MOCK EXAM NO. ( )

Name: .....

Section (3)	
No. of right answers	
No. of wrong answers	

Section (4)	
No. of right answers	
No. of wrong answers	

Score: .....

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Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

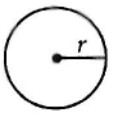
DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble 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

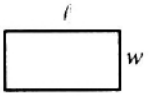
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

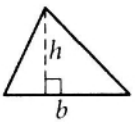


$A = \pi r^2$

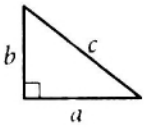
$C = 2\pi r$



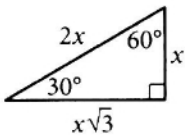
$A = \ell w$

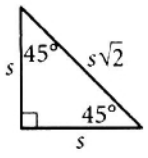


$A = \frac{1}{2}bh$

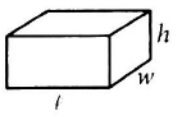


$c^2 = a^2 + b^2$

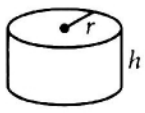




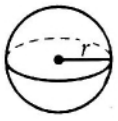
Special Right Triangles



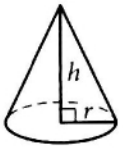
$V = \ell wh$



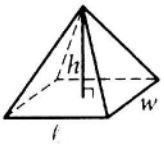
$V = \pi r^2 h$



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



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

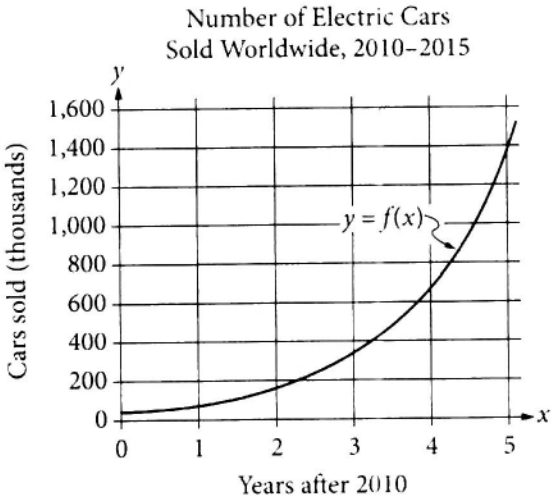


$V = \frac{1}{3}\ell wh$

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.

CONTINUE

1



The graph of the exponential function f shown gives the estimated number of electric cars, in thousands, that were sold worldwide x years after 2010. Which of the following equations best models the function $f(x)$?

A) $f(x) = 2.05(37.6)^x$

B) $f(x) = 2.05(37.6)^{-x}$

C) $f(x) = 37.6(2.05)^x$

D) $f(x) = 37.6(2.05)^{-x}$

2

$$y = 36$$

$$y = x^2$$

If (x, y) is a solution to the system of equations above and $x > 0$, what is the value of x ?

A) 6

B) 9

C) 18

D) 72

3

$$\frac{5}{x+1} = \frac{5}{8}$$

What is the solution to the given equation?

A) 7

B) $\frac{39}{5}$

C) 9

D) 35

4

Nathaniel is shopping online. In order to receive free shipping, Nathaniel must spend at least $50 before taxes. He currently has a $30 candle holder in his online shopping cart. The inequality $10x + 30 \geq 50$ represents this situation, where x is the number of candles Nathaniel will add to his cart to receive free shipping. Which of the following is the best interpretation of the number 10 in this context?

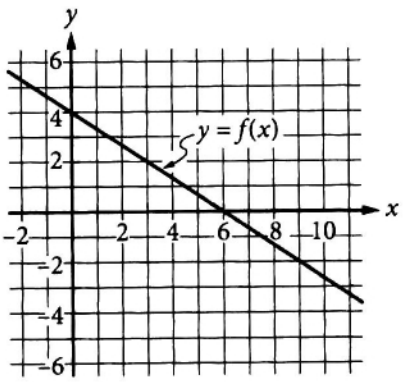
A) The total number of products he will add to his cart

B) The total number of candles he will add to his cart

C) The price, in dollars, of all the products in his cart

D) The price, in dollars, of one candle that will be added to his cart

5



The graph of the linear function f is shown in the xy-plane above. Which of the following defines f?

A) $f(x) = -\frac{2}{3}x + 4$

B) $f(x) = \frac{1}{3}x + 4$

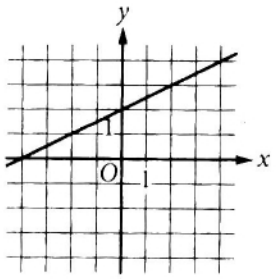
C) $f(x) = -\frac{3}{2}x + 6$

D) $f(x) = -\frac{1}{2}x + 6$

CONTINUE

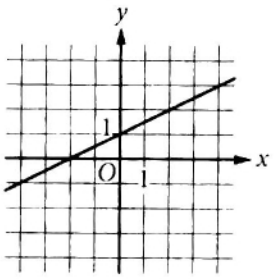
3

6

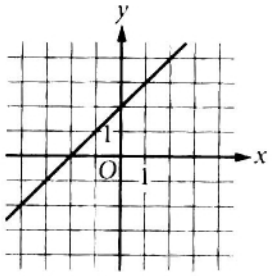


The graph of the equation $y = mx + b$, where m and b are constants, is shown in the xy-plane above. Which of the following is the graph of the equation $y = 2(mx + b)$?

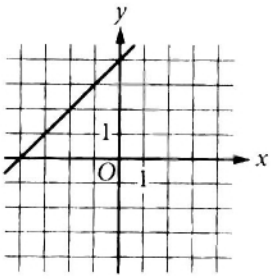
A)



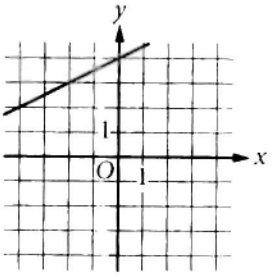
B)



C)



D)



7

In triangle ABC, one angle measures 20° and another angle measures 50°. If the length of each side of triangle ABC is doubled, which of the following is the measure of one of the angles in the resulting triangle?

A) 30°

B) 50°

C) 70°

D) 100°

CONTINUE

8

Last week, Rosa played x hours of video games on Saturday and a total of y hours of video games for the other 6 days of the week. If she played a total of 15 hours of video games last week, which of the following equations shows a relationship between x and y ?

A) $x - y = 15$

B) $x + y = 15$

C) $x + 6y = 15$

D) $6x - y = 15$

9

$$v(t) = 11t + 5$$

The given equation models the relationship between a car's speed v, in feet per second, and the number of seconds, t, after the driver started accelerating, where $0 \leq t \leq 8$. Which of the following is the best interpretation of $v(5) = 60$ in this context?

A) Five seconds after the driver started accelerating, the speed of the car was 60 times its initial speed.

B) Sixty seconds after the driver started accelerating, the speed of the car was 5 times its initial speed.

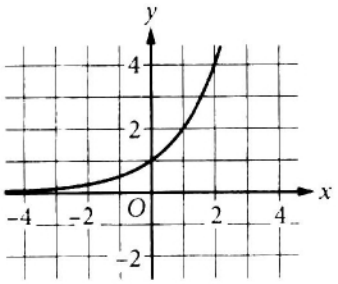
C) Sixty seconds after the driver started accelerating, the speed of the car was 5 feet per second.

D) Five seconds after the driver started accelerating, the speed of the car was 60 feet per second.

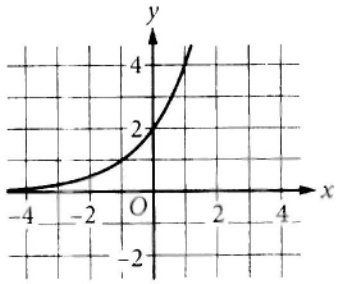
10

Which of the following is the graph of $y = 2^{x+1}$ in the xy-plane?

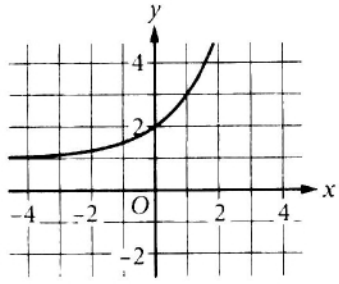
A)



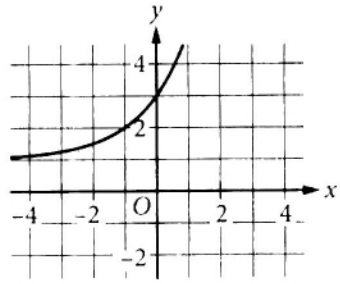
B)



C)



D)



11

Which of the following is equivalent to $(\sqrt{45})(\sqrt[3]{40})$?

A) $5\left(\sqrt[5]{5^4}\right)$

B) $5\left(\sqrt[6]{5^5}\right)$

C) $6\left(\sqrt[5]{5^4}\right)$

D) $6\left(\sqrt[6]{5^5}\right)$

12

$$p(t) = -159(t - 9)^2 + 102{,}000$$

The number of pieces of first-class mail, in millions, processed by the US Postal Service each year from 1992 to 2007 can be modeled by the given function p, where t is the number of years after 1992. Based on the model, which year from 1992 to 2007 had the greatest number of pieces of first-class mail processed?

A) 1999

B) 2000

C) 2001

D) 2002

13

The function f is graphed in the xy-plane, where $y = f(x)$. The graph contains the points $(0, 3)$, $(6, 0)$, and $(9, 0)$. Which of the following CANNOT be true?

A) $f(9) < 0$

B) $f(3) < 0$

C) $f(3) > 0$

D) $f(0) < 9$

14

If $k^2 + 6k - 10 = 0$, which of the following is a possible value of $k + 3$?

A) 2

B) $\sqrt{10}$

C) $\sqrt{19}$

D) 5

15

$$R: x^2 + y^2 = 36$$

$$T: x^2 + (y - 3)^2 = 36$$

The equations of circles R and T are given above. Which of the following transformations of the graph of R in the xy-plane results in the graph of T?

A) A shift of 3 units to the right

B) A shift of 3 units to the left

C) A shift of 3 units up

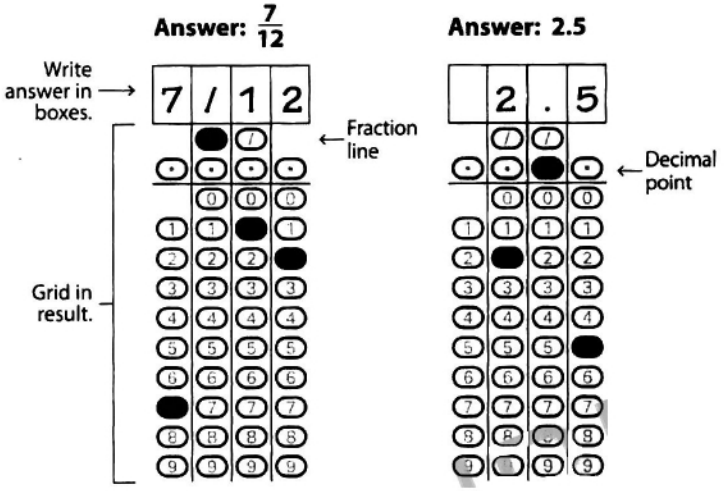
D) A shift of 3 units down

CONTINUE

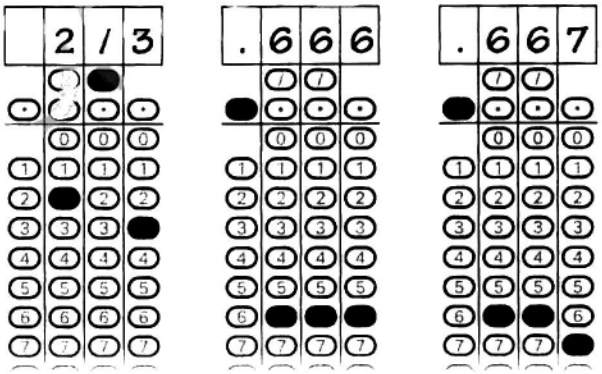
DIRECTIONS

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

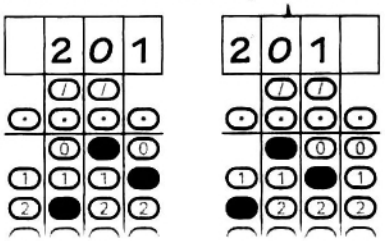
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble in any column.
3. No question has a negative answer.
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.



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.

CONTINUE

3

16

$$3x + 4 + 2x + 6 = 14$$

What is the solution to the equation above?

17

$$2x + y = 28$$

$$3y = 60$$

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

18

Sphere A and right circular cylinder C both have radius r. The height of cylinder C is 12 units. For what value of r will the volume of sphere A be twice the volume of cylinder C?

19

$$k - 2 + 6x = 2(3x + 4)$$

In the equation above, k is a constant. If the equation has an infinite number of solutions, what is the value of k ?

20

The expression $10x(x^2 + 9)$ is equivalent to $ax^b + cx$, where a, b, and c are constants. What is the value of abc ?

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 bubble 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

1. The use of a calculator **is permitted**.
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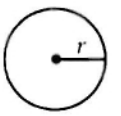

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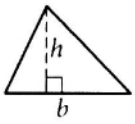
$C = 2\pi r$

$A = \ell w$



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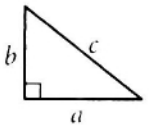
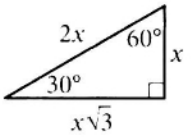
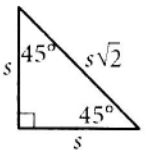
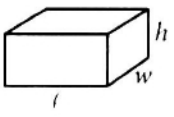


$c^2 = a^2 + b^2$





Special Right Triangles



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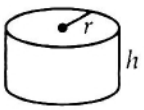
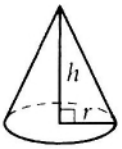
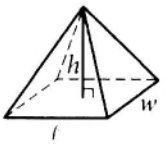


$V = \pi r^2 h$

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



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



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

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.

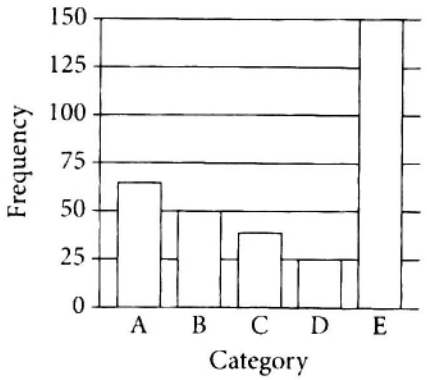
4

1

The ratio of a to b is 3 to 4. If the value of a is 1,200, what is the value of b ?

A) 900
B) 1,600
C) 3,600
D) 4,800

2



In the bar graph shown, which category has a frequency that is $\frac{1}{6}$ the frequency of category E?

A) Category A
B) Category B
C) Category C
D) Category D

Questions 3 and 4 refer to the following information.

A research company selected a random sample of 1,270 working adult residents of a city and asked them about the number of hours they work each week. The results of the survey are summarized in the table.

Number of hours reported	Fewer than 35	From 35 to 50	More than 50
Number of people	100	940	230

3

What fraction of the people surveyed reported working from 35 to 50 hours each week?

A) $\frac{10}{127}$

B) $\frac{23}{127}$

C) $\frac{33}{127}$

D) $\frac{94}{127}$

4

One person who participated in the survey will be selected at random. What is the probability, to the nearest hundredth, of selecting a person who reported working more than 50 hours each week?

A) 0.74

B) 0.22

C) 0.18

D) 0.08

4

5

A metal rod is 1,000 centimeters long. How long is the rod, in meters? (1 meter = 100 centimeters)

A) 10
B) 100
C) 10,000
D) 100,000

6

In the xy-plane, the graph of the linear equation $y = kx + c$, where k and c are constants, contains the points $(0, 0)$ and $(4, 8)$. What is the value of k ?

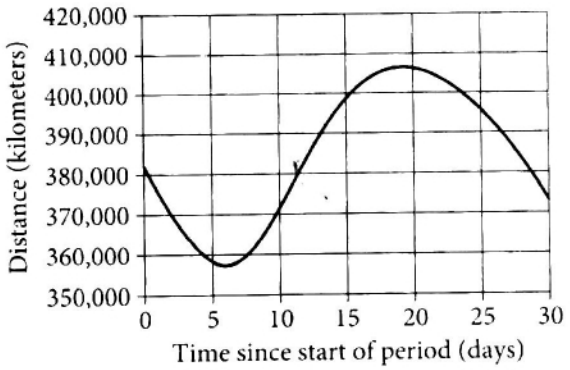
A) 1
B) 2
C) 4
D) 8

7

In the xy-plane, the graph of $y = f(x)$ is a line that passes through $(0, 20)$ and has a slope of 3. Which of the following defines f ?

A) $f(x) = 20x$
B) $f(x) = 20x + 3$
C) $f(x) = 3x$
D) $f(x) = 3x + 20$

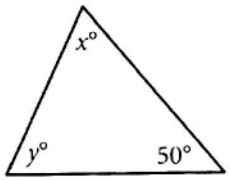
8



The graph shows the distance between the Moon and the North Pole during a 30-day period. Which of the following is closest to the total number of days that the Moon was less than 370,000 kilometers from the North Pole during this period?

A) 2
B) 8
C) 10
D) 20

9



In the triangle shown, which of the following represents y in terms of x ?

A) $y = 40 + x$
B) $y = 50 + x$
C) $y = 130 - x$
D) $y = 230 - x$

10

If $\sin(23°) = \cos(y°)$, and $0° < y < 90°$, what is the value of y ?

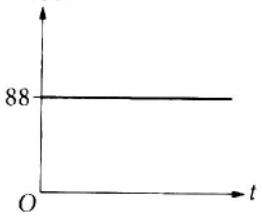
A) 23
B) 46
C) 67
D) 69

11

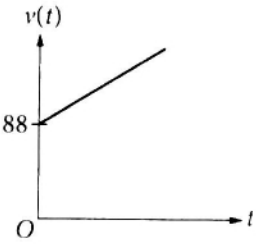
$$v(t) = 88 - at$$

The speed, in feet per second, of a car t seconds after the brakes are applied can be modeled by the function v above, where a is a positive constant. Which of the following could represent the graph of the function v ?

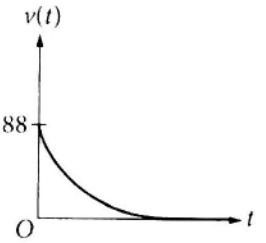
A)



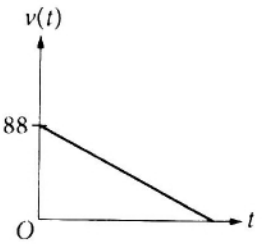
B)



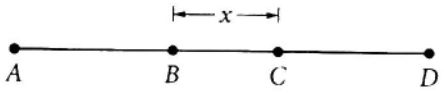
C)



D)



12



Note: Figure not drawn to scale.

For segment AD shown, $AB = 2x$ and $CD = AB + 1$. If $AD = 26$, which of the following equations represents this situation?

A) $26 = 4x + 1$

B) $26 = 4x - 1$

C) $26 = 5x + 1$

D) $26 = 5x - 1$

13

If $3x - 12 = 18$, what is the value of $3x$?

A) 30

B) 10

C) 6

D) 2

14

The frequency table shows the age distribution (rounded down to the nearest year) of 2,401 elephants that are monitored by an elephant conservation program.

Age (years)	Number of elephants
0 to 9	708
10 to 19	402
20 to 29	533
30 to 39	466
40 to 49	219
50+	73
Total	2,401

Which age interval contains the median age of these elephants?

A) 10 to 19

B) 20 to 29

C) 30 to 39

D) 40 to 49

15

In the xy-plane, line ℓ contains the point $(6, -4)$ and is perpendicular to the line $y = -3x + 5$. Which of the following is an equation of line ℓ ?

A) $y = \frac{1}{3}x - 22$

B) $y = \frac{1}{3}x - 6$

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

D) $y = -\frac{1}{3}x + 14$

CONTINUE

Questions 16 and 17 refer to the following information.

A farmer in Manitoba, Canada, is deciding, based on the information in the table, which of two crops to grow on 500 acres of land.

Crop	Cost per acre (Canadian dollars)	Market price per bushel (Canadian dollars)
Oats	190	3.00
Corn	340	4.50

The farmer uses the given functions to model the profit, in Canadian dollars, from growing each crop, where x is the yield per acre, in bushels, for the crop.

$$\text{Oats: } f(x) = 500(3x - 190)$$
$$\text{Corn: } g(x) = 500(4.5x - 340)$$

(Profit = revenue − costs. A negative profit is a loss.)

16

If the yields per acre x, in bushels, of corn and oats are equal and the predicted profits $f(x)$ and $g(x)$, in Canadian dollars, are equal, what is the value of x ?

A) 60
B) 70
C) 100
D) 150

17

If $y = g(x)$ is graphed in the xy-plane, which of the following is the best interpretation of the x-coordinate of the x-intercept in this context?

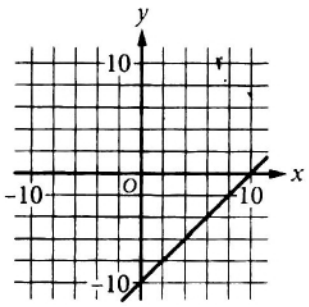
A) The yield per acre of corn, in bushels, that would result in a profit of 0 Canadian dollars
B) The yield per acre of corn, in bushels, that would result in the maximum profit
C) The loss, in Canadian dollars, if the yield per acre of corn, in bushels, were 0
D) The maximum possible profit, in Canadian dollars, from growing corn

CONTINUE

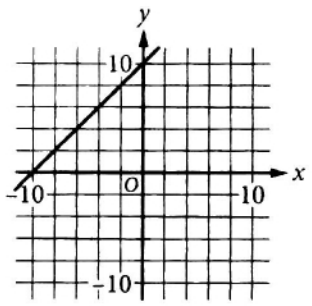
18

Which of the following shaded regions represents the solutions to the inequality $x - y \leq 10$?

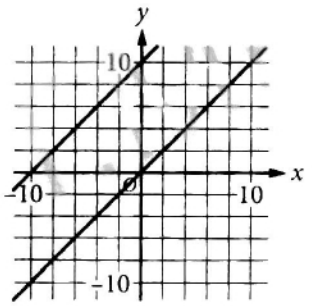
A)



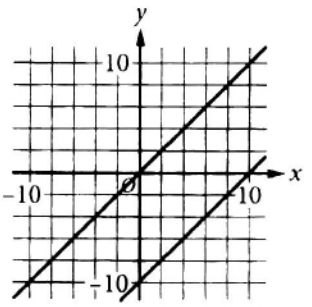
B)



C)



D)



19

$$b = kc$$

The equation above shows a relationship between the variables b and c, where k is a constant. Which of the following is equivalent to $4b$?

A) $\frac{1}{4}c$

B) $4c$

C) $\frac{k}{4}c$

D) $4kc$

20

Which of the following represents the value of d increased by 67%?

A) $0.33d$

B) $0.67d$

C) $1.33d$

D) $1.67d$

CONTINUE

21

The positive number c is 20% less than the positive number k. Which of the following is equivalent to c ?

A) $0.02k$

B) $0.08k$

C) $0.20k$

D) $0.80k$

22

Moore's law predicts that the number of transistors that can fit on an integrated circuit doubles about every 2 years. If Moore's law is modeled by a function M that gives the predicted number of transistors, $M(t)$, that can fit on an integrated circuit as a function of time t, in years, which of the following describes the function M ?

A) Decreasing exponential

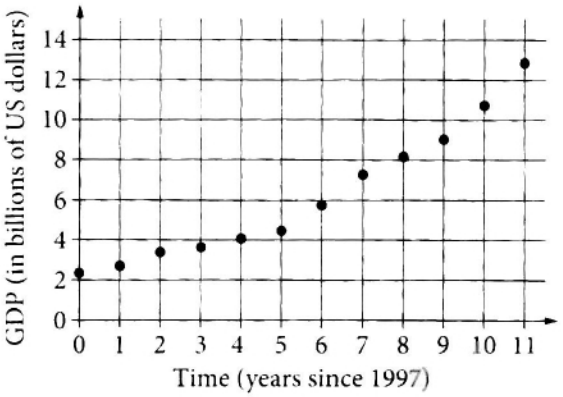
B) Increasing exponential

C) Decreasing linear

D) Increasing linear

23

The scatterplot shows the gross domestic product (GDP), in billions of US dollars, of Albania each year from 1997 to 2008.



Of the following, which equation best models the GDP y, in billions of US dollars, of Albania, where x is the number of years since 1997?

A) $y = 0.2^x$

B) $y = 1.2^x$

C) $y = 2.3(0.2)^x$

D) $y = 2.3(1.2)^x$

CONTINUE

24

$$A(t) = 55{,}000(0.79)^t$$

An antibiotic is introduced to a certain culture of bacteria. After t days, the number of bacteria per milliliter, $A(t)$, remaining can be modeled by the function A shown. Which of the following expressions represents the predicted number of bacteria remaining in each milliliter of the culture x hours after the antibiotic is introduced?

A) $55{,}000(0.79)^x$

B) $55{,}000(0.79)^{x+24}$

C) $55{,}000(0.79)^{\frac{x}{24}}$

D) $55{,}000(0.79)^{24x}$

25

Data set A consists of 30 data values. The minimum value is 40, and the maximum value is 60. Data set B consists of the 30 values in data set A and one additional value x. Which of the following values of x will result in the mean of data set B being less than the mean of data set A and the range of data set B being greater than the range of data set A?

A) 1

B) 40

C) 50

D) 100

26

$$4x^2 - 12x = c$$

In the equation above, c is a constant. If the equation has exactly one solution, what is the value of c ?

A) -9

B) -3

C) 3

D) 9

27

$$W = 0.016t + 1.2$$

$$G = 0.036t + 0.4$$

The equations above model the colony diameters, W and G, in millimeters (mm), of two colonies of a particular species of mold t hours (hr) after both colonies began to grow. Based on the models, at the time when the colony diameters are the same, which of the following is true?

A) The diameter of each colony is 40 mm.

B) Each colony has been growing for 40 hr.

C) The growth rate of each colony's diameter is 40 mm/hr.

D) Each colony's diameter has increased by 40 mm since both colonies began to grow.

28

If $x > 2$, for what value of a is $\frac{5x^2 + ax - 8}{x - 2}$

equivalent to $5x + 4$?

A) -6

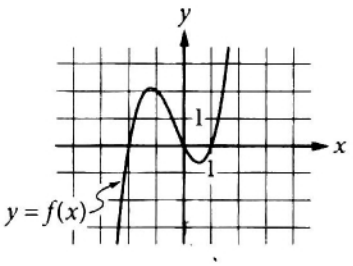
B) -2

C) 2

D) 4

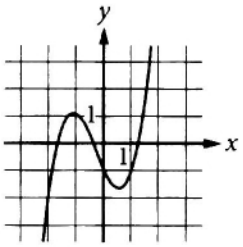
CONTINUE

29

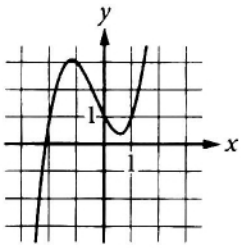


The graph of the function f, defined by $f(x) = (x + a)(x + b)(x + c)$, is shown in the xy-plane, where a, b, and c are constants. If each of the values a, b, and c is decreased by 1 to create a new function g, which of the following represents the graph of g ?

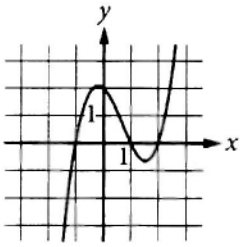
A)



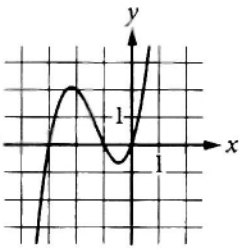
B)



C)



D)



30

The exponential function f decreases by 40% for each increase by 1 in the value of x. If $f(0) = 2$, then which of the following could define f ?

A) $f(x) = 0.4 \cdot (2^x)$

B) $f(x) = 0.6 \cdot (2^x)$

C) $f(x) = 2 \cdot (0.4^x)$

D) $f(x) = 2 \cdot (0.6^x)$

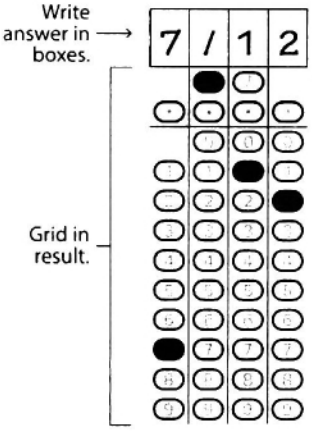
CONTINUE

DIRECTIONS

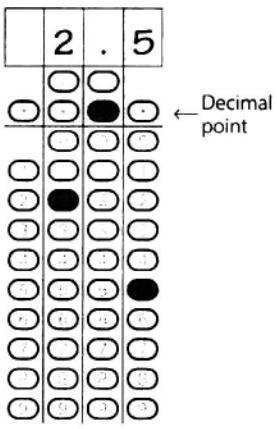
For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

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 bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble 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  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.

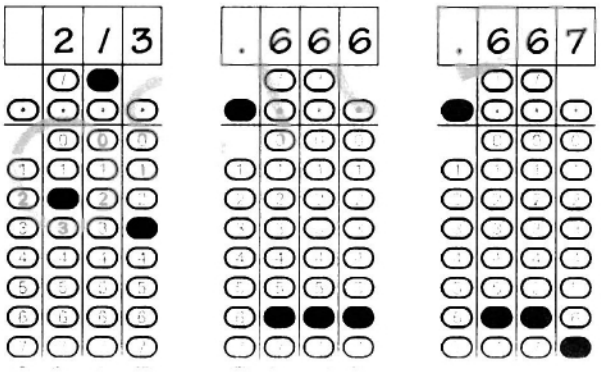
Answer: $\frac{7}{12}$



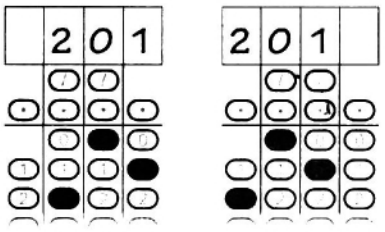
Answer: 2.5



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



Answer: 201 – either position is correct

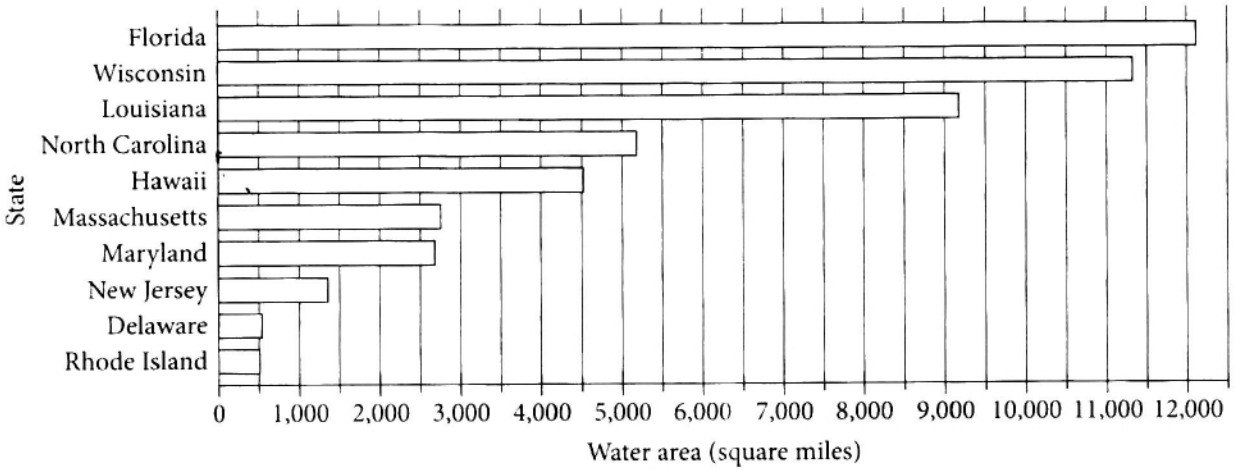


NOTE:
You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

The bar graph shows the area covered by water, in square miles, for 10 US states.



Based on the given information, how many of these states have an area covered by water of between 1000 and 6000 square miles?

32

$$t^2(t - 3) + 6(t - 3) = 0$$

What is the real value of t that satisfies the given equation?

33

Both the length and width, in feet, of a rectangular garden are integers. If the perimeter of the garden is 24 feet, what is the greatest possible area, in square feet, of the garden?

34

$$bx - 12b = 8b$$

In the equation above, b is a positive constant. What value of x satisfies the equation?

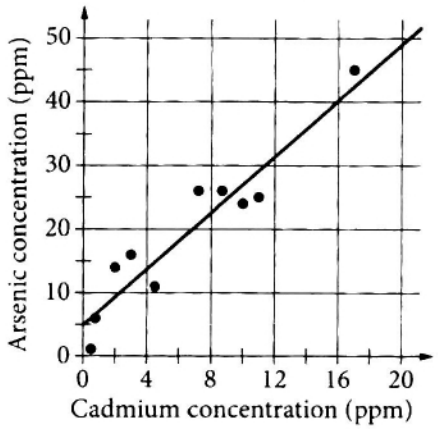
35

An integer from 1 to 20 is to be selected at random. If the number is a multiple of 3, what is the probability that it is also a multiple of 5 ? (Grid your answer as a fraction or decimal, not as a percent.)

CONTINUE

Questions 36 and 37 refer to the following information.

Contaminant Concentrations in Upper Columbia River Valley Sediment



A researcher collected 10 different sediment samples from lakes and watersheds in the upper Columbia River Valley. The researcher measured the cadmium concentration and arsenic concentration, both in parts per million (ppm), of each sample. The data are shown in the scatterplot along with a line of best fit.

36

To the nearest whole number, what is the arsenic concentration, in ppm, predicted by the line of best fit for a sediment sample with a cadmium concentration of 16 ppm?

37

Of the 10 sediment samples, p% have a cadmium concentration less than 12 ppm. What is the value of p ?

38

On circle P, an arc measures 30° and has a length of 16 centimeters. What is the circumference of circle P, in centimeters?

STOP

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