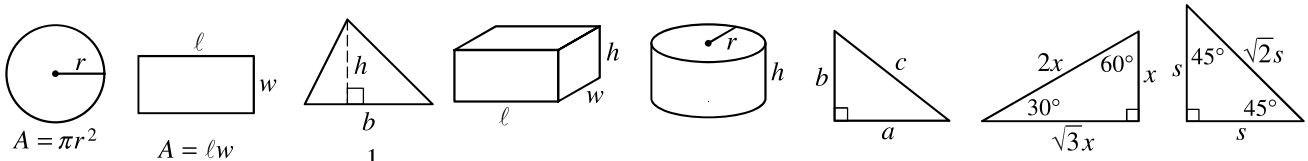
SECTION 2
Time — 30 minutes
25 Questions

Directions: 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.

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 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 $2x + 4x + 6x = -24$, then $x =$

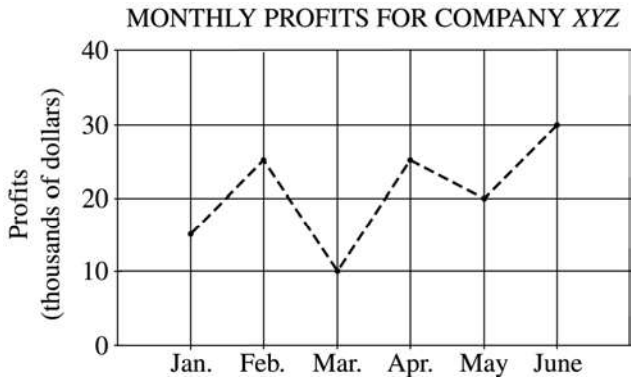
(A) -288

(B) -2

(C) $-\frac{1}{2}$

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

(E) 2



2. According to the chart above, Company *XYZ* experienced its largest increase in monthly profits between which two consecutive months?

(A) January and February
(B) February and March
(C) March and April
(D) April and May
(E) May and June

3. If $7^{10} = 7 \times 7^{n}$, what is the value of n ?

(A) 10
(B) 9
(C) 7
(D) 5
(E) 3

4. Each month, a telephone service charges a base rate of $10.00 and an additional $0.08 per call for the first 40 calls and $0.04 for every call after that. How much does the telephone service charge for a month in which 50 calls are made?

(A) $12.20
(B) $12.80
(C) $13.60
(D) $14.40
(E) $17.60

5. If 7.5 is x percent of 75, what is x percent of 10 ?

(A) 10
(B) 1
(C) 0.75
(D) 0.1
(E) 0.075

1 cup = 8 ounces
10 ounces = 60 teaspoons

6. Based on the information above, how many teaspoons are equivalent to $\frac{1}{4}$ cup?

(A) 12
(B) 10
(C) 8
(D) 6
(E) 4

E			0		3
F			0		2
G			0		0
H			0		1
	1	3	0	2	

7. Each square in the grid above is to be filled with either 1 or 0. Each number to the right of the grid is the sum of the numbers in the row to its left, and each number below the grid is the sum of the numbers in the column above it. For example, there is a 0 below the third column because the sum of the numbers in that column is 0. When the 0's and 1's are all entered correctly into the grid, what will row F be?

(A) F | 1 | 1 | 0 | 0 |

(B) F | 1 | 0 | 1 | 0 |

(C) F | 0 | 1 | 1 | 0 |

(D) F | 1 | 0 | 0 | 1 |

(E) F | 0 | 1 | 0 | 1 |

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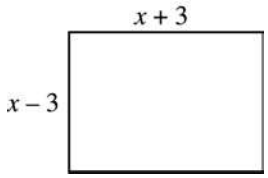


8. If the perimeter of the rectangle above is 72, what is the value of x?

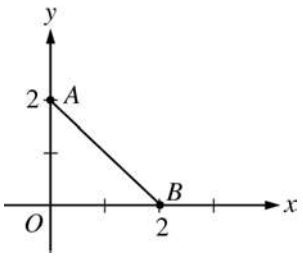
(A) 9
(B) 15
(C) 18
(D) 21
(E) 36

9. For which of the following lists of 7 numbers is the average (arithmetic mean) less than the median?

(A) 1, 2, 3, 8, 9, 10, 11
(B) 3, 4, 5, 8, 11, 12, 13
(C) 5, 5, 5, 8, 11, 11, 11
(D) 5, 6, 7, 8, 9, 10, 11
(E) 5, 6, 7, 8, 9, 10, 20

10. Wayne would like to buy a school jacket priced at \$81, but the price of the jacket is \$59 more than he has. In which of the following equations does x represent the number of dollars Wayne has?

(A) $x + 81 = 59$
(B) $x - 81 = 59$
(C) $x - 59 = -81$
(D) $x - 81 = -59$
(E) $x - 59 = 81$



11. In the figure above, line ℓ (not shown) is perpendicular to segment AB and bisects segment AB. Which of the following points lies on line ℓ?

(A) $(0, 2)$
(B) $(1, 3)$
(C) $(3, 1)$
(D) $(3, 3)$
(E) $(3, 6)$

12. If $(m - 1)(1 - k) = 0$, which of the following can be true?

I. $m = 1$
II. $k = 1$
III. $m = k$

(A) None
(B) I only
(C) II only
(D) I and II only
(E) I, II, and III

13. What is the radius of a circle whose circumference is π ?

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

14. On a map, the length of the road from Town A to Town B is measured to be 12 inches. On this map, $\frac{3}{4}$ inch represents an actual distance of 8 miles. What is the actual distance, in miles, from Town A to Town B along this road?

(A) 128
(B) 102
(C) 96
(D) 90
(E) 72

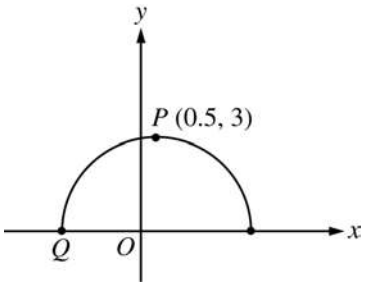
$$\begin{array}{r} R\ 2\ R \\ +\ 6\ T\ 9 \\ \hline T\ R\ 0 \end{array}$$

15. In the addition of two 3-digit numbers above, R and T represent two different digits and the units digit of the answer is zero. What digit does T represent?

(A) 1
(B) 6
(C) 7
(D) 8
(E) 9

16. How many of the prime factors of 30 are greater than 2 ?

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



17. Point P is the point with the greatest y-coordinate on the semicircle shown above. What is the x-coordinate of point Q ?

(A) −3.5
(B) −3
(C) −2.5
(D) −2
(E) −1.5

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$a,\ 2a,\ b$

18. If the average (arithmetic mean) of the 3 numbers above is $2a$, what is b in terms of a ?

(A) a

(B) $\frac{3}{2}a$

(C) $2a$

(D) $\frac{5}{2}a$

(E) $3a$

19. The ratio of a to b is 2 to 3, where a and b are positive. If x equals a increased by 50 percent of a and y equals b decreased by 50 percent of b, what is the value of $\frac{x}{y}$?

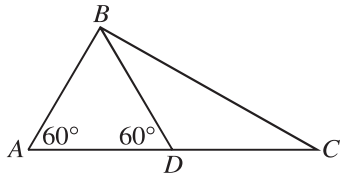
(A) $\frac{1}{3}$

(B) $\frac{2}{3}$

(C) 1

(D) $\frac{3}{2}$

(E) 2



20. In $\triangle ABC$ above, the length of AB is 3, and D is the midpoint of AC. What is the length of BC ?

(A) $3\sqrt{3}$ (approximately 5.20)

(B) $4\sqrt{2}$ (approximately 5.66)

(C) $4\sqrt{3}$ (approximately 6.93)

(D) $6\sqrt{2}$ (approximately 8.49)

(E) $5\sqrt{3}$ (approximately 8.66)

21. A garden has r parallel rows of plants, with 5 plants in each row. If x plants are added to each row, how many plants will then be in the garden, in terms of r and x ?

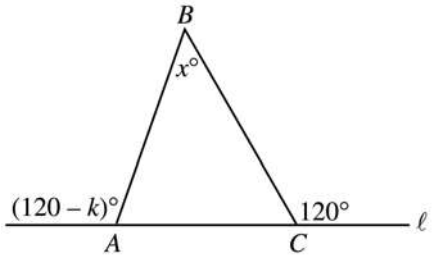
(A) $5rx$

(B) $5r + x$

(C) $5r + rx$

(D) $5r + 5x$

(E) $r + 5 + x$



Note: Figure not drawn to scale.

22. In the figure above, side AC of $\triangle ABC$ is on line ℓ. What is x in terms of k?

(A) $60 - k$
(B) k
(C) $60 + k$
(D) $120 - k$
(E) $120 - 2k$

23. Three lines are drawn in a plane so that there are exactly three different intersection points. Into how many nonoverlapping regions do these lines divide the plane?

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

24. For all values of y, let $y \star$ be defined by $y \star = y^2 - 1$. Which of the following is equal to $(y \star) \star$?

(A) $y^4 - 1$
(B) $y^4 - y^2 - 1$
(C) $y^4 + y^2 - 1$
(D) $y^4 - 2y^2$
(E) $y^4 - 2y^2 + 1$

25. A club is buying boxes of candy bars to sell for a fund-raiser. If each box contains c candy bars, and each member sells x bars each day, how many boxes are needed to supply enough candy bars for $3c$ members to sell for 5 days?

(A) $15c^2x$
(B) $\frac{x}{15}$
(C) $\frac{3x}{5}$
(D) $\frac{15c^2}{x}$
(E) $15x$

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.

SECTION 3

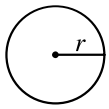
Time — 30 minutes
25 Questions

Directions: This section contains two types of questions. You have 30 minutes to complete both types. You may use any available space for scratchwork.

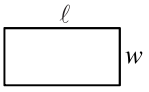
Notes:

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.

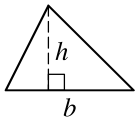
Reference Information



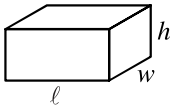
$A = \pi r^2$
$C = 2\pi r$



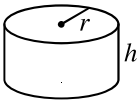
$A = \ell w$



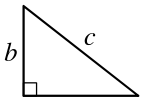
$A = \frac{1}{2}bh$



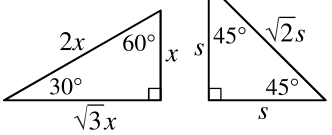
$V = \ell wh$



$V = \pi r^2 h$



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



Special Right Triangles

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

Directions for Quantitative Comparison Questions

Questions 1-15 each consist of two quantities in boxes, one in Column A and one in Column B. You are to compare the two quantities and on the answer sheet fill in oval

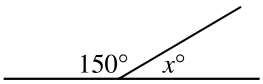
A if the quantity in Column A is greater;
B if the quantity in Column B is greater;
C if the two quantities are equal;
D if the relationship cannot be determined from the information given.

AN E RESPONSE WILL NOT BE SCORED.

Notes:

1. In some questions, information is given about one or both of the quantities to be compared. In such cases, the given information is centered above the two columns and is not boxed.
2. In a given question, a symbol that appears in both columns represents the same thing in Column A as it does in Column B.
3. Letters such as x, n, and k stand for real numbers.

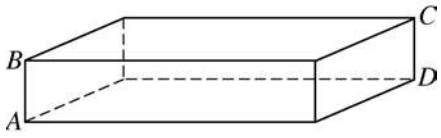
EXAMPLES

	Column A	Column B	Answers
E1	5^2	20	● Ⓑ Ⓒ Ⓓ Ⓔ
E2	 x	30	Ⓐ Ⓑ ● Ⓓ Ⓔ
E3	r and s are integers. $r + 1$	$s - 1$	Ⓐ Ⓑ Ⓒ ● Ⓔ

SUMMARY DIRECTIONS FOR COMPARISON QUESTIONS

Answer: **A if the quantity in Column A is greater;**
B if the quantity in Column B is greater;
C if the two quantities are equal;
D if the relationship cannot be determined from the information given.

	Column A	Column B
	t is negative.	
1.	$\frac{1}{t}$	$1 - t$



The figure above is a rectangular solid.

2.	The distance from A to C	The distance from B to D

$a \neq 0$

3.	$a \times a$	$a + (-a)$

A person is going to pick a marble at random from a bag containing 8 red marbles, 6 white marbles, 2 blue marbles, and no other marbles.

4.	The probability that the marble picked will be red	The probability that the marble picked will be white or blue

	Column A	Column B
	Point O is the center of a circle. Point P is inside the circle, and point M is outside the circle.	
5.	The length of OP	The length of PM

At a book sale, 300 people each bought at least 1 book. A total of 350 books were sold.

6.	The number of people who each bought more than 1 book	51

$t = (2y \times 10^3) + (3y \times 10^3)$
$y > 0$

7.	t	$5y \times 10^3$

$n^2 > 10$, and n is a positive integer.

8.	n^3	50

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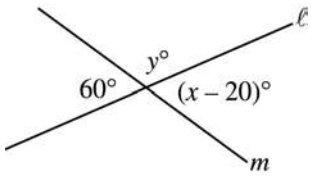
SUMMARY DIRECTIONS FOR COMPARISON QUESTIONS

Answer: **A if the quantity in Column A is greater;**
B if the quantity in Column B is greater;
C if the two quantities are equal;
D if the relationship cannot be determined from the information given.

	Column A	Column B
9.	 $2x$	y
10.	$a^2 - b^2$	$a - b$
11.	For all positive integers n, let $\boxed{n} = n$ if n is odd, and let $\boxed{n} = n + 1$ if n is even. $\boxed{4 - 3}$	$\boxed{4} - \boxed{3}$
12.	$x - y = 7$ $x - z < 7$ y	z

	Column A	Column B
13.	n is a positive integer. The least multiple of 3 that is greater than n	$2n - 1$
14.	$(r + p)25 = rx + py$ for all values of r and p. $x + y$	50
15.	$h > 1$ The perimeter of an equilateral triangle with height h	The perimeter of an equilateral triangle with sides of length h

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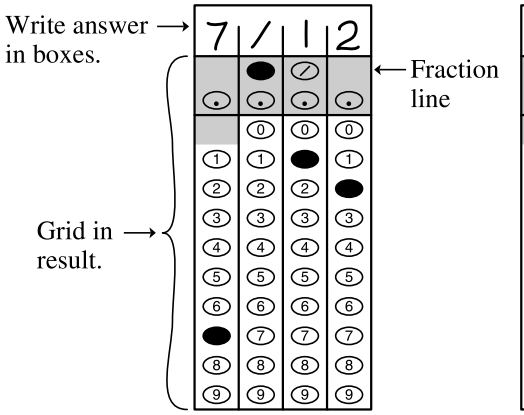
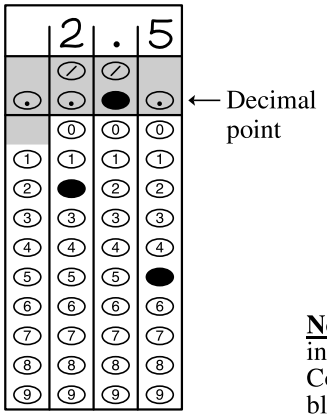
Directions for Student-Produced Response Questions

Each of the remaining 10 questions requires you to solve the problem and enter your answer by marking the ovals in the special grid, as shown in the examples below.

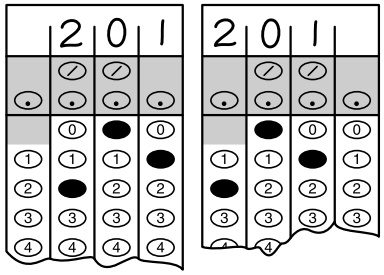
Answer: $\frac{7}{12}$ or 7/12



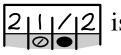
Answer: 2.5



Answer: 201
Either position is correct.

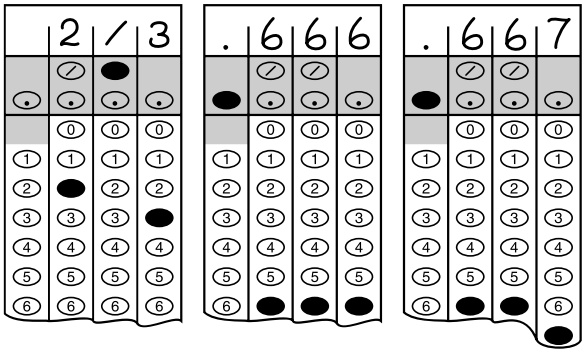


Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

- Mark no more than one oval in any column.
- Because the answer sheet will be machine-scored, **you will receive credit only if the ovals 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 ovals 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 $2\frac{1}{2}$ must be gridded as 2.5 or 5/2. (If  is gridded, it will be interpreted as $\frac{21}{2}$, not $2\frac{1}{2}$.)

- **Decimal Accuracy:** If you obtain a decimal answer, **enter the most accurate value the grid will accommodate.** For example, if you obtain an answer such as 0.6666 . . . , you should record the result as .666 or .667. **Less accurate values such as .66 or .67 are not acceptable.**

Acceptable ways to grid $\frac{2}{3}$ = .6666 . . .



16. How many $\frac{1}{4}$-pound sticks of butter together weigh as much as 25 pounds of butter?

17. If $\frac{(5 + 2)m + 3}{4} = 6$, what is the value of m ?

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18. In isosceles triangle ABC, the measure of angle A is $80°$. If another angle of the triangle measures $x°$, where $x \neq 80$, what is one possible value of x ?

19. Of 650 cities surveyed, each city had an art museum, or a nature museum, or both. Of the 320 cities that had art museums, $\frac{1}{4}$ also had nature museums. What is the total number of cities surveyed that had nature museums?

A	B
D	C

20. In the figure above, the lengths and widths of rectangles A, B, C, and D are whole numbers. The areas of rectangles A, B, and C are 35, 45, and 36, respectively. What is the area of the entire figure?

WHERE DO TWELFTH GRADERS USE COMPUTERS?

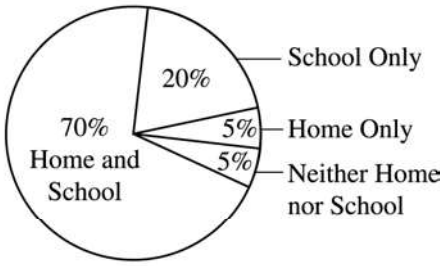


Figure 1

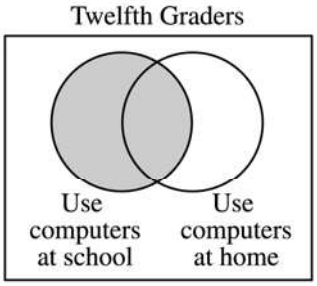
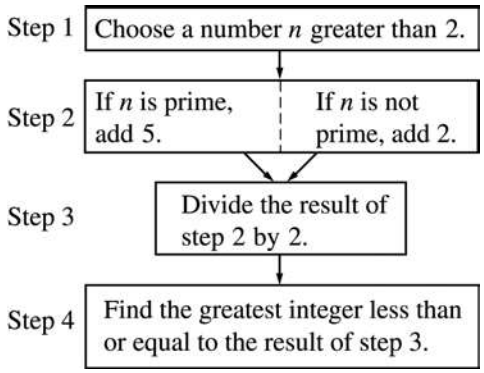


Figure 2

Note: Figure 2 not drawn to scale.

21. The Lyndhurst High School twelfth graders are represented in the circle graph in Figure 1. Figure 2 is another way to illustrate the use of computers by these twelfth graders. If the same 200 twelfth graders are represented in both figures, what is the total number of twelfth graders represented by the shaded circle in Figure 2 ?

22. In an art class, there were just enough staplers, rulers and glue bottles so that every 2 students had to share a stapler, every 3 students had to share a ruler, and every 4 students had to share a glue bottle. If the sum of the number of staplers, rulers, and glue bottles used by the class was 65, how many students were in the class?



23. In the chart above, if the number n chosen in step 1 is 39, what number will be the result of step 4 ?

24. Two numbers have the property that their sum is equal to their product. If one of the numbers is 6, what is the other number?

25. How many positive integers less than 1,000 are multiples of 5 and are equal to 3 times an even integer?

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.

SECTION 6

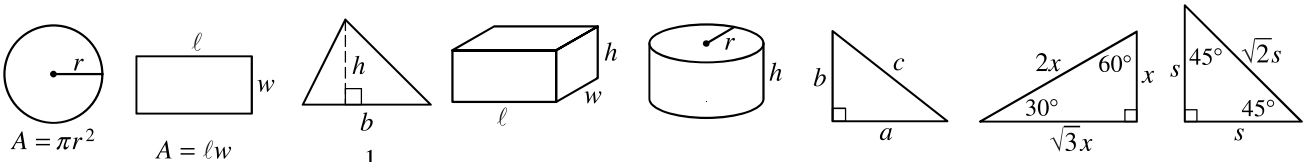
Time — 15 minutes
10 Questions

Directions: 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.

Reference Information



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

$A = \ell w$

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

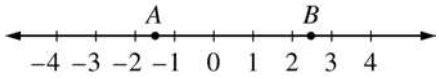
$V = \ell wh$

$V = \pi r^2 h$

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

Special Right Triangles

The number of degrees of arc in a circle is 360.
The 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. Which of the following is the best estimate of the length of segment AB on the number line above?

(A) 4
(B) 3.5
(C) 3
(D) 1.5
(E) 1

2. For every 8,000 lawn mowers produced by a lawn mower factory, exactly 6 are defective. At this rate, how many lawn mowers were produced during a period in which exactly 15 lawn mowers were defective?

(A) 800
(B) 8,000
(C) 12,000
(D) 20,000
(E) 24,000

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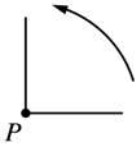


3. The figure above will be rotated 90° about point P in the direction indicated. Which of the following represents the rotated figure?

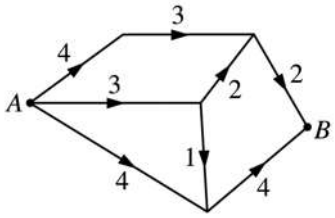
(A) 

(B) 

(C) 

(D) 

(E) 



Note: Figure not drawn to scale.

4. In the diagram of roads above, the numbers represent road distances in miles, and the arrows show the only directions in which travel is permitted on the roads. If the length of the longest route from A to B is ℓ miles, and if the length of the shortest route from A to B is s miles, then $\ell - s =$

(A) 9
(B) 8
(C) 7
(D) 3
(E) 2

5. If $a^2 = b^{10}c^8$, and if a, b, and c are positive numbers, then $a =$

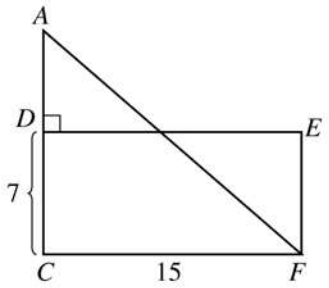
(A) $\frac{b^{10}c^8}{2}$

(B) b^5c^8

(C) $\frac{b^5c^8}{2}$

(D) b^5c^4

(E) $\frac{b^5c^4}{2}$



Note: Figure not drawn to scale.

6. In the figure above, if the area of triangle CAF is equal to the area of rectangle $CDEF$, what is the length of segment AD ?

(A) $\frac{7}{2}$

(B) 5

(C) 7

(D) $\frac{15}{2}$

(E) 15

7. Six points are placed on a circle. What is the greatest number of different lines that can be drawn so that each line passes through two of these points?

(A) 12
(B) 15
(C) 25
(D) 30
(E) 36

$y,\ 2y + 7,\ y + 6, \ldots$

8. In the increasing sequence above, the first term is y and the difference between any two consecutive terms is 3. What is the value of the fourth term in the sequence?

(A) -4
(B) 2
(C) 5
(D) 13
(E) 19

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9. If q and r are positive numbers, what percent of $(q + 1)$ is r ?

(A) $\frac{1}{100r(q + 1)}\%$

(B) $\frac{q + 1}{100r}\%$

(C) $\frac{100(q + 1)}{r}\%$

(D) $\left(\frac{100r}{q} + 1\right)\%$

(E) $\frac{100r}{q + 1}\%$

10. If three different circles are drawn on a piece of paper, at most how many points can be common to all three?

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

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.