1. If $x = 2y$ and $y = \frac{10}{z}$, what is the value of $x$ when $z = 4$?

(A) $\frac{5}{4}$
(B) $\frac{5}{2}$
(C) 5
(D) 8
(E) 20

2. In the figure above, which lettered point, other than point $O$, lies in the interior of a circle with center $O$ and radius 4?

(A) $A$
(B) $B$
(C) $C$
(D) $D$
(E) $E$
3. In the figure above, $ABCD$ is a square. What percent of the square is shaded?

(A) 25%
(B) 33 $\frac{1}{3}$%
(C) 37 $\frac{1}{2}$%
(D) 40%
(E) 50%

4. Each of the boxes above must contain one number from the set \{8, 15, 16, 18, 27\}. A different number is to be placed in each box so that the following conditions are met.

(1) Box $P$ contains an odd number.
(2) Box $Q$ contains an even number.
(3) Boxes $R$ and $S$ each contain a number that is a multiple of 9.
(4) The number in box $P$ is less than the number in box $Q$.

What number must be in box $T$?

(A) 8
(B) 15
(C) 16
(D) 18
(E) 27
Questions 5-6 refer to the following graphs, which show the change in the number and average (arithmetic mean) size of farms in the United States during the years 1940-1990.

**United States Farms, 1940-1990**

<table>
<thead>
<tr>
<th>Number of Farms</th>
<th>Approximate Average Size of Farms (in acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,000,000</td>
<td>150</td>
</tr>
<tr>
<td>5,000,000</td>
<td>200</td>
</tr>
<tr>
<td>4,000,000</td>
<td>300</td>
</tr>
<tr>
<td>3,000,000</td>
<td>375</td>
</tr>
<tr>
<td>2,000,000</td>
<td>425</td>
</tr>
<tr>
<td>1,000,000</td>
<td>450</td>
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<tr>
<td>1940</td>
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<td>1970</td>
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<tr>
<td>1980</td>
<td>1980</td>
</tr>
<tr>
<td>1990</td>
<td>1990</td>
</tr>
</tbody>
</table>

5. Which of the following is NOT a valid conclusion from the information shown in the graphs?

(A) From 1950 to 1960, the number of farms decreased by approximately 2,000,000.
(B) From 1940 to 1990, the number of farms decreased.
(C) From 1940 to 1990, the average size of farms increased each decade.
(D) In 1980, there were about 2,500,000 farms.
(E) From 1950 to 1960, the average size of farms increased by approximately 100%.

6. According to the graphs, which of the following is the best estimate of the total acreage of farms in 1950?

(A) 200,000
(B) 1,100,000
(C) 5,500,000
(D) 1,100,000,000
(E) 11,000,000,000
7 In the exact middle of a certain book, when the page numbers on the facing pages, $x$ and $x + 1$, are multiplied together, the product is 210. If all of the pages are numbered in order, how many numbered pages are in the book?

(A) 24  
(B) 26  
(C) 28  
(D) 32  
(E) 34

8 Segments $AC, AF, BF, \text{ and } EC$ intersect at the labeled points as shown in the figure above. Define two points as “independent” if they do not lie on the same segment in the figure. Of the labeled points in the figure, how many pairs of independent points are there?

(A) None  
(B) One  
(C) Two  
(D) Three  
(E) Four

9 If $a$ and $b$ are positive integers, which of the following expressions is equivalent to $\frac{(3^a)^b}{3^a}$?

(A) $1^b$  
(B) $3^b$  
(C) $3^{ab-1}$  
(D) $3^{ab} - 3^a$  
(E) $(3^a)^{b-1}$

10 $AB, BC, \text{ and } AC$ are diameters of the three circles shown above. If $BC = 2$ and $AB = 2BC$, what is the area of the shaded region?

(A) $12\pi$  
(B) $6\pi$  
(C) $\frac{9}{2}\pi$  
(D) $3\pi$  
(E) $2\pi$

Note: Figure not drawn to scale.
Section 7

Time—15 Minutes 10 Questions

In this section solve each problem, using any available space on the page for scratchwork. Then decide which is the best of the choices given and fill in the corresponding oval on the answer sheet.

Notes:
1. The use of a calculator is permitted. All numbers used are real numbers.

2. 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.

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

1. If \( x + 2y = 8 \) and \( 4y = 4 \), what is the value of \( x \)?
   (A) 0
   (B) 2
   (C) 4
   (D) 6
   (E) 7

2. What is the least positive integer that is a multiple of 4, 15, and 18?
   (A) 30
   (B) 60
   (C) 180
   (D) 360
   (E) 1,080
3. Which of the following is an expression for 10 less than the product of $x$ and 2?

(A) $x^2 - 10$
(B) $2(x - 10)$
(C) $(x + 2) - 10$
(D) $10 - 2x$
(E) $2x - 10$

5. How many minutes are required for a car to go 10 miles at a constant speed of 60 miles per hour?

(A) 600
(B) 100
(C) 60
(D) 10
(E) 6

4. The figure above shows a square and five labeled points. What is the least number of these five points that need to be moved so that all five points lie on the same circle?

(A) One
(B) Two
(C) Three
(D) Four
(E) Five

6. In right triangle $ABC$ above, what is the value of $y$?

(A) 45
(B) 48
(C) 54
(D) 60
(E) 72
Questions 7-8 refer to the following information.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

The diagram above represents six building lots along a street. There are no other residential sites in the area. Five families—v, w, x, y, and z—are each interested in purchasing a lot, with the following restrictions.

v will occupy lot 6.
y and z will live on different sides of the street.
w and x will live on the same side of the street, and x will be the only next-door neighbor that w has.

One lot will remain unsold.

If all five families purchased lots and fulfilled all the restrictions and if y purchased lot 3, which of the following must be true?

I. w purchased lot 1.
II. x purchased lot 4.
III. z purchased lot 5.

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

If all five families purchased lots and fulfilled all the restrictions, which of the following pairs of lots could be the ones purchased by y and z?

(A) 1 and 2
(B) 1 and 3
(C) 2 and 3
(D) 3 and 5
(E) 3 and 6
9. In a plane, lines are drawn through a given point \(O\) so that the measure of each non-overlapping angle formed about point \(O\) is 60°. How many different lines are there?

(A) Two  
(B) Three  
(C) Four  
(D) Five  
(E) Six

10. For how many different positive integer values of \(k\) does \((kx - 6)^2 = 0\) have integer solutions?

(A) None  
(B) One  
(C) Two  
(D) Four  
(E) Six