

SECTION 2
Time — 25 minutes
18 Questions

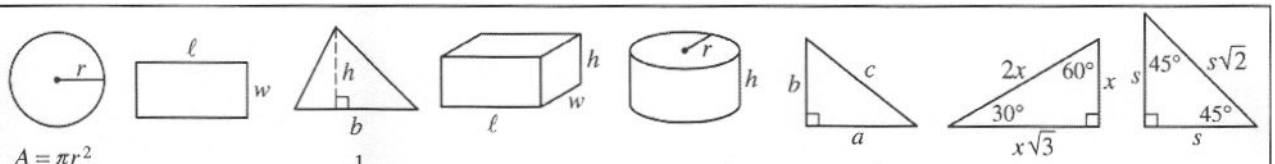
Turn to Section 2 (page 4) of your answer sheet to answer the questions in this section.

Directions: This section contains two types of questions. You have 25 minutes to complete both types. For questions 1-8, solve each problem and decide which is the best of the choices given. Fill in the corresponding circle on the answer sheet. You may use any available space for scratchwork.

Notes

1. The use of a calculator is permitted.
2. All numbers used are real numbers.
3. Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that the figure is not drawn to scale. All figures lie in a plane unless otherwise indicated.
4. Unless otherwise specified, the domain of any function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

Reference Information



$A = \pi r^2$, $C = 2\pi r$ | $A = \ell w$ | $A = \frac{1}{2}bh$ | $V = \ell wh$ | $V = \pi r^2 h$ | $c^2 = a^2 + b^2$ | Special Right Triangles

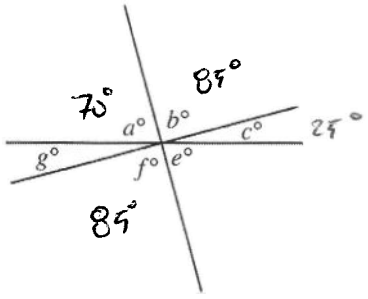
The number of degrees of arc in a circle is 360.
The sum of the measures in degrees of the angles of a triangle is 180.

1. If $4(t + u) + 3 = 19$, then $t + u =$

(A) 3
(B) 4
(C) 5
(D) 6
(E) 7

$4(t+u) = 19-3 = 16$

$t+u = \frac{16}{4} = 4$



Note: Figure not drawn to scale.

2. In the figure above, three lines intersect at a point. If $f = 85$ and $c = 25$, what is the value of a?

(A) 60
(B) 65
(C) 70
(D) 75
(E) 85

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3. If Marisa drove n miles in t hours, which of the following represents her average speed, in miles per hour?

(A) $\frac{n}{t}$

(B) $\frac{t}{n}$

(C) $\frac{1}{nt}$

(D) nt

(E) n^2t

$D = V \cdot T$

Distance = Velocity · Time

$\frac{D}{T} = V$elocity

$V = \frac{n}{t}$

4. If a is an odd integer and b is an even integer, which of the following is an odd integer?

(A) $3b$

(B) $a + 3$

(C) $2(a + b)$

(D) $a + 2b$

(E) $2a + b$

ODD + EVEN = ODD

5. In the coordinate plane, the points $F(-2, 1)$, $G(1, 4)$, and $H(4, 1)$ lie on a circle with center P. What are the coordinates of point P?

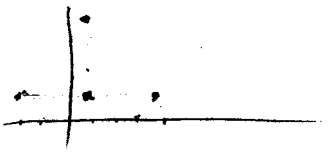
(A) (0, 0)

(B) (1, 1)

(C) (1, 2)

(D) (1, −2)

(E) (2.5, 2.5)



Center = (1,1)

because it has to be equidistant from all the points F, G, and H

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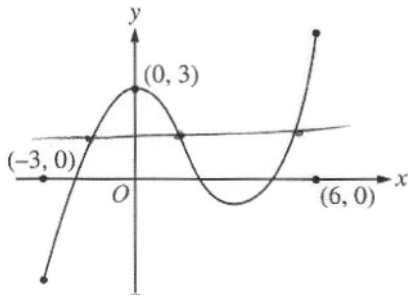

6. The graph of $y = f(x)$ is shown above. If $-3 \le x \le 6$, for how many values of x does $f(x) = 2$?

(A) None
(B) One
(C) Two
(D) Three
(E) More than three

7. If the average (arithmetic mean) of t and $t + 2$ is x and if the average of t and $t - 2$ is y, what is the average of x and y ?

(A) 1
(B) $\frac{t}{2}$
(C) t
(D) $t + \frac{1}{2}$
(E) $2t$

$\frac{t+(t+2)}{2} = x$

$\frac{2t+2}{2} = x$

$t+1 = x$

$\frac{t+(t-2)}{2} = y$

$\frac{2t-2}{2} = y$

$t-1 = y$

$\frac{x+y}{2} = \frac{t+1+t-1}{2} = \frac{2t+0}{2}$

$= t$

8. For all numbers x and y, let $x \triangle y$ be defined as $x \triangle y = x^2 + xy + y^2$. What is the value of $(3 \triangle 1) \triangle 1$?

(A) 5
(B) 13
(C) 27
(D) 170
(E) 183

$3 \triangle 1 = 3^2 + 3 + 1 = 13$

$13 \triangle 1 = 13^2 + 13 + 1$

$= 169 + 13 + 1$

$= 183$

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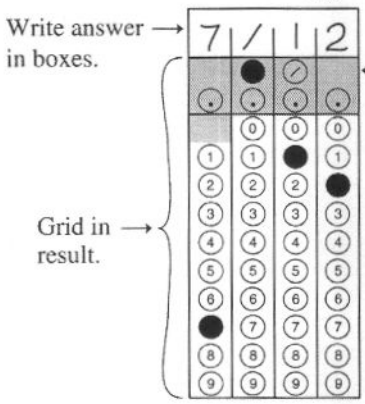
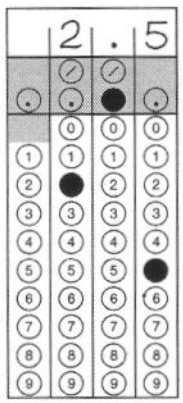
Directions: For Student-Produced Response questions 9-18, use the grids at the bottom of the answer sheet page on which you have answered questions 1-8.

Each of the remaining 10 questions requires you to solve the problem and enter your answer by marking the circles in the special grid, as shown in the examples below. You may use any available space for scratchwork.

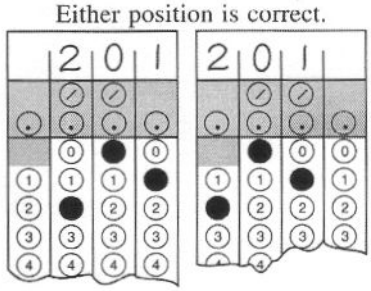
Answer: $\frac{7}{12}$



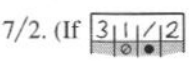
Answer: 2.5



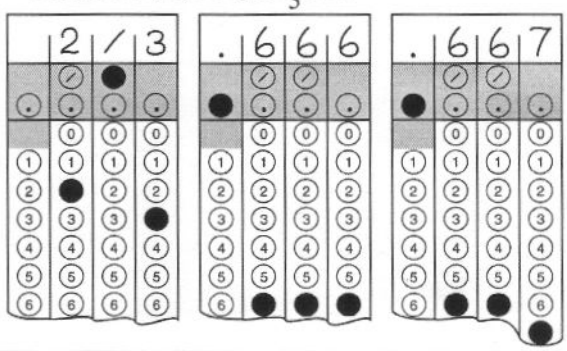
Answer: 201
Either position is correct.



Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

- Mark no more than one circle in any column.
- Because the answer sheet will be machine-scored, **you will receive credit only if the circles are filled in correctly.**
- 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.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- No question has a negative answer.
- **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is gridded, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- **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. For example, if you obtain an answer such as 0.6666..., you should record your result as .666 or .667. **A less accurate value such as .66 or .67 will be scored as incorrect.**

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



9. Morgan's plant grew from 42 centimeters to 57 centimeters in a year. Linda's plant, which was 59 centimeters at the beginning of the year, grew twice as many centimeters as Morgan's plant did during the same year. How tall, in centimeters, was Linda's plant at the end of the year?

Morgan's Grew = 57 − 42 = 15 cm

Linda's Plant = 59 + 2 × 15

= 59 + 30 = 89 cm

10. Since the beginning of 1990, the number of squirrels in a certain wooded area has tripled during every 3-year period of time. If there were 5,400 squirrels in the wooded area at the beginning of 1999, how many squirrels were in the wooded area at the beginning of 1990 ?

$S(t) = S_0 \times 3^{t/3}$ $\quad t$ = Years − 1990

1999 → $t = 9$

$S(9) = 5400 = S_0 \times 3^{9/3} = 27 S_0$

$S_0 = \frac{5400}{27} = 200$ Squirrels

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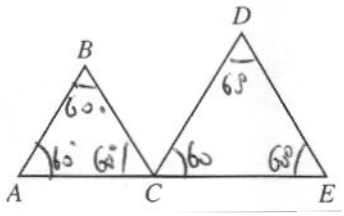

11. In the figure above, triangles ABC and CDE are equilateral and line segment $\overline{AE}$ has length 25. What is the sum of the perimeters of the two triangles?

$AB = BC = AC$, $CD = DE = CE$

$P = 3AC + 3CE = 3(AC+CE)$

$= 3 \times 25$

$= \underline{\underline{75}}$

$x = 3v$
$v = 4t$
$x = pt$

13. For the system of equations above, if $x \neq 0$, what is the value of p ?

$3V = Pt$

$P = \frac{3V}{t} = \frac{3 \cdot 4t}{t}$

$= \underline{\underline{12}}$

12. Marbles are to be removed from a jar that contains 12 red marbles and 12 black marbles. What is the least number of marbles that could be removed so that the ratio of red marbles to black marbles left in the jar will be 4 to 3 ?

| 12R 12B |

Key word is the Least.

$\frac{R}{B} = \frac{4}{3} = \frac{12}{9}$ Least

⇒ Remove 3 Black marbles

$\frac{4}{3} = \frac{8}{6}$ X

14. If $|-2x + 1| < 1$, what is one possible value of x ?

$-1 < -2x+1 < 1$

$-2 < -2x < 0$

$1 > x > 0$

$0 < x < 1$

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15. For what positive number is the square root of the number the same as the number divided by 40 ?

$\sqrt{x} = \frac{x}{40}$

$x = \frac{x^2}{1600}$

$x^2 = 1600x$

$x^2 - 1600x = 0$

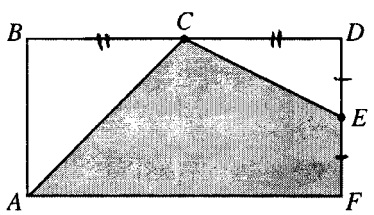
$x(x-1600) = 0$

$x \neq 0$

$x - 1600 = 0$

$x = 1600$

$x = 1600$



16. In rectangle $ABDF$ above, C and E are midpoints of sides $\overline{BD}$ and $\overline{DF}$, respectively. What fraction of the area of the rectangle is shaded?

Area of Rectangle $= AB \cdot BD$

$= 2CD \cdot 2DE = 4CD \cdot DE$

2 of 2 triangles $= \frac{BC \cdot BA}{2} + \frac{CD \cdot DE}{2}$

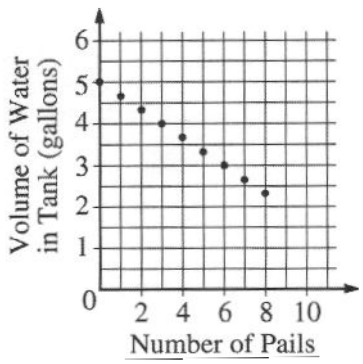
$= \frac{CD \cdot 2DE}{2} + \frac{CD \cdot DE}{2}$

$= \frac{3}{2} CD \cdot DE$

Fraction of Shaded area $= \frac{4CD \cdot DE - 3/2\, CD \cdot DE}{4CD \cdot DE}$

$= 1 - \frac{3}{2} \cdot \frac{1}{4} = 1 - \frac{3}{8}$

$= 5/8$



17. The graph above shows the amount of water remaining in a tank each time a pail was used to remove x gallons of water. If 5 gallons were in the tank originally and $2\frac{1}{3}$ gallons remained after the last pail containing x gallons was removed, what is the value of x ?

After 3 Pails we have 4 Gallons

$3x = 1 \Rightarrow x = 1/3$ Gallon.

18. If $0 \leq x \leq y$ and $(x+y)^2 - (x-y)^2 \geq 25$, what is the least possible value of y ?

$x^2 + 2xy + y^2 - (x^2 - 2xy + y^2) \geq 25$

$4xy \geq 25$

$xy \geq \frac{25}{4}$

If $x = y \Rightarrow y^2 \geq \frac{25}{4}$

$y \geq \sqrt{\frac{25}{4}} = \frac{5}{2}$

$\Rightarrow$ Least possible value for $y = \frac{5}{2}$

STOP

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