Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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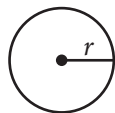

DIRECTIONS

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.
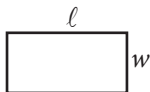
NOTES

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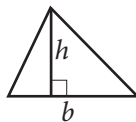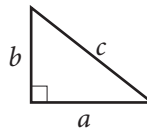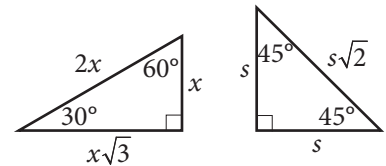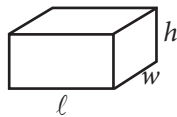
REFERENCE

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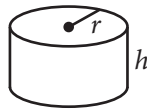$C = 2\pi r$

$A = \ell w$

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

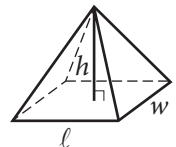$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell w h$

$V = \pi r^2 h$

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

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

$V = \dfrac{1}{3}\ell w h$

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

Jamila plans to invest $300 by buying shares of two different stocks. Stock A costs $5.62 per share and Stock B costs $12.97 per share. Which equation represents the number of shares of these stocks Jamila can buy, where a is the number of shares of Stock A and b is the number of shares of Stock B? (Assume that there are no fees.)

A) $12.97a + 5.62b = 300$

B) $12.97a - 5.62b = 300$

C) $5.62a + 12.97b = 300$

D) $5.62a - 12.97b = 300$

2
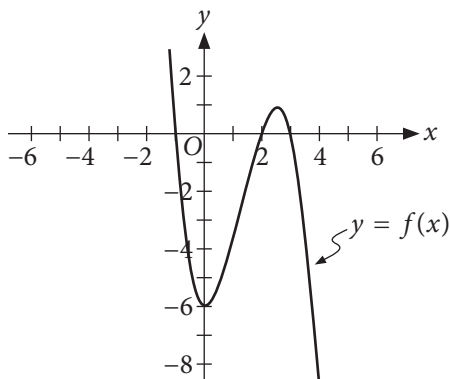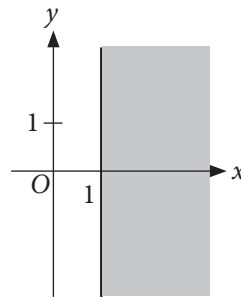

The graph of $y = f(x)$ is shown. What is the value of $f(0)$?

A)   3

B)   2

C) −1

D) −6

3

The shaded region shown in the graph represents all the solutions to which inequality?

A) $x \leq 1$

B) $x \geq 1$

C) $y \leq 1$

D) $y \geq 1$

4

The function f is defined by $f(x) = x^3 - 2x^2$. what is the value of $f(-2)$?

A) −16

B)   −8

C)   0

D)   2

If $g(5) = 3$ and $g(9) = 7$, which of the following defines the linear function g ?

A) $g(x) = 2x$

B) $g(x) = -2x$

C) $g(x) = x + 2$

D) $g(x) = x - 2$

A sphere has a diameter of 4 meters. What is the volume, in cubic meters, of this sphere?

A) $\dfrac{256}{3}\pi$

B) $\dfrac{32}{3}\pi$

C) 16π

D) 4π
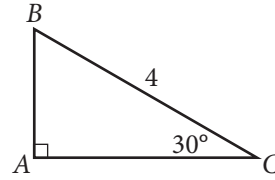
What is the length of side $\overline{AC}$ in right triangle ABC above?

A) 2

B) $2\sqrt{3}$

C) 4

D) $4\sqrt{3}$

$$1.2x - 3y = 0$$
$$2x + 10y = 9$$

The solution to the given system of equations is (x, y). What is the value of x ?

A) 0.6

B) 1.5

C) 2.25

D) 9

9
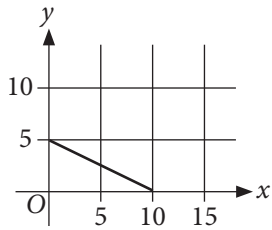
The line shown models the number of cubic yards of soil, x, and mulch, y, a landscaper can purchase for $150. What is the price per cubic yard of soil?

A) $5

B) $10

C) $15

D) $30

10

What is an equation of the graph shown?

A) $y = \left(\dfrac{1}{4}\right)^x$

B) $y = \left(\dfrac{1}{4}\right)^x + 1$

C) $y = \left(\dfrac{5}{4}\right)^x$

D) $y = \left(\dfrac{5}{4}\right)^x + 1$

11

$$\frac{5g + 1}{g + 2} - 1$$

Which of the following is equivalent to the given expression if $g > 0$?

A) $\dfrac{5g}{g + 1}$
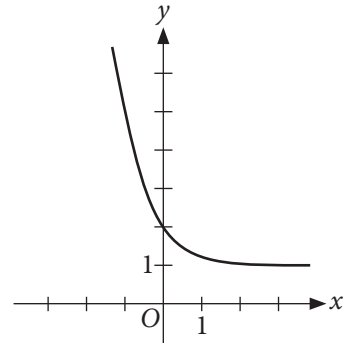
B) $\dfrac{5g}{g + 2}$

C) $\dfrac{4g - 1}{g + 2}$

D) $\dfrac{4g + 3}{g + 2}$

12

Which value is a solution to the equation $x(x + 4) = 2$?

A) $4 + 2\sqrt{6}$

B) $-4 - 2\sqrt{6}$

C) $2 + \sqrt{6}$

D) $-2 - \sqrt{6}$

13

$$y = 8$$
$$y = -2(x - 10)^2 + 6$$

If the given equations are graphed in the xy-plane, at how many points do the graphs intersect?

A) Zero

B) One

C) Two

D) Infinitely many

CONTINUE

14

Circle A: $x^2 + y^2 = 4$

Circle B: $2x^2 + 2y^2 = 8$

Which statement accurately compares the graphs of the given equations in the xy-plane?

A) The graph of circle B is the same as the graph of circle A.

B) The radius of circle B is twice the length of the radius of circle A.

C) The graph of circle B is the result of translating the graph of circle A two units to the right.

D) The graph of circle B is the result of translating the graph of circle A two units to the left.

15

$$(\sqrt{8})^a = 4^{\frac{b}{3}}$$

If a and b are positive numbers in the equation above, what is the value of $\dfrac{a}{b}$?

A) $\dfrac{4}{9}$

B) $\dfrac{2}{3}$

C) $\dfrac{3}{2}$

D) $\dfrac{9}{4}$

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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: $\frac{7}{12}$ are: Answer: 2.5

Write answer in boxes. → Fraction line ← Decimal point ←

Grid in result.

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.

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CONTINUE ▶

16

$$4(b + 21) = 16b$$

What is the solution to the given equation?

17

The function p is defined by $p(x) = \dfrac{1}{4}x + \dfrac{3}{4}$. What is the slope of the graph of $y = p(x)$ in the xy-plane?

18

$$cx + 2 = 3x + 6$$

In the given equation, c is a constant. The equation has no solution. What is the value of c ?

19

Joan is designing a rectangular flower garden so that the ratio of the length of the garden to its width is 3 to 2. If the area of the garden is 96 square feet, what is the perimeter, in feet, of the garden?

20

$$| x - 4 | = 2$$

What is the sum of the solutions to the given equation?

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

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REFERENCE

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$C = 2\pi r$

$A = \ell w$

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

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

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$V = \pi r^2 h$

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

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CONTINUE ▷

1

An object travels at a rate of 8 meters per second. What is the distance, in meters, that the object travels in 2 seconds?

A) 4

B) 6

C) 10

D) 16

2

27, 8, 20, 43, 32

What is the mean of the given data set?

A) 20

B) 26

C) 27

D) 35

3

Seth asked 50 students if they planned to vote for Jada or Katie for class president. Of the students polled, 20 said they planned to vote for Jada and 30 said they planned to vote for Katie. If one of the students polled is selected at random, what is the probability that the selected student said he or she planned to vote for Jada?
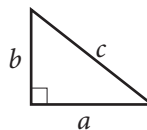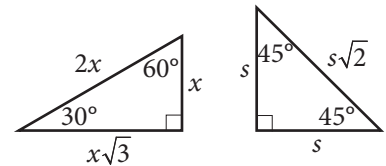
A) 20%

B) 30%

C) 40%

D) 60%

4

If $6x - 3 = 15$, what is the value of $2x - 1$?

A) 1

B) 2

C) 4

D) 5

5

$$4x + y = 10$$
$$-3x - y = -7$$

The solution to the given system of equations is (x, y). What is the value of x ?

A) 17

B) 3

C) −3

D) −17

6

A café manager found that when cups of tea were sold for $1.00, a total of 50 cups of tea were sold each day. For every $0.10 increase in the price of a cup of tea, 1 less cup of tea was sold each day. Which equation models the total amount collected S, in dollars, from tea sales each day, where x is the number of $0.10 price increases?

A) $S = (1.00 + x)(50 - x)$

B) $S = (1.00 + x)(50 + x)$

C) $S = (1.00 + 0.10x)(50 - x)$

D) $S = (1.00 + 0.10x)(50 + x)$

7

$$\sqrt{(x)^4} = 25$$

What are all possible solutions to the given equation?

A) −5 only

B) 5 only

C) −5 and 5

D) −25 and 25

8

The gravitational potential energy of an object near the surface of Earth is proportional to its height above Earth's surface. An object near Earth's surface is at height h and has gravitational potential energy P. If the object's height doubles while remaining near Earth's surface, which expression gives the gravitational potential energy of the object in terms of P ?

A) $\dfrac{1}{4}P$

B) $\dfrac{1}{2}P$

C) $2P$

D) $4P$

Questions 9 and 10 refer to the following information.

Sample	Sample size	Length (inches)		
		minimum	maximum	mean
A	11	15.0	20.0	18.0
B	20	12.5	22.5	17.2

The table shows the minimum, maximum, and mean lengths, in inches, of brown trout in two different samples. The sample sizes are also shown.

9

If one of the trout from the two samples is selected at random, what is the probability that the selected trout is from sample A?

A) $\dfrac{11}{31}$

B) $\dfrac{11}{20}$

C) $\dfrac{11}{18}$

D) $\dfrac{11}{15}$

CONTINUE

10

Which of the following statements must be true?

I. The length of each trout in sample A is greater than the length of each trout in sample B.

II. The range of the lengths of the trout in sample A is greater than the range of the lengths of the trout in sample B.

A) I only

B) II only

C) I and II

D) Neither I nor II

11

Industries in Canada, May 2012

Goods-producing industry	Percent of GDP
Agriculture	5%
Construction	25%
Manufacturing	36%
Mining, oil, and gas extraction	26%
Utilities	8%

The table shows the distribution by percent of the gross domestic product (GDP) for the five goods-producing industries in Canada. The total GDP for all five goods-producing industries in Canada for May 2012 was approximately $474 billion. Which of the following is closest to the GDP for utilities, in billions of dollars?

A) 8

B) 38

C) 59
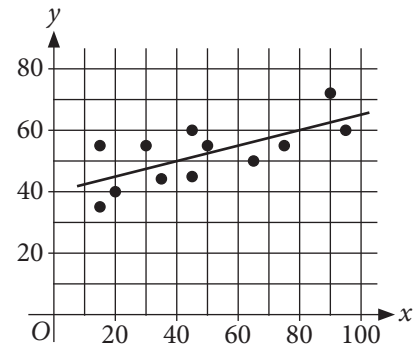
D) 95

12

If $a = x^3 - 2x + 7$ and $b = x + 1$, which of the following is equivalent to ab ?

A) $x^3 - 2x^2 + 8$

B) $x^3 - 2x^2 - 2x + 8$

C) $x^4 - 2x + 7$

D) $x^4 + x^3 - 2x^2 + 5x + 7$

13

The scatterplot shows twelve data points and a line of best fit for the data. What is the slope of the line?

A) $\dfrac{1}{2}$

B) $\dfrac{1}{3}$

C) $\dfrac{1}{4}$

D) $\dfrac{1}{5}$

14

Which of the following is(are) true about the linear function $y = 10 + 2x$ and exponential function $y = 5(2)^x$?

    I. When $x = 0$, the value of the linear function is greater than the value of the exponential function.

    II. When $x = 10$, the value of the linear function is greater than the value of the exponential function.

A) I only

B) II only

C) I and II

D) Neither I nor II

15

The volume of a certain cylinder with height 6 is given by $V = 6\pi r^2$, where r is the radius of the circular base of the cylinder. Which of the following is the graph of this equation in the xy-plane, where $x = r$ and $y = V$?

A)   B)

C)   D)

CONTINUE
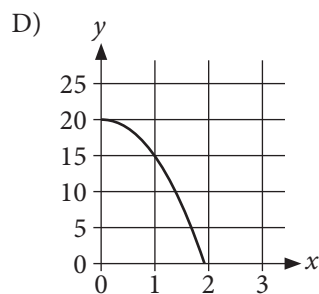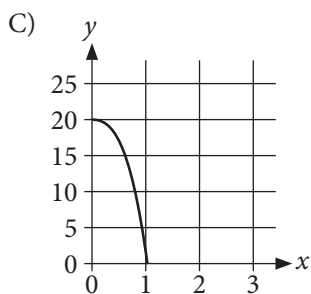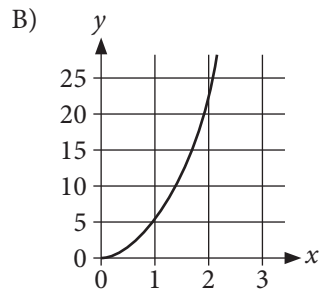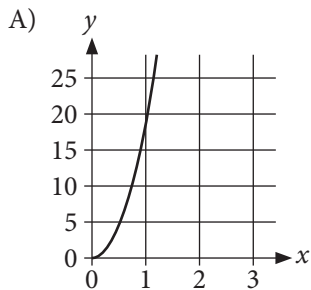
16

Triangles *ABC* and *DEF* each have a corresponding angle measuring 25° and a corresponding angle measuring 60°. Which additional piece of information is sufficient to determine whether triangle *ABC* is congruent to triangle *DEF* ?

A) The perimeter of triangle *ABC*

B) The area of triangle *DEF*

C) The length of one pair corresponding sides from the two triangles

D) No additional piece of information is necessary to determine whether the two triangles are congruent.

17

x	y
400	2
800	4
1,200	6

The table shows the number of cans of a type of flooring stain, *y*, needed to cover *x* square feet of flooring. Which of the following equations best models the relationship between *x* and *y* ?

A) $y = 100x^2$

B) $y = 200x$

C) $y = \dfrac{x}{200}$

D) $y = \dfrac{x^2}{200}$

18
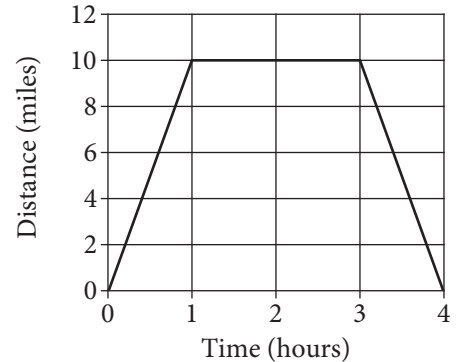
Coraline biked on a straight bike path. The graph shows her distance from the start of the path as a function of time. Which of the following best describes Coraline's bike ride?

A) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a constant speed for 1 hour.

B) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then continued to bike away from the start of the path at a constant speed for 1 hour.

C) She biked away from the start of the path at an increasing speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a decreasing speed for 1 hour.

D) She biked away from the start of the path at an increasing speed for 1 hour, biked at a constant speed for 2 hours, then biked back to the start of the path at a decreasing speed for 1 hour.

CONTINUE ▶

Questions 19 and 20 refer to the following information.

Year	Percent of US households with TV
1951	23.5
1958	83.2
1978	98.0

The table shows the percent of US households with TV for three different years. From 1951 to 1958, the percent of US households with TV increased linearly over time and can be modeled by a linear function P. From 1958 to 1978, the percent of US households with TV also increased linearly, but at a different rate.

19

Which of the following functions best models the percent of US households with TV, $P(t)$, as a function of the number of years since 1951, t, where $0 \le t \le 7$?

A) $P(t) = 23.5t$

B) $P(t) = 23.5 + 7.5t$
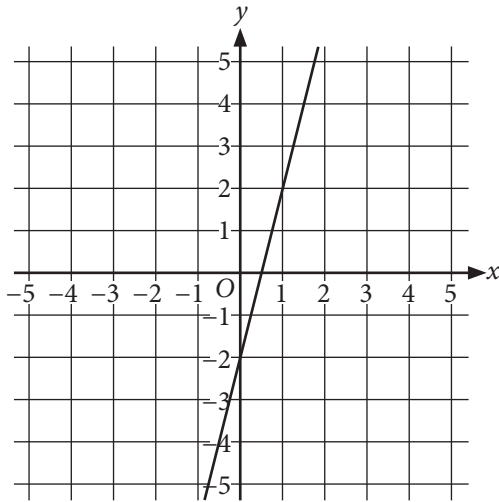
C) $P(t) = 23.5 + 8.5t$

D) $P(t) = 7.5 + 23.5t$

20

Based on the information given, which of the following is closest to the percent of US households with TV in 1962?

A) 91.3%

B) 90.6%

C) 87.4%

D) 86.2%

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CONTINUE

21

The line $y = mx + b$, where m and b are constants, is shown in the xy-plane. Which of the following equations could represent the equation of this line after it is translated 1 unit to the left?

A) $y = 4x - 3$

B) $y = 4x - 1$

C) $y = 4x + 1$

D) $y = 4x + 2$

22

$$x - y = 1$$
$$2x - 2y = 1$$

How many solutions does the given system of equations have?

A) Zero

B) Exactly one

C) Exactly two

D) Infinitely many

23

$$x^2 - 6x + c = 0$$

In the equation above, c is a constant such that $0 \le c < 9$. Which of the following is the greater of the two solutions to the equation, in terms of c ?

A) $\dfrac{6 - \sqrt{36 - 4c}}{2}$

B) $\dfrac{6 + \sqrt{36 - 4c}}{2}$

C) $\dfrac{-6 - \sqrt{36 - 4c}}{2}$

D) $\dfrac{-6 + \sqrt{36 - 4c}}{2}$

24

There are 10 rare coins in a collection. If the value of each of the 10 coins increases by \$2, which of the following will be true?

A) The new mean of the values will be \$2 more than the previous mean, but the standard deviation will remain the same.

B) The mean of the values will remain the same, but the new standard deviation will be \$2 more than the previous standard deviation.

C) Both the new mean and standard deviation of the values will be \$2 more than the previous mean and standard deviation.

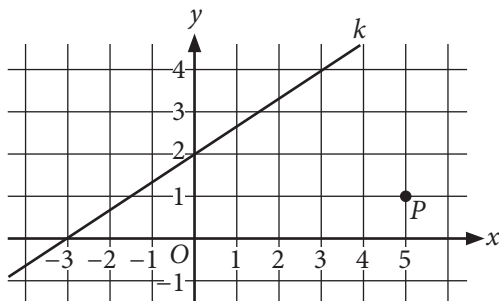D) Neither the mean nor the standard deviation of the values will change.

25

In right triangle ABC, angle A is the right angle and the value of cos B is 0.8. Which of the following is the value of sin C?
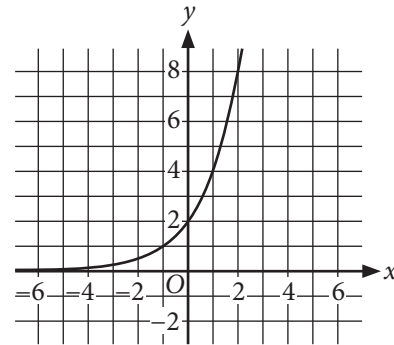
A) 0.8

B) 0.6

C) 0.4

D) 0.2

26

Line k and point P are shown in the xy-plane, Line ℓ (not shown) is perpendicular to line k and passes through point P. Which of the following is an equation of line ℓ?

A) $y = -\dfrac{3}{2}x + \dfrac{7}{2}$

B) $y = -\dfrac{3}{2}x + \dfrac{17}{2}$

C) $y = \dfrac{2}{3}x - \dfrac{7}{2}$

D) $y = \dfrac{2}{3}x - \dfrac{17}{2}$

27

The graph of an exponential function is shown in the xy-plane.

Which of the following is an equation of the graph shown, where b is a positive constant?

A) $y = 2^x + b$

B) $y = 2^{x+b}$

C) $y = 2^x - b$

D) $y = 2^{x-b}$

28

A company that manufactures staplers calculates its monthly profit by subtracting its fixed monthly costs from its monthly revenue from sales. The equation $12{,}000 = 2.00x - 3{,}500$ represents this situation for a month where x staplers are manufactured and sold. What is the meaning of $2.00x$ in this context?

A) The total cost of manufacturing x staplers

B) The total cost of manufacturing each stapler

C) The total monthly revenue from each stapler sold

D) The total monthly revenue from selling x staplers

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CONTINUE ▶

29

The quantity k is reduced by 20% of its value. Which expression is equivalent to the resulting value?

A) $0.80k$

B) $0.20k$

C) $0.08k$

D) $0.02k$

30

A truck trailer holds 16 cubic meters of soil. How many <u>cubic centimeters</u> of soil does the trailer hold? (1 meter = 100 centimeters)

A)   16,000

B)   160,000

C)   1,600,000

D) 16,000,000

CONTINUE ▷

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

Write answer in boxes.

Grid in result.

| 7 | / | 1 | 2 |

← Fraction line

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

The net force, in newtons, acting on an object is proportional to the object's mass, in kilograms (kg), when the acceleration, in meters per second squared (m/s²), is constant. Two objects, one of mass 70 kg and the other of mass 50 kg, have accelerations of 4 m/s² in the same direction. If the force acting on the 70 kg object is 280 newtons, what is the force, in newtons, acting on the 50 kg object?

32

A certain blue whale calf weighed 5500 pounds when it was born, and its weight increased at a rate of 250 pounds per day for the first n days, where n is an integer. If the calf's weight was greater than 8000 pounds but less than 9000 pounds n days after birth, what is one possible value of n ?

33

The scatterplot shows the relationship between two variables, x and y. A line of best fit for the data is also shown.
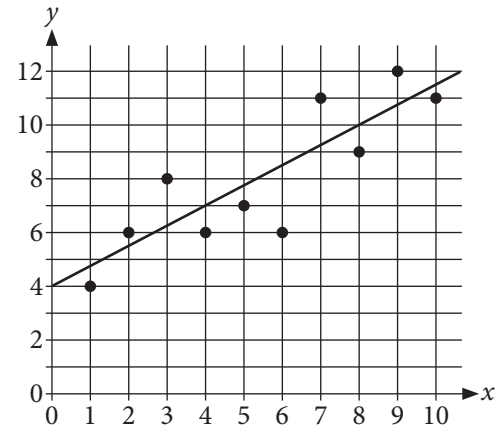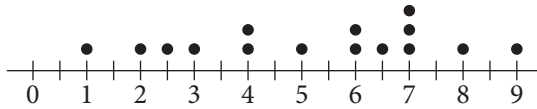

For how many of the 10 data points does the line of best fit predict a y-value that is greater than the actual y-value?

34

Between 1749 and 1811, the population of China increased 100%. In 1811, China's population was 360 million. In 1749, what was China's population, in millions?
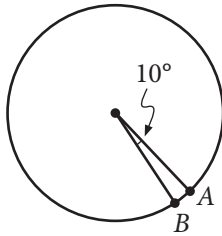
35

Mohs' scale of hardness can be used to compare substances. The dot plot displays the hardness value of each of 15 substances. What is the median hardness value of the 15 substances?

36

The circle shown has a circumference of 72π. The length of minor arc $\overset{\frown}{AB}$ is $x\pi$. What is the value of x ?

37

$$H(n) = 1000(1 - 0.05)^n$$

As a beam of X-ray photons passes through a metal block, the metal absorbs several of the photons. The function H, defined by the equation shown, models the relationship between the predicted number of photons, $H(n)$, remaining in a beam and the number of blocks of metal, n, the beam has passed through. Based on this model, the percentage of photons remaining after passing through 1 metal block is p%. What is the value of p ?

38

In the xy-plane, the line that contains the points $(-3, 5)$ and $(1, 2)$ intersects the y-axis at $(0, c)$. What is the value of c ?

STOP

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