

MATHEMATICS PRACTICE TEST 5 EXPLANATORY ANSWERS

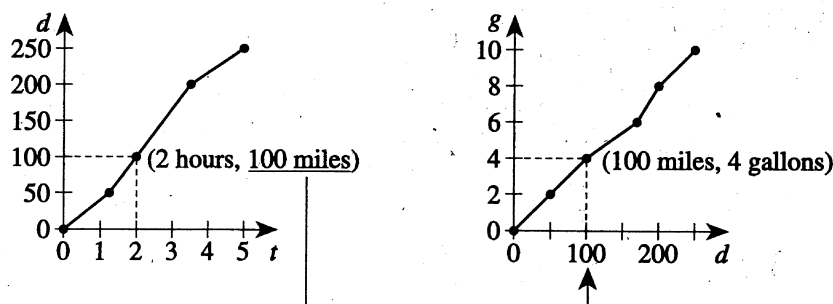
Question 1. The correct answer is B. Using the *Subtraction Property of Equality*, you can subtract 12 from both sides of the given equation to obtain $\frac{3x}{2} = -8$. Next, using the *Multiplication Property of Equality*, you can multiply both sides of this equation by 2 to obtain $3x = -16$. Finally, using the *Division Property of Equality*, you can divide both sides by 3 and get the equation $x = -\frac{16}{3}$.

Question 2. The correct answer is H. A natural first step in simplifying the expression $2x^4 \cdot 5x^7$ is to use the *Commutative Property for Multiplication* and *Associative Property for Multiplication* to rearrange the terms in the product. This produces the equivalent expression $(2 \cdot 5)x^4x^7$, which is equal to $10x^4x^7$. By the rules of exponents, $10x^4x^7 = 10x^{4+7} = 10x^{11}$.

In this solution method, you *multiply* the integer coefficients and *add* the exponents. If you chose K, you probably multiplied in both cases, and if you chose G, you probably added in both cases.

Question 3. The correct answer is B. Finding the value of $f(10)$ is equivalent to finding the value of $\frac{x^2+12}{x-6}$ when $x = 10$. Substituting 10 for x gives $\frac{10^2+12}{10-6} = \frac{100+12}{10-6} = \frac{112}{4} = 28$.

Question 4. The correct answer is G. As shown in the time-distance graph below at left, 2 hours on the horizontal axis corresponds to 100 miles on the vertical axis. This means the car traveled a distance of 100 miles during the first 2 hours. Since both graphs represent the same car on the same trip, the vertical axis in the graph at left is identical to the horizontal axis in the distance-gallons graph at right. So the 100-mile mark on the vertical axis at left corresponds to the 100-mile mark on the horizontal axis at right, as shown in the figure. In the graph at right, 100 miles corresponds to 4 gallons. This means that when the car traveled 100 miles, it used 4 gallons of gasoline, or equivalently, during the first 2 hours of the trip, the car used 4 gallons of gasoline.



Question 5. The correct answer is E. The sum of $442 + 325 + 287$ is 1,054. Since the value of the digit in the tens place is greater than or equal to 5, the digit 0 in the hundreds place increases to 1 when the sum is rounded to the nearest hundred. So the sum, rounded to the nearest hundred, is 1,100.

Question 6. The correct answer is F. Let the variable b represent the number of buses owned by the company. The company “keeps 3 tires in stock for every bus it owns, plus an additional 30 tires,” so the total number of tires in stock is equal to $(3b + 30)$. Therefore, the solution to the equation $3b + 30 = 120$ gives the number of buses the company owns. Subtracting 30 from both sides of the equation gives $3b = 90$, and dividing by 3 gives $b = 30$.

You can quickly check this answer: the company “keeps 3 tires in stock” for *each of the 30 buses* it owns, “plus an additional 30 tires” means the company has $3(30) + 30 = 120$ tires in stock.

Question 7. The correct answer is B. You can solve this equation by following these steps:

By the *Distributive Property* $2(x - 6) + x = 36$ is equivalent to $2x - 12 + x = 36$. (If you chose C, the most common incorrect answer, you probably forgot to distribute the 2 to the 6.)

Combining like terms on the left side of the equation $2x - 12 + x = 36$ results in $3x - 12 = 36$. (If you chose A, you may have forgotten the term x on the left-hand side.)

Adding 12 to both sides of $3x - 12 = 36$ results in $3x = 48$. (If you subtracted 12 from both sides, you probably chose E.)

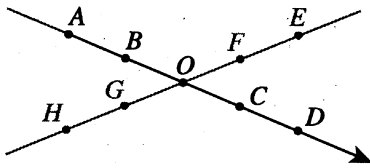
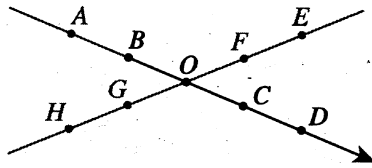
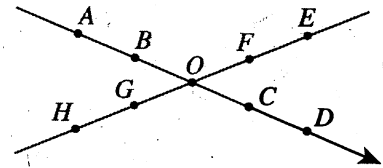
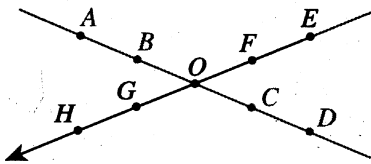
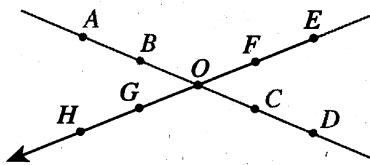
Finally, dividing both sides of $3x = 48$ by 3 leads to the solution $x = 16$.

You can quickly verify the solution by substituting 16 for x in the expression $2(x - 6) + x$ to obtain $2(16 - 6) + 16 = 2(10) + 16 = 20 + 16 = 36$.

Question 8. The correct answer is H. In ray notation, the first letter represents the endpoint of the ray and the second letter represents a second point through which the ray

passes. For example, \overrightarrow{AD} (shown darker in Figure 1 on the next page) is a ray with endpoint A that passes through point D . Each of the 5 figures below illustrates one of the 5 given rays with respect to the 2 intersecting lines. Ray \overrightarrow{AB} is shown in Figure 1, \overrightarrow{BD} is shown in Figure 2, \overrightarrow{CD} is shown in Figure 3, \overrightarrow{EF} is shown in Figure 4, and \overrightarrow{EG} is shown in Figure 5. (\overrightarrow{EF} and \overrightarrow{EG} are 2 names for the same ray.)

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Figure 1: \overrightarrow{AD} Figure 2: \overrightarrow{BD} Figure 3: \overrightarrow{CD} Figure 4: \overrightarrow{EF} Figure 5: \overrightarrow{EG}

From the 5 figures it can be seen that only \overrightarrow{CD} does not contain point O .

Question 9. The correct answer is **A**. To solve this system of equations, you can work backward, substituting $t = 3$ into the equation $st = 36$ to obtain the equation $3s = 36$. Dividing both sides by 3 produces $s = 12$. Working backward once more, substitute $s = 12$ into the equation $rs = 24$ to obtain the equation $12r = 24$. Dividing both sides by 12 gives the solution: $r = 2$.

Question 10. The correct answer is **J**. Let s represent the score on the 6th test. Then the average score on the 6 tests is equal to $\frac{75 + 70 + 92 + 95 + 97 + s}{6}$, or equivalently $\frac{s + 429}{6}$. Be sure to read carefully: the average is 85 *points*, not *percent*. Interpreting the average as a percent leads to **K** (the most common incorrect answer), rather than the correct answer of $\frac{s + 429}{6} = 85$.

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Question 11. The correct answer is C. There are only 12 whole numbers from 44 through 55, so you can check each number individually to determine if that number satisfies the given condition, as in the table below.

Whole number	44	45	46	47	48	49	50	51	52	53	54	55
Is the ones digit greater than the tens digit?	no	yes	yes	yes	yes	yes	no	no	no	no	no	no

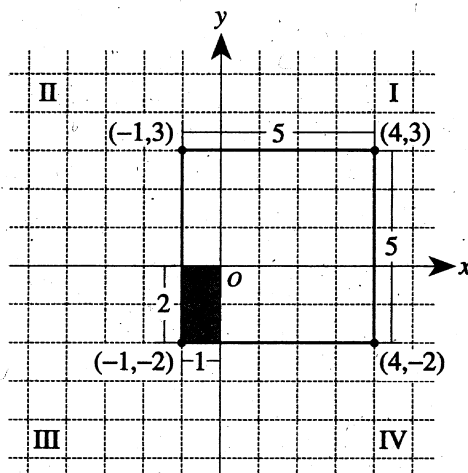
| ← 5 values → |

There are 5 numbers, shown in the shaded region of the table, that satisfy the given condition.

Question 12. The correct answer is J. “The weight of [the] circular rod . . . is proportional to its length” implies that the ratio $\frac{\text{the weight of the rod, in pounds}}{\text{the length of the rod, in feet}}$ must be equal for all circular rods of this type. Let w represent the weight, in pounds, of the 21-foot circular rod. Then, $\frac{35 \text{ pounds}}{15 \text{ feet}}$ must equal $\frac{w \text{ pounds}}{21 \text{ feet}}$, which gives the equation $\frac{35}{15} = \frac{w}{21}$. So $(35)(21) = 15w$, and $w = \frac{(35)(21)}{15} = 49$ pounds.

Question 13. The correct answer is A. As shown in the figure below, the given vertices form a 5-unit-by-5-unit rectangle (or square), which has an area of $5 \times 5 = 25$ square coordinate units. The portion of that square lying in Quadrant III is shown in the figure as the 2-unit-by-1-unit shaded rectangle, which has an area of $2 \times 1 = 2$ square coordinate units. Therefore, the

percent of the total area of the square lying in Quadrant III = $\frac{\text{the area of the shaded rectangle}}{\text{the area of the square}} \times 100\% = \frac{2}{25} \times 100\% = 8\%$.



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Question 14. The correct answer is J. The rational expression given in the problem can be simplified by following the steps shown below.

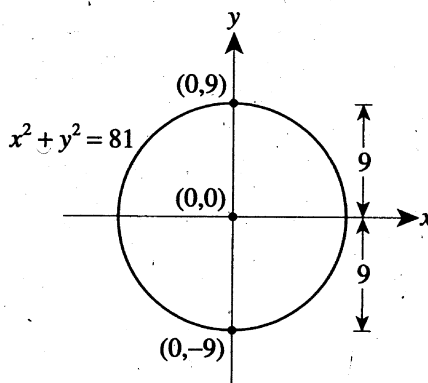
$$\frac{3+7(x-6)}{3(x-6)+10} = \frac{3+7x-42}{3x-18+10} = \frac{7x-39}{3x-8}$$

If you chose F, perhaps you thought that the $x - 6$ in the numerator and the $x - 6$ in the denominator could be “cancelled,” producing $\frac{3+7}{3+10}$. But this can only be done when $x - 6$ appears as a common *factor* of both numerator and denominator.

Question 15. The correct answer is B. You can approach this problem analytically or graphically.

In the analytic approach, you must find all points on the y -axis of the form $(0,y)$ that also lie on the circle. The possible values of y are the solutions to the equation $0^2 + y^2 = 81$, or $y^2 = 81$, so $y = \pm 9$.

In the graphical approach, the equation $x^2 + y^2 = 81$ (or $(x - 0)^2 + (y - 0)^2 = 9^2$) represents a circle of radius 9 that is centered at $(0,0)$, as shown in the standard (x,y) coordinate plane below. The desired points must be 9 coordinate units from $(0,0)$ on the y -axis. These points are at $(0, 0 + 9)$ and $(0, 0 - 9)$.



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Question 16. The correct answer is J. You can approach this problem by drawing a series of sketches that represent the characteristics of the 4 points on the circle.

Since “B is 5 units counterclockwise from A,” draw B on a circle so that the point is approximately $\frac{1}{3}$ (about $\frac{5}{17}$) of the distance counterclockwise around the circle (see Figure 1 below).

Since “C is 3 units clockwise from A,” draw C on the circle so that the point is approximately $\frac{1}{5}$ (about $\frac{3}{17}$) of the distance counterclockwise around the circle (see Figure 2 below).

Since “D is 11 units clockwise from A and 6 units counterclockwise from A,” draw D on the circle so that the point is 6 units from A in a counterclockwise direction, or just beyond B (which lies 5 units from A). Since the clockwise distance is also from A, this distance could be ignored when sketching (see Figure 3 below).

Figure 4 shows the final order of points, A, C, D, B, going clockwise around the circle.

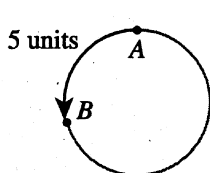


Figure 1

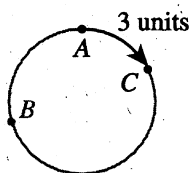


Figure 2

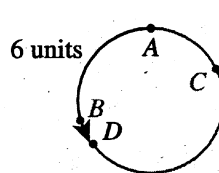


Figure 3

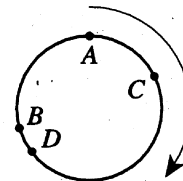


Figure 4

Question 17. The correct answer is B: Assuming the cost increased *linearly* is equivalent to assuming the cost increased *at a constant rate*. Since the cost of the clothing increased from \$620 to \$1,000 in 10 years, the constant rate is equal to $\frac{\$1,000 - \$620}{10 \text{ years}}$, or \$38 per year. Therefore, the cost of the family’s clothing in 1991 (6 years after 1985) is:

$$\$620 + (6 \text{ years})(\$38 \text{ per year}) = \$620 + \$228 = \$848.$$

Question 18. The correct answer is H. You can solve this problem numerically by considering all of the possible pairs of integer values representing the width and length of the room for which the area equals 180 ft². Then you can find the pair of values for which the perimeter equals 54 ft (that pair is 12 ft and 15 ft in the shaded region of the table below).

Width (ft)	1	2	3	4	5	6	9	10	12
Length (ft)	180	90	60	45	36	30	20	18	15
Area (ft ²)	180	180	180	180	180	180	180	180	180
Perimeter (ft)	362	184	126	98	82	72	58	56	54

You can also approach this problem analytically by solving the system of equations $2w + 2l = 54$ and $wl = 180$, which result from using the perimeter and the area formulas, respectively.

