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Question: 1

A rectangle is twice as long as it is wide. If it were 3 inches shorter and 3 inches wider, it would be square. What is the width in inches of the rectangle?

- A. 4
- B. 6
- C. 8
- D. 12

Answer: B

Explanation:

If x represents the width of the shape, its length is equal to $2x$. Since we are told it would be a square if it were 3 inches shorter and 3 inches wider, and the sides of a square are equal, we can use the following equation to solve for x .

$$\begin{aligned}2x - 3 &= x + 3 \\x - 3 &= 3 \\x &= 6\end{aligned}$$

So, the shape is 6 inches wide.

Question: 2

The equation below calculates the growth of an apple tree, where h is the height in feet and y is the number of years since the tree was planted. How many inches does the tree grow each year?

$$h = 2.5 + 0.75y$$

- A. 0.75
- B. 2.5
- C. 9
- D. 30

Answer: C

Explanation:

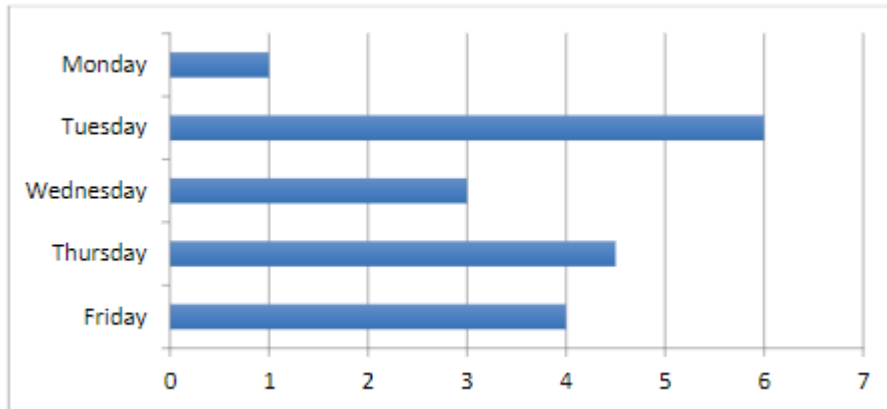
The equation can be translated:

Height = (original height when planted) + $0.75(\text{number of years since planted})$

In other words, it grows 0.75 feet every year. The question asks for the number of inches, so we multiply 0.75 by 12 to obtain 9 inches per year.

Question: 3

The graph below shows the number of miles Jen runs each day, Monday through Friday. What fraction of the time does she run at least four miles?



- A. $\frac{3}{7}$
- B. $\frac{3}{2}$
- C. $\frac{2}{5}$
- D. $\frac{3}{5}$

Answer: D

Explanation:

The graph shows five days that Jen runs. On three of the days (Tuesday, Thursday, and Friday), she runs four or more miles. So three out of five days, or $\frac{3}{5}$ of the time, she runs at least four miles.

Question: 4

Simplify the following: $\frac{x^2}{y^2} + \frac{x}{y^3}$

- A. $\frac{x^3+x}{y^6}$
- B. $\frac{x^2+xy}{y^3}$
- C. $\frac{x^2y+xy}{y^3}$
- D. $\frac{x^2y+x}{y^3}$

Answer: D

Explanation:

To add the two fractions, first rewrite them with the least common denominator, which is in this case y^3 . This is already the denominator in $\frac{x}{y^3}$, and we can rewrite $\frac{x^2}{y^2}$ as $\frac{x^2 \times y}{y^2 \times y} = \frac{x^2 y}{y^3}$. Thus, $\frac{x^2}{y^2} + \frac{x}{y^3} = \frac{x^2 y}{y^3} + \frac{x}{y^3} = \frac{x^2 y + x}{y^3}$.

Question: 5

A man invested \$150 in the stock market. During the first week, he lost \$45. During the second week, he tripled his money. How much does he have at the end of the second week?

- A. \$105
- B. \$210
- C. \$315
- D. \$420

Answer: C

Explanation:

First, calculate how much he had at the end of the first week by subtracting \$45 from the amount he invested.

$$\$150 - \$45 = \$105$$

Since he tripled his money the second week, this value by 3.

$$\$105 \times 3 = \$315$$

The man has \$315 at the end of the second week.

Question: 6

What is the area of a square inscribed in a circle of radius r ?

- A. $2r^2$
- B. $2r^3$
- C. $2\pi r$
- D. $4r^2$

Answer: A

Explanation:

The diagonal of the square corresponds to the diameter of the circle. This allows for calculation of the side a by the Pythagorean theorem, where the diameter is $d = 2r$.

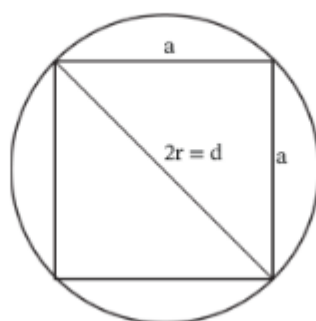
$$d^2 = a^2 + a^2$$

$$(2r)^2 = 2a^2$$

$$4r^2 = 2a^2$$

$$2r^2 = a^2$$

Since the area of the square is a^2 , we can say the area of a square inscribed within a circle is $2r^2$.



Question: 7

Determine the volume of a rectangular box with a length of 5 inches, a height of 7 inches, and a width of 9 inches.

- A. 445 in^3
- B. 315 in^3
- C. 45 in^3
- D. 35 in^3

Answer: B

Explanation:

The volume of a rectangular box can be determined using the formula $V = l \times w \times h$, where l is the length of the box, w is the width of the box, and h is the height of the box. Therefore, the volume of the box described in this question is equal to $5 \times 7 \times 9$, or 315 in^3 .

Question: 8

Expand the following: $9x(3x^2 + 2x - 9)$

- A. $27x^2 + 18x - 81$
- B. $27x^3 + 18x^2 - 81x$
- C. $12x^3 + 11x^2 - x$
- D. $27x^3 + 18x^2 - 18x$

Answer: B

Explanation:

To simplify, multiply the value outside of the parentheses by each value inside of the parentheses.

$$\begin{aligned} 9x(3x^2 + 2x - 9) &= 9x(3x^2) + 9x(2x) + 9x(-9) \\ &= 27x^3 + 18x^2 - 81x \end{aligned}$$

Question: 9

What is the average of $\frac{7}{5}$ and 1.4?

- A. 1.4
- B. 2.8
- C. 4.2
- D. 7.4

Answer: A

Explanation:

The value of the fraction $\frac{7}{5}$ can be evaluated by dividing 7 by 5, which yields 1.4. The average of 1.4 and 1.4 is $\frac{1.4+1.4}{2} = 1.4$.

Question: 10

An airplane leaves Atlanta at 2 PM and flies north at 250 miles per hour. A second airplane leaves Atlanta 30 minutes later and flies north at 280 miles per hour. At what time will the second airplane overtake the first?

- A. 6:00 PM
- B. 6:20 PM
- C. 6:40 PM
- D. 6:50 PM

Answer: C

Explanation:

Define the variable t as the elapsed time (in minutes) from the time the first airplane takes off. Then, at any time, the distance traveled by the first plane is $d_1 = 250t$. The second plane takes off 30 minutes later so that at any time, the distance that it has traveled is $d_2 = 280(t - 30)$. This plane will overtake the first when the two distances are equal, which is when $d_1 = d_2$, or when $250t = 280(t - 30)$. First, use the distributive property to get rid of the parentheses.

$$250t = 280t - 8,400$$

Next, subtract $280t$ from each side of the equation.

$$-30t = -8,400$$

Next, divide both sides by -30 .

$$t = 280$$

This gives the value of t in minutes. Convert to hours by dividing 280 by 60 minutes per hour, which yields an elapsed time of 4.67 hours, or 4 hours and 40 minutes. Since the first plane left at 2 PM, 4 hours and 40 minutes later is 6:40 PM.



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