

5 Pens And 7 Pencil Together Cost Rs 50. Whereas 7 Pens And 5 Pencils Together Cost Rs 46. Find The Cost

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Understanding the cost of pens and pencils when given their combined prices is a common problem in algebra and arithmetic. Such problems often appear in competitive exams, math quizzes, and everyday shopping scenarios. The problem states:

- 5 pens and 7 pencils together cost Rs 50.
- 7 pens and 5 pencils together cost Rs 46.

The challenge is to find the individual costs of one pen and one pencil.

In this article, we will explore how to approach this problem systematically, using algebraic methods. We will break down the problem step-by-step, provide detailed explanations, and offer tips to solve similar problems efficiently.

Understanding the Problem

Before diving into calculations, it's essential to understand what the problem is asking and the information provided.

Given:

- Total cost of 5 pens + 7 pencils = Rs 50
- Total cost of 7 pens + 5 pencils = Rs 46

Objective:

- Find the cost of a single pen
- Find the cost of a single pencil

This is a classic system of linear equations problem, where the variables represent the costs of one pen and one pencil.

Setting Up Variables

To solve the problem, assign variables to the unknown quantities:

- Let x = cost of one pen (in Rs)
- Let y = cost of one pencil (in Rs)

Now, translate the given information into algebraic equations:

1. For 5 pens and 7 pencils:

$$5x + 7y = \text{Rs } 50$$

2. For 7 pens and 5 pencils:

$$7x + 5y = \text{Rs } 46$$

Formulating the Equations

The two key equations are:

Equation 1: $5x + 7y = 50$

Equation 2: $7x + 5y = 46$

Our goal is to solve these equations simultaneously to find the values of x and y .

Methods to Solve the System of Equations

There are multiple methods to solve simultaneous equations:

- Substitution method
- Elimination method
- Cross-multiplication method

For this problem, the elimination method is efficient because it aligns the coefficients for easy elimination.

Applying the Elimination Method

Step 1: Equalize the coefficients of either x or y .

Let's eliminate x. To do this, multiply the equations by suitable numbers so that the coefficients of x are equal.

- Multiply Equation 1 by 7:

$$(7)(5x + 7y) = 7 \cdot 50$$

$$35x + 49y = 350$$

- Multiply Equation 2 by 5:

$$(5)(7x + 5y) = 5 \cdot 46$$

$$35x + 25y = 230$$

Step 2: Subtract the second new equation from the first to eliminate x:

$$(35x + 49y) - (35x + 25y) = 350 - 230$$

Simplify:

$$35x - 35x + 49y - 25y = 120$$

$$0x + 24y = 120$$

$$\Rightarrow 24y = 120$$

Step 3: Solve for y:

$$y = 120 / 24 = \text{Rs } 5$$

This means each pencil costs Rs 5.

Finding the Cost of a Pen

Now that we have $y = \text{Rs } 5$, substitute this value back into one of the original equations to find x.

Using Equation 1:

$$5x + 7y = 50$$

Substitute $y = 5$:

$$5x + 7 \cdot 5 = 50$$

$$5x + 35 = 50$$

Subtract 35 from both sides:

$$5x = 50 - 35 = 15$$

Divide both sides by 5:

$$x = 15 / 5 = \text{Rs } 3$$

So, each pen costs Rs 3.

Summary of Results

Item	Cost (Rs)
Pen	Rs 3
Pencil	Rs 5

Therefore, the cost of one pen is Rs 3, and the cost of one pencil is Rs 5.

Verification of the Solution

To ensure our solution is correct, substitute the values into the original equations:

Equation 1: $5x + 7y = 50$

$$5 \times 3 + 7 \times 5 = 15 + 35 = \text{Rs } 50 \quad \checkmark$$

Equation 2: $7x + 5y = 46$

$$7 \times 3 + 5 \times 5 = 21 + 25 = \text{Rs } 46 \quad \checkmark$$

Since both equations are satisfied, our solution is verified.

Additional Tips for Solving Similar Problems

- Always assign variables clearly to unknown quantities.
- Write equations systematically to avoid errors.
- Use elimination or substitution based on which method simplifies calculations.

- Double-check solutions by substituting back into original equations.
- Be attentive to units and ensure consistent use of variables.

Real-Life Applications

Problems involving the cost of items based on combined prices are common in daily life, such as:

- Shopping discounts
- Budget planning
- Cost analysis in business

Mastering these algebraic techniques helps in quick calculations and decision-making.

Conclusion

Solving for the individual costs of pens and pencils when given their combined prices involves setting up equations based on the problem's data and solving these equations systematically. In our example, we found that:

- Each pen costs Rs 3
- Each pencil costs Rs 5

This approach can be applied to various similar problems, enhancing problem-solving skills and algebraic understanding.

Remember, breaking down a problem into smaller steps and verifying your solutions are key to accurately solving system of equations problems like these.

By mastering such algebraic techniques, students can confidently tackle a wide range of mathematical problems, both in exams and real-world scenarios.

Frequently Asked Questions

How can we determine the individual cost of one pen and one pencil from the given equations?

By setting up two equations based on the total costs— $5P + 7Q = 50$ and $7P + 5Q = 46$ —and solving them simultaneously, we can find the costs of one pen (P) and one pencil (Q).

What method is most effective to solve for the individual costs in this problem?

The elimination method or substitution method are effective. For example, multiplying equations to align coefficients and subtracting to eliminate one variable helps find the values of P and Q.

What is the cost of one pen and one pencil based on the calculations?

By solving the equations, the cost of one pen (P) is Rs 4, and the cost of one pencil (Q) is Rs 2.

How do we verify the correctness of the solution for the costs of pens and pencils?

Substitute the found values of P and Q into the original equations to check if both equations hold true, confirming the accuracy of the solution.

What is the total cost of 5 pens and 7 pencils together, based on the individual costs?

Using the calculated costs, 5 pens (Rs 4 each) and 7 pencils (Rs 2 each) together cost $\text{Rs } 20 + \text{Rs } 14 = \text{Rs } 34$.

Additional Resources

5 Pens And 7 Pencil Together Cost Rs 50. Whereas 7 Pens And 5 Pencils Together Cost Rs 46. Find The Cost

In the realm of everyday mathematics, word problems involving the combined cost of items are quite common. They often serve as practical applications of algebra, helping to develop logical reasoning and problem-solving skills. One such intriguing problem involves calculating the individual costs of pens and pencils based on their combined prices in two different scenarios. The problem statement reads: "5 pens and 7 pencils together cost Rs 50, whereas 7 pens and 5 pencils together cost Rs 46. Find the individual costs of a pen and a pencil." This problem, while seemingly straightforward, involves a systematic approach to deciphering the unknowns through algebraic equations.

In this article, we will explore the problem in depth, breaking down the steps involved in deriving the individual costs, understanding the underlying principles, and providing a clear, reader-friendly guide to solving such equations. Whether you are a student sharpening your algebra skills or a curious reader interested in mathematical problem-solving, this comprehensive guide aims to clarify the process with detailed explanations and logical reasoning.

Understanding the Problem Statement

Before jumping into the solution, it is essential to understand what the problem is asking for and how

to interpret the given data.

The Given Data:

- The combined cost of 5 pens and 7 pencils is Rs 50.
- The combined cost of 7 pens and 5 pencils is Rs 46.

The Unknowns:

- Cost of a single pen (let's denote it as x Rs).
- Cost of a single pencil (let's denote it as y Rs).

The goal is to find the individual costs of a pen and a pencil, i.e., to determine the values of x and y.

Formulating the Equations

The core of the problem lies in translating the word problem into algebraic equations. Based on the data:

1. Cost of 5 pens and 7 pencils:

Since each pen costs x Rs and each pencil costs y Rs, the total cost is:

$$\begin{aligned} & \backslash[\\ & 5x + 7y = 50 \\ & \backslash] \end{aligned}$$

2. Cost of 7 pens and 5 pencils:

Similarly,

$$\begin{aligned} & \backslash[\\ & 7x + 5y = 46 \\ & \backslash] \end{aligned}$$

Now, we have a system of two linear equations:

$$\begin{aligned} & \backslash[\\ & \begin{cases} 5x + 7y = 50 & \text{(Equation 1)} \\ 7x + 5y = 46 & \text{(Equation 2)} \end{cases} \\ & \backslash] \end{aligned}$$

The task reduces to solving these two equations simultaneously to find the values of x and y.

Solving the System of Equations

There are multiple methods to solve simultaneous equations: substitution, elimination, or using

matrices. Here, we'll utilize the elimination method, which is straightforward for such problems.

Step 1: Equalize coefficients to eliminate one variable

Our goal is to eliminate either x or y. Let's choose to eliminate x.

- Multiply Equation 1 by 7:

$$\begin{aligned} & 7 \times (5x + 7y) = 7 \times 50 \\ & 35x + 49y = 350 \end{aligned}$$

- Multiply Equation 2 by 5:

$$\begin{aligned} & 5 \times (7x + 5y) = 5 \times 46 \\ & 35x + 25y = 230 \end{aligned}$$

Now, subtract the second new equation from the first:

$$\begin{aligned} & (35x + 49y) - (35x + 25y) = 350 - 230 \\ & (35x - 35x) + (49y - 25y) = 120 \\ & 0 + 24y = 120 \end{aligned}$$

Step 2: Solve for y

$$\begin{aligned} & 24y = 120 \\ & y = \frac{120}{24} = 5 \end{aligned}$$

Thus, the cost of a pencil is Rs 5.

Finding the Cost of a Pen (x)

With y known, substitute $y = 5$ into either of the original equations to find x . Let's use Equation 1:

$$\begin{aligned} &5x + 7(5) = 50 \\ &5x + 35 = 50 \\ &5x = 50 - 35 = 15 \\ &x = \frac{15}{5} = 3 \end{aligned}$$

Thus, the cost of a pen is Rs 3.

Final Answer:

- Cost of one pen = Rs 3
- Cost of one pencil = Rs 5

Validating the Results

To ensure our solutions are correct, substitute $x = 3$ and $y = 5$ into the second equation:

$$7x + 5y = 7(3) + 5(5) = 21 + 25 = 46$$

which matches the given data. Therefore, our calculations are consistent and accurate.

Additional Insights and Practical Applications

While the problem at hand is a pure algebraic exercise, the approach exemplifies real-world applications. For instance, retailers or suppliers often need to determine individual item costs based on bundled prices. This approach can also extend to more complex scenarios involving multiple variables and constraints, such as budgeting, inventory management, or pricing strategies.

Furthermore, understanding how to formulate equations from word problems enhances logical thinking and numerical literacy. It encourages a systematic approach: interpret the problem, translate words into equations, solve algebraically, and validate results.

Common Challenges and Tips in Solving Similar Problems

1. Identify the variables clearly: Assign meaningful symbols to the unknowns, typically x and y .
2. Translate words into equations carefully: Pay attention to the quantities and how they combine.
3. Check for consistency: Before solving, verify whether equations are consistent and independent.
4. Use elimination or substitution effectively: Choose the method that simplifies calculations.
5. Validate solutions: Substitute the found values back into original equations to confirm correctness.
6. Be cautious with signs and coefficients: Ensure all calculations are accurate, especially when multiplying equations to align coefficients.

Conclusion

Solving for the individual costs of pens and pencils from combined price data involves a fundamental understanding of algebraic systems. By translating the problem into equations, systematically solving them, and verifying the results, one can confidently determine the unknowns. In the case discussed, the cost of a pen is Rs 3, and a pencil costs Rs 5.

This exercise underscores the importance of algebra as a practical tool for everyday problem-solving, demonstrating that with methodical reasoning and clear steps, even seemingly complex questions become manageable. Whether for academic purposes, business calculations, or personal budgeting, mastering such techniques enhances one's analytical capabilities and mathematical literacy.

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