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real sat math B2_Page49.jpg

real sat math B2_Page50.jpg

real sat math B2_Page51.jpg

real sat math B2_Page52.jpg

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real sat math B2_Page54.jpg

CollegeBoard

SAT® Test March 2018 USA

IMPORTANT REMINDERS

1

a no. 2 pencil is required for the test. do not use a mechanical pencil or pen.

2

sharing any questions with anyone is a violation of test security and Fairness policies and may result in your scores being canceled.

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

**Turn to Section 3 of your answer sheet to answer the questions in this section.**

DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 16-20,** solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

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2. All variables and expressions used represent real numbers unless otherwise indicated.

3. Figures provided in this test are drawn to scale unless otherwise indicated.

4. All figures lie in a plane unless otherwise indicated.

5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
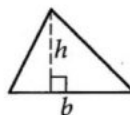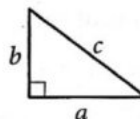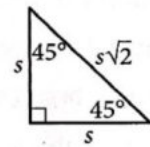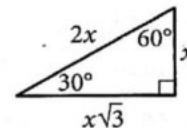
REFERENCE

$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$
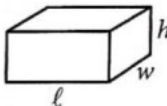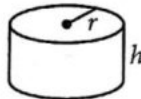
$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell wh$
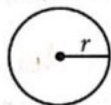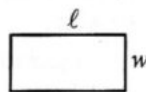
$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$
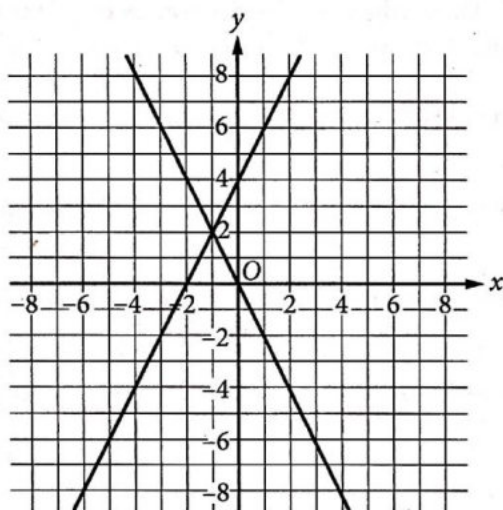
$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

1

The lines in the *xy*-plane above are the graphs of two linear equations. What is the solution (x, y) to the system formed by the equations?

A) $(-2, 4)$

B) $(-1, 2)$

C) $(0, 0)$

D) $(0, 4)$

2

A checkers enthusiast is customizing a checkers set by painting a design on each of the 24 checkers in the set. It takes the enthusiast 35 minutes to paint the design on each checker. If c of the checkers are already painted, which of the following represents the number of additional minutes needed to finish painting the set of checkers?

A) $24(35 - c)$

B) $24(c - 35)$

C) $35(24 - c)$

D) $35(c - 24)$

3
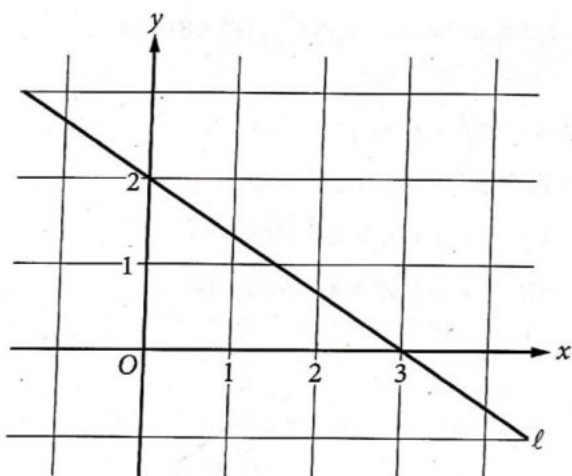
What is the sum of $(3x^5 + 4x^2 + 8)$ and $(12x^3 - 2x^2 + 6)$?

A) $15x^8 + 2x^2 + 14$

B) $3x^5 + 12x^3 + 2x^2 + 14$

C) $3x^5 + 12x^3 + 6x^2 + 14$

D) $3x^5 + 12x^3 + 4x^2 - 2x + 14$

4

Line ℓ is shown in the xy-plane above. Line m (not shown) is parallel to line ℓ and passes through the point $(0, 3)$. Which of the following is an equation of line m ?

A) $y = -\dfrac{2}{3}x + 3$

B) $y = -\dfrac{3}{2}x + 3$

C) $y = \dfrac{2}{3}x + 3$

D) $y = \dfrac{3}{2}x + 3$

5

What are the slope and the y-intercept of the graph in the xy-plane of the equation $5x + 4y + 3 = 0$?

A) The slope is $-\dfrac{5}{4}$, and the y-intercept is $(0, -\dfrac{3}{4})$.

B) The slope is $-\dfrac{5}{4}$, and the y-intercept is $(0, \dfrac{3}{4})$.

C) The slope is $\dfrac{5}{4}$, and the y-intercept is $(0, -\dfrac{3}{4})$.

D) The slope is $\dfrac{5}{4}$, and the y-intercept is $(0, \dfrac{3}{4})$.

6

$$\frac{1}{4}x - 2 = 3 - x$$

What value of x satisfies the equation above?

A) $\dfrac{4}{3}$

B) 4

C) 5

D) $\dfrac{20}{3}$

7

$$(2x-1)(x+2)^2 = 0$$

What is the solution set to the equation above?

A) $\left\{\dfrac{1}{2}, -2\right\}$

B) $\left\{-\dfrac{1}{2}, 2\right\}$

C) $\left\{\dfrac{1}{2}, -2, 2\right\}$

D) $\left\{-\dfrac{1}{2}, -2, 2\right\}$

8

$$(3+4i)-(2+3i)$$

In the complex number system, which of the following is equivalent to the expression above? (Note: $i = \sqrt{-1}$)

A) 0

B) $1+i$

C) $-1-i$

D) $-5-7i$

9

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

What is the solution to the equation shown?

A) -5

B) -2

C) 0

D) 1

10

$$P(x) = x^2 - 11x + k$$

In the function above, k is a constant. If 2 is a zero of the function, what is the value of k ?

A) -18

B) -2

C) 3

D) 18

11

$$\frac{2}{3x^2} - \frac{1}{6x^2}$$

Which of the following expressions is equivalent to the expression above for $x > 0$?

A) $-\dfrac{1}{2x^2}$

B) $-\dfrac{1}{3x^2}$

C) $\dfrac{1}{3x^2}$

D) $\dfrac{1}{2x^2}$

12

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

What is the solution set of the equation above?

A) $\{1\}$

B) $\{0, 3\}$

C) $\{1, 2\}$

D) $\{1, 3\}$

13

$$P(t) = 60(3)^{\frac{t}{2}}$$

The number of microscopic organisms in a petri dish grows exponentially with time. The function P above models the number of organisms after growing for t days in the petri dish. Based on the function, which of the following statements is true?

A) The predicted number of organisms in the dish triples every two days.

B) The predicted number of organisms in the dish doubles every three days. ·

C) The predicted number of organisms in the dish triples every day.

D) The predicted number of organisms in the dish doubles every day.

14

In the xy-plane, the graph of the equation $y = 9x - 8$ intersects the graph of the equation $y = x^2$ at two points. What is the sum of the x-coordinates of the two points?

A) −9

B) −7

C) 7

D) 9

15

Which of the following expressions is equivalent to $(-4x^3)^{\frac{2}{3}}$?

A) $-2x^3 \cdot \sqrt[3]{2}$

B) $-x^3 \cdot \sqrt[3]{16}$

C) $2x^2 \cdot \sqrt[3]{2}$

D) $2x^2 \cdot \sqrt[3]{16}$

DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the *circles are filled in correctly.*

2. Mark no more than one circle in any column.

3. No question has a negative answer.

4. Some problems may have more than one correct answer. In such cases, grid only one answer.

5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If [3 1 / 2] is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)

6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$

Write answer in boxes. → Fraction line

Grid in result.

Answer: 2.5

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

Answer: 201 – either position is correct

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

16

Note: Figure not drawn to scale.

In right triangle ABC above, $BC = 8$. If the

cosine of $x°$ is $\dfrac{\sqrt{3}}{2}$, what is the length of $\overline{AB}$?

17

$$\frac{1}{x} + \frac{1}{x-1} = 0$$

What value of x satisfies the equation above?

18

For a function f, $f(-1) = 12$ and $f(1) = 16$. If the graph of $y = f(x)$ is a line in the xy-plane, what is the slope of the line?

19

An angle measure of 540 degrees was written in radians as $x\pi$. What is the value of x ?

20

Tamika is ordering desktop computers for her company. The desktop computers cost \$375 each, and tax is an additional 6% of the total cost of the computers. If she can spend no more than \$40,000 on the desktop computers, including tax, what is the maximum number of computers that Tamika can purchase?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.


DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 31-38,** solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

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4. All figures lie in a plane unless otherwise indicated.

5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
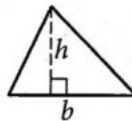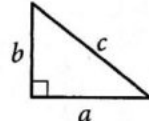
REFERENCE

$A = \pi r^2$
$C = 2\pi r$
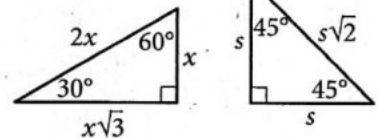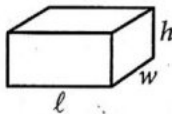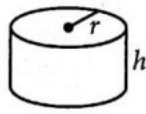
$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$
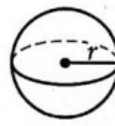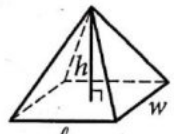
Special Right Triangles

$V = \ell wh$
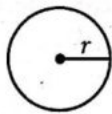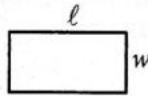
$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

1

$$(3x + 2)(2x + 3)$$

Which of the following is equivalent to the expression above?

A) $3x^2 + 10x + 5$

B) $5x^2 + 13x + 5$

C) $6x^2 + 13x + 6$

D) $6x^2 + 15x + 9$

2

$$f(x) = 2x - 11$$

The function f is defined above. What is the value of $f(-2)$?

A) -15

B) -7

C) 15

D) 30

3

Number of Flight Arrivals at
Centerville Airport in a Month

	On time	Delayed	Total
Airline A	2,029	861	2,890
Airline B	1,150	700	1,850
Total	3,179	1,561	4,740

Based on the table above, what fraction of the flights for Airline A were delayed?

A) $\dfrac{700}{1,850}$

B) $\dfrac{861}{1,561}$

C) $\dfrac{861}{2,890}$

D) $\dfrac{2,029}{2,890}$

4

A political scientist wants to predict how the residents of New Jersey will react to a new bill proposed in the state senate. Which of the following study designs is most likely to provide reliable results for the political scientist?

A) Mailing a questionnaire to each of 200 randomly selected residents of New Jersey

B) Surveying a group of 300 randomly selected New Jersey residents

C) Interviewing a group of students randomly selected from a large public university in New Jersey

D) Surveying a group of 1,500 randomly selected US residents

5

If the ratio of $0.5 : x$ is equivalent to $1.5 : 2.25$, what is the value of x ?

A) 0.75

B) 1.6875

C) 3

D) 3.25

6

$$8ax - 4 = 24$$

Based on the equation above, what is the value of $2ax - 1$?

A) 3

B) 6

C) 8

D) 12

7

$$P = 2,000x$$
$$P = 500(2^x)$$

A website administrator is considering using one of the two models above to predict the total number of purchases, P, made x weeks after the website's advertising campaign begins. How many more purchases are predicted by the exponential model than by the linear model 5 weeks after the advertising campaign begins?

A)   6,000

B)   8,000

C)   10,000

D)   16,000

Questions 8-10 refer to the following information.

The Conowingo Reservoir had an original storage capacity of 300,000 acre-feet at the end of 1928, the year in which it was built. Starting in 1929, sediment carried downstream by the Susquehanna River collected in the reservoir and began reducing the reservoir's storage capacity at the approximate rate of 1,700 acre-feet per year.

8

Which of the following could be a graph of the reservoir's capacity c, in acre-feet, as a function of time t, in years, after 1928?

A)

B)

C)

D)
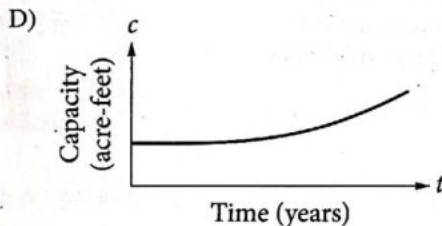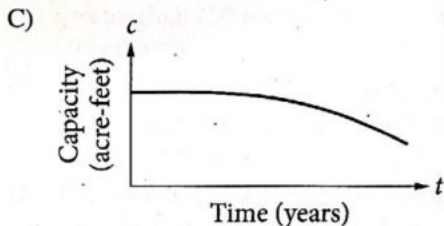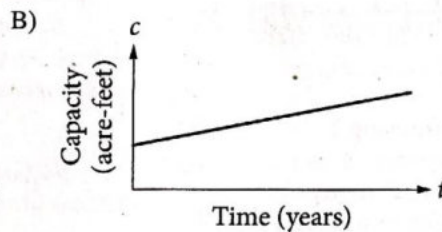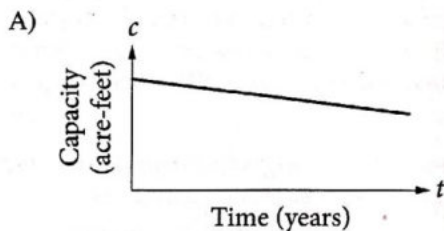
9

What was the approximate storage capacity, in acre-feet, of the reservoir at the end of 1993?

A) 300,000

B) 189,500 ·

C) 175,000

D) 159,500

10

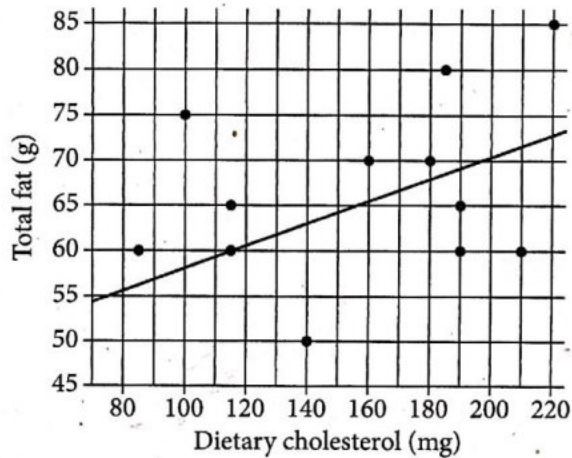If the reservoir's capacity t years after 1928 was between 290,000 and 292,000 acre-feet, which of the following must be true?

A) $t < 2$

B) $2 < t < 4$

C) $4 < t < 6$

D) $6 < t < 8$

11

Total Fat and Dietary Cholesterol of Sandwiches

The scatterplot above shows the relationship between the amount of dietary cholesterol, in milligrams (mg), and the amount of total fat, in grams (g), in the 12 sandwiches offered by a certain restaurant. The line of best fit predicts the amount of total fat a sandwich has based on the amount of dietary cholesterol in the sandwich. How many grams of total fat are in the sandwich for which this prediction is the most accurate?
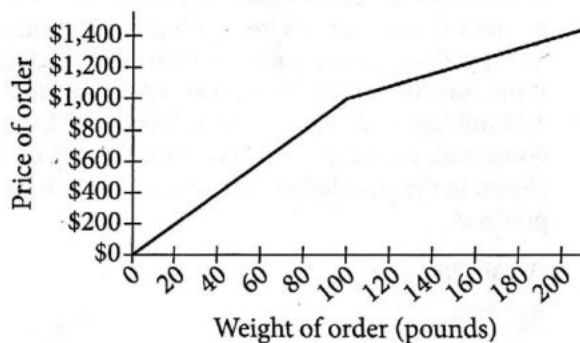
A) 140

B) 115

C) 85

D) 60

12

Which of the following is a solution to the equation $\sqrt{14-x}+2=x$?

I. -2

II. 1

III. 5

A) I only

B) II only

C) III only

D) I and III

13

Fragrance Oil Price

The graph above shows the price that a chemical company charges for an order of fragrance oil, depending on the weight of the order. Based on the graph, which of the following statements must be true?

A) The company charges more per pound for orders greater than 100 pounds than for orders less than 100 pounds.

B) The company charges less per pound for orders greater than 100 pounds than for orders less than 100 pounds.

C) The company charges less per pound for orders greater than 1,000 pounds than for orders less than 1,000 pounds.

D) The company charges the same price per pound, regardless of order size.

14

If $2x + 3 = x - 4$, what is the value of $x + 8$?

A) -7

B) -1

C) 1

D) 7

15

A group of 10 students played a certain game. Every player received a score equal to an integer from 1 to 10, inclusive. For the 10 players, the mean score was 4. If more than half of the players received a score greater than 5, which of the following is true about the mean score of the remaining players?

A) It must be less than 4.

B) It must be equal to 4.

C) It must be between 4 and 5.

D) It must be greater than 5.

16
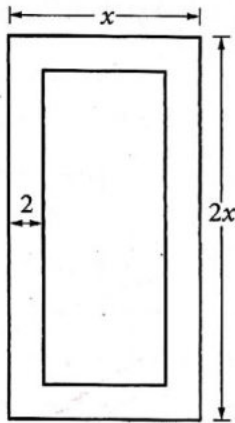
The figure above represents a rectangular painting with a frame that is 2 inches wide. The expression $2x^2 - (x-4)(2x-4)$ represents the area of the frame, in square inches. What does the quantity $(x-4)(2x-4)$ in the expression represent?

A) The width of the painting, in inches
B) The height of the frame, in inches
C) The area, in square inches, of the inner rectangle
D) The combined area, in square inches, of the frame and painting

17

$$f(x) = x(x+5)$$

The function f is defined above. If the function g is defined by $g(x) = f(x) + 5$, what is the value of $g(3)$?

A) 8
B) 15
C) 24
D) 29

18

A sample of 600 ninth graders was selected at random and asked how much time they spend on homework each day. Of the ninth graders selected, 220 spend less than 2 hours on homework each day. If the conclusion was drawn that "approximately 1.35 million ninth graders spend less than 2 hours on homework each day," which of the following is closest to the population, in millions, of ninth graders?

A) 0.495
B) 1.35
C) 3.68
D) 5.84

19

$$y = -2$$
$$y + 11 = x^2$$

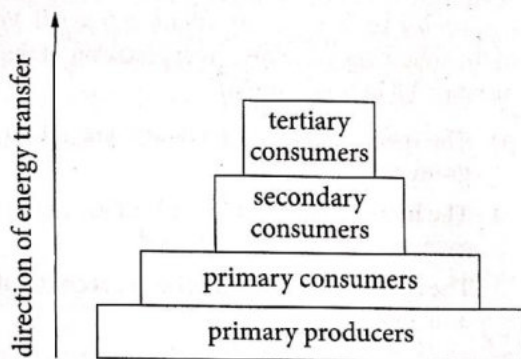If (x_1, y_1) and (x_2, y_2) are solutions to the system of equations above, what are the values of x_1 and x_2 ?

A) $-\sqrt{13}$ and $\sqrt{13}$
B) $-\sqrt{11}$ and $\sqrt{11}$
C) -2 and 2
D) -3 and 3

20

The energy pyramid below shows four trophic levels in an ecosystem and the direction of energy transfer between those levels.

On average, 10% of the net energy of one trophic level is transferred to the next trophic level in an ecosystem. Based on the energy pyramid, if primary producers have 5,000 joules (J) of energy, approximately how much of this energy, in <u>calories</u>, is transferred to the secondary consumers in this ecosystem? (1 calorie = 4.18 J)
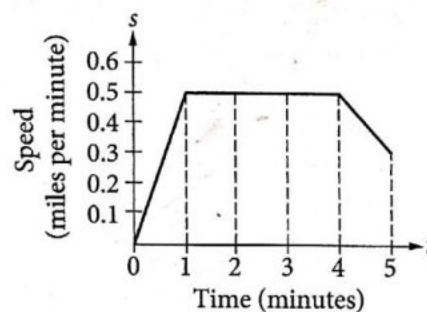
A) 11.96

B) 20.90

C) 119.6

D) 209.0

21

$$\sqrt[a]{x^b}$$

Which of the following is equivalent to the expression above for all $x > 0$, where a and b are positive integers?

A) x^{ab}

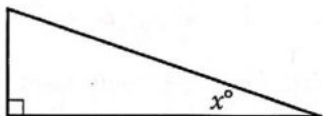B) $x^{\frac{a}{b}}$

C) $x^{\frac{b}{a}}$

D) x^{a-b}

22

The graph above models the speed, s, of an automobile during the first 5 minutes of travel time, t. What was the total distance traveled from $t = 1$ to $t = 4$?

A) 0.5 mile

B) 1.5 miles

C) 2.0 miles

D) 2.5 miles

23

Note: Figure not drawn to scale.

In the figure above, $\sin(90° - x°) = \dfrac{12}{13}$. What is the value of $\sin x°$?

A) $\dfrac{12}{13}$

B) $\dfrac{5}{13}$

C) $\dfrac{5}{12}$

D) $\dfrac{13}{12}$

24

$$s = 9.8t$$

The equation above can be used to approximate the speed s, in meters per second (m/s), of an object t seconds after being dropped into a free fall. Which of the following is the best interpretation of the number 9.8 in this context?

A) The speed, in m/s, of the object when it hits the ground

B) The increase in speed, in m/s, of the object for each second after it is dropped

C) The speed, in m/s, of the object t seconds after it is dropped

D) The initial speed, in m/s, of the object when it is dropped

25

A magazine article on video game habits in the United States reported that in 2012 gamers spent an average of 5.6 hours per week playing games. The article also reported the average for 2013 to be 6.3 hours per week. Based on the article, how did the average number of hours that gamers spent playing games per week change from 2012 to 2013?

A) It decreased by 12.5%.

B) It increased by 7.0%.

C) It increased by 11.1%.

D) It increased by 12.5%.

26

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

In the system of equations above, a is a constant. What is the y-value of the solution to the system in terms of a ?

A) $\dfrac{-3a - 25}{7}$

B) $\dfrac{a - 1}{7}$

C) $\dfrac{2a + 5}{7}$

D) $\dfrac{10a + 5}{7}$

27

$$y = x^2 - 6x - 16$$

The graph of the equation above in the xy-plane is a parabola. Which of the following equivalent forms of the equation includes the x- and y-coordinates of the vertex as constants?

A) $y = (x - 3)^2 - 25$

B) $y = x(x - 6) - 16$

C) $y = x^2 - 2(3x + 8)$

D) $y + 16 = x(x - 6)$

Questions 28 and 29 refer to the following information.

For a particular office building with 1,420 employees, Tia and Amir each conducted a survey about the average one-way commute times, in minutes, between the employees' home and office. Both Tia and Amir selected employees at random, mailed out surveys, and collected data from the returned surveys. For both surveys, respondents were asked to report their average commute times to the nearest 5 minutes. Tia collected data from 150 employees, and Amir collected data from 85 employees. The results from Tia's and Amir's returned surveys are summarized below.

Tia's Survey Results

Average one-way commute time
(minutes)

Amir's Survey Results
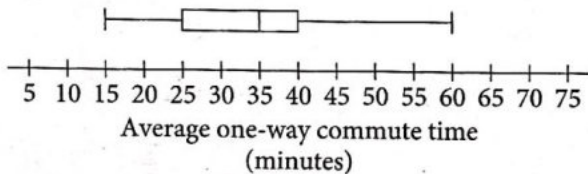
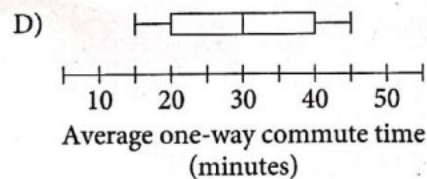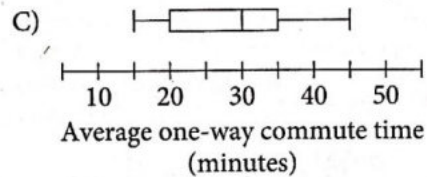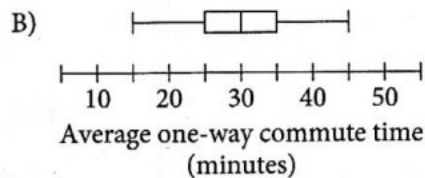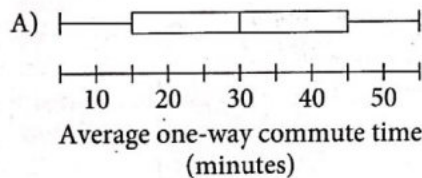Average one-way commute time (minutes)
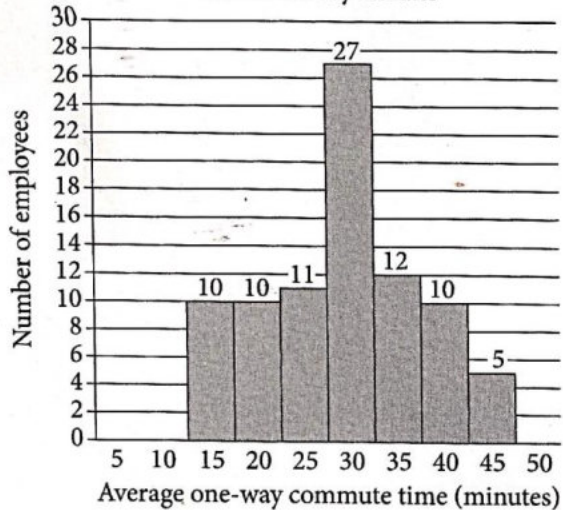
28

If T is the median commute time of the employees who responded to Tia's survey and A is the median commute time of the employees who responded to Amir's survey, what is the value of $T - A$?

A) 10

B) 8

C) 5

D) 0

Which of the following box plots could represent Amir's survey data?

A)

Average one-way commute time
(minutes)

B)

Average one-way commute time
(minutes)

C)

Average one-way commute time
(minutes)

D)

Average one-way commute time
(minutes)
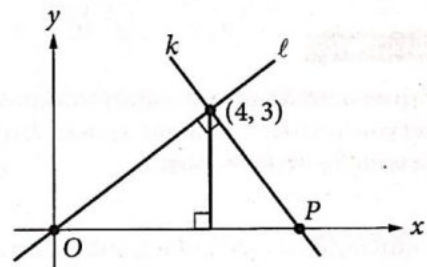
In the xy-plane above, lines k and ℓ are perpendicular. What is the x-coordinate of point P ?

A) 5.25

B) 5.75

C) 6

D) 6.25

DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If $\boxed{3\,1\,/\,2}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$

Write answer in boxes. → 7 / 1 2
← Fraction line
Grid in result.

Answer: 2.5

2 . 5
← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

2 / 3   . 6 6 6   . 6 6 7

Answer: 201 – either position is correct

2 0 1   2 0 1

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

31

A museum built a scale model of an *Apatosaurus* dinosaur skeleton, where 1 centimeter in the model is equivalent to 16 centimeters of the actual skeleton. If the length of the femur bone of the actual skeleton is 184 centimeters, what is the length, to the nearest tenth of a centimeter, of the femur bone in the model?

32

How many cups, each with a capacity of 8 fluid ounces, can be filled with water from a cooler that contains 10 gallons of water? (1 gallon = 128 fluid ounces)

33

In triangle ABC, angle A measures 48°, angle B measures 88°, and angle C measures 44°.

Triangle ABC is similar to triangle LMN, such that $\frac{LM}{AB} = \frac{MN}{BC} = \frac{LN}{AC} = 3$. What is the measure, in degrees, of angle L ?

34

$$\frac{1}{2}y = \frac{19}{12} - \frac{1}{3}x$$
$$5y = 3x$$

In the xy-plane, the lines that correspond to the system of equations above intersect at the point (a, b). What is the value of $\frac{a}{b}$?

35

$$z = \frac{5}{2}z - \frac{21}{8}$$

What value of z satisfies the equation above?

36

A circle in the xy-plane has a diameter with endpoints $(-1, -3)$ and $(7, 3)$. If the point $(0, b)$ lies on the circle and $b > 0$, what is the value of b ?

Questions 37 and 38 refer to the following information.

Race Summary

Split number	Race segment (meters)	Split time (seconds)	Total race time at end of split (seconds)
1	0–500	109	109
2	500–1000	112	221
3	1000–1500	111	332
4	1500–2000	108	440

A rowing team entered a 2000-meter race. The team's coach is analyzing the race based on the team's split times, as shown in the table above. A split time is the time it takes to complete a 500-meter segment of the race.

37

During the fourth split of the race, the team rowed at a rate of 28 strokes per minute. To the nearest whole number, how many strokes did it take the team to complete the final 500 meters of the race?

38

By the end of the season, the coach wants the team to reduce its mean split time by 10% as compared to this race. At the end of the season, what should the team's mean split time be, in seconds?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.