Model Test 3

Section 1

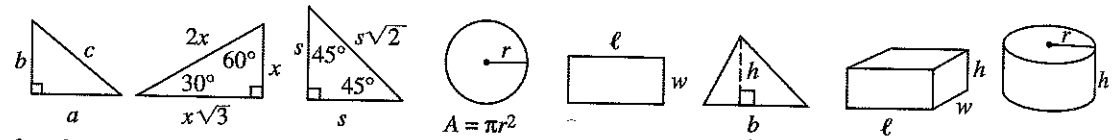
Time: 25 Minutes/20 Multiple-Choice Questions

Solve each problem in this section. Then decide which is the best of the choices given and mark your answer on the answer sheet on page 419.

Notes:

1. The usage of a calculator is allowed. Only real numbers are used.
2. The figures that accompany problems provide useful information to help solve the problems. Unless otherwise noted, these figures are drawn as accurately as possible and lie in a plane.
3. Unless otherwise noted, the domain, x, and the range, $f(x)$, of any given function, f, is the set of real numbers.

Formulas & Information

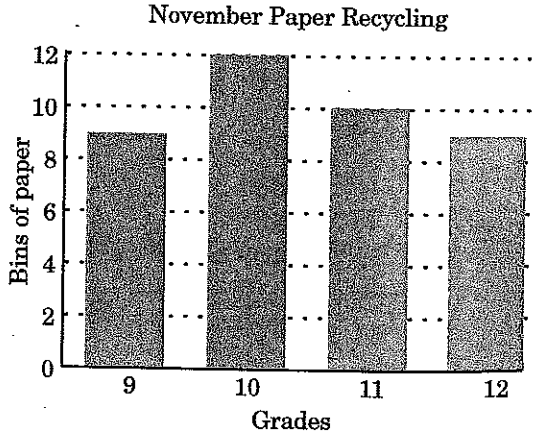


$c^2 = a^2 + b^2$ Special Right Triangles $A = \pi r^2$ $C = 2\pi r$ $A = \ell w$ $A = \frac{1}{2}bh$ $V = \ell wh$ $V = \pi r^2 h$

The measure of a straight angle is 180°.
The sum of the measures of the interior angles in a triangle is 180°.
The total number of degrees in a circle is 360°.

1. On a map, 1 inch represents 45 miles. If two towns are 405 miles apart, how many inches apart on the map are they?

(A) 8 (B) 9 (C) 10
(D) 360 (E) 550

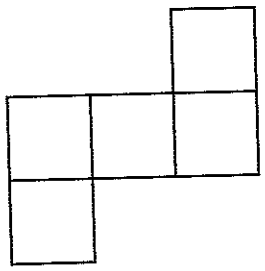


2. Star High School recycles white paper. The November results for each grade level are shown in the graph above. The school goal is to recycle 50 bins of paper each month. What percent of the school goal was not achieved in November?

(A) 0% (B) 10% (C) 20%
(D) 25% (E) 100%

3. If $\frac{5}{8}m = 40$, then what is the value of $\frac{1}{8}m$?

(A) 5 (B) 8 (C) 24
(D) 25 (E) 64



This figure consists of 5 congruent squares.

4. If the area of the figure above is 180 square inches, then what is the number of inches in the perimeter?

(A) 36 (B) 45 (C) 72
(D) 96 (E) 900

5. If m is an odd integer, what is the third consecutive odd integer following m?

(A) $m + 3$ (B) $m + 6$ (C) $m + 7$
(D) $3m$ (E) $3m + 1$

6. Points A, B, C, and D lie on a straight line in that order. If the length of segment AC is 28, the length of segment BD is 20, and the length of segment AB is 9, what is the length of CD?

(A) 1 (B) 2 (C) 8
(D) 11 (E) 19

7. If the lengths of two sides of a triangle measure 10 and 13, then which of the following must be true of the third side?

(A) $3 < x < 23$
(B) $3 < x < 13$
(C) $10 < x < 13$
(D) $3 < x < \sqrt{269}$
(E) $23 < x < 130$

8. If $\frac{a+b}{x-y} = \frac{3}{5}$ then $\frac{10a + 10b}{9x - 9y} =$

(A) $\frac{50}{27}$ (B) $\frac{5}{3}$ (C) $\frac{10}{9}$
(D) $\frac{2}{3}$ (E) $\frac{27}{50}$

x	$f(x)$
1	3
2	5
3	7
4	9

9. In the table shown above, which equation best describes the relationship between x and $f(x)$?

(A) $f(x) = x + 1$ (B) $f(x) = x + 2$
(C) $f(x) = \frac{x}{2} + 3$ (D) $f(x) = 2x + 1$
(E) $f(x) = 2x + 3$

10. If $5r = 41$ and $10r + 3y = 1$, then what is the value of y?

(A) -81 (B) $-27\frac{2}{3}$ (C) -27
(D) 27 (E) 82

11. If $a = b - 1$, then what is the value of $(a - b)^3 - (b - a)^3$?

(A) -2 (B) -1 (C) 0
(D) 1 (E) 2

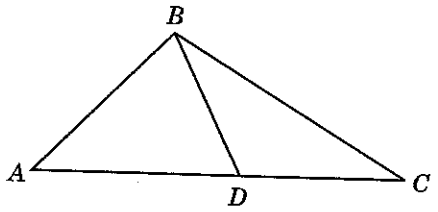
12. If a circle has a pair of perpendicular chords of lengths 4 and 6, then what is the smallest possible area of the circle?

(A) 4π (B) 6π (C) 9π
(D) 16π (E) 36π

13. If an integer n is increased by r times that integer equals t times that integer, then what is the value of r in terms of t?

(A) $\frac{t-1}{t}$ (B) $t-1$ (C) t

(D) $t+1$ (E) $\frac{t+1}{t}$



Note: Figure not drawn to scale.

14. In triangle ABC above, point D is the midpoint of side AC. If $BD = DC$, then what is the degree measure of angle ABC?

(A) 45 (B) 60 (C) 90
(D) 100 (E) 120

15. If K is a positive integer and N is a negative integer, which of the following statements must always be true?

I. $K^2 > 0$
II. $N^2 > 0$
III. $K^3 > 0$ or $N^3 > 0$

(A) I only (B) I and II only
(C) I and III only (D) II and III only
(E) I, II, and III

16. A circle is inscribed in a square. If the perimeter of the square is 4π, what is the circumference of the circle?

(A) $\frac{\pi^2}{4}$ (B) $\frac{\pi^2}{2}$ (C) π^2

(D) $\frac{\pi^3}{4}$ (E) $\frac{\pi^3}{2}$

17. If $3x^2 - 5x - 8 = 0$, what is the value of $6x^2 - 10x - 11$?

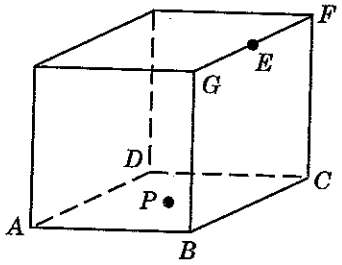
(A) -6 (B) -3 (C) 3
(D) 5 (E) 19.

18. What is the area of a triangle formed by the lines represented by $x = 0$, $y = 0$, and $y = -3x + 3$?

(A) 1 (B) 1.5 (C) 2
(D) 2.5 (E) 3

19. If one solution to the equation $x^2 - 3x + k = 0$ is 4, then what is the other solution?

(A) -4 (B) -1 (C) 1
(D) 4 (E) Cannot be determined from the information given



20. The cube in the figure above has an edge of length 6 and point P is the center of the bottom face $ABCD$. If point E is the midpoint of line segment GF, then what is the length of line segment PE?

(A) $3\sqrt{2}$ (B) $3\sqrt{5}$ (C) $6\sqrt{2}$
(D) 9 (E) 45

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.

STOP

Section 2 Time: 25 Minutes/18 Questions

This section contains two types of questions.
You have 25 minutes to complete both types.

Example

Which of the following is a multiple of 5?

(A) 23 (B) 52 (C) 76 (D) 120 (E) 551 Ex. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

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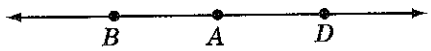
3. Unless otherwise noted, the domain, x, and the range, $f(x)$, of any given function, f, is the set of real numbers.

1. If $|x| < 2$, then the set of all integers, that satisfy the inequality are

(A) $\{-1, 1\}$ (B) $\{0, 1\}$
(C) $\{-2, -1, 0\}$ (D) $\{-1, 0, 1\}$
(E) $\{0, 1, 2\}$

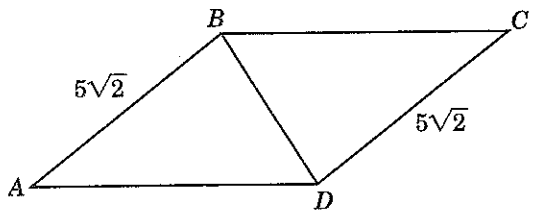


2. In the figure above, the intersection of ray BD and ray AB is

(A) line segment BD
(B) line segment BA
(C) line BD
(D) ray BD
(E) ray AB

3. If the graphs of the linear functions $f(x) = -3x + 7$ and $g(x) = -ax + 7$ are perpendicular, what is the value of a?

(A) -3 (B) $-\frac{3}{7}$ (C) $-\frac{1}{3}$
(D) $\frac{1}{3}$ (E) 3



Note: Figure not drawn to scale.

4. In the figure above, parallelogram $ABCD$ has two opposite sides that each measure $5\sqrt{2}$. If $\angle A$ measures 45° and diagonal BD also measures $5\sqrt{2}$, what is the length of side BC?

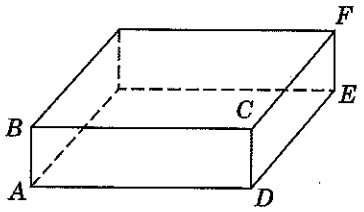
(A) 5 (B) $5\sqrt{2}$ (C) $5\sqrt{3}$
(D) 10 (E) $10\sqrt{2}$

5. The sum of the positive integers A and B is 6, and the product of positive integers K and M is 12. What is the positive difference between the probability that $A = 2$ and $B = 4$, and the probability that $K = 2$ and $M = 6$?

(A) 0 (B) $\frac{1}{30}$ (C) $\frac{1}{4}$
(D) $\frac{3}{10}$ (E) $\frac{7}{15}$

6. If the circumference of a circle is $2\sqrt{\pi}$, then the area of the circle is

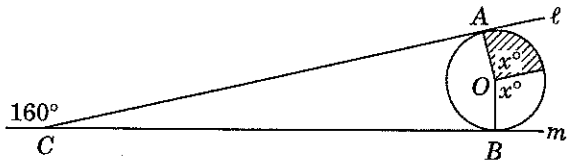
(A) 1 (B) $\sqrt{\pi}$ (C) 2
(D) π (E) 4π



Note: Figure not drawn to scale.

7. In the rectangular solid above, the edges are integers and the area of face *ABCD* is 12 and the area of the face *DCFE* is 8. What is the greatest difference between the possible volumes of the rectangular solid?

(A) 96 (B) 72 (C) 48
(D) 24 (E) 12



8. In the figure above, lines ℓ and m are tangents to the circle O at points A and B. If the radius of the circle is 3, what is the area of the shaded region?

(A) $\frac{5\pi}{3}$ (B) 2π (C) $\frac{5\pi}{2}$

(D) 3π (E) 5π