

## Eighth grade math test solution

1.

$$5^7 \times 5^{-10}$$

A.  $1/3$

B.  $5^{-2}$

C.  $1/125$

D.  $5^{17}$

$$5^7 \times 5^{-10} = 5^{7+(-10)} \quad \{ \quad a^n \times a^m = a^{n+m}$$

$$= 5^{-3}$$

$$= \frac{1}{5^3} \quad \{ \quad a^{-n} = \frac{1}{a^n}$$

$$= \frac{1}{5 \times 5 \times 5}$$

$$= \frac{1}{125}$$

The answer is C.

2.

If  $2x^3 = 54$ , what is x?

A. 1

B. 5

C. 2

D. 3

$$2x^3 = 54$$

$$\frac{2x^3}{2} = \frac{54}{2}$$

Divide both sides by 2

$$x^3 = 27$$

$$x = 3 \text{ since } 3^3 = 3 \times 3 \times 3 = 27$$

**3.**

a. The answer for  $20000000 \times 3.5 \times 1000000$  in scientific notation is

(Hint: put 20000000 and 1000000 in scientific notation first)

**A.**  $7 \times 10^{13}$

**B.**  $3.5 \times 10^{13}$

**C.**  $2 \times 10^{13}$

**D.**  $7 \times 10^{12}$

b.  $0.0004 \times 4000$  as a decimal is \_\_\_\_\_ and as a fraction is \_\_\_\_\_

a.  $20000000 = 20000000.$

To put 20000000 in scientific notation, move the decimal point 7 places to the left

$$20000000 = 2 \times 10^7$$

$$1000000 = 1000000.$$

To put 1000000 in scientific notation, move the decimal point 6 places to the left

$$1000000 = 1 \times 10^6 = 10^6$$

$$20000000 \times 3.5 \times 1000000 = 2 \times 10^7 \times 3.5 \times 10^6$$

$$= 7 \times 10^{7+6}$$

$$= 7 \times 10^{13}$$

b.  $0.0004 \times 4000$  as a decimal is \_\_\_\_\_ and as a fraction is \_\_\_\_\_

Put 0.0004 in scientific notation.

Move the decimal point 4 places to the right

$$0.0004 = 4 \times 10^{-4}$$

Put 4000 in scientific notation.

$$4000 = 4000.$$

Move the decimal point 3 places to the left

$$4000 = 4 \times 10^3$$

$$0.0004 \times 4000 = 4 \times 10^{-4} \times 4 \times 10^3$$

$$= 16 \times 10^{-4+3}$$

$$= 16 \times 10^{-1}$$

$$= 1.6 \quad (\text{After moving the decimal point 1 place to the left})$$

$$1.6 = 16 \times \frac{1}{10} = \frac{16}{1} \times \frac{1}{10}$$

$$= \frac{16}{10}$$

$$= \frac{8}{5} \quad (\text{Written as a fraction})$$

4.

a. Which set contains only rational numbers?

- A.  $\{\sqrt{49}, \sqrt{7}, 1/2, 9/5\}$
- B.  $\{\sqrt{121}, 12/5, \sqrt{169}, 0.333333333333\}$
- C.  $\{4 \times \sqrt{5}, 2, \sqrt{100}, 0\}$

b. Pull out all the irrational numbers from each set above and write them down here.

A rational number is a number that can be written as a fraction.

a. Set B has rational numbers only.

$$\sqrt{121} = 11 = \frac{11}{1}$$

$\frac{12}{5}$  is already written as a fraction, so it is a rational number

$$\sqrt{169} = 13 = \frac{13}{1}$$

$$0.33333333 = \frac{1}{3}$$

b. The irrational numbers are  $\sqrt{7}$  and  $4 \times \sqrt{5}$  since they cannot be written as a fraction.

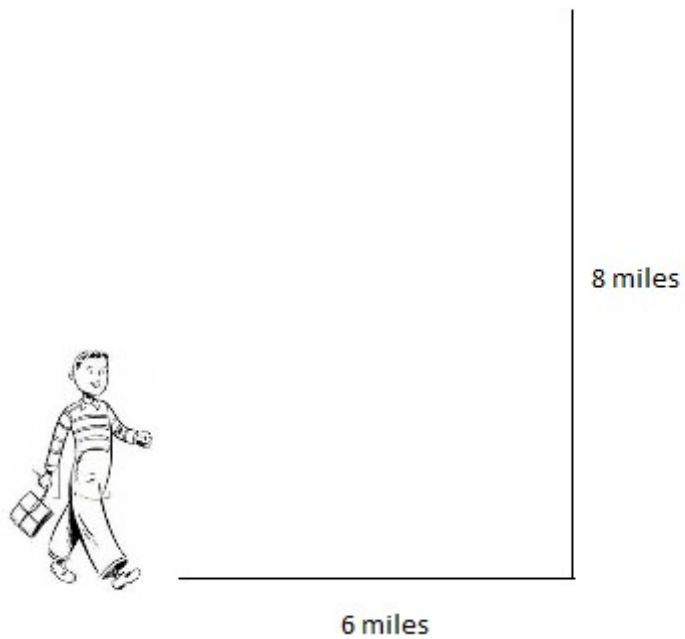
5.

To go to school, you have to walk 6 miles east and then 8 miles north ?

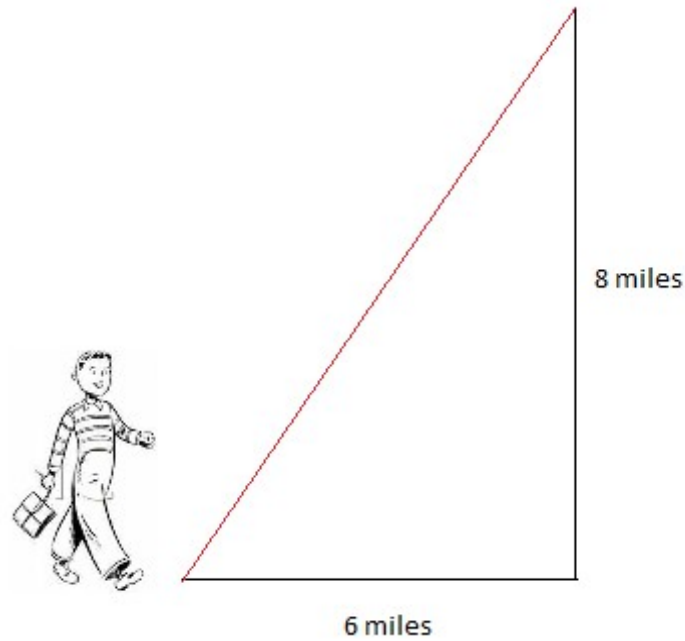
- a. Draw a figure representing your path from home to school
- b. Draw a line representing the shortest distance you could have taken.

Then, calculate this distance \_\_\_\_\_

a.



The shortest distance you could have taken is shown below with a red line



Use the pythagorean theorem to compute this distance

$$c^2 = 6^2 + 8^2$$

$$c^2 = 36 + 64$$

$$c^2 = 100$$

$$c = 10 \text{ since } 10^2 = 10 \times 10 = 100$$

6.

The formula for the area of a circle is shown below

$$A = \pi r^2$$

a. Which of the following is the correct expression for r or the radius in terms of A and pi?

**A.**  $r = \sqrt{(A / 2\pi)}$     **B.**  $r = \sqrt{(2A / \pi)}$     **C.**  $r = \sqrt{(\pi / A)}$     **D.**  $r = \sqrt{(A / \pi)}$

b. Use the correct formula you found in part a and  $\pi = 3$  to find  $r$  when  $A = 48$  square feet.

$$r = \underline{\hspace{2cm}}$$

Use the formula  $A = \pi \times r^2$  and solve for  $r$

Divide both sides by  $\pi$

$$\frac{A}{\pi} = \frac{\pi}{\pi} \times r^2$$

$$\frac{A}{\pi} = r^2$$

$$r = \sqrt{\frac{A}{\pi}}$$

The answer is D.

b.

$$r = \sqrt{\frac{A}{\pi}}$$

$$= \sqrt{\frac{48}{3}}$$

$$= \sqrt{16}$$

$$= 4$$

7.

A company charges a flat fee of 1500 dollars to rent a yacht. In addition, renters must pay 100 dollars per hour.

a. Which equation shows the cost  $C$  to rent a yacht for  $h$  hours?

**A.**  $C = 100 + 1500 \times h$       **B.**  $C = 1500 \times h$

**C.**  $C = 100 \times h + 1500$       **D.**  $C = 100 \times h + 1500 \times h$

b. How much would it cost you to rent a yacht for 5 hours?

c. What is the slope of the cost? what is the y-intercept?

d. Using the answers for c, graph the cost on the coordinate system.

a. The correct equation that shows the cost is  $C$ . Or  $C = 100 \times h + 1500$

b.

$$C = 100 \times 5 + 1500$$

$$= 500 + 1500$$

$$= 2000$$

The cost for 5 hours is 2000 dollars

c. The cost has the same format as  $y = mx + b$  with  $y = C$  and  $h = x$

For  $y = mx + b$ ,  $m$  is the slope and  $b$  is the y-intercept

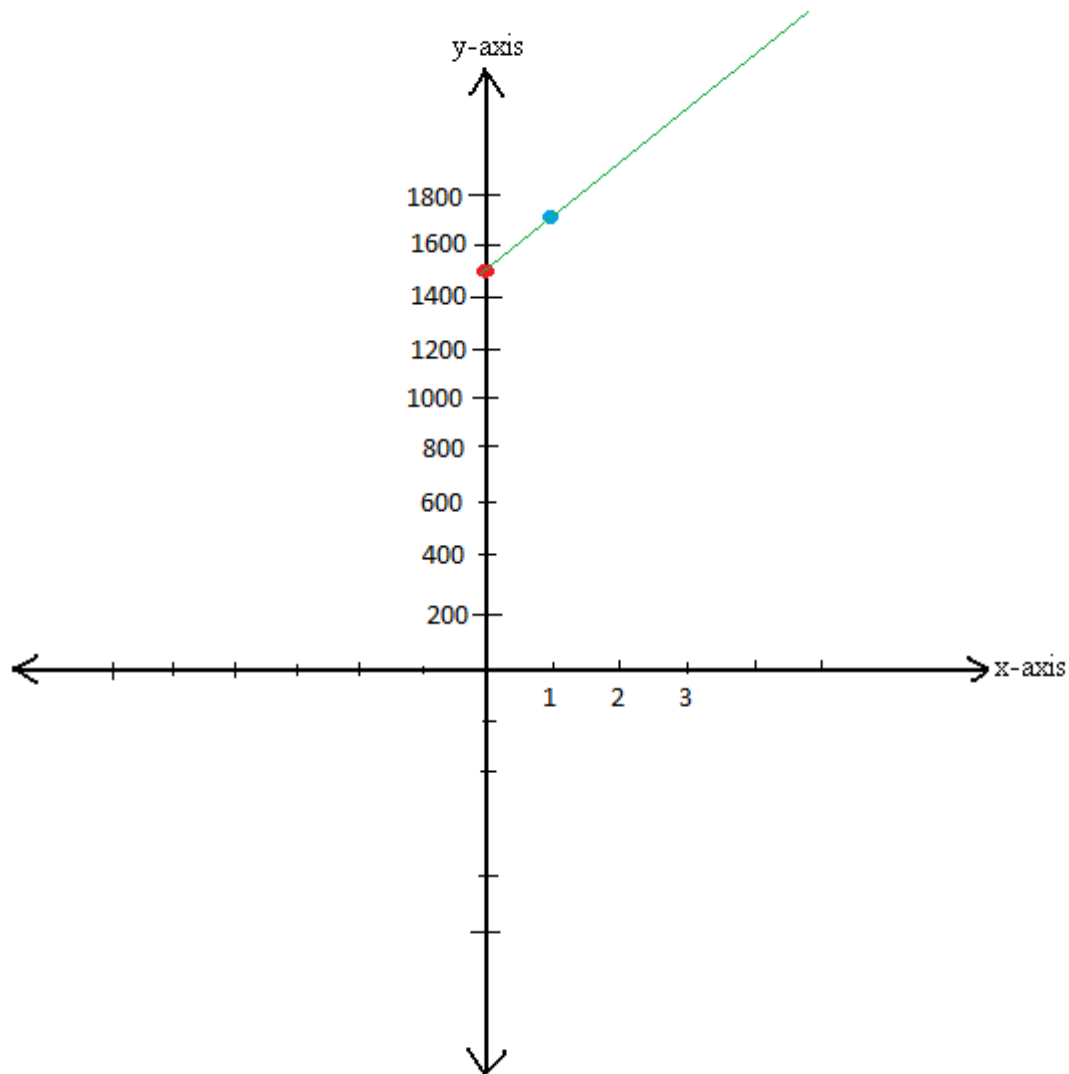
You could could rewrite the cost as  $y = 100x + 1500$

The slope of the cost is  $m = 100$

The y-intercept is  $b = 1500$

d.

The graph is shown below



Notice that the scale of the x-axis is different than that of the y-axis.

The y-intercept is shown with a red dot.

$$m = 100 = \frac{100}{1} = \frac{\text{rise}}{\text{run}}$$

$\frac{100}{1}$  means to go up 100 and to the right 1

Start at the red dot, go up 100 and then to the right 1.

You end up where you see the blue dot

Draw a line between the red dot and the blue dot.

8.

Escalator 1 has a rise of 6 and a run of 4. Escalator 2 has a rise of 12 and a run of 6. Do the escalators have the same slope? Explain with math computation.

Slope =  $\frac{\text{rise}}{\text{run}}$

Escalator 1:  $Slope = \frac{6}{4} = \frac{3}{2} = 1.5$

Escalator 2:  $Slope = \frac{12}{6} = 2$

The escalators do not have the same slope.

Furthermore, since the slope of escalator 2 is bigger, the slope is steeper

9.

Celita has a garden shaped like a square. How does the area change if she triples the length of each side?

A. The area of the garden is tripled

B. The area of the garden is nonupled

C. halved

D. sextupled

Let  $x$  be the length of one side.

$$Area = x^2$$

Now, let us triple the length to  $3x$  and compute the area again.

$$Area = (3x)^2$$

$$Area = 3x \times 3x = 9x^2$$

The area of the garden is nonupled or 9 times bigger.

**10.**

Find the volume of a cone with a radius of 8 inches and a height of 3 inches.

(Hint: Use  $v = \frac{1}{3} (\pi \times r^2 \times h)$ )

$$v = \frac{\pi \times r^2 \times h}{3}$$

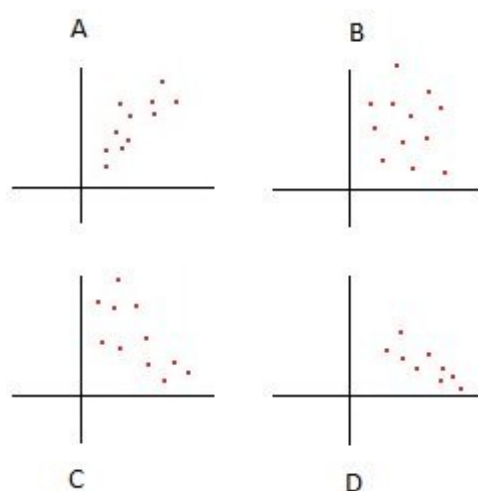
$$v = \frac{3.14 \times 8^2 \times 3}{3}$$

$$v = 3.14 \times 8^2 \quad (\text{The 3 on top cancels with the one at the bottom})$$

$$v = 3.14 \times 64$$

$$v = 200.96$$

11.



a. Look at the figure above and then tell which graph(s) show the following correlation.

**Positive correlation.** \_\_\_\_\_

**Negative correlation** \_\_\_\_\_

**No correlation** \_\_\_\_\_

b. What kind of correlation is the following situation?

Number of gallons of gas in your car and the distance you can travel \_\_\_\_\_

Number of oranges you can eat and your height \_\_\_\_\_

Number of students going to a concert and the revenue generated. \_\_\_\_\_

c. If a scatter plot shows a negative correlation, which line of best fit could represent the scatter plot?

**A.**  $y = x - 5$       **B.**  $y = -1000x + 5000$       **C.**  $y = 100x - 7$       **D.**  $y = 5$

a.

Positive correlation is graph A. The points have an upward trend as we move from left to right.

Negative correlation are graphs C and D. The points have a downward trend as we move from left to right.

No correlation is graph B. There is no specific trend.

b. What kind of correlation is the following situation?

Number of gallons of gas in your car and the distance you can travel.

This situation will give a negative correlation. The number of gallons of gas left in any car will diminish as your distance increases

Number of oranges you can eat and your height

There is no correlation since your height does not depend on the number of oranges you eat

Number of students going to a concert and the revenue generated.

There is a positive correlation since the more students attend the concert, the more the revenue generated.

c. If a scatter plot shows a negative correlation, which line of best fit could represent the scatter plot?

- A.**  $y = x - 5$       **B.**  $y = -1000x + 5000$       **C.**  $y = 100x - 7$       **D.**  $y = 5$

With negative correlation, the line that best fits the data goes down when moving from left to right.

When a line goes down as we move from left to right, the slope is negative.

The line that has a negative slope is  $y = -1000x + 5000$  since the slope = -1000

**12.** What is the equation of a line that has a slope of  $\frac{3}{5}$  and a y-intercept of 2?

- A.**  $5y + 3x = 10$       **B.**  $5x - 3y = 10$       **C.**  $5y - 3x = 10$       **D.**  $5x + 3y = 10$

We must put all equations into standard form  $y = mx + b$ .

**A.**  $5y + 3x = 10$

$$5y + 3x = 10$$

$$5y + 3x - 3x = 10 - 3x$$

$$5y = -3x + 10$$

$$\frac{5y}{5} = \frac{-3x}{5} + \frac{10}{5}$$

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

The slope is  $\frac{-3}{5}$  and the y-intercept is 2.

B.  $5x - 3y = 10$

$$5x - 3y = 10$$

$$5x - 3y + 3y = 10 + 3y$$

$$5x = 10 + 3y$$

$$5x - 10 = 10 - 10 + 3y$$

$$5x - 10 = 3y$$

$$\frac{5x}{3} + \frac{-10}{3} = \frac{3y}{3}$$

$$\frac{5}{3}x + \frac{-10}{3} = y$$

The slope is  $\frac{5}{3}$  and the y-intercept is  $\frac{-10}{3}$

C.  $5y - 3x = 10$

$$5y - 3x + 3x = 3x + 10$$

$$5y = 3x + 10$$

$$\frac{5y}{5} = \frac{3x}{5} + \frac{10}{5}$$

$$y = \frac{3}{5}x + 2$$

slope is equal to  $\frac{3}{5}$  and the y-intercept is 2

D.  $5x + 3y = 10$

$$5x + 3y = 10$$

$$5x - 5x + 3y = -5x + 10$$

$$3y = -5x + 10$$

$$\frac{3y}{3} = \frac{-5x}{3} + \frac{10}{3}$$

$$y = \frac{-5}{3}x + \frac{10}{3}$$

The slope is  $\frac{-5}{3}$  and the y-intercept is  $\frac{10}{3}$

Therefore, the answer is C

**13.**

Triangle ABC has vertices (1,1), (3,5), and (5, 3). This triangle is dilated by a factor of 3.

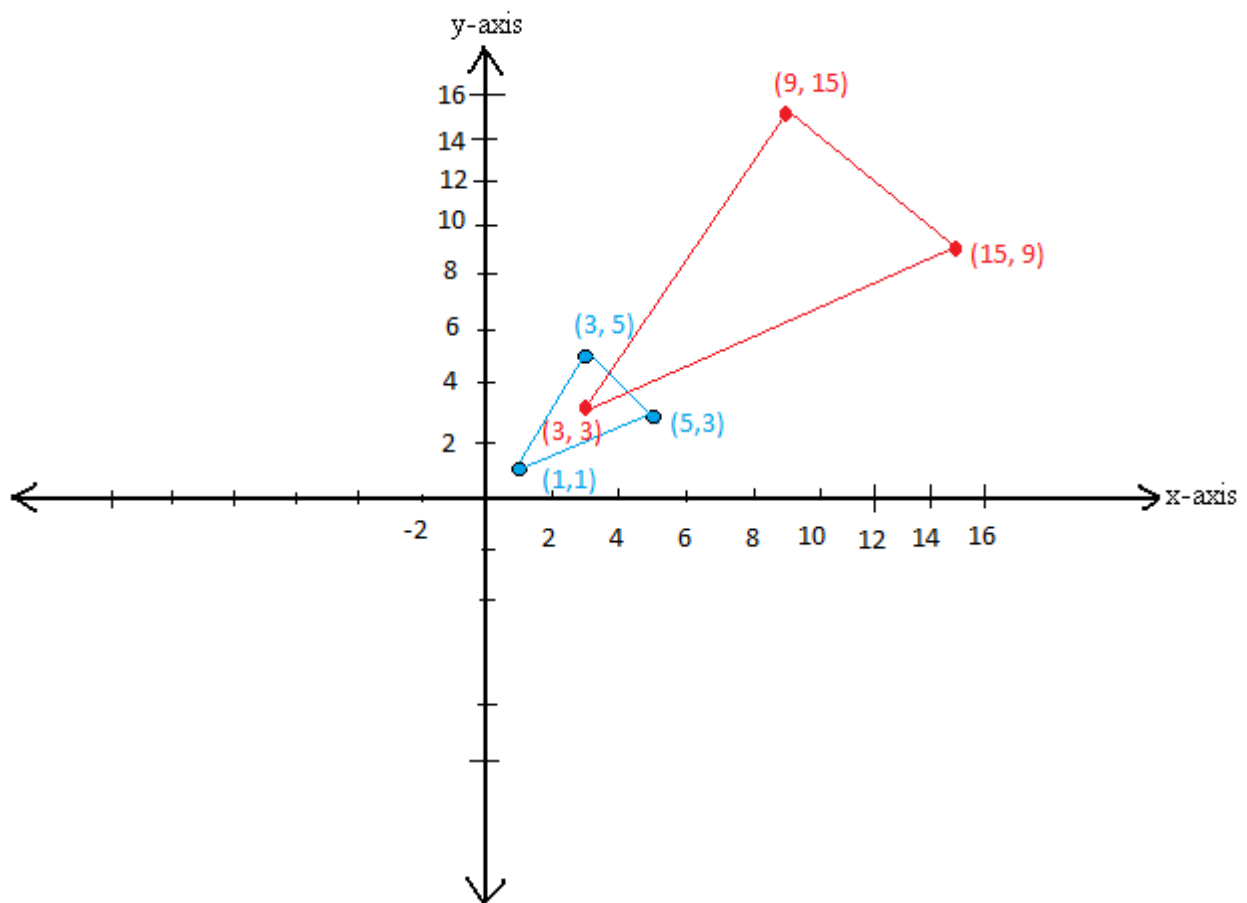
What are the images of the 3 vertices. Graph ABC and the image A'B'C'

To dilate the triangle by 3, just multiply each point by 3

$(1, 1)$  becomes  $(3, 3)$

$(3, 5)$  becomes  $(9, 15)$

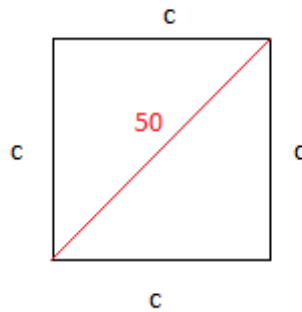
$(5, 3)$  becomes  $(15, 9)$



ABC is the blue triangle

The image A'B'C' is the red triangle

14. The diagonal of a square computer screen is 50 inches. What is the perimeter of this TV?
- 



First, we must find  $c$  using the pythagorean theorem.

$$50^2 = c^2 + c^2$$

$$2500 = 2c^2$$

$$\frac{2500}{2} = \frac{2c^2}{2}$$

$$1250 = c^2$$

$$c = \sqrt{1250}$$

$$c = 35.35$$

The perimeter of the TV is  $4 \times 35.35 = 141.4$  inches

15.

100 students take a survey to see what kind of ice cream people in America like to eat.

Which of the following will most **likely** flaw the survey?

- A. Some students were not born in the United States
- B. The students were not young enough
- C. The survey may not include people who travel 50 miles to get ice cream
- D. Choose students from a variety of schools.

Some students were not born in the United States

This will not flaw the survey since having people with different places of birth is a good thing. It makes the survey cover people with different origin or nationalities.

The students were not young enough.

This may not flaw the survey. Since the students will take survey, they must know how to read and write. Choosing students that are not too young ensure that they have the maturity to answer the questions.

The survey may not include people who travel 50 miles to get ice cream

This will flaw the survey. If students are willing to travel 50 miles to get ice cream, then they must love ice cream. They should be included to say what they think.

Choose students from a variety of schools.

This will not flaw the survey since choosing students from a variety of schools is a good thing. Students from just one school could have a tendency to think alike.

**Conclusion:**

What will most **likely** flaw is if we don't allow students who travel a long distance to take the survey.

16.

Which statement shows the similarity between the following 2 graphs?

$$4y = 2x + 0.5 \text{ and } 4y = 5x + 1/2$$

**A.** The y-intercepts are the same

**B.** The graphs are identical

**C.** The x-intercepts are the same

**D.** The slopes are the same

Put the equations in slope intercept form

$$4y = 2x + 0.5$$

$$\frac{4y}{4} = \frac{2x}{4} + \frac{0.5}{4}$$

$$y = \frac{1}{2}x + 0.125$$

$$4y = 5x + 1/2$$

$$\frac{4y}{4} = \frac{5x}{4} + \frac{1/2}{4}$$

$$y = \frac{5}{4}x + \frac{0.5}{4}$$

$$y = \frac{5}{4}x + 0.125$$

The slopes are  $\frac{1}{2}$  and  $\frac{5}{4}$ , so they are not the same

The graphs are not identical since the slopes are different.

The graph with a slope of  $\frac{5}{4}$  will be steeper.

The y-intercept for both graphs is 0.125, so the y-intercepts are the same

The x-intercept for  $y = \frac{1}{2}x + 0.125$  is found when  $y = 0$

$$0 = \frac{1}{2}x + 0.125$$

$$-0.125 = \frac{1}{2}x$$

Multiply both sides by 2

$$2 \times -0.125 = 2 \times \frac{1}{2}x$$

$$-0.25 = x$$

The x-intercept for  $y = \frac{5}{4}x + 0.125$  is found when  $y = 0$

$$0 = \frac{5}{4}x + 0.125$$

$$0 = 1.25x + 0.125$$

$$-0.125 = 1.25x$$

$$\frac{-0.125}{1.25} = \frac{1.25x}{1.25}$$

$$-0.1 = x$$

The x-intercept are -0.1 and -0.25, so they are not the same. The answer is A.

17.

Below are 3 equations

1)  $4x - 2x + 1 = -1 + 2 + 2x$

2)  $2x - 2 = 6 - 4 + 4x$

3)  $5 + 3x = 2 + 3x + 5$

Solve all equations and then say

Which equation has 1 solution \_\_\_\_\_, no solutions \_\_\_\_\_, infinitely many solutions \_\_\_\_\_

1)

$$4x - 2x + 1 = -1 + 2 + 2x$$

$$2x + 1 = -1 + 2 + 2x$$

$$2x + 1 = 1 + 2x$$

$$2x - 2x + 1 = 1 + 2x - 2x$$

$$1 = 1$$

This equation has infinitely many solutions

2)

$$2x - 2 = 6 - 4 + 4x$$

$$2x - 2 = 2 + 4x$$

$$2x - 2 + 2 = 2 + 2 + 4x$$

$$2x = 4 + 4x$$

$$2x - 2x = 4 + 4x - 2x$$

$$0 = 4 + 2x$$

$$0 - 4 = 4 - 4 + 2x$$

$$-4 = 2x$$

$$\frac{-4}{2} = \frac{2x}{2}$$

$$-2 = x$$

This equation has 1 solution

3)

$$5 + 3x = 2 + 3x + 5$$

$$5 - 5 + 3x = 2 + 3x + 5 - 5$$

$$3x = 2 + 3x$$

$$3x - 3x = 2 + 3x - 3x$$

$$0 = 2$$

We have a contradiction, so this equation has no solution.

18.

A tree is 8 feet tall and cast a shadow that is 6 feet. a. If your child's height is 4 feet, which equation can you use to find the length of his shadow?

a. Which proportion can you use to solve this problem?

**A.**  $8/5 = 6/x$       **B.**  $4/6 = x/8$       **C.**  $8/4 = 6/x$       **D.**  $x/4 = 8/6$

b. What is the length of the shadow? \_\_\_\_\_

a.

$$\frac{\text{Height of tree}}{\text{height of child}} = \frac{\text{length of tree ' s shadow}}{\text{length of child ' s shadow}}$$

$$\frac{8}{4} = \frac{6}{\text{Length of child ' s shadow}}$$

Let x be the length of child's shadow.

$$\frac{8}{4} = \frac{6}{x}$$

The correct proportion is C.

b.

Cross multiply:

$$8 \times x = 6 \times 4$$

$$8x = 24$$

$$\frac{8x}{8} = \frac{24}{8}$$

$$x = 3$$

19.

Solve the following simultaneous equations.

$$2x + 4y = 8$$

$$4x - 4y = 6$$

a. by graphing

b. algebraically

a. Before we graph, put both equation in standard form

$$2x + 4y = 8$$

$$2x - 2x + 4y = -2x + 8$$

$$4y = -2x + 8$$

$$\frac{4y}{4} = \frac{-2x}{4} + \frac{8}{4}$$

$$y = \frac{-1}{2}x + 2$$

$$4x - 4y = 6$$

$$4x - 4y + 4y = 6 + 4y$$

$$4x = 6 + 4y$$

$$4x - 6 = 6 - 6 + 4y$$

$$4x - 6 = 4y$$

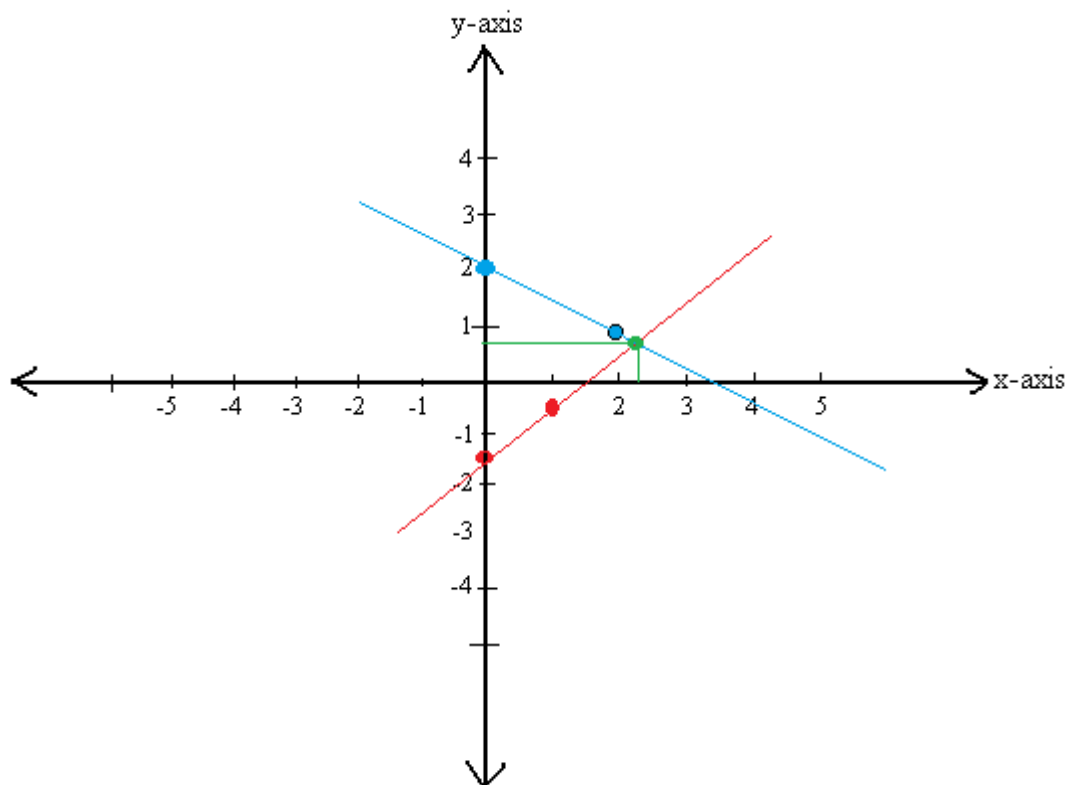
$$\frac{4x}{4} + \frac{-6}{4} = \frac{4y}{4}$$

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

$$1x + -1.5 = y$$

Now we can use  $y = \frac{-1}{2}x + 2$  and  $y = 1x + -1.5$  to graph

$y = \frac{-1}{2}x + 2$  is the blue line and  $y = 1x + -1.5$  is the red line



The green point is the solution. In this case, only an estimation is possible.

$x$  is approximately equal to 2.33 and  $y$  is about 0.80

When we solve it algebraically, we will be able to get a better answer.

How did we graph?

For  $y = \frac{-1}{2}x + 2$

2 is the y-intercept, so put 2 on the y-axis.

This is shown with the blue dot on the left and on top.

$\frac{-1}{2}$  means to go down 1 and to the right 2. Start from the blue dot on top and go down 1 and

to the right 2. You will end up where the second blue dot is on the right and at the bottom

For  $y = 1x + -1.5$  -1.5 is the y-intercept, so put -1.5 on the y-axis.

This is shown with the red dot on the left and at the bottom.

1 means to go down 1 and to the right 1. Start from the red dot at the bottom and go up 1 and

to the right 1. You will end up where the second red dot is on the right and on top

b. algebraically

We can use the standard form of the equations to solve algebraically

$$y = \frac{-1}{2}x + 2 \text{ and } y = 1x + -1.5$$

Replace  $y = 1x + -1.5$  in the other equation

$$1x + -1.5 = \frac{-1}{2}x + 2$$

$$1x + \frac{1}{2}x + -1.5 = \frac{-1}{2}x + \frac{1}{2}x + 2$$

$$1x + \frac{1}{2}x + -1.5 = 2$$

$$1x + \frac{1}{2}x + -1.5 + 1.5 = 2 + 1.5$$

$$1x + \frac{1}{2}x = 2 + 1.5$$

$$1x + \frac{1}{2}x = 3.5$$

$$\frac{1x}{1} + \frac{1}{2}x = 3.5$$

$$\frac{1x}{1} \times \frac{2}{2} + \frac{1}{2}x = 3.5$$

$$\frac{2x}{2} + \frac{x}{2} = 3.5$$

$$\frac{3x}{2} = 3.5$$

$$1.5x = 3.5$$

Divide both sides by 1.5

$$\frac{1.5x}{1.5} = \frac{3.5}{1.5}$$

$$x = 2.333$$

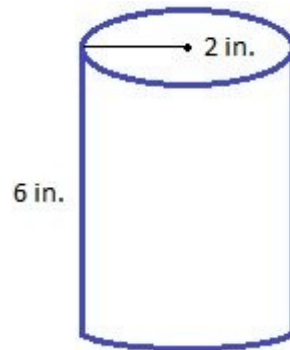
Replace  $x = 2.33$  into this equation to get  $y$ .  $y = 1x + -1.5$

$$y = 1 \times 2.33 + -1.5$$

$$y = 2.33 + -1.5 = 0.83$$

The solution is (2.33, 0.83)

20. The cup below is  $\frac{2}{3}$  full. How much water can the cup hold? \_\_\_\_\_



$$Volume = \pi \times r^2 \times h$$

$$Volume = 3.14 \times 2^2 \times 6$$

$$Volume = 3.14 \times 4 \times 6$$

$$Volume = 3.14 \times 24$$

$$\text{volume} = 75.36 \text{ inches}^3$$

$$1 \text{ cubic inch} = 0.016 \text{ liter}$$

$$75.36 \text{ cubic inches} = 75.36 \text{ times } 0.016 \text{ liter} = 1.21 \text{ liters}$$

$$\text{The cylinder is } \frac{2}{3} \text{ full, so } \frac{2}{3} \times 1.21 = \frac{2 \times 1.21}{3} = \frac{2.42}{3} = 0.80$$

The cylinder can hold about 0.80 liter of water