Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

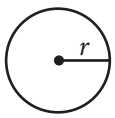
DIRECTIONS

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.

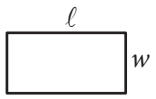
NOTES

1. The use of a calculator **is 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.

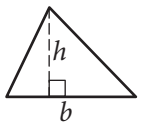
REFERENCE



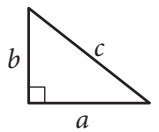
$A = \pi r^2$
$C = 2\pi r$



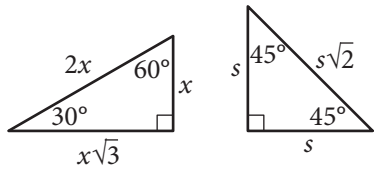
$A = \ell w$



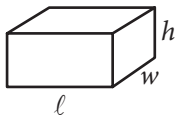
$A = \frac{1}{2}bh$



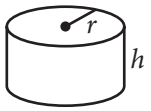
$c^2 = a^2 + b^2$



Special Right Triangles

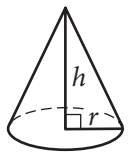


$V = \ell wh$

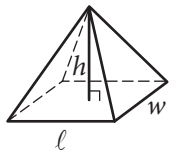


$V = \pi r^2 h$

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



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



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

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.

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CONTINUE

1

What value of x satisfies the equation $3x + 3 = 27$?

A) 3

B) 8

C) 10

D) 27

2

Two units of length used in ancient Egypt were cubits and palms, where 1 cubit is equivalent to 7 palms. The Great Sphinx statue in Giza is approximately 140 cubits long. Which of the following best approximates the length, in palms, of the Great Sphinx statue?

A) 0.05

B) 20

C) 140

D) 980

3

If $\frac{2n}{5} = 10$, what is the value of $2n - 1$?

A) 24

B) 49

C) 50

D) 99

4

$$\sqrt{x^2} = x$$

Which of the following values of x is NOT a solution to the equation above?

A) -4

B) 0

C) 1

D) 3

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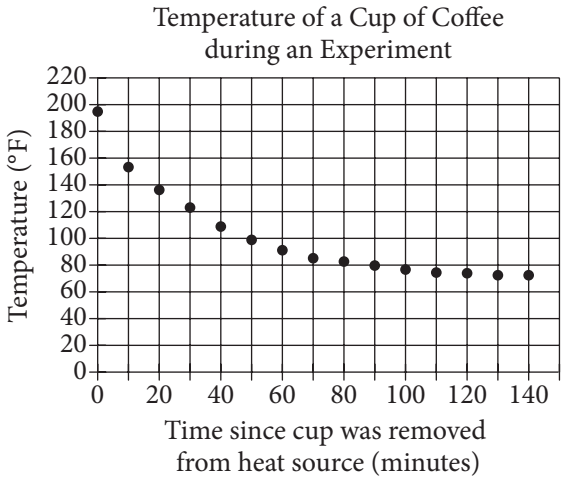
Questions 5 and 6 refer to the following information.



In an experiment, a heated cup of coffee is removed from a heat source, and the cup of coffee is then left in a room that is kept at a constant temperature. The graph above shows the temperature, in degrees Fahrenheit (°F), of the coffee immediately after being removed from the heat source and at 10-minute intervals thereafter.

5

Of the following, which best approximates the temperature, in degrees Fahrenheit, of the coffee when it is first removed from the heat source?

A) 75

B) 100

C) 155

D) 195

6

During which of the following 10-minute intervals does the temperature of the coffee decrease at the greatest average rate?

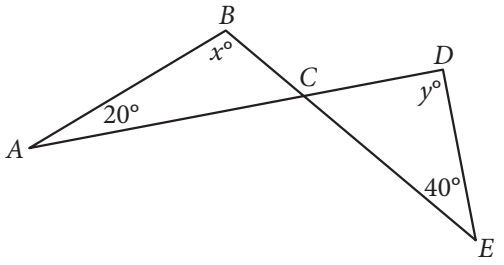
A) Between 0 and 10 minutes

B) Between 30 and 40 minutes

C) Between 50 and 60 minutes

D) Between 90 and 100 minutes

7



Note: Figure not drawn to scale.

In the figure above, $\overline{AD}$ intersects $\overline{BE}$ at C. If $x = 100$, what is the value of y ?

A) 100

B) 90

C) 80

D) 60

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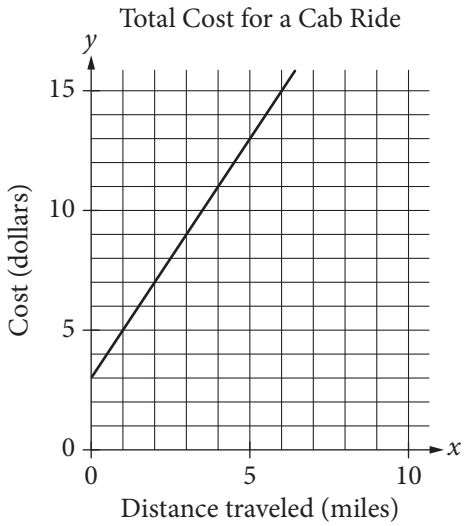
8

The line graphed in the xy-plane below models the total cost, in dollars, for a cab ride, y, in a certain city during nonpeak hours based on the number of miles traveled, x.



According to the graph, what is the cost for each additional mile traveled, in dollars, of a cab ride?

A) \$2.00

B) \$2.60

C) \$3.00

D) \$5.00

9

Customer Purchases at a Gas Station

	Beverage purchased	Beverage not purchased	Total
Gasoline purchased	60	25	85
Gasoline not purchased	35	15	50
Total	95	40	135

On Tuesday, a local gas station had 135 customers. The table above summarizes whether or not the customers on Tuesday purchased gasoline, a beverage, both, or neither. Based on the data in the table, what is the probability that a gas station customer selected at random on that day did not purchase gasoline?

A) $\frac{15}{50}$

B) $\frac{15}{40}$

C) $\frac{35}{50}$

D) $\frac{50}{135}$

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CONTINUE

10

Washington High School randomly selected freshman, sophomore, junior, and senior students for a survey about potential changes to next year's schedule. Of students selected for the survey, $\frac{1}{4}$ were freshmen and $\frac{1}{3}$ were sophomores. Half of the remaining selected students were juniors. If 336 students were selected for the survey, how many were seniors?

A) 240
B) 140
C) 120
D) 70

11

Plant A is currently 20 centimeters tall, and Plant B is currently 12 centimeters tall. The ratio of the heights of Plant A to Plant B is equal to the ratio of the heights of Plant C to Plant D. If Plant C is 54 centimeters tall, what is the height of Plant D, in centimeters?

A) 32.4
B) 44.0
C) 62.0
D) 90.0

12

Biologists found a new species of pale shrimp at the world's deepest undersea vent, the Beebe Vent Field. The vent is 3.1 miles below the sea's surface. Approximately how many kilometers below the sea's surface is the vent? (1 kilometer ≈ 0.6214 miles)

A) 2
B) 3
C) 4
D) 5

13

A cargo helicopter delivers only 100-pound packages and 120-pound packages. For each delivery trip, the helicopter must carry at least 10 packages, and the total weight of the packages can be at most 1,100 pounds. What is the maximum number of 120-pound packages that the helicopter can carry per trip?

A) 2
B) 4
C) 5
D) 6

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CONTINUE

14

A company purchased a machine valued at \$120,000. The value of the machine depreciates by the same amount each year so that after 10 years the value will be \$30,000. Which of the following equations gives the value, v, of the machine, in dollars, t years after it was purchased for $0 \le t \le 10$?

A) $v = 30{,}000 - 9{,}000t$

B) $v = 120{,}000 - 9{,}000t$

C) $v = 120{,}000 + 9{,}000t$

D) $v = 120{,}000 - 30{,}000t$

15

Line m in the xy-plane contains the points $(2, 4)$ and $(0, 1)$. Which of the following is an equation of line m ?

A) $y = 2x + 3$

B) $y = 2x + 4$

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

D) $y = \frac{3}{2}x + 1$

16

$$(4x + 4)(ax - 1) - x^2 + 4$$

In the expression above, a is a constant. If the expression is equivalent to bx, where b is a constant, what is the value of b ?

A) -5

B) -3

C) 0

D) 12

17

If $2w + 4t = 14$ and $4w + 5t = 25$, what is the value of $2w + 3t$?

A) 6

B) 10

C) 13

D) 17

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CONTINUE

Questions 18-20 refer to the following information.

Jennifer bought a box of Crunchy Grain cereal. The nutrition facts on the box state that a serving size of the cereal is $\frac{3}{4}$ cup and provides 210 calories, 50 of which are calories from fat. In addition, each serving of the cereal provides 180 milligrams of potassium, which is 5% of the daily allowance for adults.

18

If p percent of an adult's daily allowance of potassium is provided by x servings of Crunchy Grain cereal per day, which of the following expresses p in terms of x ?

A) $p = 0.5x$

B) $p = 5x$

C) $p = (0.05)^x$

D) $p = (1.05)^x$

19

On Tuesday, Jennifer will mix Crunchy Grain cereal with Super Grain cereal for her breakfast. Super Grain cereal provides 240 calories per cup. If the total number of calories in one cup of Jennifer's mixture is 270, how much Super Grain cereal is in one cup of the mixture?

A) $\frac{1}{8}$ cup

B) $\frac{1}{4}$ cup

C) $\frac{1}{3}$ cup

D) $\frac{1}{2}$ cup

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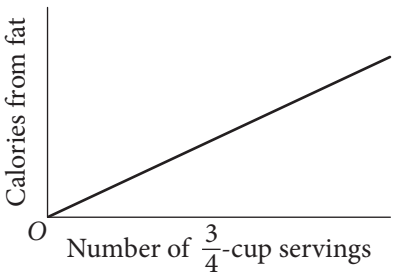
CONTINUE

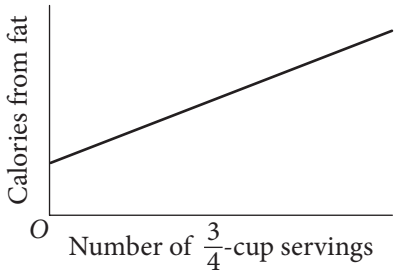
20

Which of the following could be the graph of the number of calories from fat in Crunchy Grain cereal as a function of the number of $\frac{3}{4}$-cup servings of the cereal?

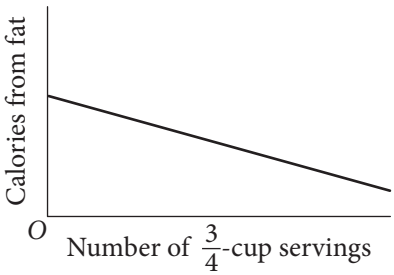
A)



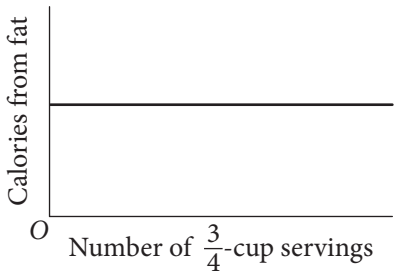
B)



C)



D)



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21

The graph of the exponential function h in the xy-plane, where $y = h(x)$, has a y-intercept of d, where d is a positive constant. Which of the following could define the function h ?

A) $h(x) = -3(d)^x$

B) $h(x) = 3(x)\,d$

C) $h(x) = d(-x)^3$

D) $h(x) = d(3)^x$

22

The weights, in pounds, for 15 horses in a stable were reported, and the mean, median, range, and standard deviation for the data were found. The horse with the lowest reported weight was found to actually weigh 10 pounds less than its reported weight. What value remains unchanged if the four values are reported using the corrected weight?

A) Mean

B) Median

C) Range

D) Standard deviation

23

Near the end of a US cable news show, the host invited viewers to respond to a poll on the show's website that asked, "Do you support the new federal policy discussed during the show?" At the end of the show, the host reported that 28% responded "Yes," and 70% responded "No." Which of the following best explains why the results are unlikely to represent the sentiments of the population of the United States?

A) The percentages do not add up to 100%, so any possible conclusions from the poll are invalid.

B) Those who responded to the poll were not a random sample of the population of the United States.

C) There were not 50% "Yes" responses and 50% "No" responses.

D) The show did not allow viewers enough time to respond to the poll.

24

If $f(x) = 5x^2 - 3$ and $f(x + a) = 5x^2 + 30x + 42$, what is the value of a ?

A) -30

B) -3

C) 3

D) 30

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CONTINUE

25

If $\sin x° = a$, which of the following must be true for all values of x ?

A) $\cos x° = a$

B) $\sin(90° - x°) = a$

C) $\cos(90° - x°) = a$

D) $\sin(x^2)° = a^2$

26

$$h(x) = -16x^2 + 100x + 10$$

The quadratic function above models the height above the ground h, in feet, of a projectile x seconds after it had been launched vertically. If $y = h(x)$ is graphed in the xy-plane, which of the following represents the real-life meaning of the positive x-intercept of the graph?

A) The initial height of the projectile

B) The maximum height of the projectile

C) The time at which the projectile reaches its maximum height

D) The time at which the projectile hits the ground

27

In the xy-plane, the graph of the polynomial function f crosses the x-axis at exactly two points, $(a, 0)$ and $(b, 0)$, where a and b are both positive. Which of the following could define f ?

A) $f(x) = (x - a)(x - b)$

B) $f(x) = (x + a)(x + b)$

C) $f(x) = (x - a)(x + b)$

D) $f(x) = x(x - a)(x - b)$

28

If $y = 3x^2 + 6x + 2$ is graphed in the xy-plane, which of the following characteristics of the graph is displayed as a constant or coefficient in the equation?

A) y-coordinate of the vertex

B) x-intercept(s)

C) y-intercept

D) x-intercept of the line of symmetry

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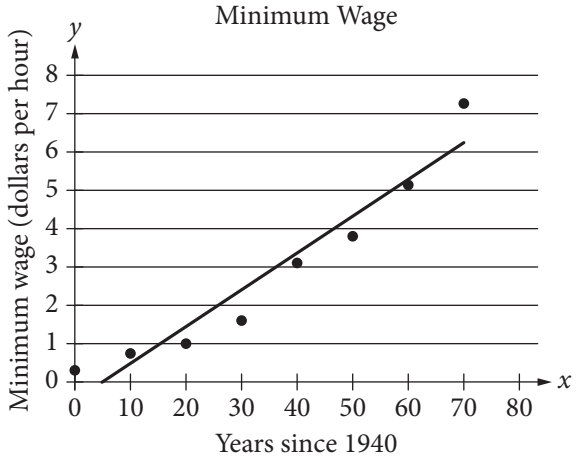
29



The scatterplot above shows the federal-mandated minimum wage every 10 years between 1940 and 2010. A line of best fit is shown, and its equation is $y = 0.096x - 0.488$. What does the line of best fit predict about the increase in the minimum wage over the 70-year period?

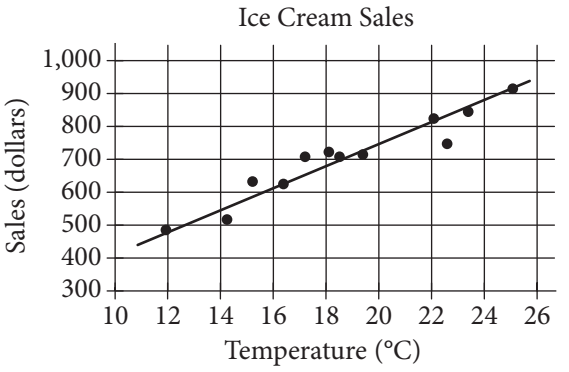
A) Each year between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.

B) Each year between 1940 and 2010, the average increase in minimum wage was 0.49 dollars.

C) Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.

D) Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.488 dollars.

30



The scatterplot above shows a company's ice cream sales d, in dollars, and the high temperature t, in degrees Celsius (°C), on 12 different days. A line of best fit for the data is also shown. Which of the following could be an equation of the line of best fit?

A) $d = 0.03t + 402$

B) $d = 10t + 402$

C) $d = 33t + 300$

D) $d = 33t + 84$

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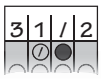
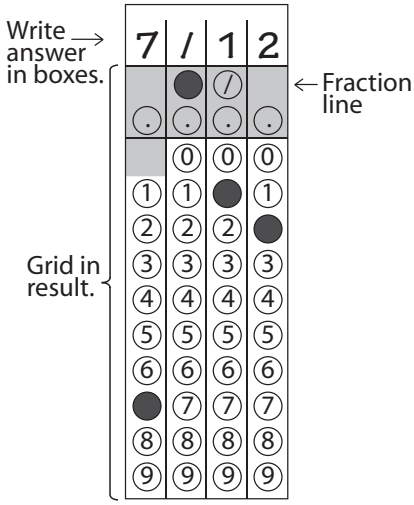
CONTINUE

DIRECTIONS

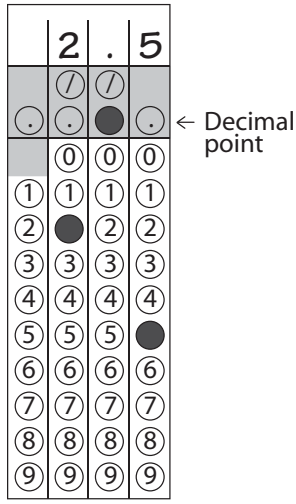
For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

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 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  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.

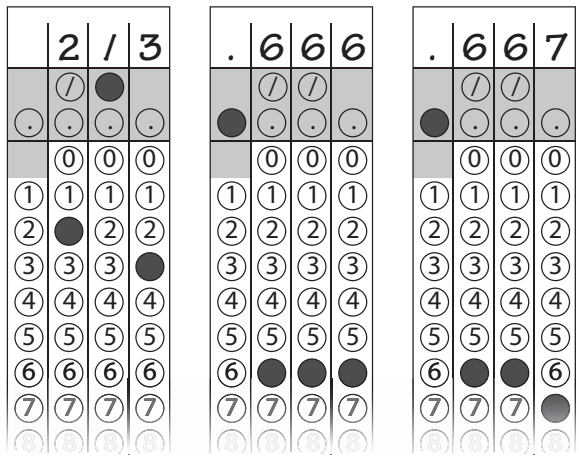
Answer: $\frac{7}{12}$



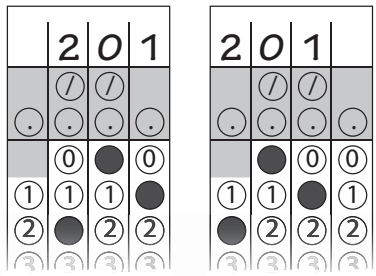
Answer: 2.5



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.

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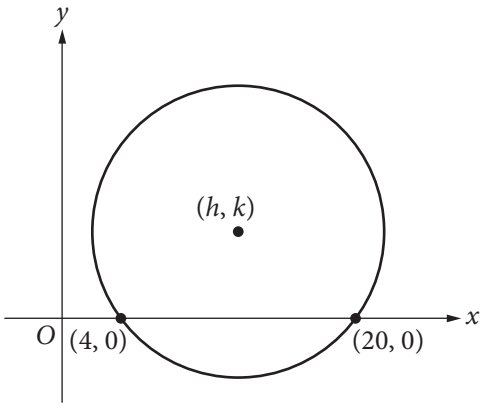
31



In the xy-plane above, the circle has center (h, k) and radius 10. What is the value of k ?

32

In the xy-plane, line ℓ has a y-intercept of -13 and is perpendicular to the line with equation $y = -\frac{2}{3}x$. If the point $(10, b)$ is on line ℓ, what is the value of b ?

33

	Blood type			
Rhesus factor	A	B	AB	O
+	33	9	3	37
–	7	2	1	x

Human blood can be classified into four common blood types—A, B, AB, and O. It is also characterized by the presence (+) or absence (–) of the rhesus factor. The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative (–) is chosen at random, the probability that the person has blood type B is $\frac{1}{9}$. What is the value of x ?

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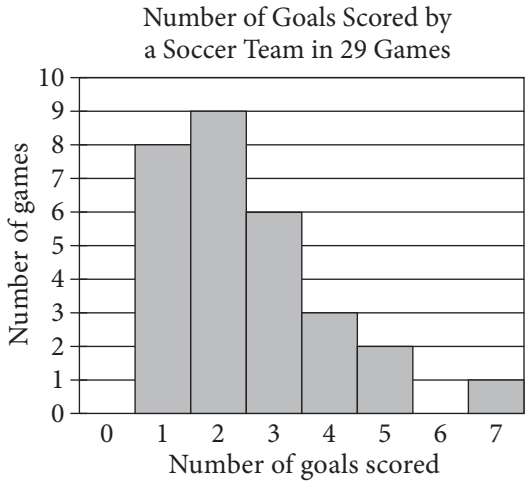
34



Based on the graph above, in how many of the games played did the soccer team score goals equal to the median number of goals for the 29 games?

35

Gisela would owe \$15,500 in taxes each year if she were not eligible for any tax deductions. This year, Gisela is eligible for tax deductions that reduce the amount of taxes she owes by \$2,325.00. If these tax deductions reduce the taxes Gisela owes this year by d%, what is the value of d ?

36

$$\frac{3}{4}x - \frac{1}{2}y = 12$$
$$ax - by = 9$$

The system of equations above has no solutions. If a and b are constants, what is the value of $\frac{a}{b}$?

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CONTINUE

Questions 37 and 38 refer to the following information.

International Tourist Arrivals, in millions

Country	2012	2013
France	83.0	84.7
United States	66.7	69.8
Spain	57.5	60.7
China	57.7	55.7
Italy	46.4	47.7
Turkey	35.7	37.8
Germany	30.4	31.5
United Kingdom	26.3	32.2
Russia	24.7	28.4

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2012 and 2013.

37

Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2013 than the median number in 2012, to the nearest tenth of a million?

38

The number of international tourist arrivals in Russia in 2012 was 13.5% greater than in 2011. The number of international tourist arrivals in Russia was k million more in 2012 than in 2011. What is the value of k to the nearest integer?

STOP

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