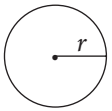
DIRECTIONS

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

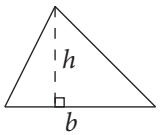
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

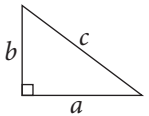


$A = \pi r^2$
$C = 2\pi r$

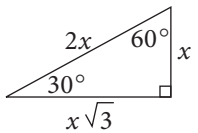
$A = \ell w$

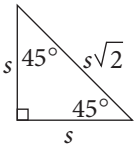


$A = \frac{1}{2}bh$

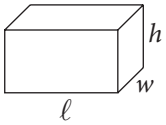


$c^2 = a^2 + b^2$

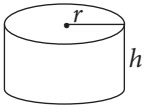




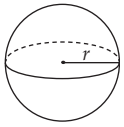
Special Right Triangles



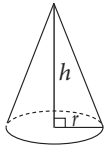
$V = \ell wh$



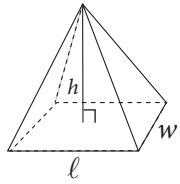
$V = \pi r^2 h$



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



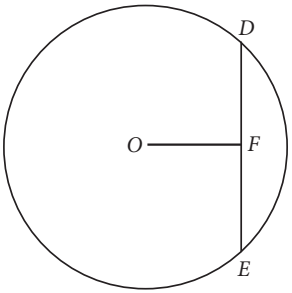
$V = \frac{1}{3}\pi r^2 h$



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

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.

5



Note: Figure not drawn to scale.

In the figure above, the circle has center O and area 169π. The midpoint of $\overline{DE}$ is F, and $\overline{OF} = 12$. What is the length of $\overline{DE}$?

A) 5

B) 10

C) 13

D) 26

8

A store reduces the price of a pair of shoes by 15 percent. If the sale price is r dollars, which of the following is the closest approximation of the original price, in dollars, of the shoes, in terms of r ?

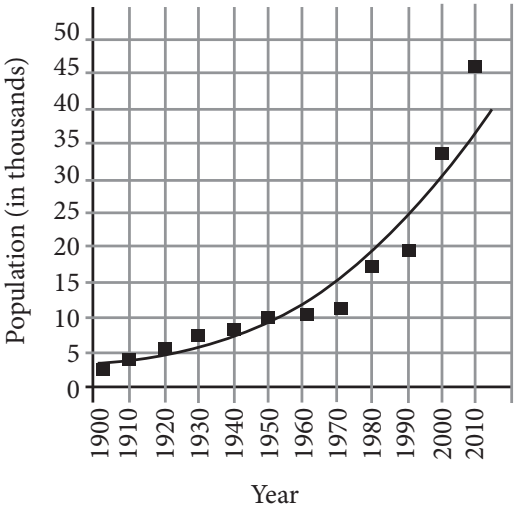
A) $1.18r$

B) $1.15r$

C) $1.10r$

D) $0.87r$

12



The scatterplot diagram above shows the population of Warren County, Iowa, in thousands of people, since 1900. The curve of best fit shown has a y-intercept of 3,400. Which of the following statements is true about the population of Warren Country, Iowa, given this y-intercept?

A) The median population for Warren County, Iowa, from 1900 to 2000 was 3,400.

B) On average, the population of Warren County, Iowa, increased by 3,400 every 10 years.

C) The population of Warren County, Iowa, in 1900 was exactly 3,400.

D) The population of Warren County, Iowa, in 1990 was approximately 3,400.

15

Driver Age (Years)	Sign Legibility Distance (feet)
15	550
25	512
31	487
35	472
42	443
50	409

A biostatistician is studying the relationship between a driver's age and the driver's visual ability. She finds that the distance from which the driver can read a certain highway sign depends on the driver's age, as shown in the table above. Which of the following best describes the relationship between the age of the driver and the sign legibility?

A) The relationship is approximately exponential, since for every year, the sign legibility distance decreases by approximately 15%.

B) The relationship is approximately exponential, since for every year, the sign legibility decreases by approximately 25%.

C) The relationship is approximately linear, since for every year, the sign legibility distance decreases by approximately 4 feet.

D) The relationship is approximately linear, since for every year, the sign legibility distance decreases by approximately 8 feet.

17

As a result of the rapid growth of cell phone usage in the United States, the number of people using telephone landlines in a certain small town in California is decreasing at a rate of 25% per year. If there are currently 150,000 people using landlines in this particular town, and x represents the number of years, which of the following expressions best represents the trend in the town's landline usage?

A) $150{,}000(0.25)^x$

B) $150{,}000(0.25)x$

C) $150{,}000(0.75)^x$

D) $150{,}000(0.75)x$

20

$$f(x) = (x^2 - 2x - 35)(x + 5)(x + c)$$

The function f above is a polynomial function where c is a constant. If $(-5, 0)$ and $(3, 0)$ are points on the graph of $f(x)$, what is the product of the zeros of f?

A) -525

B) -105

C) 105

D) 525

23

An athletic trainer coaches only athletes who play football, baseball, and soccer. In a certain month, 3 football players were coached for every 7 baseball players, and 6 soccer players were coached for every football player. If the total number of athletes coached that month was between 375 and 400, how many soccer players were coached?

A) 42

B) 72

C) 98

D) 252

26

Scott takes three times as long to pack 12 boxes as Jean takes to pack 7 boxes. What is the ratio of Scott's average packing rate to Jean's average packing rate?

A) 2:3

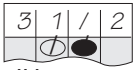
B) 4:7

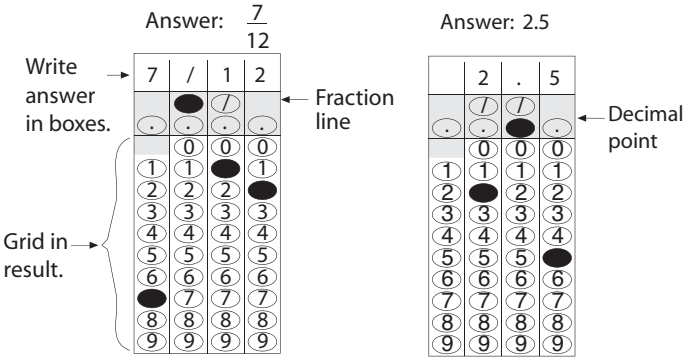
C) 7:4

D) 7:12

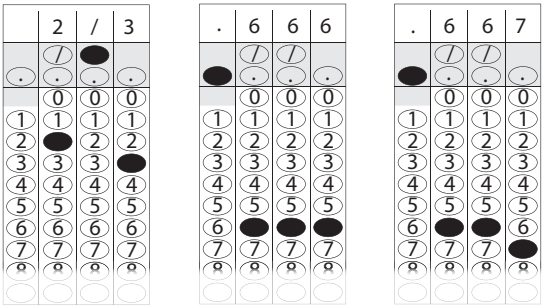
DIRECTIONS

For questions 32-33, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

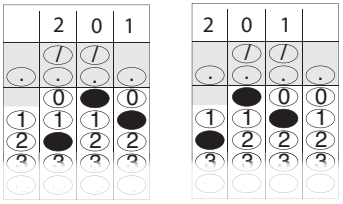
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.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



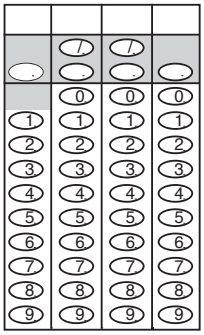
Answer: 201 – either position is correct

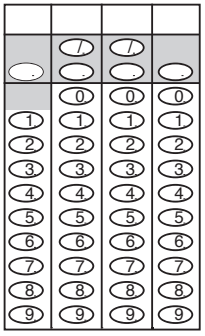


NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

32

The function f is defined by $f(x) = 4x + 3$. If $3 \cdot f(r) = 93$, what is the value of r ?



33

A jar contains glass beads of equivalent weights. If 47 glass beads have a total weight of 3.2 ounces, and the maximum capacity of the jar is 4 pounds, how many glass beads can the jar hold? (Note: 16 ounces = 1 pound)