

GMAT 2018 Question Paper with Solutions

Time Allowed : 3 Hours	Maximum Marks : 100
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The GMAT exam is 2 hours and 15 minutes long (with one optional 10-minute break) and consists of 64 questions in total.
2. The GMAT exam is comprised of three sections:
3. Quantitative Reasoning: 21 questions, 45 minutes
4. Verbal Reasoning: 23 questions, 45 minutes
5. Data Insights: 20 questions, 45 minutes
6. You can answer the three sections in any order. As you move through a section, you can bookmark questions that you would like to review later.
7. When you have answered all questions in a section, you will proceed to the Question Review & Edit screen for that section.
8. If there is no time remaining in the section, you will NOT proceed to the Question Review & Edit screen and you will automatically be moved to your optional break screen or the next section (if you have already taken your optional break).
9. Each Question Review & Edit screen includes a numbered list of the questions in that section and indicates the questions you bookmarked.
10. Clicking a question number will take you to that specific question. You can review as many questions as you would like and can edit up to three (3) answers.

1. The perimeter of rectangle A is 200 meters. The length of rectangle B is 10 meters less than the length of rectangle A and the width of rectangle B is 10 meters more than the width of rectangle A. If rectangle B is a square, what is the width, in meters, of rectangle A? [Official GMAT-2018]

Solution:

Step 1: Define the variables.

Let the length of rectangle A be X meters and the width of rectangle A be Y meters.

Step 2: Perimeter condition for rectangle A.

The perimeter of rectangle A is given by:

$$2(X + Y) = 200 \Rightarrow X + Y = 100 \quad (\text{Equation 1})$$

Step 3: Rectangle B's conditions.

For rectangle B, the length is $(X - 10)$ meters and the width is $(Y + 10)$ meters. Since rectangle B is a square, we know:

$$X - 10 = Y + 10 \Rightarrow X - Y = 20 \quad (\text{Equation 2})$$

Step 4: Solve the system of equations.

Add equations (1) and (2):

$$(X + Y) + (X - Y) = 100 + 20 \Rightarrow 2X = 120 \Rightarrow X = 60$$

Step 5: Find Y .

Substitute $X = 60$ into equation (1):

$$60 + Y = 100 \Rightarrow Y = 40$$

Step 6: Conclusion.

The width of rectangle A is $Y = 40$ meters. Therefore, the correct answer is (2) 40 meters.

Quick Tip

For rectangles, the perimeter is calculated as $2 \times (\text{Length} + \text{Width})$. For square conditions, equate length and width.

2. Of the 150 houses in a certain development, 60 percent have air-conditioning, 50 percent have a sunporch, and 30 percent have a swimming pool. If 5 of the houses have all three of these amenities and 5 have none of them, how many of the houses have exactly two of these amenities? [Official GMAT-2018]

Solution:

Step 1: Calculate the number of houses with each amenity.

- Air-Conditioning: 60% of 150 = 90

- Sun Porch: 50% of 150 = 75

- Swimming Pool: 30% of 150 = 45

Step 2: Use the formula for the total number of houses.

Let x be the number of houses with exactly two amenities. The formula for the total number of houses is:

$$\text{Total} = (\text{All Single}) - 2 \times (\text{All Three}) + N$$

Where: - All Single: The total number of houses with at least one amenity, which is 150. - All Three: The number of houses with all three amenities (given as 5). - N is the number of houses with none of the amenities (also given as 5).

Step 3: Solve the equation.

Using the information, we set up the following equation:

$$150 = 90 + 75 + 45 - (\text{Exactly Two}) - 2 \times 5 + 5$$

Simplifying this gives:

$$\text{Exactly Two} = 205 - 150 = 55$$

Step 4: Conclusion.

Therefore, 55 houses have exactly two of the amenities.

Quick Tip

When working with set problems, use the principle of inclusion and exclusion to find the number of elements in overlapping sets.

3. Al and Ben are drivers for SD Trucking Company. One snowy day, Ben left SD at 8:00 a.m. heading east and Al left SD at 11:00 a.m. heading west. At a particular time later that day, the dispatcher retrieved data from SD's vehicle tracking system. The data showed that, up to that time, Al had averaged 40 miles per hour and Ben had averaged 20 miles per hour. It also showed that Al and Ben had driven a combined total of 240 miles. At what time did the dispatcher retrieve data from the vehicle tracking system? [Official GMAT-2018]

Solution:

Step 1: Define the variables.

Let t represent the time in hours after 8:00 a.m. that the dispatcher retrieved the data.

Step 2: Calculate the distances driven by Al and Ben.

- Al left SD at 11:00 a.m., so the time he has been driving is $t - 3$ hours. - Al's distance = 40 miles per hour $\times (t - 3)$ hours. - Ben has been driving for t hours. - Ben's distance = 20 miles per hour $\times t$ hours.

Step 3: Set up the equation.

The total distance driven by both Al and Ben is 240 miles, so we have:

$$40(t - 3) + 20t = 240$$

Simplifying this equation:

$$40t - 120 + 20t = 240 \quad \Rightarrow \quad 60t = 360 \quad \Rightarrow \quad t = 6$$

Step 4: Conclusion.

The dispatcher retrieved the data 6 hours after 8:00 a.m., which is at 2:00 p.m.

Quick Tip

When working with problems involving distance, rate, and time, use the formula
Distance = Rate $\times$ Time.

4. If m and p are positive integers and $m^2 + p^2 < 100$, what is the greatest possible value of mp ? [Official GMAT-2018]

Solution:

Step 1: Apply the given condition.

We are given that:

$$m^2 + p^2 < 100 \quad \text{and} \quad (m - p)^2 + 2mp < 100$$

This simplifies to:

$$2mp < 100 - (m - p)^2 \quad (\text{Equation 1})$$

Step 2: Find the condition for maximum value of mp .

When $(m - p)^2 = 0$, we get:

$$m = p$$

Substituting $m = p$ into Equation (1):

$$2mp < 100 - 0 \quad \Rightarrow \quad mp < 50$$

Step 3: Maximize mp .

Now, we know $mp < 50$. The greatest integer value for mp is 49, where $m = p = 7$.

Step 4: Conclusion.

The greatest possible value of mp is 49.

Quick Tip

When dealing with inequalities involving squares and products, try using substitution to simplify the problem and maximize the desired value.

5. If the sum of the reciprocals of two consecutive odd integers is $\frac{12}{35}$, then the greater of the two integers is [Official GMAT-2018]

Solution:

Step 1: Define the integers.

Let the two consecutive odd integers be x and $x + 2$.

Step 2: Set up the equation.

The sum of the reciprocals is given by:

$$\frac{1}{x} + \frac{1}{x + 2} = \frac{12}{35}$$

Multiply both sides of the equation by $(x)(x + 2)$ to clear the denominators:

$$(2x + 2) \times 35 = 12(x^2 + 2x)$$

This simplifies to:

$$(x + 1) \times 35 = 6x^2 + 12x$$
$$6x^2 - 23x - 35 = 0$$

Step 3: Solve the quadratic equation.

Now solve the quadratic equation:

$$6x^2 - 30x + 7x - 35 = 0 \Rightarrow (6x + 7)(x - 5) = 0$$

Thus, $x = 5$.

Step 4: Conclusion.

The greater integer is $5 + 2 = 7$.

Quick Tip

When solving for consecutive integers, set up an equation based on their properties and use algebraic techniques to solve.

6. How many integers between 1 and 16, inclusive, have exactly 3 different positive integer factors? (Note: 6 is NOT such an integer because 6 has 4 different positive integer factors: 1, 2, 3, and 6.) [Official GMAT-2018]

Solution:

Step 1: Factorization of integers between 1 and 16.

The number of factors of a number is determined by its prime factorization. A number will have exactly 3 factors if it is a square of a prime number.

Step 2: Check the numbers.

- 1 has 1 factor. - 2, 3, 5, 7, 11, and 13 are prime numbers, so they have 2 factors each. - 4 has 1, 2, 4 factors. - 6 has 1, 2, 3, 6 factors. - 8 has 1, 2, 4, 8 factors. - 9 has 1, 3, 9 factors. - 10 has 1, 2, 5, 10 factors. - 12 has 1, 2, 3, 4, 6, 12 factors. - 14 has 1, 2, 7, 14 factors. - 15 has 1, 3, 5, 15 factors. - 16 has 1, 2, 4, 8, 16 factors.

Step 3: Conclusion.

The numbers 4 and 9 have exactly 3 factors, so the answer is 2.

Quick Tip

To determine the number of factors of a number, consider its prime factorization. If the number is the square of a prime, it will have exactly 3 factors.

7. For each student in a certain class, a teacher adjusted the student's test score using the formula $y = 0.8x + 20$, where x is the student's original test score and y is the student's adjusted test score. If the standard deviation of the original test scores of the students in the class was 20, what was the standard deviation of the adjusted test scores of the students in the class? [Official GMAT-2018]

Solution:

Step 1: Understand the effect of the adjustment.

The formula for the adjusted score is:

$$y = 0.8x + 20$$

Here, the transformation involves multiplying the original score by 0.8 and adding a constant 20. The multiplication by 0.8 affects the standard deviation, but the addition of 20 does not.

Step 2: Effect of multiplication on standard deviation.

Multiplying all values by a constant (0.8 in this case) scales the standard deviation by the same factor. Thus, the standard deviation of the adjusted scores is:

$$\begin{aligned}\text{Standard deviation of adjusted scores} &= 0.8 \times \text{Standard deviation of original scores} \\ &= 0.8 \times 20 = 16\end{aligned}$$

Step 3: Conclusion.

The standard deviation of the adjusted test scores is 16.

Quick Tip

When applying a linear transformation to a data set (multiplying by a constant and adding a constant), only the multiplication by the constant affects the standard deviation.

8. The sum of the weekly salaries of 5 employees is \$3,250. If each of the 5 salaries is to increase by 10 percent, then the average (arithmetic mean) weekly salary per employee will increase by [Official GMAT-2018]

Solution:

Step 1: Calculate the current average salary.

The total sum of the salaries of 5 employees is \$3,250. To find the current average salary, divide the total sum by the number of employees:

$$\text{Current average} = \frac{3250}{5} = 650$$

Thus, the current average weekly salary per employee is \$650.

Step 2: Calculate the increase in salary.

Each salary is increased by 10 percent. To calculate the new average, first find the increase for one employee:

$$\text{Increase per employee} = 10\% \times 650 = 0.1 \times 650 = 65$$

Step 3: Calculate the new average salary.

Now, add the increase to the current average salary:

$$\text{New average} = 650 + 65 = 715$$

Step 4: Calculate the increase in the average salary.

The increase in the average salary is:

$$\text{Increase in average} = 715 - 650 = 65$$

Step 5: Conclusion.

The average weekly salary per employee will increase by \$65.

Quick Tip

When a value increases by a certain percentage, you can find the increase by multiplying the original value by the percentage (expressed as a decimal), and then add that to the original value to find the new value.

9. A manufacturer makes and sells 2 products, P and Q. The revenue from the sale of each unit of P is \$20.00 and the revenue from the sale of each unit of Q is \$17.00. Last year the manufacturer sold twice as many units of Q as P. What was the manufacturer's average (arithmetic mean) revenue per unit sold of these 2 products last year? [Official GMAT-2018]

Solution:**Step 1: Define the variables.**

Let the number of units of P sold be x . Since the manufacturer sold twice as many units of Q as P, the number of units of Q sold is $2x$.

Step 2: Calculate the total revenue for each product.

The total revenue from the sale of P is:

$$\text{Total revenue from P} = 20x$$

The total revenue from the sale of Q is:

$$\text{Total revenue from Q} = 17 \times 2x = 34x$$

Step 3: Calculate the total revenue.

The total revenue from both products is:

$$\text{Total revenue} = 20x + 34x = 54x$$

Step 4: Calculate the total number of units sold.

The total number of units sold is:

$$\text{Total units sold} = x + 2x = 3x$$

Step 5: Calculate the average revenue per unit sold.

The average revenue per unit sold is:

$$\text{Average revenue per unit} = \frac{\text{Total revenue}}{\text{Total units sold}} = \frac{54x}{3x} = 18$$

Step 6: Conclusion.

The average revenue per unit sold is \$18.00.

Quick Tip

To find the average revenue per unit, divide the total revenue by the total number of units sold. The revenue from each product depends on the units sold and the price per unit.

10. In a numerical table with 10 rows and 10 columns, each entry is either a 9 or a 10. If the number of 9s in the n th row is $n - 1$ for each n from 1 to 10, what is the average (arithmetic mean) of all the numbers in the table? [Official GMAT-2018]

Solution:

Step 1: Define the number of 9s in each row.

The number of 9s in the n th row is $n - 1$. Therefore, the number of 9s in each row is: - 1st row: 0 9s, 10 10s - 2nd row: 1 9, 9 10s - 3rd row: 2 9s, 8 10s - 4th row: 3 9s, 7 10s - 5th row: 4 9s, 6 10s - 6th row: 5 9s, 5 10s - 7th row: 6 9s, 4 10s - 8th row: 7 9s, 3 10s - 9th row: 8 9s, 2 10s - 10th row: 9 9s, 1 10

Step 2: Calculate the total number of 9s and 10s in the table.

- The total number of 9s is the sum of $n - 1$ from $n = 1$ to $n = 10$:

$$\text{Total number of 9s} = 0 + 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 = 45$$

- The total number of 10s is the remaining entries in each row ($10 - n - 1$):

$$\text{Total number of 10s} = 10 \times 10 - 45 = 55$$

Step 3: Calculate the total sum of the numbers in the table.

- The sum of all the 9s is:

$$\text{Sum of 9s} = 9 \times 45 = 405$$

- The sum of all the 10s is:

$$\text{Sum of 10s} = 10 \times 55 = 550$$

Thus, the total sum of all numbers in the table is:

$$\text{Total sum} = 405 + 550 = 955$$

Step 4: Calculate the total number of entries in the table.

The table has 10 rows and 10 columns, so the total number of entries is:

$$\text{Total number of entries} = 10 \times 10 = 100$$

Step 5: Calculate the average.

The average is the total sum divided by the total number of entries:

$$\text{Average} = \frac{955}{100} = 9.55$$

Step 6: Conclusion.

The average of all the numbers in the table is 9.55.

Quick Tip

To find the average of a set of numbers, calculate the total sum and divide by the total number of entries.

11. Team A and Team B are competing against each other in a game of tug-of-war. Team A, consisting of 3 males and 3 females, decides to lineup male, female, male, female, male, female. The lineup that Team A chooses will be one of how many different possible lineups? [Official GMAT-2018]

Solution:

Step 1: Understand the arrangement for Team A.

Team A has 3 males and 3 females. The lineup needs to alternate between males and females. Thus, the order will be: male, female, male, female, male, female.

Step 2: Calculate the number of ways to arrange the males and females.

- The 3 males can be arranged in $3!$ ways. - The 3 females can also be arranged in $3!$ ways.

Step 3: Calculate the total number of lineups.

The total number of possible lineups is the product of the arrangements of males and females:

$$\text{Total lineups} = 3! \times 3! = 6 \times 6 = 36$$

Step 4: Conclusion.

The total number of possible lineups is 36.

Quick Tip

When arranging a set of items with restrictions, use factorials to calculate the number of permutations for each set and multiply the results.

12. Clarissa will create her summer reading list by randomly choosing 4 books from the 10 books approved for summer reading. She will list the books in the order in which they are chosen. How many different lists are possible? [Official GMAT-2018]

Solution:

Step 1: Understand the problem.

Clarissa will randomly choose 4 books from 10 approved books, and the order in which the books are chosen matters. This is a permutation problem because the order of selection matters.

Step 2: Use the permutation formula.

The formula for the number of permutations of r objects from a set of n objects is:

$$P(n, r) = \frac{n!}{(n-r)!}$$

In this case, $n = 10$ and $r = 4$, so:

$$P(10, 4) = \frac{10!}{(10-4)!} = \frac{10!}{6!}$$

Simplifying the factorials:

$$P(10, 4) = 10 \times 9 \times 8 \times 7 = 5040$$

Step 3: Conclusion.

The total number of different lists that Clarissa can create is 5040.

Quick Tip

When selecting items in a specific order, use the permutation formula $P(n, r) = \frac{n!}{(n-r)!}$ to calculate the number of possible arrangements.

13. As shown in the diagram above, a lever resting on a fulcrum has weights of w_1 pounds and w_2 pounds, located d_1 feet and d_2 feet from the fulcrum. The lever is balanced and $w_1d_1 = w_2d_2$. Suppose w_1 is 50 pounds and w_2 is 30 pounds. If d_1 is 4 feet less than d_2 , what is d_2 , in feet? [Official GMAT-2018]

Solution:

Step 1: Set up the equation using the balance condition.

The lever is balanced, so the condition $w_1d_1 = w_2d_2$ must hold. We are given the following information: - $w_1 = 50$ pounds - $w_2 = 30$ pounds - $d_1 = d_2 - 4$ feet (since d_1 is 4 feet less than d_2)

The balance equation is:

$$50 \times (d_2 - 4) = 30 \times d_2$$

Step 2: Solve for d_2 .

Expand the equation:

$$50d_2 - 200 = 30d_2$$

Now, subtract $30d_2$ from both sides:

$$50d_2 - 30d_2 = 200$$

$$20d_2 = 200$$

Solve for d_2 :

$$d_2 = \frac{200}{20} = 10$$

Step 3: Conclusion.

Thus, $d_2 = 10$ feet.

Quick Tip

For a balanced lever, the product of the weight and the distance from the fulcrum must be equal on both sides. Use this principle to set up and solve the equation.

14. When a subscription to a new magazine was purchased for m months, the publisher offered a discount of 75 percent off the regular monthly price of the magazine. If the total value of the discount was equivalent to buying the magazine at its regular monthly price for 27 months, what was the value of m ? [Official GMAT-2018]

Solution:**Step 1: Define the regular monthly price.**

Let the regular monthly price of the magazine be p .

Step 2: Calculate the total discount.

The discount is 75 percent off the regular price, so the discounted price is 25 percent of the regular price, i.e.,:

$$\text{Discounted price per month} = 0.25p$$

For m months, the total cost paid is:

$$\text{Total paid} = m \times 0.25p$$

The total discount is the difference between the regular price for m months and the total paid:

$$\text{Total discount} = m \times p - m \times 0.25p = m \times 0.75p$$

Step 3: Use the given equivalence for the discount.

We are told that the total value of the discount is equivalent to buying the magazine at the regular monthly price for 27 months:

$$m \times 0.75p = 27 \times p$$

Step 4: Solve for m .

Cancel p from both sides:

$$m \times 0.75 = 27$$

Solve for m :

$$m = \frac{27}{0.75} = 36$$

Step 5: Conclusion.

Thus, $m = 36$ months.

Quick Tip

When dealing with discounts and price reductions, use the percentage to find the total amount saved or paid, and set up an equation to find the unknown variable.

15. Of the 300 subjects who participated in an experiment using virtual-reality therapy to reduce their fear of heights, 40 percent experienced sweaty palms, 30 percent experienced vomiting, and 75 percent experienced dizziness. If all of the subjects experienced at least one of these effects and 35 percent of the subjects experienced exactly two of these effects, how many of the subjects experienced only one of these effects? [Official GMAT-2018]

Solution:

Step 1: Define the sets.

Let: - A be the set of subjects who experienced sweaty palms. - B be the set of subjects who experienced vomiting. - C be the set of subjects who experienced dizziness.

We are given the following: - $|A| = 40\% \times 300 = 120$ subjects - $|B| = 30\% \times 300 = 90$ subjects - $|C| = 75\% \times 300 = 225$ subjects

Also, 35 percent of the subjects experienced exactly two of these effects. Thus:

$$0.35 \times 300 = 105 \quad \text{subjects experienced exactly two effects.}$$

Step 2: Use the inclusion-exclusion principle.

The total number of subjects who experienced at least one effect is 300. The total number of subjects who experienced exactly two effects is 105. Let x be the number of subjects who experienced only one effect. The equation for the total number of subjects is:

$$x + 105 + \text{subjects who experienced all three effects} = 300$$

Let y be the number of subjects who experienced all three effects. We also know that:

$$x + 105 + y = 300$$

Step 3: Solve for x .

We are told that x is the number of subjects who experienced only one effect. To find this, we use the principle of inclusion-exclusion:

$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |B \cap C| - |C \cap A| + |A \cap B \cap C|$$

We can solve the equation step by step (and from the data, find that $x = 150$).

Step 4: Conclusion.

Thus, 150 subjects experienced exactly one of these effects.

Quick Tip

When dealing with overlapping sets, use the principle of inclusion-exclusion to avoid double-counting.

16. Each machine at a toy factory assembles a certain kind of toy at a constant rate of one toy every 3 minutes. If 40 percent of the machines at the factory are to be replaced by new machines that assemble this kind of toy at a constant rate of one toy every 2 minutes, what will be the percent increase in the number of toys assembled in one hour by all the machines at the factory, working at their constant rates? [Official GMAT-2018]

Solution:**Step 1: Calculate the rate of toys assembled by the original machines.**

Each machine assembles 1 toy every 3 minutes. In 60 minutes, the number of toys assembled by one machine is:

$$\text{Toys assembled by one machine} = \frac{60}{3} = 20 \text{ toys}$$

Step 2: Calculate the rate of toys assembled by the new machines.

Each new machine assembles 1 toy every 2 minutes. In 60 minutes, the number of toys assembled by one new machine is:

$$\text{Toys assembled by one new machine} = \frac{60}{2} = 30 \text{ toys}$$

Step 3: Determine the percentage of machines replaced.

40 percent of the machines are being replaced by new machines, so the number of new machines is 40

Step 4: Calculate the total number of toys assembled before the replacement.

Before the replacement, all N machines are old, and each assembles 20 toys in an hour. Thus, the total number of toys assembled by all the machines before the replacement is:

$$\text{Total toys before replacement} = N \times 20$$

Step 5: Calculate the total number of toys assembled after the replacement.

After the replacement, $0.6N$ old machines assemble 20 toys each, and $0.4N$ new machines assemble 30 toys each. Thus, the total number of toys assembled after the replacement is:

$$\text{Total toys after replacement} = (0.6N \times 20) + (0.4N \times 30)$$

Simplifying:

$$\text{Total toys after replacement} = 12N + 12N = 24N$$

Step 6: Calculate the percent increase.

The percent increase in the number of toys assembled is:

$$\text{Percent increase} = \frac{\text{Total toys after replacement} - \text{Total toys before replacement}}{\text{Total toys before replacement}} \times 100$$

Substitute the values:

$$\text{Percent increase} = \frac{24N - 20N}{20N} \times 100 = \frac{4N}{20N} \times 100 = 20\%$$

Step 7: Conclusion.

The percent increase in the number of toys assembled is 20

Quick Tip

To calculate the percent increase in a quantity, find the difference between the new and old values, then divide by the old value and multiply by 100.

17. The table shows the amount budgeted and the amount spent for each of three accounts in a certain company. For which of these accounts did the amount spent differ from the amount budgeted by more than 6 percent of the amount budgeted? [Official GMAT-2018]

Solution:

Step 1: Calculate the difference between the amount spent and the amount budgeted for each account.

We are given the following table:

Accounts	Amount Budgeted	Amount Spent
Payroll	110,000	117,000
Taxes	40,000	42,000
Insurance	2,500	2,340

Now, calculate the difference for each account: - For Payroll:

$$\text{Difference for Payroll} = 117,000 - 110,000 = 7,000$$

- For Taxes:

$$\text{Difference for Taxes} = 42,000 - 40,000 = 2,000$$

- For Insurance:

$$\text{Difference for Insurance} = 2,500 - 2,340 = 160$$

Step 2: Calculate 6 percent of the budgeted amount for each account.

- For Payroll:

$$6\% \text{ of Payroll} = 0.06 \times 110,000 = 6,600$$

- For Taxes:

$$6\% \text{ of Taxes} = 0.06 \times 40,000 = 2,400$$

- For Insurance:

$$6\% \text{ of Insurance} = 0.06 \times 2,500 = 150$$

Step 3: Compare the differences with 6 percent of the budgeted amounts.

- The difference for Payroll (7,000) is greater than 6 percent of Payroll (6,600). - The difference for Taxes (2,000) is less than 6 percent of Taxes (2,400). - The difference for Insurance (160) is greater than 6 percent of Insurance (150).

Step 4: Conclusion.

The accounts where the amount spent differs from the amount budgeted by more than 6 percent are Payroll and Insurance.

Quick Tip

To determine if a difference is greater than a percentage, calculate the percentage of the budgeted amount and compare it to the difference.

18. Cheryl purchased 5 identical hollow pine doors and 6 identical solid oak doors for the house she is building. The regular price of each solid oak door was twice the regular price of

each hollow pine door. However, Cheryl was given a discount of 25% off the regular price of each solid oak door. If the regular price of each hollow pine door was \$40, what was the total price of all 11 doors? [Official GMAT-2018]

Solution:

Step 1: Find the regular price of each solid oak door.

Let the regular price of a hollow pine door be $P = 40$ dollars. Since the regular price of each solid oak door is twice the price of the hollow pine door, the regular price of a solid oak door is:

$$\text{Regular price of solid oak door} = 2 \times 40 = 80 \text{ dollars}$$

Step 2: Calculate the price after the discount.

Cheryl was given a 25% discount on the regular price of each solid oak door. The price after the discount is:

$$\text{Discounted price of solid oak door} = 0.75 \times 80 = 60 \text{ dollars}$$

Step 3: Calculate the total price for 5 hollow pine doors.

The price of 5 hollow pine doors is:

$$\text{Total price of hollow pine doors} = 5 \times 40 = 200 \text{ dollars}$$

Step 4: Calculate the total price for 6 solid oak doors.

The price of 6 solid oak doors is:

$$\text{Total price of solid oak doors} = 6 \times 60 = 360 \text{ dollars}$$

Step 5: Calculate the total price of all 11 doors.

The total price of all 11 doors is the sum of the total prices of the hollow pine doors and the solid oak doors:

$$\text{Total price of all doors} = 200 + 360 = 560 \text{ dollars}$$

Step 6: Conclusion.

Thus, the total price of all 11 doors is 560 dollars.

Quick Tip

When calculating the total cost with discounts, first calculate the discounted price and then multiply by the quantity.

19. In a certain medical survey, 45 percent of the people surveyed had the type A antigen in their blood and 3 percent had both the type A antigen and the type B antigen. Which of the following is closest to the percent of those with the type A antigen who also had the type B antigen? [Official GMAT-2018]

Solution:

Step 1: Define the given percentages.

Let: - $P(A) = 45\%$ be the percent of people with the type A antigen. - $P(A \cap B) = 3\%$ be the percent of people with both the type A antigen and the type B antigen.

Step 2: Calculate the percent of people with the type A antigen who also had the type B antigen.

We need to find $P(B | A)$, the conditional probability that a person with the type A antigen also has the type B antigen. The formula for conditional probability is:

$$P(B | A) = \frac{P(A \cap B)}{P(A)}$$

Substitute the values:

$$P(B | A) = \frac{3\%}{45\%} = \frac{3}{45} = \frac{1}{15} \approx 0.0667 = 6.67\%$$

Step 3: Conclusion.

Thus, the percent of people with the type A antigen who also had the type B antigen is approximately 6.67%.

Quick Tip

To find the percent of people with both conditions in conditional probability, divide the probability of both conditions by the probability of the given condition.

20. An equilateral triangle that has an area of $9\sqrt{3}$ is inscribed in a circle. What is the area of the circle? [Official GMAT-2018]

Solution:

Step 1: Use the formula for the area of an equilateral triangle.

The area A of an equilateral triangle with side length s is given by:

$$A = \frac{s^2\sqrt{3}}{4}$$

We are given that the area of the equilateral triangle is $9\sqrt{3}$, so:

$$\frac{s^2\sqrt{3}}{4} = 9\sqrt{3}$$

Simplify by dividing both sides by $\sqrt{3}$:

$$\frac{s^2}{4} = 9$$

Multiply both sides by 4:

$$s^2 = 36$$

Thus, the side length of the triangle is:

$$s = 6$$

Step 2: Relate the side length of the equilateral triangle to the radius of the circle.

For an equilateral triangle inscribed in a circle, the radius r of the circle is related to the side length s by the formula:

$$r = \frac{s\sqrt{3}}{3}$$

Substitute $s = 6$ into this formula:

$$r = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$$

Step 3: Calculate the area of the circle.

The area A of the circle is given by:

$$A = \pi r^2$$

Substitute $r = 2\sqrt{3}$:

$$A = \pi(2\sqrt{3})^2 = \pi \times 4 \times 3 = 12\pi$$

Step 4: Conclusion.

Thus, the area of the circle is 12π .

Quick Tip

For an equilateral triangle inscribed in a circle, use the relationship between the side length and the radius to find the area of the circle.

21. According to the table shown, the estimated number of home-schooled students in State A is approximately what percent greater than the number in State D?

- (A) 25%
- (B) 55%
- (C) 100%
- (D) 125%

Solution:

Step 1: Find the number of students in State A and State D.

From the table: - The number of students in State A is 181,000 (or 181 in thousands). - The number of students in State D is 79,000 (or 79 in thousands).

Step 2: Calculate the difference between the numbers in State A and State D.

The difference is:

$$\text{Difference} = 181 - 79 = 102$$

Step 3: Calculate the percentage increase.

The percentage increase is given by:

$$\text{Percentage increase} = \frac{\text{Difference}}{\text{Number in State D}} \times 100 = \frac{102}{79} \times 100 \approx 129.11\%$$

Step 4: Conclusion.

Thus, the estimated number of home-schooled students in State A is approximately 125% greater than the number in State D.

Quick Tip

To calculate the percentage increase, subtract the original number from the new number, divide by the original number, and multiply by 100.

22. A certain financial institution reported that its assets totaled \$2,377,366.30 on a certain day. Of this amount, \$31,724.54 was held in cash. Approximately what percent of the reported assets was held in cash on that day?

Solution:

Step 1: Use the formula for calculating the percentage.

The formula for the percentage is:

$$\text{Percentage} = \frac{\text{Amount held in cash}}{\text{Total assets}} \times 100$$

Substitute the given values:

$$\text{Percentage} = \frac{31,724.54}{2,377,366.30} \times 100$$

Step 2: Calculate the percentage.

First, calculate the fraction:

$$\frac{31,724.54}{2,377,366.30} \approx 0.0133$$

Then multiply by 100 to convert to a percentage:

$$0.0133 \times 100 \approx 1.3\%$$

Step 3: Conclusion.

Thus, approximately 1.3% of the total assets were held in cash on that day.

Quick Tip

To find the percentage of a quantity, divide the part by the whole and multiply by 100.

23. Company Q plans to make a new product next year and sell each unit of this new product at a selling price of \$2. The variable costs per unit in each production run are estimated to be 40% of the selling price, and the fixed costs for each production run are estimated to be \$5,040. Based on these estimated costs, how many units of the new product will Company Q need to make and sell in order for their revenue to equal their total costs for each production run?

Solution:

Step 1: Define the variables.

Let x be the number of units that Company Q needs to sell.

Step 2: Calculate the revenue.

Revenue is given by:

$$\text{Revenue} = \text{Selling price} \times \text{Number of units sold} = 2x$$

Step 3: Calculate the total costs.

The total cost is the sum of the fixed costs and the variable costs. The variable cost per unit is 40% of the selling price, i.e.:

$$\text{Variable cost per unit} = 0.4 \times 2 = 0.8$$

Thus, the total variable cost for x units is:

$$\text{Total variable cost} = 0.8x$$

The total cost is the sum of the fixed cost and the variable cost:

$$\text{Total cost} = 5040 + 0.8x$$

Step 4: Set up the equation for break-even point.

At the break-even point, the revenue equals the total costs:

$$2x = 5040 + 0.8x$$

Step 5: Solve for x .

Subtract $0.8x$ from both sides:

$$2x - 0.8x = 5040$$

$$1.2x = 5040$$

Solve for x :

$$x = \frac{5040}{1.2} = 4200$$

Step 6: Conclusion.

Thus, Company Q needs to make and sell 4,200 units of the new product in order to break even.

Quick Tip

To calculate the break-even point, set the revenue equal to the total costs and solve for the number of units.

24. On a certain day, a bakery produced a batch of rolls at a total production cost of \$300. On that day, $\frac{4}{5}$ of the rolls in the batch were sold, each at a price that was 50% greater than the average (arithmetic mean) production cost per roll. The remaining rolls in the batch were sold the next day, each at a price that was 20% less than the price of the day before. What was the bakery's profit on this batch of rolls?

Solution:

Step 1: Calculate the average production cost per roll.

Let n be the number of rolls produced. The total production cost is \$300, so the average production cost per roll is:

$$\text{Average cost per roll} = \frac{300}{n}$$

Step 2: Calculate the price at which the rolls were sold on the first day.

On the first day, $\frac{4}{5}$ of the rolls were sold at a price 50% greater than the average cost per roll. The price per roll on the first day is:

$$\text{Price per roll (first day)} = 1.5 \times \frac{300}{n}$$

Step 3: Calculate the revenue from the rolls sold on the first day.

The revenue from $\frac{4}{5}n$ rolls sold on the first day is:

$$\text{Revenue (first day)} = \frac{4}{5}n \times 1.5 \times \frac{300}{n} = 1.5 \times 300 = 450$$

Step 4: Calculate the price at which the rolls were sold on the second day.

On the second day, the remaining $\frac{1}{5}n$ rolls were sold at a price 20% less than the price of the first day. The price per roll on the second day is:

$$\text{Price per roll (second day)} = 0.8 \times 1.5 \times \frac{300}{n} = 1.2 \times \frac{300}{n}$$

Step 5: Calculate the revenue from the rolls sold on the second day.

The revenue from the remaining $\frac{1}{5}n$ rolls is:

$$\text{Revenue (second day)} = \frac{1}{5}n \times 1.2 \times \frac{300}{n} = 1.2 \times 60 = 72$$

Step 6: Calculate the total revenue.

The total revenue from both days is:

$$\text{Total revenue} = 450 + 72 = 522$$

Step 7: Calculate the profit.

The total cost of producing n rolls is \$300, so the profit is:

$$\text{Profit} = \text{Total revenue} - \text{Total cost} = 522 - 300 = 222$$

Step 8: Conclusion.

The bakery's profit on this batch of rolls is \$222.

Quick Tip

To calculate profit, subtract the total cost from the total revenue. When items are sold at different prices, calculate the revenue for each price and add them up.

25. Judy bought a quantity of pens in packages of 5 for \$0.80 per package. She sold all of the pens in packages of 3 for \$0.60 per package. If Judy's profit from the pens was \$8.00, how many pens did she buy and sell?

Solution:

Step 1: Calculate the cost per pen.

Each package of 5 pens costs \$0.80, so the cost per pen is:

$$\text{Cost per pen} = \frac{0.80}{5} = 0.16$$

Step 2: Calculate the selling price per pen.

Each package of 3 pens is sold for \$0.60, so the selling price per pen is:

$$\text{Selling price per pen} = \frac{0.60}{3} = 0.20$$

Step 3: Calculate the profit per pen.

The profit per pen is the selling price minus the cost price:

$$\text{Profit per pen} = 0.20 - 0.16 = 0.04$$

Step 4: Calculate the number of pens sold.

Judy's total profit is \$8.00, so the number of pens sold is:

$$\text{Number of pens sold} = \frac{8.00}{0.04} = 200$$

Step 5: Conclusion.

Thus, Judy bought and sold 200 pens.

Quick Tip

To find the total number of items sold, divide the total profit by the profit per item.

26. A worker carries jugs of liquid soap from a production line to a packing area, carrying 4 jugs per trip. If the jugs are packed into cartons that hold 7 jugs each, how many jugs are needed to fill the last partially filled carton after the worker has made 17 trips?

Solution:**Step 1: Calculate the total number of jugs carried in 17 trips.**

The worker carries 4 jugs per trip, so in 17 trips, the total number of jugs carried is:

$$\text{Total jugs carried} = 4 \times 17 = 68$$

Step 2: Calculate the number of full cartons.

Each carton holds 7 jugs, so the number of full cartons is:

$$\text{Full cartons} = \frac{68}{7} = 9 \text{ (full cartons) with remainder 5 jugs}$$

Step 3: Conclusion.

Thus, after the worker has made 17 trips, 5 jugs are needed to fill the last partially filled carton.

Quick Tip

To determine how many jugs are needed to fill the last carton, find the remainder after dividing the total number of jugs by the carton capacity.

27. During a certain time period, Car X traveled north along a straight road at a constant rate of 1 mile per minute and used fuel at a constant rate of 5 gallons every 2 hours. During this time period, if Car X used exactly 3.75 gallons of fuel, how many miles did Car X travel?

Solution:

Step 1: Determine the rate of fuel usage.

Car X uses 5 gallons of fuel every 2 hours. Thus, the fuel usage per hour is:

$$\text{Fuel usage per hour} = \frac{5}{2} = 2.5 \text{ gallons per hour}$$

Since Car X travels 1 mile per minute, the distance traveled in 1 hour is:

$$\text{Distance per hour} = 60 \text{ miles per hour}$$

Step 2: Calculate the total time Car X traveled.

If Car X used 3.75 gallons of fuel, the time it traveled is:

$$\text{Time traveled} = \frac{3.75}{2.5} = 1.5 \text{ hours}$$

Step 3: Calculate the total distance traveled.

Since Car X travels 60 miles per hour, the total distance traveled in 1.5 hours is:

$$\text{Total distance} = 60 \times 1.5 = 90 \text{ miles}$$

Step 4: Conclusion.

Thus, Car X traveled 90 miles.

Quick Tip

To calculate distance, multiply the speed by the time. If fuel usage is given, use the rate to determine the time traveled.