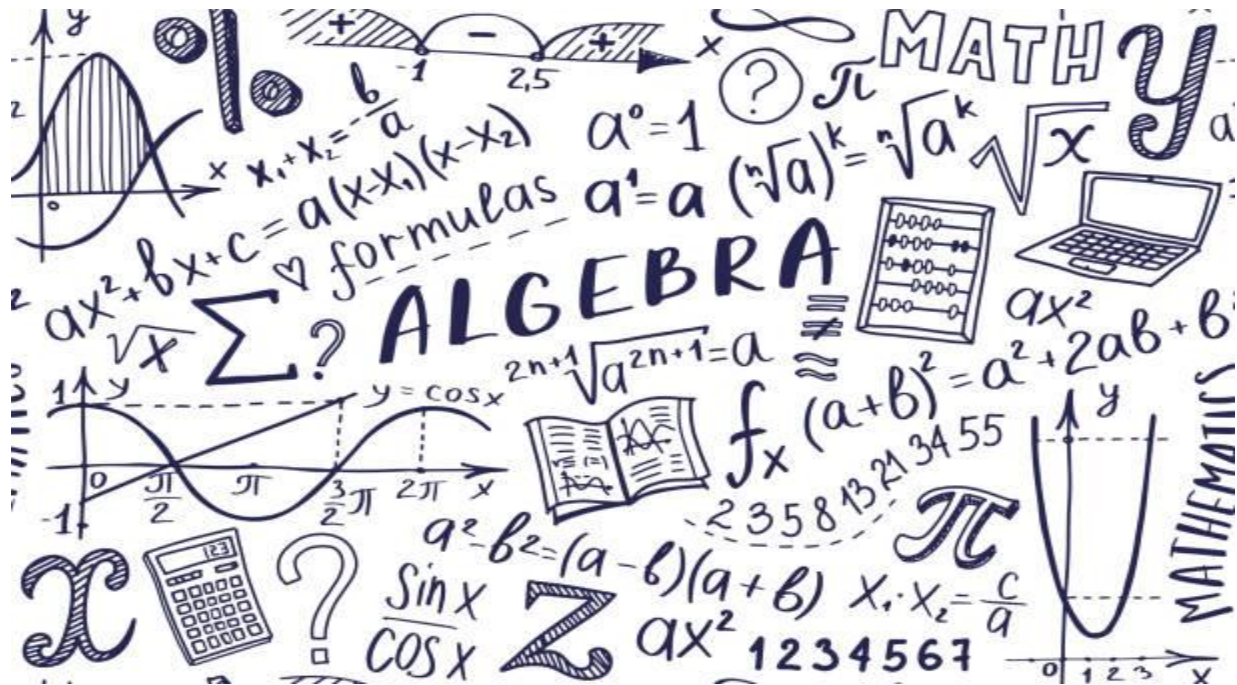


# SUMMER PACKET PREPARING FOR ALGEBRA 1



## SUFFIELD PUBLIC SCHOOLS

Supply List	Video/ App Resources	Pre-Requisites
<ul style="list-style-type: none"> <li>• Pencils</li> <li>• Colored Pencils</li> <li>• Graph Paper</li> <li>• Graphing Calculator (TI 84 – Preferred))</li> <li>• Compass and Protractor</li> <li>• Ruler</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a></li> <li>• <a href="https://mathantics.com/">https://mathantics.com/</a></li> <li>• <a href="https://webmath.com/">https://webmath.com/</a></li> <li>• <a href="https://www.mathplanet.com/">https://www.mathplanet.com/</a></li> <li>• <a href="http://www.math.com/">http://www.math.com/</a></li> <li>• <a href="https://www.ixl.com/math/algebra-1">https://www.ixl.com/math/algebra-1</a></li> <li>• <a href="https://www.purplemath.com">https://www.purplemath.com</a></li> </ul>	<ul style="list-style-type: none"> <li>• Adding and Subtracting Polynomials</li> <li>• Simplifying Algebraic Expressions using Properties of exponents.</li> <li>• Solving Linear Equations</li> <li>• Graphing Linear Functions</li> <li>• Writing Equations of Lines</li> <li>• Solving and Graphing Systems of Linear Equations</li> <li>• Solving and Graphing Absolute Value Equations</li> <li>• Factoring</li> <li>• Solving Quadratic Equations</li> <li>• Graphing Quadratic Functions</li> </ul>

To Any student entering Algebra 1 in the fall –

To ensure your success in Algebra 1, you need to be proficient in the foundational skills and concepts that you have learned over your time at Suffield Middle School (whether you are going into 8<sup>th</sup> grade or 9<sup>th</sup> grade), as this will enable you to easily grasp the new concepts that will be covered, and apply them to solve mathematical and real-life problems. We highly recommend that you take time to review and solidify your knowledge of these topics over the course of the summer. Just like we take the time to practice our skills in other activities (soccer, baseball, softball, dancing, running, swimming), we also need to practice our mathematical skills.

Learning Mathematics is like building a house; if your foundation is weak, you can't build high, and if there are gaps or floors that are not complete, the next floor is nearly impossible to build.

**Our wish and hope for all our math students is not just to get by, but to excel in mathematics, and to ultimately enjoy and appreciate the beauty and power of mathematics** – a subject we love and hope we can get you excited to continue learning. We are providing you with resources to do as much preparation and solidification of the basic skills needed to engage with the course material fluently and confidently.

Attached is a summer packet which has practice problems for several of the major topics that you have studied over the last couple of years. The packet begins with practice of key algebraic skills and then has a mixed review section that has similar problems students encountered in the Illustrative mathematics Program. There are also links to on-line resources that you can access for help. Please take the time to work through the packet by doing a couple of problems each day, and use the resources that are provided for review when you do not remember how to solve a problem. You can certainly use other on-line resources that you can find for help, or ask relatives and/or friends for help.

We wish you a happy summer, and hope you return in the fall with high expectations for yourself, the willingness to ask questions and reach out for help when you are struggling, and with the confidence that you can be successful.

## A. Simplifying Polynomial Expressions

Objectives: The Student will be able to –

- Apply the appropriate arithmetic operations and algebraic properties needed to simplify an algebraic expression.
- Simplify polynomial expressions using addition and subtraction

Simplify:

1.  $8x - 9y + 16x + 12y$

2.  $14y + 22 - 15y^2 + 23y$

3.  $5n - (3 - 4n)$

4.  $-2(11x - 3)$

5.  $3(8z - 4w) + 2(10z - 6w)$

6.  $5(3x - 4) - 2(4x - 6)$

Simplifying Polynomials:

<https://www.youtube.com/watch?v=ZvL9aDGNHqA>

<https://www.khanacademy.org/math/algebra-home/alg-polynomials/alg-introduction-to-polynomials/v/simplify-a-polynomial>

<https://www.youtube.com/watch?v=ZvL9aDGNHqA>

## B. Solving Linear Equations

Objectives: The Student will be able to –

- Solve one and two step equations.
- Solve equations with variables on both sides.
- Solve Multi-step equations that need to be simplified first

Solve each equation. You must show all work.

1.  $5x - 2 = 33$

2.  $140 = 4x + 36$

3.  $8(3x - 4) = 196$

4.  $45x - 720 + 15x = 60$

5.  $132 = 4(12x - 9)$

6.  $154 + 7x - 68 = 198$

7.  $-5(3x - 8) + 6x = -131$

8.  $-7x - 10 = 18 + 3x$

9.  $12x + 8 - 15 = -2(3x - 82)$

10.  $-(12x - 6) = 2x - 14$

Solving Linear Equations (One Step):

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-1>

Solving Linear Equations (Two Step):

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-2>

Solving Linear Equations (Multi - Step):

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-3>

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-4>

## C. Properties of Exponents

Objectives: The Student will be able to –

- Simplify expressions using the properties of exponents

Simplify each expression. Express answers with positive exponents.

1.  $x^5 \cdot x \cdot x^2 =$

2.  $\frac{m^{15}}{m^3} =$

3.  $(k^4)^5 =$

4.  $y^0 =$

5.  $(p^4n^2) \cdot (p^7n^5) =$

6.  $\frac{45y^3z^{10}}{5y^3z} =$

7.  $(4h^5k^3) \cdot (15h^3k^2) =$

8.  $\frac{12a^4b^6}{36ab^2c} =$

9.  $(3m^2y)^3 =$

10.  $(3x^4y^2)^2 \cdot (2x^3y^5m^3)^2 =$

11.  $4x^2(3x^5y^2)^0 =$

Properties of Exponents:

<https://www.youtube.com/watch?v=tePk4uUBrsU>

<https://www.youtube.com/watch?v=etMK3xViMAc>

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-exponent-properties/v/exponent-properties-involving-products>

## D. Slopes of Lines

Objectives: The Student will be able to –

- Identify and calculate the slope of a line.

Calculate the Slopes of the lines with following pairs of points.

1.  $(-1,4)$  and  $(1,-2)$

2.  $(3,5)$  and  $(-3,1)$

3.  $(2,5)$  and  $(5,10)$

4.  $(2,-5)$  and  $(-4,-5)$

5.  $(3,-2)$  and  $(3,7)$

Slopes:

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:linear-equations-graphs/x2f8bb11595b61c86:slope/v/slope-of-a-line-2>

[https://www.youtube.com/watch?v=Id\\_UqMLAXzY](https://www.youtube.com/watch?v=Id_UqMLAXzY)

## F. Graphing Linear Functions

Objectives: The Student will be able to –

- Graph lines given in Slope – Intercept form.
- Identify the equation of a line from its graph.

Graphing Linear Functions:

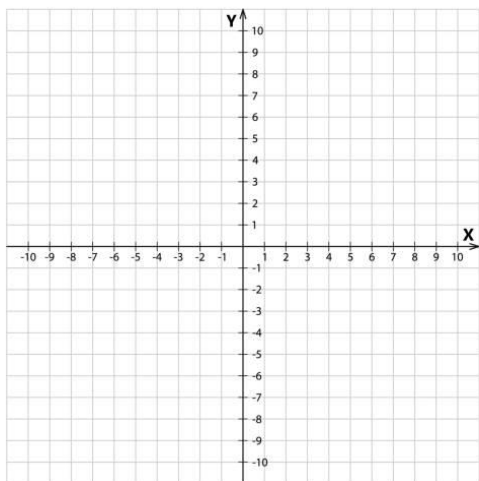
<https://www.youtube.com/watch?v=zihUOJgDkv0>

<https://www.khanacademy.org/math/in-in-grade-9-ncert/xfd53e0255cd302f8:linear-equations-in-two-variables/xfd53e0255cd302f8:graph-of-a-linear-equation-in-two-variables/v/graphs-of-linear-equations>

[https://www.youtube.com/watch?v=UgtMbCI4G\\_I](https://www.youtube.com/watch?v=UgtMbCI4G_I)

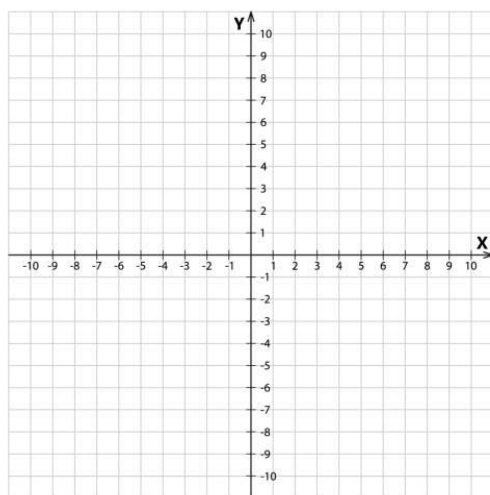
1. Graph the line :  $y = 2x + 5$

Slope = \_\_\_\_\_ Y-intercept = \_\_\_\_\_



2. Graph the line :  $y = \frac{1}{2}x - 3$

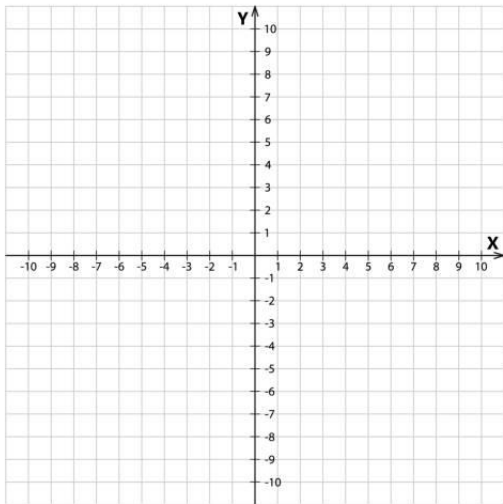
Slope = \_\_\_\_\_ Y-intercept = \_\_\_\_\_





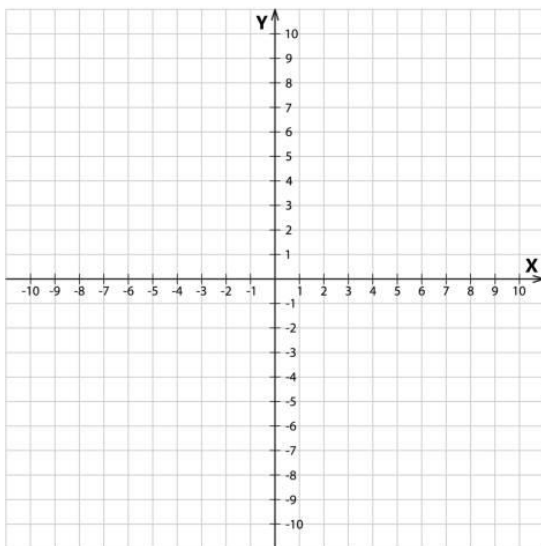
3. Graph the line :  $y = -\frac{2}{5}x + 4$

Slope = \_\_\_\_\_ Y-intercept = \_\_\_\_\_



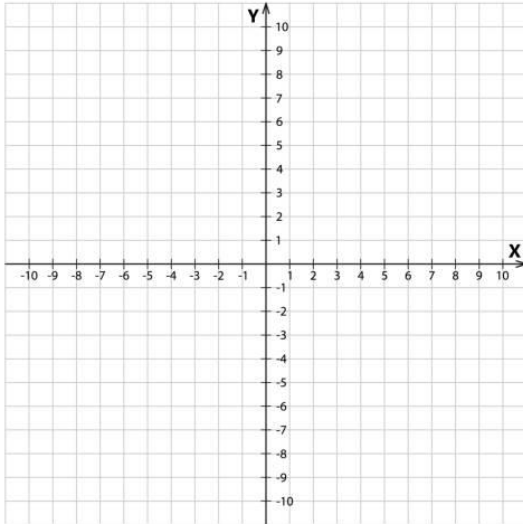
4. Graph the line :  $y = -3x$

Slope = \_\_\_\_\_ Y-intercept = \_\_\_\_\_



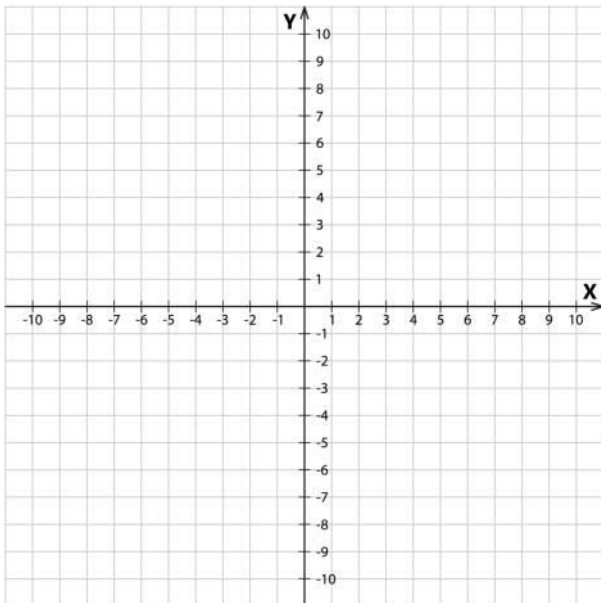
5. Graph the line :  $y = -3x + 3$

X-intercept = \_\_\_\_\_ Y-intercept = \_\_\_\_\_



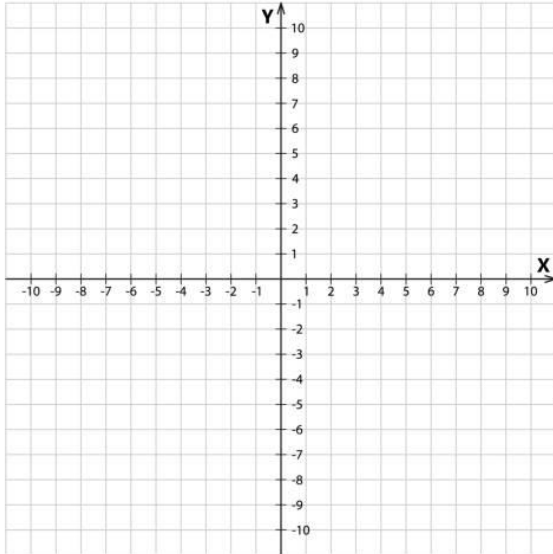
6. Graph the line :  $y = \frac{3}{5}x - 3$

X-intercept = \_\_\_\_\_ Y-intercept = \_\_\_\_\_



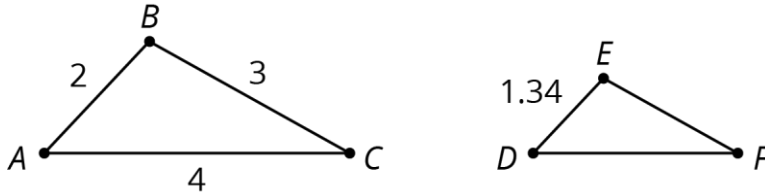
7. Graph the line :  $x = -4$

X-intercept = \_\_\_\_\_ Y-intercept = \_\_\_\_\_

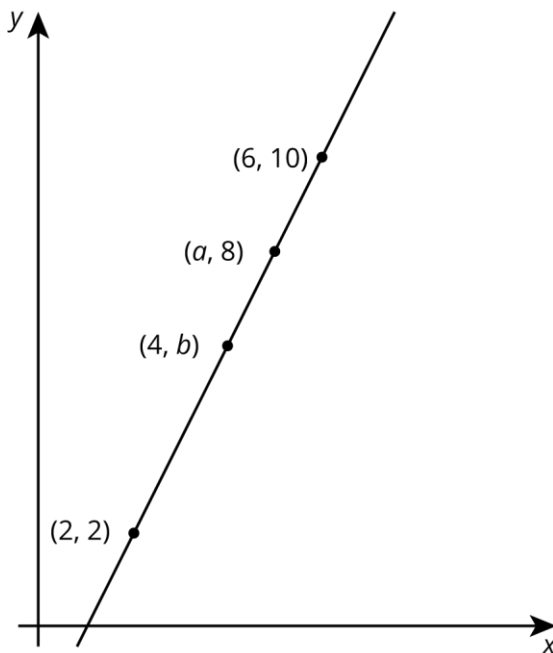


## G. Mixed Review (Illustrative Mathematics)

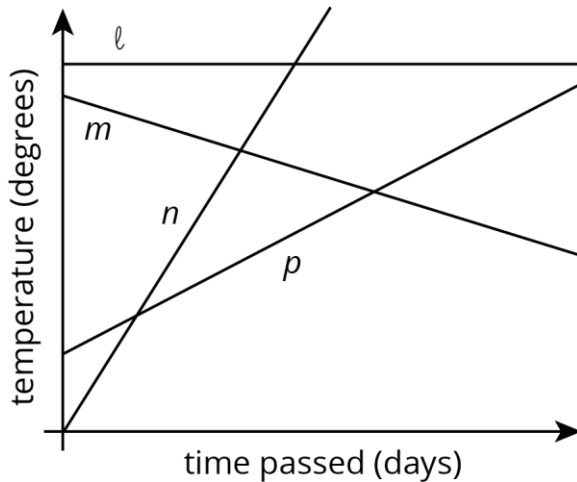
1. Triangles  $ABC$  and  $DEF$  are similar.



- Find the length of segment  $DF$ .
  - Find the length of segment  $EF$ .
2. All of the points in the picture are on the same line.
- Find the slope of the line. Explain or show your reasoning.
  - Write an equation for the line.
  - Find the values for  $a$  and  $b$ . Explain or show your reasoning.

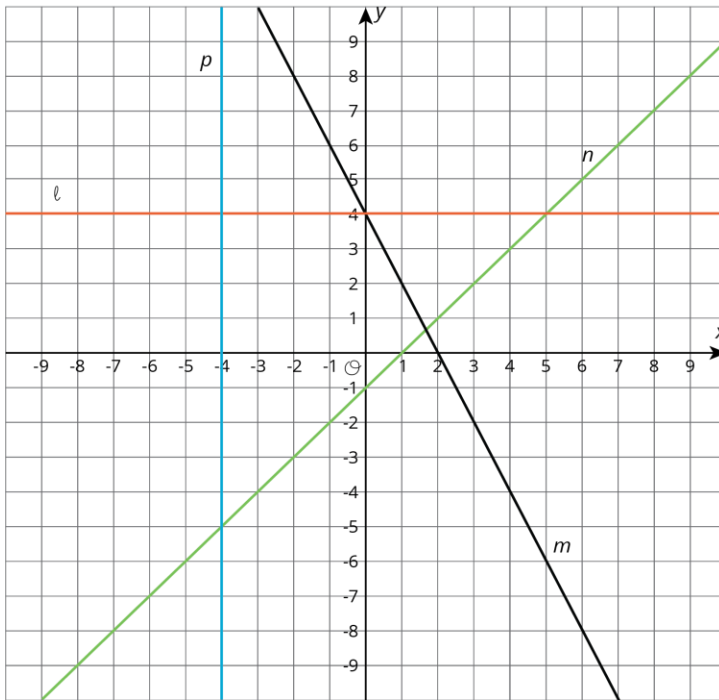


3. Select **all** the points that are on the graph of the line  $2x + 4y = 20$ .
- (0,5)
  - (0,10)
  - (1,2)
  - (1,4)
  - (5,0)
  - (10,0)
4. For two weeks, the highest temperature each day was recorded in four different cities. Lines  $\ell$ ,  $m$ ,  $n$ , and  $p$  are graphs of the temperature over time in Lubbock, Memphis, New Orleans, and Phoenix. Which statement is true?

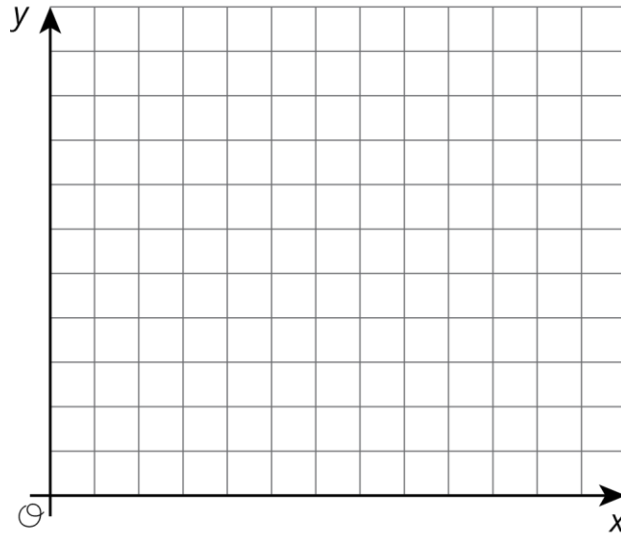


- The high temperature in Lubbock increased as time passed.
- The high temperature in Memphis decreased steadily.
- Initially, the high temperature was warmer in Phoenix than in Memphis.
- The high temperature in Phoenix rose faster than the temperature in New Orleans.

5. Write an equation for each line.



6. Han's cell phone plan costs \$200 to start. Then there is a \$50 charge each month.
- What is the total cost (start up fee and monthly charge) to use the cell phone plan for 1 month?
  - What is the total cost for  $x$  months?



- Graph the cost of the cell phone plan over a period of two years, using months as the units of time. Be sure to label your axes and scale them by labeling each gridline with a number.
- Is there a proportional relationship between time and the cost of the cell phone plan? Explain how you know.
- Tyler's cell phone plan costs \$350 to start, then there is a \$50 charge each month. On the same grid as Han's plan, graph the cost of Tyler's cell phone plan over a period of two years. Describe how the two graphs are the same and how they are different.

7. Select **all** the equations on which the point  $(10,0)$  lies.

- $5x + 2y = 15$
- $2x + 4y = 20$
- $x + 6y = 10$
- $3x + 3y = 13$
- $4x + 2y = 20$

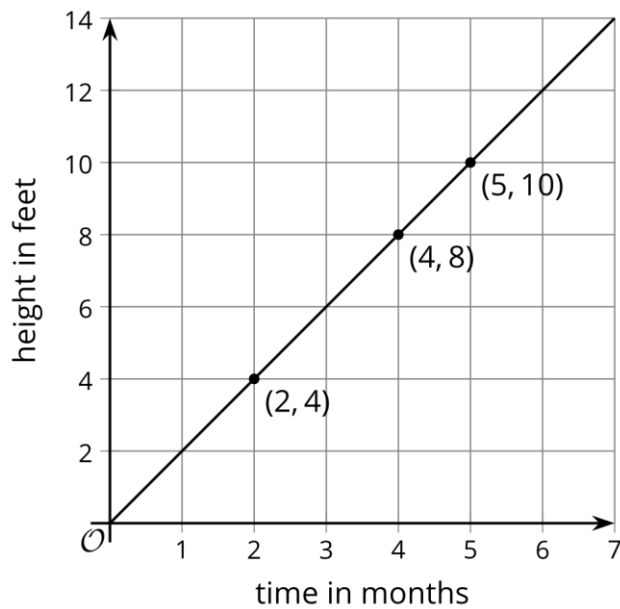
8. Noah is growing three different types of trees. He is keeping track of the height of each tree over time.

– This equation represents the height (in feet) of the first tree over  $m$  months.  $h = 3.5m$ .

– The second tree's information is in the table:

time (months)	height of tree (feet)
2	5
4	10
5	12.5
8	20

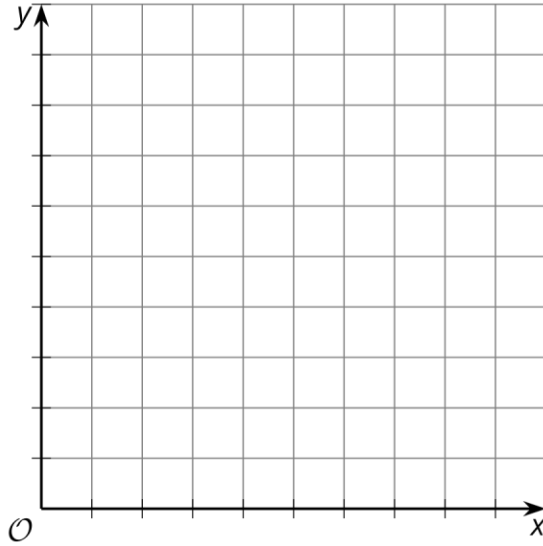
– This graph shows how long, in months, it takes the third tree to grow  $h$  feet.



Which tree is growing the slowest? Explain how you know.



9. A sandwich store charges a \$10 delivery fee, and \$4.50 for each sandwich.
- What is the total cost (sandwiches and delivery charge) if an office orders 6 sandwiches?
  - What is the total cost for  $x$  sandwiches?
  - Graph the total cost of sandwiches and delivery based on number of sandwiches ordered. Be sure to label your axes and scale them by labeling each gridline with a number.



- Is there a proportional relationship between number of sandwiches and the cost of the order? Explain how you know.
- At a different sandwich shop, there is a \$5 delivery fee, and each sandwich costs \$4.50. On the same grid, graph the total cost of sandwiches and deliver based on number of sandwiches ordered for this new shop. Describe how the two graphs are the same and how they are different.

10. A truck is shipping jugs of drinking water and cases of paper towels. A jug of drinking water weighs 40 pounds and a case of paper towels weighs 16 pounds. The truck can carry 2,000 pounds of cargo altogether.

jugs of drinking water,  $w$

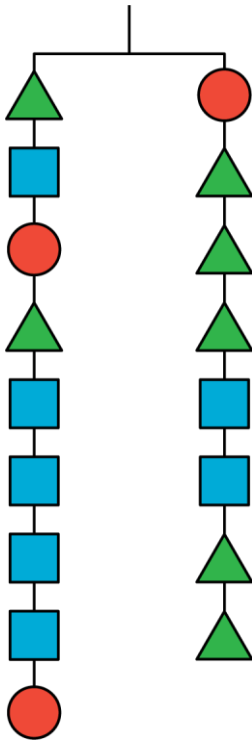
cases of paper towels,  $t$

10

50

- Complete the table showing three ways the truck could be packed with jugs of water and cases of paper towels.
  - Write an equation relating the number of jugs of water and the number of cases of paper towels the truck can carry
11. Here is a balanced hanger diagram:

A circle has a mass of 3 grams and a square has a mass of 2 grams. What is the mass of a triangle?



12. Solve this equation. Explain or show your reasoning.

$$\frac{1}{2}x - 7 = \frac{1}{3}(x - 12)$$

13. Select **all** the equations that have no solution.

a.  $x + 6 = 5 + x$

b.  $-2(x - 3) = -2x + 6$

c.  $4 - 4x = 3x + 2$

d.  $4(x + 1) = 3(x + 2)$

e.  $5 - 3x = -3x + 4$

14. What is the solution to  $3x + 30 + x = 10 + 2x + 5x + 2$ ?

15. Mai solved the equation below incorrectly. Identify Mai's error and then solve the equation correctly.

$$\frac{1}{3}\left(\frac{1}{2}x - 9\right) = \frac{1}{2}(x + 18)$$

$$\frac{1}{6}x - 3 = \frac{1}{2}x + 9$$

$$\frac{1}{4}x - 3 = 9$$

$$\frac{1}{4}x = 12$$

$$x = 48$$

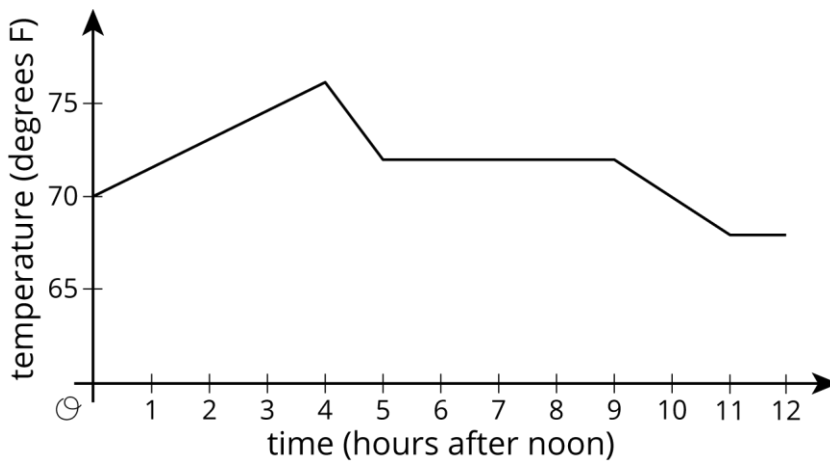
16. Lin and Han's families provide money for their school lunch accounts.

- Han starts with \$100 in his account. He spends \$15 each week on lunches.
- Lin starts with \$25 in her account and does not spend any of it. Her family adds \$10 each week to her account.
- a. At the end of 4 weeks, who has more money in their account?
- b. After how many weeks will Han and Lin have the same amount of money in their lunch accounts?

17. Select **all** the functions whose graphs include the point (16,4).

- a.  $y = 2x$
- b.  $y = x^2$
- c.  $y = x + 12$
- d.  $y = x - 12$
- e.  $y = \frac{1}{4}x$

18. This graph shows the temperature in Diego's house between noon and midnight one day.



Select **all** the true statements.

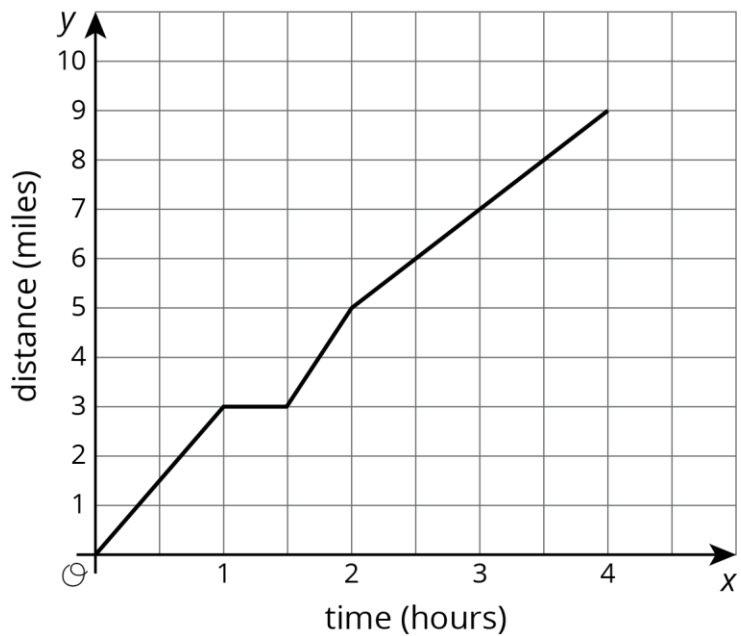
- a. Time is a function of temperature.
- b. The lowest temperature occurred between 4:00 and 5:00.
- c. The temperature was increasing between 9:00 and 10:00.
- d. The temperature was 74 degrees twice during the 12-hour period.
- e. There was a four-hour period during which the temperature did not change.

19. This table shows a linear relationship between the amount of water in a tank and time.

time (minutes)	water (gallons)
0	30
5	20
10	10

Which of these statements is true?

- a. The water in the tank is increasing at a rate of 2 gallons per minute.
  - b. The water in the tank is increasing at a rate of 10 gallons per minute.
  - c. The water in the tank is decreasing at a rate of 2 gallons per minute.
  - d. The water in the tank is decreasing at a rate of 10 gallons per minute.
20. Elena goes for a long walk. This graph shows her time and distance traveled throughout the walk.



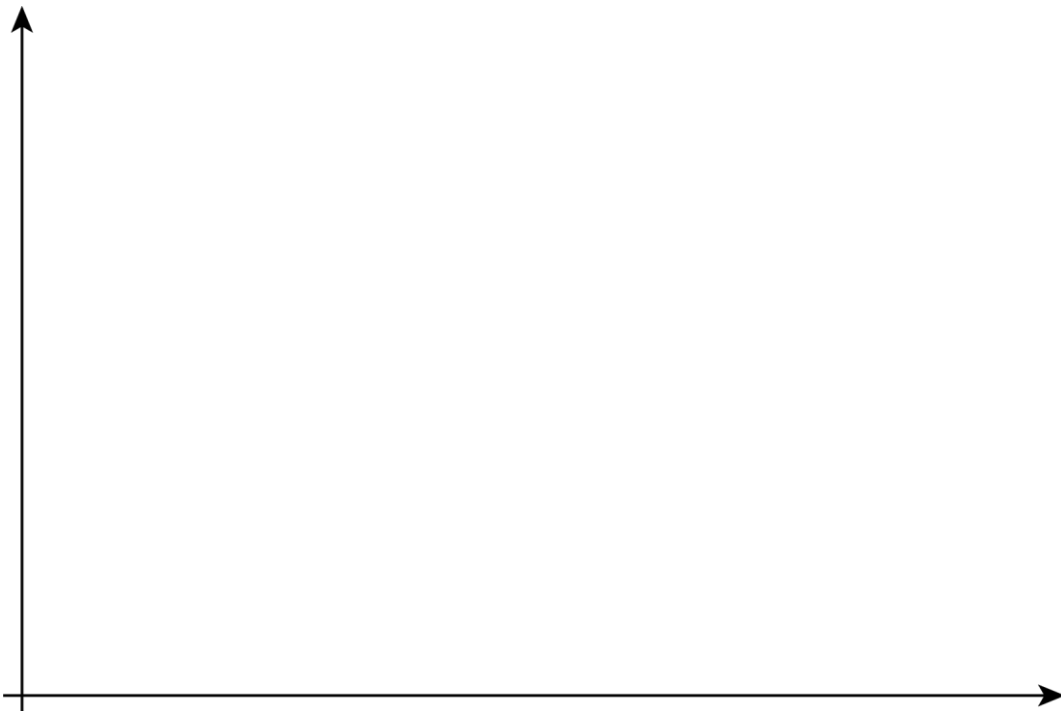
What was her fastest speed, in miles per hour?

21. Lin counts 5 bacteria under a microscope. She counts them again each day for four days, and finds that the number of bacteria doubled each day—from 5 to 10, then from 10 to 20, and so on.

Is the population of bacteria a function of the number of days? If so, is it linear? Explain your reasoning.

22. Draw a graph of Andre's distance as a function of time for this situation:

When the football play started, Andre ran forward 20 yards, then turned around and ran 5 yards back. He stood in that spot for 3 seconds, then walked back to where he began.



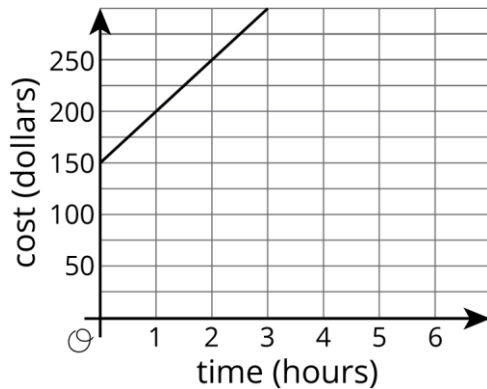
Label the axes appropriately. You do *not* have to include numbers on the axes or the coordinates of points on your graph.

23. Two plumbing companies charge money for each hour of work, plus a one-time fee.

A Plus Plumbing charges according to this table:

time (hours)	cost (dollars)
1	140
4	320
6	440

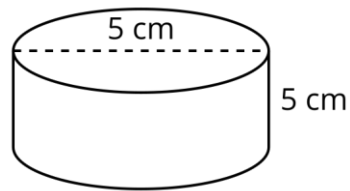
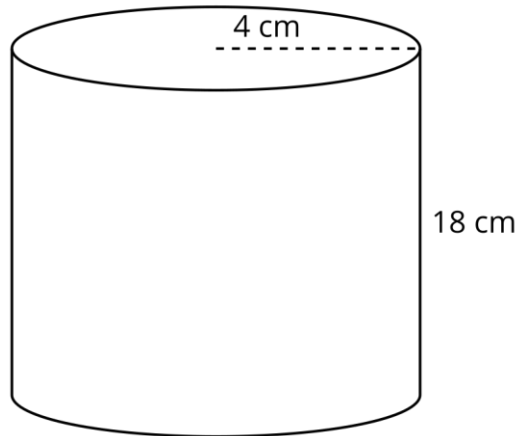
Quality Plumbing charges according to this graph:



- How much does A Plus Plumbing cost for each hour of work, and what is the one-time fee? Explain or show your reasoning.
- How much does Quality Plumbing charge for each hour of work, and what is the one-time fee? Explain or show your reasoning.
- Can A Plus Plumbing and Quality Plumbing ever charge the same total for the same amount of time? Explain or show your reasoning.

You may use any type of calculator.

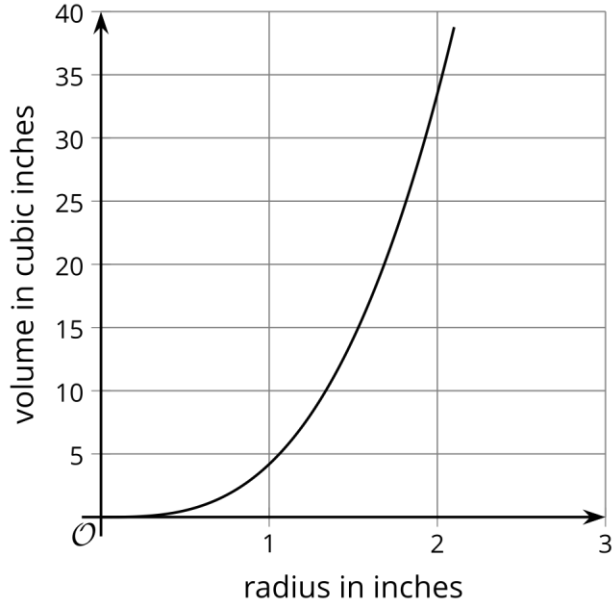
24. What is the difference in the volume of the two cylinders?



25. A sphere has a volume of  $972\pi \text{ cm}^3$ . What is its radius in centimeters?



26. The graph shows the relationship between a sphere's radius and volume.



Select **all** the statements that are true about this relationship.

- a. If the radius doubles, the volume doubles.
- b. If the radius doubles the volume becomes about 4 times bigger.
- c. If the radius doubles, the volume becomes about 8 times bigger.
- d. The relationship is linear.
- e. The relationship is not linear.

27. A cone and cylinder have the same height and their bases are congruent circles. If the volume of the cylinder is  $120 \text{ in}^3$ , what is the volume of the cone?

28. Three students each calculated the volume of a sphere with a radius of 6 centimeters.

- Diego found the volume to be  $288\pi$  cubic centimeters.
- Andre approximated 904 cubic centimeters.
- Noah calculated 226 cubic centimeters.

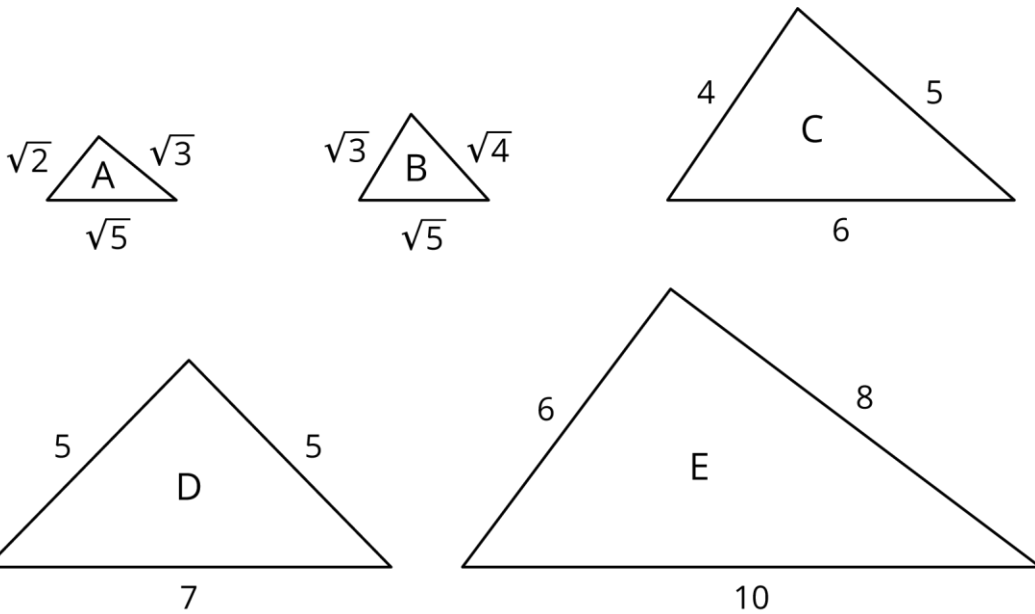
Do you agree with any of them? Explain your reasoning.

Do not use a calculator.

29. Select **all** the numbers that are solutions to the equation  $x^3 = 27$ .

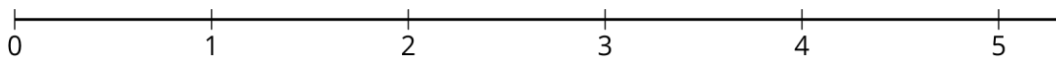
- a.  $\sqrt{27}$
- b. 3
- c.  $\sqrt[3]{27}$
- d.  $27^3$
- e. 9

30. Select **all** the right triangles, given the lengths of the sides.

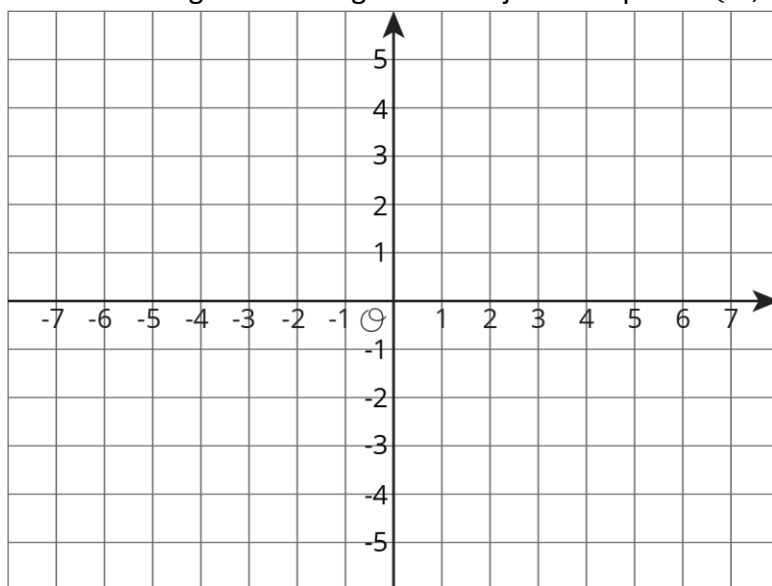


- a. A
- b. B
- c. C
- d. D
- e. E

31. Plot these numbers on the number line:  $\sqrt{2}$ ,  $\sqrt{5}$ ,  $\sqrt[3]{8}$ ,  $\sqrt{9}$ ,  $\sqrt{15}$ ,  $\sqrt[3]{25}$



32. Find the length of the segment that joins the points  $(-5,4)$  and  $(6,-3)$ .



Do not use a calculator.

33. Select **all** the expressions that equal  $4 \times 10^6$ .

a.  $(2 \times 10^8)(2 \times 10^{-2})$

b.  $40 \times 10^5$

c.  $40^6$

d. 400,000

e.  $\frac{1.2 \times 10^9}{3 \times 10^2}$

34. Select **all** the expressions that equal  $6^{-10}$ .

a.  $6^{-5} \cdot 6^2$

b.  $\left(\frac{1}{6^2}\right)^5$

c.  $(6^{-5})^2$

d.  $\frac{6^{-3}}{6^7}$

e.  $\frac{6^5 \cdot 6^{-3}}{6^{-8}}$

35. About  $3.9 \times 10^7$  people live in California. About  $1.3 \times 10^6$  people live in Maine. About how many more people live in California than live in Maine?

a.  $2.6 \times 10^6$

b.  $2.6 \times 10^7$

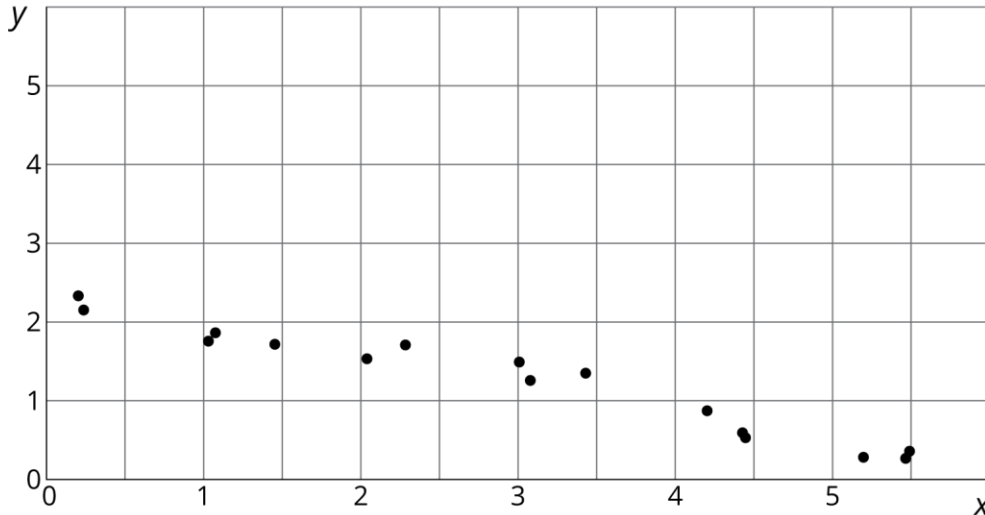
c.  $3.77 \times 10^6$

d.  $3.77 \times 10^7$

36. In 2015, there were about 22 million teenagers (aged 13–17) in the United States. They each sent an average of 900 text messages per month. About how many text messages did all of the teenagers in the United States send each month? Express your answer using scientific notation

You may use graph paper and a four-function or scientific calculator, but not a graphing calculator.

37. Here is a scatter plot:



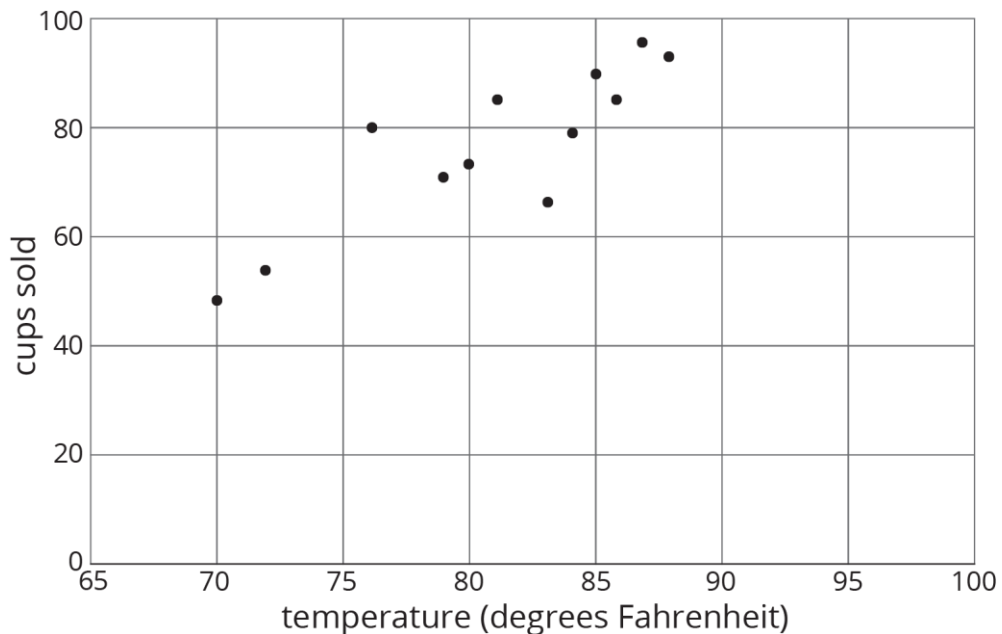
The graph of what linear equation is a good fit for this data? Explain.

- a.  $y = \frac{-1}{3}x + 2$
  - b.  $y = \frac{-1}{3}x + 6$
  - c.  $y = \frac{1}{3}x + 2$
  - d.  $y = \frac{1}{3}x + 6$
38. Select **all** the relationships that demonstrate a positive association between variables.
- a. Outside temperature and cost to heat a home
  - b. Length of time you have walked and distance you have traveled
  - c. Pounds of cherries you buy and amount of money you spend on cherries
  - d. Speed of a train and the amount of time it takes for the train to get to its destination
  - e. Number of people in a grocery check-out line and how long you have to wait to check out

39. Jada surveyed all 7th and 8th graders at her school about whether they have pets. Complete the missing entries in this two-way table.

	has pet	has no pet	total
7th grade	102		150
8th grade		68	175
total			

40. Lin opened a lemonade stand during the summer. She noticed that she sold more lemonade on warmer days. For each day she sold lemonade, she plotted the point  $(t, c)$ , where  $t$  represents high temperature and  $c$  represents cups of lemonade sold.



- On the same axes, draw a line that you think is a good fit for the data.
- A computer program found that the line  $c = 2t - 89$  is a good fit for the data. Use this equation to predict how many cups of lemonade Lin might sell on a day when the high temperature is 74 degrees.
- The high temperature this Sunday is expected to be 5 degrees warmer than the high temperature this Saturday. Using the line  $c = 2t - 89$ , how many more cups of lemonade should Lin expect to sell on Sunday than Saturday? Explain or show your reasoning.