

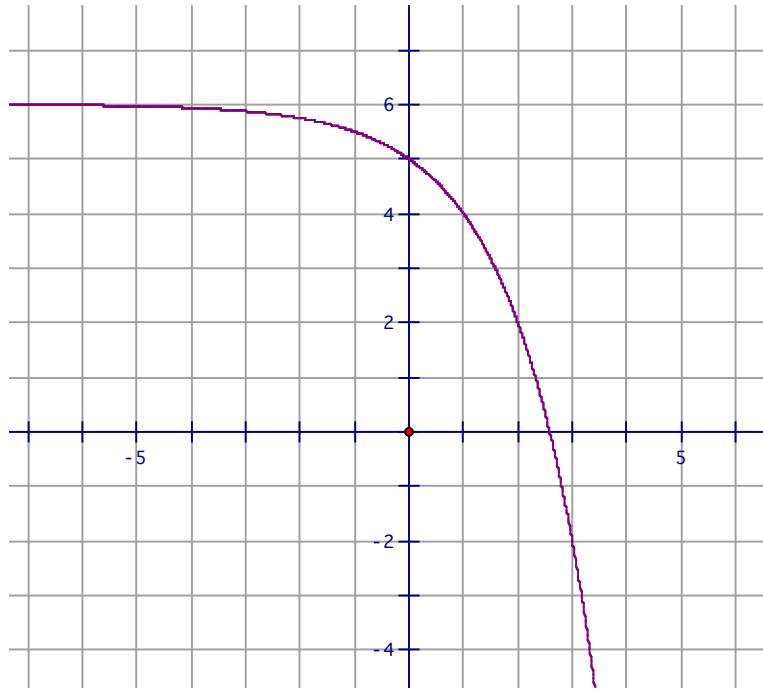
1. The table below has information about a person's distance from home (in feet) as a function of time (in minutes). If the relationship between distance ( $y$ ) and time ( $x$ ) were graphed, what would be the slope of the graph and what would it mean in terms of the walking situation?

Time (minutes)	Distance (feet)
0	1000
2	760
4	520
6	280
8	40

- a. The slope would be 240 feet per minute because the person is walking toward home at 240 feet per minute.
- b. The slope would be -240 feet per minute because the person is walking toward home at 240 feet per minute.
- c. The slope would be 240 feet per minute because the person is walking away from home at 240 feet per minute.
- d. The slope would be 120 feet per minute because the person is walking toward home at 120 feet per minute.
- e. The slope would be -120 feet per minute because the person is walking toward home at 120 feet per minute.
2. The summation symbol sigma,  $\sum$ , is used as shorthand to indicate a sum of a sequence of numbers. For example,  $\sum_{k=1}^5 2k$  means  $2 + 4 + 6 + 8 + 10$ . The number below sigma indicates the starting value for  $k$  in the given formula ( $2k$ ). Increase  $k$  by one until you get to the number on top of sigma. Determine the value of  $\sum_{k=1}^5 k \cdot (-1)^k$ .
- a.  $-1 + 2 + -3 + 4 + -5 = -3$
- b.  $-1 + -2 + -3 + -4 + -5 = -15$
- c.  $1 + 2 + 3 + 4 + 5 = 15$
- d.  $1 + -2 + 3 + -4 + 5 = 3$
- e.  $1 + 2 + 3 + 4 + -5 = 5$
3. The intensity of the noise a car makes is  $10^{-5}$  watts per square meter. The intensity of the noise a train makes is  $10^{-2}$  watts per square meter. Which statement is true about the relationship between the noise levels of the car and the train.
- a. The train is 1000 times as noisy as the car.
- b. The car is 1000 times as noisy as the train.
- c. The train is 10,000,000 times as noisy as the car.
- d. The car is 10,000,000 times as noisy as the train.
- e. The train is 0.0000001 times as noisy as the car.

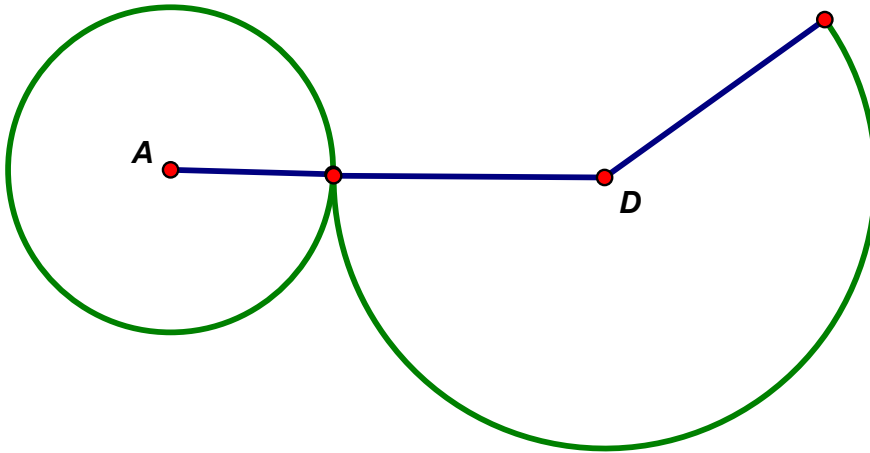
4. The United States paid a total of \$15,000,000 for the Louisiana Purchase, which included 828,000 square miles of territory. How much did they pay per square mile? (Round to the nearest dollar.)
- \$2 per square mile
  - \$18 per square mile
  - \$181 per square mile
  - \$1812 per square mile
  - \$18,116 per square mile
5. A 40.0 gram sample of iodine-131 undergoes radioactive decay. The half-life of iodine-131 is 8 days. In other words, every 8 days half of the Iodine-131 will have degraded. The relationship between the amount in grams remaining ( $y$ ) of Iodine-131 and elapsed time in days ( $x$ ) can be modeled by this equation:  $y = 40 \cdot 2^{-(x/8)}$ . Approximately how many grams of Iodine-131 would there be after 10 days? (Round to the nearest tenth of a gram.)
- There will be 95.1 grams remaining.
  - There will be 19.7 grams remaining.
  - There will be 20.0 grams remaining.
  - There will be 16.8 grams remaining.
  - There will be 15.2 grams remaining.
6. Put these numbers in order from least to greatest:  $\left(\frac{2}{3}\right)^{-90}$   $\left(\frac{2}{3}\right)^{80}$   $\left(\frac{3}{2}\right)^{75}$
- $\left(\frac{2}{3}\right)^{80}$   $\left(\frac{3}{2}\right)^{75}$   $\left(\frac{2}{3}\right)^{-90}$
  - $\left(\frac{3}{2}\right)^{75}$   $\left(\frac{2}{3}\right)^{-90}$   $\left(\frac{2}{3}\right)^{80}$
  - $\left(\frac{2}{3}\right)^{-90}$   $\left(\frac{2}{3}\right)^{80}$   $\left(\frac{3}{2}\right)^{75}$
  - $\left(\frac{2}{3}\right)^{-90}$   $\left(\frac{3}{2}\right)^{75}$   $\left(\frac{2}{3}\right)^{80}$
  - $\left(\frac{2}{3}\right)^{80}$   $\left(\frac{2}{3}\right)^{-90}$   $\left(\frac{3}{2}\right)^{75}$
7. Which ordered pair is a solution to the inequality  $y < |2x - 6|$ ?
- (0, 6)
  - (1, 1)
  - (2, 2)
  - (3, 1)
  - (4, 3)

8. The graph below shows a functional relationship between  $x$  shown on the horizontal axis and  $y$  on the vertical axis. Use the graph to approximate the value of  $x$  when  $y = -2$ .



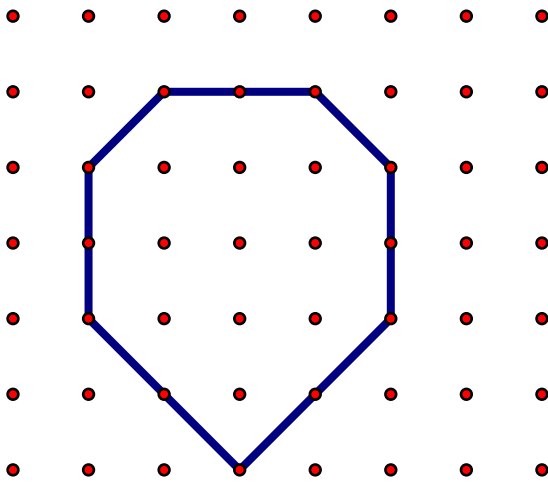
- When  $y = -2$ ,  $x \approx 4$ .
  - When  $y = -2$ ,  $x \approx 3$ .
  - When  $y = -2$ ,  $x \approx$  a little less than 6.
  - When  $y = -2$ ,  $x \approx 0$ .
  - When  $y = -2$ ,  $x \approx 2$ .
9. The set of integers is **closed** under the operation of addition because the sum of any two integers is an integer. The set of integers is **not closed** under the operation of division because some quotients involving integers are not integers (for example,  $1 \div 2$  does not yield an integer.) Which statement is **false**?
- The set of rational numbers is closed under multiplication.
  - The set of irrational numbers is closed under multiplication.
  - The set of even numbers is closed under addition.
  - The set of whole numbers is not closed under subtraction.
  - The set of negative integers is not closed under multiplication.
10. Which set of five numbers is most likely to have a mean that is 10 more than the median?
- The number of m&m's in each of five bags that all weigh the same amount.
  - The ages in years of a man, his wife, and their 3 children.
  - The heights in inches of the five starting players on a college basketball team.
  - The weights in pounds of five puppies in a litter. (That would be five puppies born at the same time to the same mother.)
  - The lengths in inches of five puppies in a litter.

11. The figure below shows the net of a right circular cone. The radius of the base circle A is 3 cm. The radius of lateral surface D is 5 cm. When the cone is assembled, what will be its volume?



- The volume of the cone will be  $15\pi$  square centimeters.
  - The volume of the cone will be  $4\pi$  square centimeters.
  - The volume of the cone will be  $225\pi$  square centimeters.
  - The volume of the cone will be  $225\pi^2$  square centimeters.
  - The volume of the cone will be  $12\pi$  square centimeters.
12. The height,  $h$ , in feet of a projectile that is launched vertically into the air can be determined by this equation:  $h = -16t^2 + v_0t + h_0$ , where  $t$  is the number of seconds since launch,  $v_0$  is the initial velocity, and  $h_0$  is the initial height of the platform from which it is launched. Suppose a projectile is launched with an initial velocity of 96 feet per second from a platform that is 12 feet tall. What will be the maximum height of the projectile?
- The maximum height of the projectile is 96 feet.
  - The maximum height of the projectile is 121 feet.
  - The maximum height of the projectile is 136 feet.
  - The maximum height of the projectile is 156 feet.
  - The maximum height of the projectile is 168 feet.
13. I used a ruler that measured to the nearest millimeter to measure three pieces of wire. These are the measurements I got: 18.2 cm, 21.5 cm, and 20.3 cm. If I add those three measurements, I get a total length of 60 cm. How far from the actual total length of the three pieces of wire could that be, assuming that I read the ruler correctly.
- The actual total length could be 1 millimeter less or greater than 60 cm.
  - The actual total length could be 0.5 millimeters less or greater than 60 cm.
  - The actual total length could be 1.5 millimeters less or greater than 60 cm.
  - The actual total length could be 2 millimeters less or greater than 60 cm.
  - The actual total length could be 2.5 millimeters less or greater than 60 cm.

14. The polygon below is constructed on centimeter dot paper. What is the perimeter of the polygon?



- a.  $6(1 + \sqrt{2})$  centimeters  
 b. 15 centimeters  
 c. 12 centimeters  
 d.  $6 + 2\sqrt{8}$  centimeters  
 e.  $12\sqrt{2}$  centimeters
15. Two pens, one pack of paper, and one notebook cost \$6.00. Two pens and two notebooks cost \$7.60. One pen, one pack of paper, and one notebook cost \$4.65. How much would three packs of paper, one pen, and one notebook cost? (Assume the same items have the same price and different items have different prices.)
- a. Three packs of paper, one pen, and one notebook cost \$6.35.  
 b. Three packs of paper, one pen, and one notebook cost \$7.35  
 c. Three packs of paper, one pen, and one notebook cost \$9.55  
 d. Three packs of paper, one pen, and one notebook cost \$4.05  
 e. Three packs of paper, one pen, and one notebook cost \$5.95
16. When I enter  $0.8^{50}$  in my calculator, this is what the display shows:

$0.8^{50}$   
 1.427247693E-5

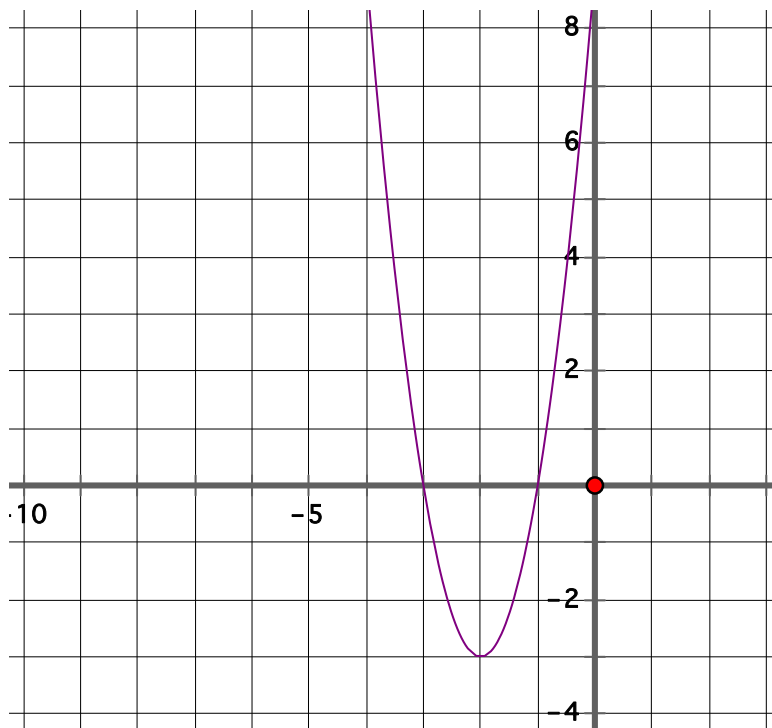
What does that number mean?

- a. It means that  $0.8^{50}$  is exactly equal to 1.427 247 698 3  
 b. It means that  $0.8^{50}$  is exactly equal to 0.000 014 272 476 983.  
 c. It means that  $0.8^{50}$  is approximately equal to 0.000 014 272 476 983.  
 d. It means that  $0.8^{50}$  is exactly equal to 0.000 001 427 247 698 3.  
 e. It means that  $0.8^{50}$  is approximately equal to 0.000 001 427 247 698 3.

17. Assume that  $m$  and  $n$  are integers. Which of the following statements are true for all values of  $x$ ,  $m$ , and  $n$ ?

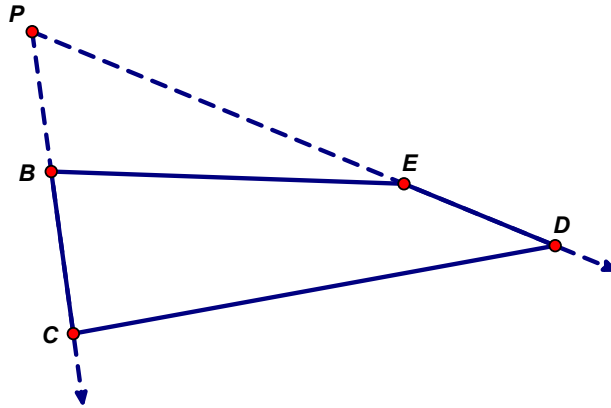
- a.  $x^m \cdot x^n = x^{mn}$
- b.  $\frac{x^m}{x^n} = x^{m/n}$
- c.  $\sqrt[m]{x^n} = x^{n-m}$
- d.  $(x^m)^{-n} = x^{m-n}$
- e.  $\left(\frac{1}{x^m}\right)^n = x^{-mn}$

18. Below is the graph of a quadratic function. In other words, the general form of the equation which this graph models would be  $y = ax^2 + bx + c$ . What is the factored form involving real numbers only, if any, of the equation for this function? (Factored form is  $y = a(x - m)(x - n)$  where  $a$ ,  $m$ , and  $n$  are real numbers.)

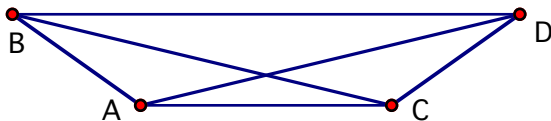


- a. Factored form is  $y = 3(x + 3)(x + 1)$
- b. Factored form is  $y = 3(x - 3)(x - 1)$
- c. Factored form is  $y = (x + 3)(x + 1)$
- d. Factored form is  $y = (x - 3)(x - 1)$
- e. The equation for this graph does not have a factored form.

19. An equilic quadrilateral has one pair of opposite sides that are congruent. The rays containing the congruent opposite sides form a  $60^\circ$  angle. Polygon  $BEDC$  is an equilic quadrilateral because  $BC = ED$  and the rays containing those sides form a  $60^\circ$  angle. Suppose that the measure of angle  $EBC$  is  $82^\circ$ . What is the measure of angle  $BED$ ?

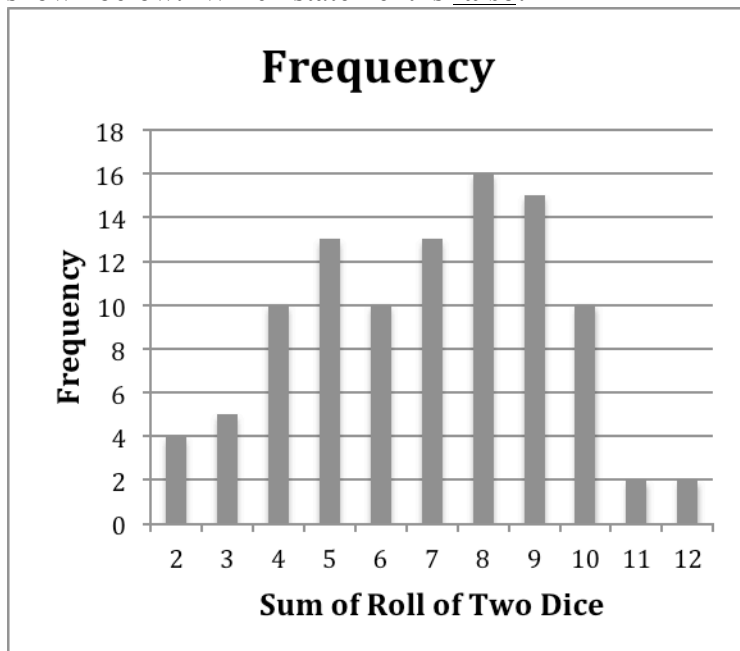


- $m\angle BED = 82^\circ$
  - $m\angle BED = 98^\circ$
  - $m\angle BED = 120^\circ$
  - $m\angle BED = 158^\circ$
  - $m\angle BED = 172^\circ$
20. Two different whole numbers,  $m$  and  $n$ , are both greater than 1. The greatest common factor of  $m$  and  $n$  is 42. Which statement is **false** about these two numbers?
- At least one of the two numbers is even.
  - The least common multiple of these two numbers cannot be 42.
  - The product of these two numbers must be divisible by  $42^2$ .
  - The sum of these two numbers must be divisible by 42.
  - At least one of these number must be odd.
21. In the isosceles trapezoid shown below the measure of angle  $CAD$  is  $21^\circ$  and the measure of angle  $ABC$  is  $22^\circ$ . What is the measure of angle  $ACD$ ?



- $116^\circ$
- $121^\circ$
- $122^\circ$
- $131^\circ$
- $137^\circ$

22. The vertices of triangle ABC have the following coordinates:  $A = (-5, 2)$ ,  $B = (-3, -3)$ ,  $C = (2, -1)$ . What kind of triangle is triangle ABC?
- Triangle ABC is an equilateral triangle.
  - Triangle ABC is an acute isosceles triangle.
  - Triangle ABC is an obtuse scalene triangle.
  - Triangle ABC is a right isosceles triangle.
  - Triangle ABC is an acute scalene triangle.
23. The Y was offering beginner, intermediate, and advanced swimming lessons. A bunch of children signed up for the lessons. One fourth of the children who signed up were boys. Two thirds of the boys wanted in the advanced class. Half of the other boys wanted the intermediate class. The rest of the boys wanted the beginner class. Fifty-four girls signed up. How many boys signed up for the beginner lessons?
- 14 boys signed up for beginner lessons.
  - 7 boys signed up for beginner lessons.
  - 27 boys signed up for beginner lessons.
  - 5 boys signed up for beginner lessons.
  - 3 boys signed up for beginner lessons.
24. A die has six sides numbered from 1 to 6. A pair of dice was rolled 100 times. The sum of the numbers rolled was recorded each time. The results of rolling the pair of dice 100 times are shown below. Which statement is **false**?



- The experimental probability of rolling a sum of seven in this experiment is different from the theoretical probability of rolling a sum of seven.
- The mode of these data is 10.
- The mode of these data is 8.
- The median of these data is 7.
- The mean of these data is 6.88.



25. You have a dollar bill, 1 quarter, 2 nickels, and 2 pennies in your pocket. You want to buy an item that costs less than one dollar including tax. The item is not free. What is the probability you can pay for the item with exact change?

- a.  $\frac{1}{11}$
- b.  $\frac{17}{99}$
- c.  $\frac{5}{33}$
- d.  $\frac{23}{99}$
- e.  $\frac{4}{9}$

26. There are four tiles in a bag. They are identical except for color. One is blue and three are red. You play a game in which you draw two tiles at the same time at random from the bag. If the tiles do not match you win. If they do match, you lose. What is the probability that you win?

- a. The probability you will win is  $\frac{1}{4}$ .
- b. The probability you will win is  $\frac{1}{3}$ .
- c. The probability you will win is  $\frac{1}{2}$ .
- d. The probability you will win is  $\frac{2}{3}$ .
- e. The probability you will win is  $\frac{3}{4}$ .

27. Will has a collection of toy cars and trucks. Half of his toys are trucks. The rest are cars. 14 of his vehicles are red. Thirty eight of his vehicles are metal. Twenty five percent of his collection consists of cars that are not metal and that are not red. Will has 6 red cars that are not metal, 8 metal cars that are not red, and 4 red metal cars. How many vehicles are in Will's collection?

- a. Will has 100 vehicles in his collection.
- b. Will has 72 vehicles in his collection.
- c. Will has 70 vehicles in his collection.
- d. Will has 66 vehicles in his collection.
- e. Will has 54 vehicles in his collection.

28. Three different whole numbers have a product of 144 and a sum of 17. What is the sum of the squares of the three numbers?
- 169
  - 125
  - 115
  - 109
  - 117
29. There are 924 carrots and 490 apples to put into bags. Each bag must be filled with  $x$  carrots and  $y$  apples. There cannot be any carrots or apples left over. If the largest number of bags possible are filled, what is  $x + y$ ?
- 98
  - 99
  - 100
  - 101
  - 102
30. The local pizza parlor classifies its pizzas by their diameters. They have 8-inch pizzas that are cut in fourths. Their 10-inch pizzas that are cut in sixths. Their 12-inch pizzas are cut in eighths. Their 14-inch pizzas are cut in tenths. Their 16-inch pizzas are cut in sixteenths. All pizzas are circular and the same thickness. Which pizza has the most volume in a single slice?
- The 8-inch pizza has the most volume in a single slice.
  - The 10-inch pizza has the most volume in a single slice.
  - The 12-inch pizza has the most volume in a single slice.
  - The 14-inch pizza has the most volume in a single slice.
  - The 16-inch pizza has the most volume in a single slice.