

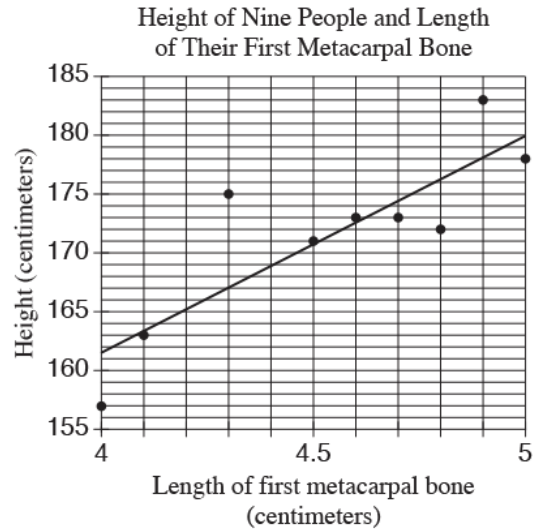
1) The recommended daily calcium intake for a 20-year-old is 1,000 milligrams (mg). One cup of milk contains 299 mg of calcium and one cup of juice contains 261 mg of calcium. Which of the following inequalities represents the possible number of cups of milk m and cups of juice j a 20-year-old could drink in a day to meet or exceed the recommended daily calcium intake from these drinks alone?

- A) $299m + 261j \geq 1,000$
- B) $299m + 261j > 1,000$
- C) $\frac{299}{m} + \frac{261}{j} \geq 1,000$
- D) $\frac{299}{m} + \frac{261}{j} > 1,000$

2) A research assistant randomly selected 75 undergraduate students from the list of all students enrolled in the psychology-degree program at a large university. She asked each of the 75 students, "How many minutes per day do you typically spend reading?" The mean reading time in the sample was 89 minutes, and the margin of error for this estimate was 4.28 minutes. Another research assistant intends to replicate the survey and will attempt to get a smaller margin of error. Which of the following samples will most likely result in a smaller margin of error for the estimated mean time students in the psychology-degree program read per day?

- A) 40 randomly selected undergraduate psychology-degree program students
- B) 40 randomly selected undergraduate students from all degree programs at the college
- C) 300 randomly selected undergraduate psychology-degree program students
- D) 300 randomly selected undergraduate students from all degree programs at the college

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



3) How many of the nine people have an actual height that differs by more than 3 centimeters from the height predicted by the line of best fit?

- A) 2
- B) 4
- C) 6
- D) 9

4) Which of the following is the best interpretation of the slope of the line of best fit in the context of this problem?

- A) The predicted height increase in centimeters for one centimeter increase in the first metacarpal bone
- B) The predicted first metacarpal bone increase in centimeters for every centimeter increase in height
- C) The predicted height in centimeters of a person with a first metacarpal bone length of 0 centimeters
- D) The predicted first metacarpal bone length in centimeters for a person with a height of 0 centimeters

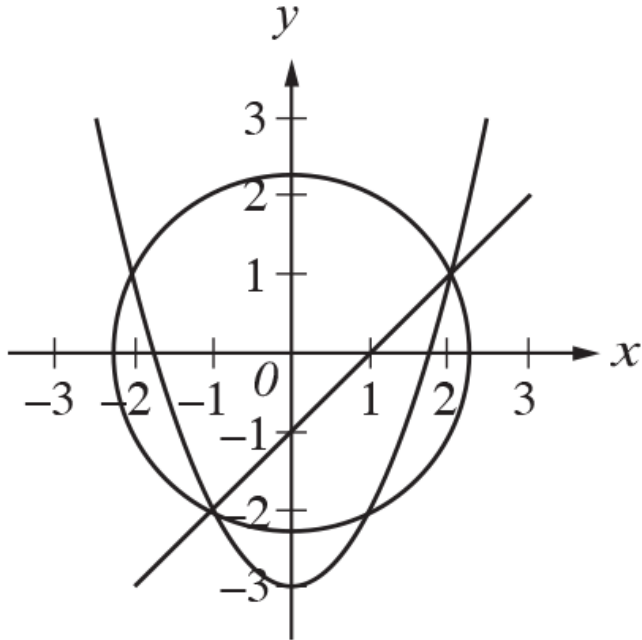
5) Based on the line of best fit, what is the predicted height for someone with a first metacarpal bone that has a length of 4.45 centimeters?

- A) 168 centimeters
- B) 169 centimeters
- C) 170 centimeters
- D) 171 centimeters

6) Aaron is staying at a hotel that charges \$99.95 per night plus tax for a room. A tax of 8% is applied to the room rate, and an additional onetime untaxed fee of \$5.00 is charged by the hotel. Which of the following represents Aaron's total charge, in dollars, for staying x nights?

- A) $(99.5 + 0.08x) + 5$
- B) $1.08(99.95x) + 5$
- C) $1.08(99.95x + 5)$
- D) $1.08(99.95 + 5)x$

7)



$$x^2 + y^2 = 5$$

$$y = x^2 - 3$$

$$x - y = 1$$

A system of three equations and their graphs in the xy -plane are shown above. How many solutions does the system have?

- A) One
- B) Two
- C) Three
- D) Four

8) The table below classifies 103 elements as metal, metalloid, or nonmetal and as solid, liquid, or gas at standard temperature and pressure.

	Solids	Liquids	Gases	Total
Metals	77	1	0	78
Metalloids	7	0	0	7
Nonmetals	6	1	11	18
Total	90	2	11	103

What fraction of all solids and liquids in the table are metalloids?

9) If $-\frac{9}{5} < -3t + 1 < -\frac{7}{4}$, what is one possible value of $9t - 3$?

10) A survey was conducted among a randomly chosen sample of U.S. citizens about U.S. voter participation in the November 2012 presidential election. The table below displays a summary of the survey results.

Reported Voting by Age (in thousands)				
	Voted	Did Not Vote	No Response	Total
18- to 34-year-olds	30,329	23,211	9,468	63,008
35- to 54-year-olds	47,085	17,721	9,476	74,282
55- to 74-year-olds	43,075	10,092	6,831	59,998
People 75 years old and over	12,459	3,508	1,827	17,794
Total	132,948	54,532	27,602	215,082

According to the table, for which age group did the greatest percentage of people report that they had voted?

- A) 18- to 34-year-olds
- B) 35- to 54-year-olds
- C) 55- to 74-year-olds
- D) People 75 years old and over

11) Of the 18- to 34-year-olds who reported voting, 500 people were selected at random to do a follow-up survey where they were asked which candidate they voted for. There were 287 people in this follow-up survey sample who said they voted for Candidate A, and the other 213 people voted for someone else. Using the data from both the follow-up survey and the initial survey, which of the following is most likely to be an accurate statement?

- A) About 123 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.
- B) About 76 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.
- C) About 36 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.
- D) About 17 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.

12) A company's manager estimated that the cost C , in dollars, of producing n items is $C = 7n + 350$. The company sells each item for \$12. The company makes a profit when total income from selling a quantity of items is greater than the total cost of producing that quantity of items. Which of the following inequalities gives all possible values of n for which the manager estimates that the company will make a profit?

- A) $n < 70$
- B) $n < 84$
- C) $n > 70$
- D) $n > 84$

13) At a primate reserve, the mean age of all the male primates is 15 years, and the mean age of all female primates is 19 years. Which of the following must be true about the mean age m of the combined group of male and female primates at the primate reserve?

- A) $m = 17$
- B) $m > 17$
- C) $m < 17$
- D) $15 < m < 19$

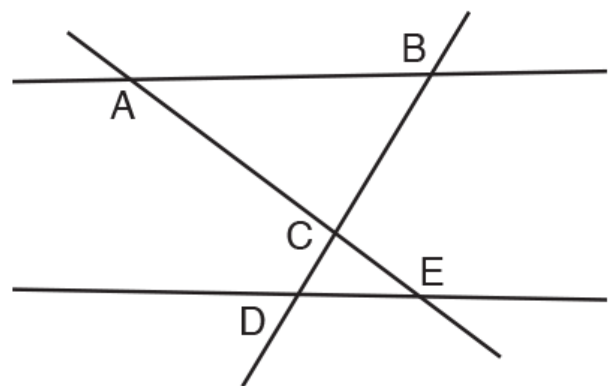
14) A researcher wanted to know if there is an association between exercise and sleep for the population of 16-year-olds in the United States. She obtained survey responses from a random sample of 2000 United States 16-year-olds and found convincing evidence of a positive association between exercise and sleep. Which of the following conclusions is well supported by the data?

- A) There is a positive association between exercise and sleep for 16-year-olds in the United States.
- B) There is a positive association between exercise and sleep for 16-year-olds in the world.
- C) Using exercise and sleep as defined by the study, an increase in sleep is caused by an increase of exercise for 16-year-olds in the United States.
- D) Using exercise and sleep as defined by the study, an increase in sleep is caused by an increase of exercise for 16-year-olds in the world.

15) A biology class at Central High School predicted that a local population of animals will double in size every 12 years. The population at the beginning of 2014 was estimated to be 50 animals. If P represents the population n years after 2014, then which of the following equations represents the class's model of the population over time?

- A) $P = 12 + 50n$
- B) $P = 50 + 12n$
- C) $P = 50(2)^{12n}$
- D) $P = 50(2)^{\frac{n}{12}}$

16)



Note: Figure not drawn to scale

In the figure above, $\triangle ABC \sim \triangle EDC$. Which of the following must be true?

- A) $\overline{AE} \parallel \overline{BD}$
- B) $\overline{AE} \perp \overline{BD}$
- C) $\overline{AB} \parallel \overline{DE}$
- D) $\overline{AB} \perp \overline{DE}$

17) The gas mileage for Peter's car is 21 miles per gallon when the car travels at an average speed of 50 miles per hour. The car's gas tank has 17 gallons of gas at the beginning of a trip. If Peter's car travels at an average speed of 50 miles per hour, which of the following functions f models the number of gallons of gas remaining in the tank t hours after the trip begins?

- A) $f(t) = 17 - \frac{21}{50t}$
- B) $f(t) = 17 - \frac{50t}{21}$
- C) $f(t) = \frac{17-21t}{50}$
- D) $f(t) = \frac{17-50t}{21}$

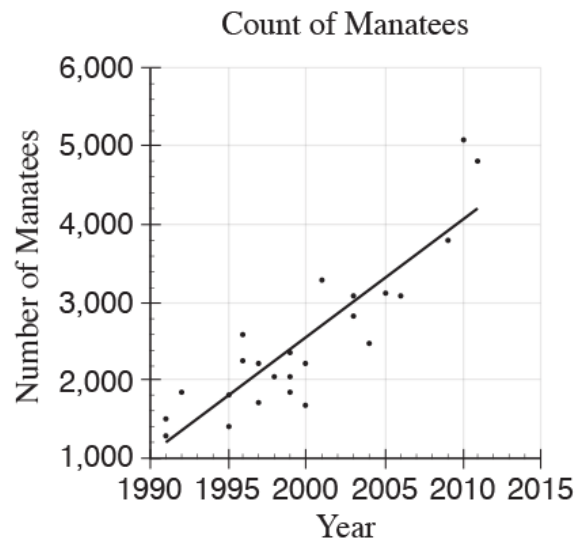
18) The toll rates for crossing a bridge are \$6.50 for a car and \$10 for a truck. During a two-hour period, a total of 187 cars and trucks crossed the bridge, and the total collected in tolls was \$1,338. Solving which of the following systems of equations yields the number of cars, x , and the number of trucks, y , that crossed the bridge during the two hours?

- A) $x + y = 1,338$
 $6.5x + 10y = 187$
- B) $x + y = 187$
 $6.5x + 10y = \frac{1,338}{2}$
- C) $x + y = 187$
 $6.5x + 10y = 1,338$
- D) $x + y = 187$
 $6.5x + 10y = 1,338 \times 2$

19) When a scientist dives in salt water to a depth of 9 feet below the surface, the pressure due to the atmosphere and surrounding water is 18.7 pounds per square inch. As the scientist descends, the pressure increases linearly. At a depth of 14 feet, the pressure is 20.9 pounds per square inch. If the pressure increases at a constant rate as the scientist's depth below the surface increases, which of the following linear models best describes the pressure p in pounds per square inch at a depth of d feet below the surface?

- A) $p = 0.44d + 0.77$
- B) $p = 0.44d + 14.74$
- C) $p = 2.2d - 1.1$
- D) $p = 2.2d - 9.9$

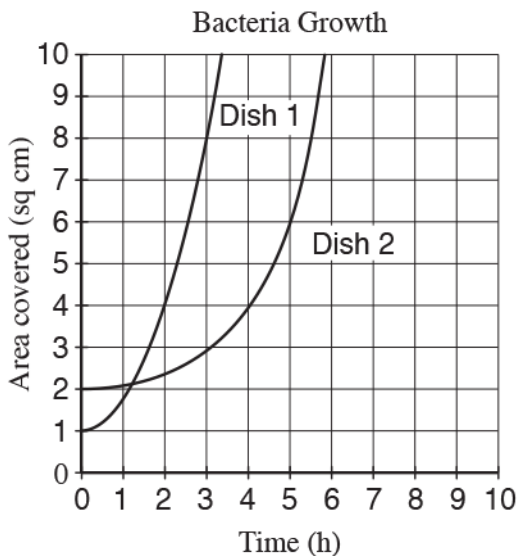
20)



The scatterplot above shows counts of Florida manatees, a type of sea mammal, from 1991 to 2011. Based on the line of best fit to the data shown, which of the following values is closest to the average yearly increase in the number of manatees?

- A) 0.75
- B) 75
- C) 150
- D) 750

21)



A researcher places two colonies of bacteria into two petri dishes that each have area 10 square centimeters. After the initial placement of the bacteria ($t = 0$) the researcher measures and records the area covered by the bacteria in each dish every ten minutes. The data for each dish were fit by a smooth curve, as shown above, where each curve represents the area of a dish covered by bacteria as a function of time, in hours. Which of the following is a correct statement about the data above?

- A) At time $t = 0$, both dishes are 100% covered by bacteria.
- B) At time $t = 0$, bacteria covers 10% of Dish 1 and 20% of Dish 2.
- C) At time $t = 0$, Dish 2 is covered with 50% more bacteria than Dish 1.
- D) For the first hour, the area covered in Dish 2 is increasing at a higher average rate than the area covered in Dish 1.

22) A typical image taken of the surface of Mars by a camera is 11.2 gigabits in size. A tracking station on Earth can receive data from the spacecraft at a data rate of 3 megabits per second for a maximum of 11 hours each day. If 1 gigabit equals 1,024 megabits, what is the maximum number of typical images that the tracking station could receive from the camera each day?

- A) 3
- B) 10
- C) 56
- D) 144

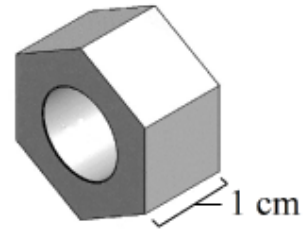
23) $x^2 + y^2 = 153$

$y = -4x$

If (x, y) is a solution to the system of equations above, what is the value of x^2 ?

- A) -51
- B) 3
- C) 9
- D) 144

24)



The figure above shows a metal hex nut with two regular hexagonal faces and a thickness of 1 cm. The length of each side of a hexagonal face is 2 cm. A hole with a diameter of 2 cm is drilled through the nut. The density of the metal is 7.9 grams per cubic cm. What is the mass of this nut, to the nearest gram? (Density is mass divided by volume.)

25) An international bank issues its Traveler credit cards worldwide. When a customer makes a purchase using a Traveler card in a currency different from the customer's home currency, the bank converts the purchase price at the daily foreign exchange rate and then charges a 4% fee on the converted cost.

Sara lives in the United States, but is on vacation in India. She used her Traveler card for a purchase that cost 602 rupees (Indian currency). The bank posted a charge of \$9.88 to her account that included the 4% fee.

What foreign exchange rate, in Indian rupees per one U.S. dollar, did the bank use for Sara's charge? Round your answer to the nearest whole number.

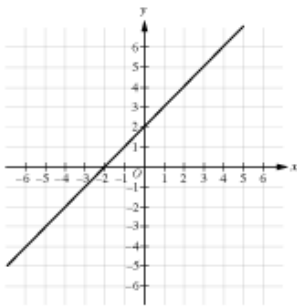
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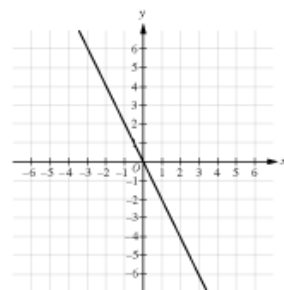
A bank in India sells a prepaid credit card worth 7,500 rupees. Sara can buy the prepaid card using dollars at the daily exchange rate with no fee, but she will lose any money left unspent on the prepaid card. What is the least number of the 7,500 rupees on the prepaid card Sara must spend for the prepaid card to be cheaper than charging all her purchases on the Traveler card? Round your answer to the nearest whole number of rupees.

27) If k is a positive constant different from 1, which of the following could be the graph of $y - x = k(x + y)$ in the xy -plane?

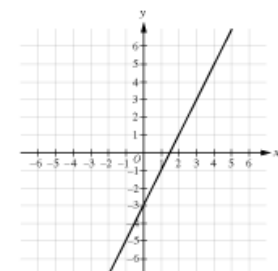
A)



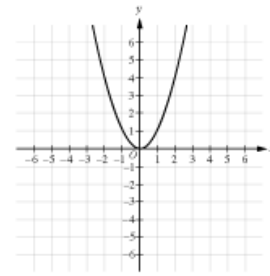
B)



C)



D)



28) The function f is defined by $f(x) = 2x^3 + 3x^2 + cx + 8$, where c is a constant. In the xy -plane, the graph of f intersects the x -axis at the three points $(-4, 0)$, $(\frac{1}{2}, 0)$, and $(p, 0)$. What is the value of c ?

A) -18

B) -2

C) 2

D) 10

29) If the expression $\frac{4x^2}{2x-1}$ is written in the equivalent form $\frac{1}{2x-1} + A$, what is A in terms of x ?

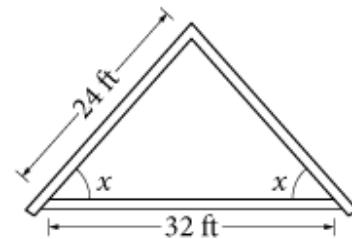
A) $2x + 1$

B) $2x - 1$

C) $4x^2$

D) $4x^2 - 1$

30) An architect drew the sketch below while designing a house roof. The dimensions shown are for the interior of the triangle.



Note: Figure not drawn to scale

What is the value of $\cos x$?