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Subjects

Question: 1

If $x = 2y - 3$ and $2x + \frac{1}{2}y = 3$, then $y = ?$

a. $-\frac{2}{3}$

b. 1

c. 2

d. $\frac{18}{7}$

A. Option A
B. Option B
C. Option C
D. Option D

Answer: C

Explanation:
The given equations form a system of linear equations. Since the first equation is already given in terms of x, it will be easier to solve the system using the substitution method. Start by substituting 2y —3 for x in the second equation:

$$2x + \frac{1}{2}y = 3$$
$$2(2y - 3) + \frac{1}{2}y = 3$$

Next, solve the resulting equation for y. Distribute the 2 and then combine like y-terms in the result:

$$4y - 6 + \frac{1}{2}y = 3$$
$$\frac{9}{2}y - 6 = 3$$

Finally, isolate the variable y by adding 6 to both sides and then dividing both sides by the coefficient of y, which is $\frac{9}{2}$ (or, equivalently, multiply by 2 and divide by 9):

$$\frac{9}{2}y = 9$$
$$y = 2$$

Question: 1

A bag contains 14 blue, 6 red, 12 green, and 8 purple buttons. 25 buttons are removed from the bag randomly. How many of the removed buttons were red if the chance of drawing a red button from the bag is now $\frac{1}{3}$?

A. 0 buttons
B. 1 button
C. 3 buttons
D. 5 buttons

Answer: B

Explanation:
Add the 14 blue, 6 red, 12 green and 8 purple buttons together to get a total of 40 buttons. If 25 buttons are removed, there are 15 buttons remaining in the bag. The chance of drawing a red button is now $\frac{1}{3}$ .So you divide 15 into thirds to get 5 red buttons remaining in the bag. The original total of red buttons was 6; so 6 — 5 = 1. One red button was removed. so choice B is correct.

Question: 2

The sides of a triangle are equal to integer values of units. Two sides are 4 and 6 units long, respectively. What is the minimum value for the triangle's perimeter?

A. 10 units
B. 11 units
C. 12 units
D. 13 units

Answer: D

Explanation:
The sides of a triangle must all be greater than O. The sum of the lengths of the two shorter sides must be greater than the length of the third side. Since we are looking for the minimum value of the perimeter, assume the longer of the two given sides, which is 6, is the longest side of the triangle. Then, the third side

must be greater than 6 — 4 = 2. Since we are told the sides are all integers. the last side must be 3 units in length. Thus, the minimum length for the perimeter is 4 + 6 + 3 = 13 units.

Question: 3

The average of six numbers is 4. If the average of two of those numbers is 2, what is the average of the other four numbers?

A. 5
B. 6
C. 7
D. 8

Answer: A

Explanation:
A set of six numbers with an average of 4 must have a collective sum of 24 because $6 \times 4 = 24$. The two numbers that average 2 will add up to 4 ($2 \times 2 = 4$), so the remaining numbers must add up to 20 ($24 - 4 = 20$). The average of these four numbers can be calculated by dividing the sum by the amount of numbers: $20 \div 4 = 5$. Therefore, the average of the other four numbers is 5.

Question: 4

There are 64 squares on a checkerboard. Bobby puts one penny on the first square, two on the second square, four on the third, eight on the fourth. He continues to double the number of coins at each square until he has covered all 64 squares. How many coins must he place on the last square?

a. 2^{64}
b. $2^{64} - 1$
c. 2^{63}
d. $2^{63} + 1$

A. Option A
B. Option B
C. Option C
D. Option D

Answer: C

Explanation:
This table shows the numbers of coins added to the first few squares and the equivalent powers of 2:

Square	1	2	3	4
Coins	1	2	4	8
Power of 2	2^0	2^1	2^2	2^3

In this series, the number of coins on each is the consecutive powers of 2. The reason is that the number doubles with each consecutive square. However, the series of powers begins with O for the first square. For the 64th square. the number of coins will be 2".

Question: 5

A commuter survey counts the people riding in cars on a highway in the morning. Each car contains only one man, only one woman, or both one man and one woman. Out of 25 cars, 13 contain a woman and 20 contain a man. How many contain both a man and a woman?

A. 0
B. 7
C. 8
D. 12

Answer: C

Explanation:
The total number of people mentioned is 20 + 13 = 33, but there are only 25 cars. Therefore, 33 — 25 = 8 cars must have both a man and a woman inside.

Question: 6

The length of Square A is 3 feet longer than the length of Square B. If the difference between their areas is 75 ft^2, what is the length of Square B?

A. 11 feet
B. 12 feet
C. 13 feet
D. 14 feet

Answer: A

Explanation:
First establish a variable, s, for the length of the smaller square. Since the larger square is 3 feet longer than the smaller one, its length is s + 3. Given that the difference between the areas of the two squares is 7 5 square feet, and the area of any square is equal to its side lengths squared, the following equation can be established and solved:

$$(s + 3)^2 - s^2 = 75$$
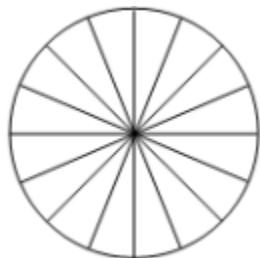$$(s + 3)(s + 3) - s^2 = 75$$
$$s^2 + 6s + 9 - s^2 = 75$$
$$6s + 9 = 75$$

Isolate the variable and divide both sides by its coefficient to solve for s:
6s = 66
s = 11

Question: 7

One method for calculating the area of a circle is to dissect it into a number of wedges. The circle below has a radius r and has been evenly dissected into 16 wedges.

If the wedges are rearranged alternately to create a shape resembling a rectangle, as shown below, what is the approximate length of the rectangle?

    a. π
    b. πr
    c. r
    d. πr^2

A. Option A
B. Option B
C. Option C
D. Option D

Answer: B

Explanation:

      When the wedges are rearranged into the rectangle, half of the wedge arcs form the top length of the rectangle and the other half of the wedge arcs form the bottom length of the rectangle. Since all of the wedge arcs combine to form the entire circumference of the circle, the length of the rectangle is half of the circumference of the circle. The formula for the circumference of a circle with radius r is $C = 2\pi r$. Half of that circumference is $\left(\frac{1}{2}\right)2\pi r = \pi r$. Answer C is the width of the rectangle. Answer D is the area of the rectangle.

Question: 8

The cost, in dollars, of shipping x computers to California for sale is 3, 000 + 100x. The amount received when selling these computers is 400x dollars. What is the least number of computers that must be shipped and sold so that the amount received is at least equal to the shipping cost?

A. 10 computers
B. 15 computers
C. 20 computers
D. 25 computers

Answer: A

Explanation:
Setting the cost of shipping equal to the amount received gives us the equation 3,000 + 100x = 400x. Subtract 100x from both sides to get 3,000 = 300x, then divide both sides by 300 to see that x = 10. Therefore, the least number of computers that must be shipped and sold is 10.

Question: 9

Given points A and B on a number line, where A = —3 and B = 7, find point C, located between A and B, such that C is four times farther from A than it is from B.

A. -1
B. 1
C. 3
D. 5

Answer: D

Explanation:

If point C is four times farther from A than from B, it means that the ratio of distances from C to A and B is $4:1$, respectively. Therefore, the line segment can be broken up into $4 + 1 = 5$ equal segments. The total distance between points A and B is $7 - (-3) = 10$ units. If we divide 10 by 5, each equal segment is 2 units in length. We can then multiply the ratio by 2 to get the actual distances of C from A and B, $(4 \times 2) : (1 \times 2) = 8 : 2$. So, C is located 8 units from A and 2 units from B. Since A is located at -3, it means that $-3 + 8 = 5$. Answer A is the location if C is four times farther from B than it is from A. Answer B is just four units from point A. Answer C is just four units from point B.

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