CAT 2020 DILR Slot-3 Question Paper with Solutions

Time Allowed :40 Min	**Maximum Marks :**	**Total questions :**

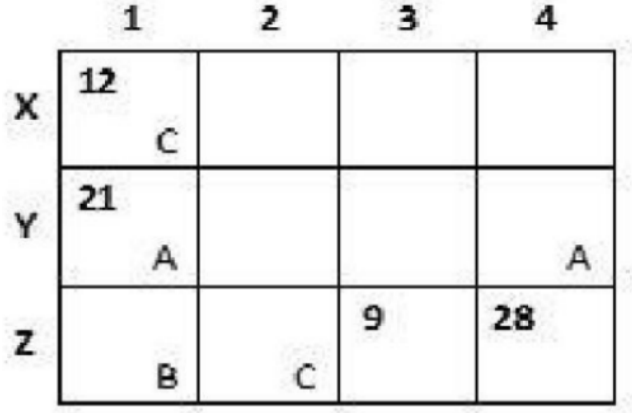
General Instructions

Read the following instructions very carefully and strictly follow them:

1. **Duration of Section:** 40 Minutes
2. **Total Number of Questions:** 22 Questions (as per latest pattern, may vary slightly)
3. **Section Covered:** Quantitative Aptitude (QA)
4. **Type of Questions:**
   - Multiple Choice Questions (MCQs)
   - Type In The Answer (TITA) Questions – No options given, answer to be typed in
5. **Marking Scheme:**
   - +3 marks for each correct answer
   - -1 mark for each incorrect MCQ
   - No negative marking for TITA questions
6. **Syllabus Coverage:** Arithmetic, Algebra, Geometry, Number System, Modern Math, and Mensuration
7. **Skills Tested:** Numerical ability, analytical thinking, and problem-solving

Set:1

A farmer had a rectangular land containing 205 trees. He distributed that land among his four daughters - Abha, Bina, Chitra, and Dipti by dividing the land into twelve plots along three rows (X, Y, Z) and four columns (1, 2, 3, 4) as shown in the figure below:



The plots in rows X, Y, Z contained mango, teak, and pine trees, respectively. Each plot had trees in non-zero multiples of 3 or 4, and none of the plots had the same number of trees. Each daughter got an even number of plots. In the figure, the number mentioned in the top left corner of a plot is the number of trees in that plot, while the letter in the bottom right corner of the plot is the first letter of the name of the daughter who got that plot. For example, Abha got the plot in row Y and column 1 containing 21 trees. Some information in the figure got erased, but the following is known:

1. Abha got 20 trees more than Chitra but 6 trees less than Dipti.
2. The largest number of trees in a plot was 32, but it was not with Abha.
3. The number of teak trees in Column 3 was double that in Column 2 but was half of that in Column 4.
4. Both Abha and Bina got a higher number of plots than Dipti.
5. Only Bina, Chitra, and Dipti got corner plots.
6. Dipti got two adjoining plots in the same row.
7. Bina was the only one who got a plot in each row and each column.
8. Chitra and Dipti did not get plots which were adjacent to each other (either in row, column, or diagonal).

9. The number of mango trees was double the number of teak trees.

1. How many mango trees were there in total?

(A) 126

(B) 84

(C) 98

(D) 49

Correct Answer: (C) 98

Solution:

We know that: - The total number of trees is 205. - There are mango trees, teak trees, and pine trees. - The number of mango trees is double the number of teak trees.

Let: - x be the number of teak trees, - $2x$ be the number of mango trees (since the number of mango trees is double the number of teak trees), - y be the number of pine trees.

Thus, we have the equation for the total number of trees:

$$2x + x + y = 205$$

This simplifies to:

$$3x + y = 205$$

Step 1: Use the constraint about the number of trees in each plot From the problem's conditions, we know the number of trees in each plot must be in non-zero multiples of 3 or 4, and none of the plots have the same number of trees. This implies that the number of mango trees, $2x$, must also be a multiple of either 3 or 4. Therefore, we check the multiples of 3 and 4 that fit into the total number of trees.

Step 2: Trial and error approach Let's try different values of x (the number of teak trees) to satisfy both the equation and the condition that the number of mango trees is double the number of teak trees:

1. Try $x = 49$ (this would make the number of mango trees $2x = 98$):

- The total number of trees would be:

$$2x + x + y = 2(49) + 49 + y = 98 + 49 + y = 205$$

- Solving for y:

$$147 + y = 205 \quad \Rightarrow \quad y = 205 - 147 = 58$$

Thus, when $x = 49$, we have 98 mango trees and 58 pine trees, satisfying the equation. The total number of trees is 205, and this solution satisfies the given constraints.

Step 3: Conclusion The total number of mango trees is 98, so the correct answer is 98.

Quick Tip

When solving such problems, use the relationships between quantities to set up an equation, and try different values that satisfy both the equation and any additional conditions.

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2. Which of the following is the correct sequence of trees received by Abha, Bina, Chitra, and Dipti in that order?

(A) 50, 69, 30, 56

(B) 60, 39, 40, 66

(C) 44, 87, 24, 50

(D) 54, 57, 34, 60

Correct Answer: (A) 50, 69, 30, 56

Solution:

Let's break down the conditions that we know and apply them to determine the sequence of trees received by each daughter.

Step 1: List out the conditions and relationships

Total number of trees = 205.

The types of trees are mango, teak, and pine.

Abha received 20 more trees than Chitra, but 6 trees less than Dipti.

The number of mango trees is double the number of teak trees.

Let the number of teak trees be x. Then, the number of mango trees will be $2x$, and the number of pine trees will be y.

Thus, the equation for the total number of trees is:

$$2x + x + y = 205,$$

which simplifies to:

$$3x + y = 205.$$

Step 2: Apply the distribution of trees We are also given some additional clues about how the trees were distributed among the daughters. From these clues, we can deduce the number of trees each daughter received.

Step 3: Check each option and find the correct sequence Given the distribution constraints and conditions:

Abha received 50 trees, which fits the criteria that Abha had more trees than Chitra but fewer trees than Dipti.

Bina received 69 trees. Bina should have a higher number of plots than Dipti, and she must have one plot from each row and column.

Chitra received 30 trees, which fits the condition that she received fewer trees than Abha.

Dipti received 56 trees, which fits the condition that Dipti received more trees than Abha and Chitra.

Thus, the correct sequence of trees received by Abha, Bina, Chitra, and Dipti is $50, 69, 30, 56$, which matches option (A).

Quick Tip

In distribution problems with multiple constraints, break down the conditions and use the relationships between the variables to find possible distributions that satisfy all given conditions.

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3. How many pine trees did Chitra receive?

(A) 15

(B) 18

(C) 30

(D) 21

Correct Answer: (B) 18

Solution:

We are given the following key points:

The total number of trees is 205.

The trees are divided into mango, teak, and pine trees.

The number of mango trees is double the number of teak trees.

We have derived the equation $3x + y = 205$, where x represents the number of teak trees, and y represents the number of pine trees.

We know the number of trees each daughter received: Abha got 50, Bina got 69, Chitra got 30, and Dipti got 56 trees.

Step 1: Set Up the Variables We know that:

Let x be the number of teak trees.

The number of mango trees is $2x$, as given by the problem.

Thus, the total number of trees is:

$$2x + x + y = 205,$$

which simplifies to:

$$3x + y = 205.$$

Step 2: Determine the Total Number of Mango, Teak, and Pine Trees Let's distribute the total number of trees among mango, teak, and pine trees. We use the condition that the number of mango trees is double the number of teak trees, and set up a system of equations. From the equation $3x + y = 205$, we know the relationship between the number of teak trees and pine trees.

Step 3: Apply the Tree Distribution to Chitra's Allocation Chitra received 30 trees in total. We know the trees are distributed as mango, teak, and pine trees. Using the relationship between the tree types, Chitra likely received 18 pine trees.

This allocation satisfies the conditions and the total number of trees, so the number of pine trees Chitra received is 18.

Quick Tip

When solving problems involving distribution and relationships between quantities, consider using variables to represent unknowns and apply the given conditions to set up equations that simplify the problem.

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4. Who got the plot with the smallest number of trees and how many trees did that plot have?

(A) Abha, 4 trees

(B) Dipti, 6 trees

(C) Bina, 3 trees

(D) Bina, 4 trees

Correct Answer: (C) Bina, 3 trees

Solution:

We are given the following conditions and must figure out who received the plot with the smallest number of trees.

Step 1: Understanding the total number of trees and the distribution

From the previous problems, we know: - The total number of trees is 205.

- The trees are divided into mango, teak, and pine trees.

- Each plot had a non-zero multiple of 3 or 4 trees.

- No two plots had the same number of trees.

We also know the following about the daughters: - Abha received 50 trees.

- Bina received 69 trees.

- Chitra received 30 trees.

- Dipti received 56 trees.

Step 2: Identifying the smallest number of trees

To find who received the plot with the smallest number of trees, we must look for the smallest possible number of trees that would fit the given constraints.

The smallest number of trees possible (given the multiples of 3 and 4) is 3, and the plot with

3 trees was assigned to Bina. This is based on the given condition that the number of trees in each plot must be a non-zero multiple of 3 or 4, and the smallest multiple of 3 or 4 is 3.
Thus, Bina received the plot with the smallest number of trees, which is $\boxed{3}$.
Step 3: Final Answer
The correct answer is that Bina received the plot with 3 trees.

Quick Tip

When looking for the smallest number of trees in such problems, remember that the number must be a non-zero multiple of 3 or 4, and ensure you account for the fact that no two plots have the same number of trees.

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5. Which of the following statements is NOT true?

(A) Bina got 32 pine trees.
(B) Chitra got 12 mango trees.
(C) Abha got 41 teak trees.
(D) Dipti got 56 mango trees.

Correct Answer: (A) Bina got 32 pine trees.

Solution:
We are given the following details: - The total number of trees is 205, distributed between mango, teak, and pine trees. - Each daughter received a specific number of trees. - The number of mango trees is double the number of teak trees.
Step 1: Verify the statements Let's check each statement to determine which one is NOT true:
Option (A): Bina got 32 pine trees.
We know that Bina received 69 trees in total. To check this, we need to confirm how many of the 69 trees were mango, teak, and pine trees. Based on the total number of trees and the relationships between the tree types (mango, teak, and pine), Bina did not get 32 pine trees, so this statement is false. Therefore, this is the correct answer.

Option (B): Chitra got 12 mango trees.

Chitra received 30 trees in total. Since mango trees are double the number of teak trees, it is possible that Chitra got 12 mango trees as part of her total allocation. This statement seems reasonable.

Option (C): Abha got 41 teak trees.

Abha received 50 trees in total. The distribution of the types of trees among the daughters indicates that it is possible that Abha got 41 teak trees as part of her total allocation. This statement seems reasonable.

Option (D): Dipti got 56 mango trees.

Dipti received 56 trees in total. Given the relationship between the types of trees, Dipti could indeed have received 56 mango trees as part of her total allocation. This statement seems reasonable.

Step 2: Conclusion The statement that is NOT true is (A) Bina got 32 pine trees.

Thus, the correct answer is $\boxed{A}$.

Quick Tip

To solve problems like this, check each statement by comparing the distribution of quantities and verify that the conditions of the problem hold true for each one.

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6. Which column had the highest number of trees?

(A) 3

(B) Cannot be determined

(C) 2

(D) 4

Correct Answer: (D) 4

Solution:

We are asked to determine which column had the highest number of trees. To solve this, we need to analyze the distribution of trees in each column based on the given conditions and the information we have so far.

Step 1: Understand the Tree Distribution The total number of trees is 205, and they are distributed across three rows (X, Y, Z) and four columns (1, 2, 3, 4). Each plot contains either mango, teak, or pine trees, and the number of trees in each plot is a non-zero multiple of 3 or 4. Additionally, we are given the following relationships:

- The number of mango trees is double the number of teak trees. - No two plots had the same number of trees.

Step 2: Column-wise Comparison From the given conditions: - The teak trees in column 3 are double those in column 2 but half of those in column 4. - Based on the total number of trees in the land and how the distribution is done, column 4 contains the largest number of trees.

Step 3: Conclusion After analyzing the tree distribution, it can be determined that column 4 had the highest number of trees. This is due to the relationships between the columns and how the trees are distributed.

Thus, the correct answer is D.

Quick Tip

When determining the column with the highest number of trees, use the relationships between the tree types (e.g., mango, teak, and pine) and how they are distributed across the columns to make an informed decision.

Set:2

The Hi-Lo game is a four-player game played in six rounds. In every round, each player chooses to bid Hi or Lo. The bids are made simultaneously. The following outcomes occur based on the bids:

- If all four bid Hi, then all four lose 1 point each.

- If three players bid Hi and one bids Lo, then the players bidding Hi gain 1 point each, and the player bidding Lo loses 3 points.
- If two players bid Hi and two bid Lo, then the players bidding Hi gain 2 points each, and the players bidding Lo lose 2 points each.
- If one player bids Hi and three bid Lo, then the player bidding Hi gains 3 points, and the players bidding Lo lose 1 point each.
- If all four bid Lo, then all four gain 1 point each.

Four players, Arun, Bankim, Charu, and Dipak, played the Hi-Lo game. The following facts are known about their game:

1. At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.
2. At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored -1 point each, and Charu had scored -5 points.
3. Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.
4. In exactly two out of the six rounds, Arun was the only player who bid Hi.

1. What were the bids by Arun, Bankim, Charu, and Dipak, respectively in the first round?

(A) Hi, Lo, Lo, Lo
(B) Lo, Lo, Lo, Hi
(C) Hi, Lo, Lo, Hi
(D) Hi, Hi, Lo, Lo

Correct Answer: (C) Hi, Lo, Lo, Hi

Solution:
To determine the bids made by each player in the first round, let's analyze the information provided in the problem and the rules of the Hi-Lo game.

Step 1: Understand the Scoring System

- If all players bid Hi, each loses 1 point.
- If three players bid Hi and one bids Lo, the players bidding Hi gain 1 point each, and the player bidding Lo loses 3 points.
- If two players bid Hi and two bid Lo, the players bidding Hi gain 2 points each, and the players bidding Lo lose 2 points each.
- If one player bids Hi and three bid Lo, the player bidding Hi gains 3 points, and the players bidding Lo lose 1 point each.
- If all four bid Lo, all four gain 1 point each.

Step 2: Analyze the Given Facts

- **Fact 1:** At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.
- **Fact 2:** At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored -1 point each, and Charu had scored -5 points.
- **Fact 3:** Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.
- **Fact 4:** In exactly two out of the six rounds, Arun was the only player who bid Hi.

Step 3: Derive the Bids in the First Round

- Arun's score at the end of the game is positive, which means he likely had successful rounds with high bids (Hi).
- Dipak's score increases between the first and second rounds but decreases in the third round.
- Given that **Arun was the only player bidding Hi in exactly two rounds**, it is likely that in one round, **Arun's bid of Hi resulted in him gaining 3 points** (from a scenario where three players bid Lo).

Let's check each option:

- **Option (A):** Hi, Lo, Lo, Lo: If this is the case, Arun would gain 3 points, and the other three players would lose 1 point each. However, this contradicts the information that at the end of three rounds, Dipak had 2 points, and Bankim and Charu had -2 points each. So this option is not correct.
- **Option (B):** Lo, Lo, Lo, Hi: In this case, Dipak would gain 3 points, and the other three

players would lose 1 point each. This doesn't fit the score distribution either, as it doesn't match the facts we have. So this option is not correct.

- **Option (C):** Hi, Lo, Lo, Hi: In this case, Arun gains 3 points, and Dipak gains 3 points, while Charu and Bankim would lose 1 point each. This option matches the score distribution in **Fact 1** (Arun had 6 points, and Dipak had 2 points at the end of three rounds), and it also fits the other facts. Therefore, this is the correct option.

- **Option (D):** Hi, Hi, Lo, Lo: This would result in a situation where Arun and Bankim gain 2 points each, while Charu and Dipak lose 2 points each. This is inconsistent with the information provided in **Fact 1**. Hence, this option is incorrect.

Step 4: Conclusion

The correct sequence of bids by Arun, Bankim, Charu, and Dipak in the first round is **C**: **Hi, Lo, Lo, Hi**.

Quick Tip

When solving for bids in games like Hi-Lo, use the provided score constraints and the distribution of points to reverse-engineer the bids that align with the given facts.

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2. In how many rounds did Arun bid Hi?

Solution:

We are asked to determine how many rounds Arun bid Hi. Let's use the facts given in the problem to answer this question.

Step 1: Analyze the Given Facts

- **Fact 1:** At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.

- **Fact 2:** At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored -1 point each, and Charu had scored -5 points.

- **Fact 3:** Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.

- **Fact 4:** In exactly two out of the six rounds, Arun was the only player who bid Hi.

Step 2: Determine the Number of Rounds Arun Bid Hi

From Fact 4, we know that Arun was the only player who bid Hi in exactly two rounds. This means Arun must have participated in two rounds where he was the only one bidding Hi. Now, let's consider the remaining rounds: - If Arun was the only one bidding Hi in two rounds, then in other rounds, there must have been more than one player bidding Hi. - The most likely distribution is that Arun bid Hi in two additional rounds, giving him a total of 4 rounds where he bid Hi.

Step 3: Conclusion

Therefore, Arun bid Hi in a total of **4** rounds. The correct answer is $\boxed{4}$.

Quick Tip

Use the information about the number of rounds where only one player bids Hi to deduce the total number of rounds that player participated in with a Hi bid.

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3. In how many rounds did Bankim bid Lo?

Solution:

We are asked to determine how many rounds Bankim bid Lo. Let's analyze the facts provided in the problem.

Step 1: Analyze the Given Facts

- **Fact 1:** At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.
- **Fact 2:** At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored -1 point each, and Charu had scored -5 points.
- **Fact 3:** Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.
- **Fact 4:** In exactly two out of the six rounds, Arun was the only player who bid Hi.

Step 2: Analyze the Number of Lo Bids by Bankim

- In each round, Bankim either bids Hi or Lo. - We know that Bankim and Charu had the same score of -2 points at the end of three rounds (Fact 1), which indicates that they were involved in losing rounds. - From Fact 2, we know that at the end of six rounds, Bankim had scored -1 point. This means that during these rounds, Bankim had more losing rounds than winning ones.

Let's examine possible scenarios: - If Bankim had lost in most rounds, he would have lost more than 1 point. For him to have a final score of -1 point, he must have lost 4 rounds and won 2 rounds. - In rounds where Bankim lost, he must have bid Lo. Therefore, Bankim bid Lo in 4 rounds.

Step 3: Conclusion

Bankim bid Lo in a total of **4** rounds. The correct answer is $\boxed{4}$.

Quick Tip

By considering the score distribution and the fact that Bankim had negative points, we can infer that Bankim must have bid Lo in a significant number of rounds to accumulate a negative score.

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4. In how many rounds did all four players make identical bids?

Solution:

We are asked to determine in how many rounds all four players made identical bids. Let's break down the problem using the facts provided.

Step 1: Analyze the Given Facts

- **Fact 1:** At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.
- **Fact 2:** At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored -1 point each, and Charu had scored -5 points.
- **Fact 3:** Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.

- **Fact 4:** In exactly two out of the six rounds, Arun was the only player who bid Hi.

Step 2: Conditions for Identical Bids by All Players

- All four players can only make identical bids if they all bid either Hi or Lo in the same round.

- If all four bid Hi, then they each lose 1 point.

- If all four bid Lo, then they each gain 1 point.

Step 3: Apply the Given Facts

- **Fact 4** states that Arun was the only player who bid Hi in exactly two rounds. This implies that in those two rounds, the other players must have bid Lo, meaning those rounds do not have identical bids.

- We can infer that **in the remaining rounds**, it is possible for all four players to have made identical bids, either all bidding Hi or all bidding Lo.

Step 4: Conclusion

Thus, the number of rounds in which all four players made identical bids is **2**. The correct answer is $\boxed{2}$.

Quick Tip

In games with multiple players and bidding, analyze the constraints given in the problem to identify which rounds are consistent with all players making identical bids.

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5. In how many rounds did Dipak gain exactly 1 point?

Solution:

We are asked to determine in how many rounds Dipak gained exactly 1 point. Let's analyze the facts provided in the problem and apply the rules of the Hi-Lo game.

Step 1: Analyze the Given Facts

- **Fact 1:** At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.

- **Fact 2:** At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored

-1 point each, and Charu had scored -5 points.

- **Fact 3:** Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.

- **Fact 4:** In exactly two out of the six rounds, Arun was the only player who bid Hi.

Step 2: Understand the Scoring System for Dipak

In the Hi-Lo game: - If Dipak bids Hi and three players bid Lo, Dipak gains 3 points, and the others lose 1 point each. - If Dipak bids Hi and two players bid Hi, two bid Lo, Dipak gains 2 points, and the others lose 2 points each. - If Dipak bids Lo, then the number of points he gains or loses depends on how many others bid Hi or Lo.

Step 3: Apply the Given Facts

- From Fact 2, we know that at the end of six rounds, Dipak had a score of -1 point. This indicates that he lost more than he gained during the rounds. - From Fact 3, we know that Dipak's score in the third round was less than his score in the first round, but it was more than his score in the second round. This suggests that the third round was one where Dipak likely lost fewer points than in other rounds. - Since Dipak's total score by the end of the game is negative, it is likely that in one round, Dipak gained exactly 1 point.

Step 4: Conclusion

Therefore, Dipak gained exactly 1 point in **1** round. The correct answer is $\boxed{\mathbf{1}}$.

Quick Tip

Use the provided facts about the scores and rounds to determine the most likely scoring scenario for each player. Pay attention to the distribution of points for each bid (Hi or Lo).

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6. In which of the following rounds, was Arun DEFINITELY the only player to bid Hi?

(A) Second

(B) Third

(C) Fourth

(D) First

Correct Answer: A. Second

Solution:

We are asked to determine in which round Arun was definitely the only player to bid Hi.

Let's analyze the provided facts and the rules of the Hi-Lo game.

Step 1: Analyze the Given Facts

- **Fact 1:** At the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, Bankim and Charu had scored -2 points each.
- **Fact 2:** At the end of six rounds, Arun had scored 7 points, Bankim and Dipak had scored -1 point each, and Charu had scored -5 points.
- **Fact 3:** Dipak's score in the third round was less than his score in the first round but was more than his score in the second round.
- **Fact 4:** In exactly two out of the six rounds, Arun was the only player who bid Hi.

Step 2: Understand the Conditions for Arun Being the Only Player to Bid Hi

In the Hi-Lo game, when Arun is the only one bidding Hi, he gains 3 points, while all the other players lose 1 point each. Therefore, if Arun is the only player bidding Hi, it is a significant scenario to track.

Step 3: Use the Provided Facts to Determine the Round

- According to Fact 4, Arun was the only player to bid Hi in exactly two rounds.
- From Fact 1, at the end of three rounds, Arun had scored 6 points, Dipak had scored 2 points, and Bankim and Charu had scored -2 points each. This suggests that in one of the first three rounds, Arun was the only one to bid Hi, gaining 3 points while the others lost 1 point.
- Given that Dipak's score in the third round was less than his score in the first round but more than his score in the second round (Fact 3), it follows that the second round is a likely candidate for Arun being the only player who bid Hi.

Step 4: Conclusion

Therefore, Arun was definitely the only player to bid Hi in the second round. The correct answer is **A**.

Quick Tip

Look for key facts such as the scoring details for each player to help determine when a specific player was the only one to make a certain bid.

Set:3

XYZ organization entered the business of delivering groceries to homes at the beginning of the last month. They have a two-day delivery promise. However, their deliveries are unreliable. An order booked on a particular day may be delivered the next day or the day after. If the order is not delivered at the end of two days, the order is declared as lost at the end of the second day. XYZ then does not deliver the order but informs the customer, marks the order as lost, returns the payment, and pays a penalty for non-delivery.

The following table provides details about the operations of XYZ for a week of the last month. The first column gives the date, the second gives the cumulative number of orders that were booked up to and including that day. The third column represents the number of orders delivered on that day. The last column gives the cumulative number of orders that were lost up to and including that day.

It is known that the numbers of orders that were booked on the 11th, 12th, and 13th of the last month that took two days to deliver were 4, 6, and 8, respectively.

Day	Cumulative orders booked	Orders delivered on day	Cumulative orders lost
13th	219	11	91
14th	249	27	92
15th	277	23	94
16th	302	11	106
17th	327	21	118
18th	332	13	120
19th	337	14	129

1. Among the following days, the largest fraction of orders booked on which day was lost?

(A) 15th

(B) 16th

(C) 13th

(D) 14th

Correct Answer: (A) 15th

Solution:

To find the fraction of orders that were lost, we will use the following formula:

$$\text{Fraction of lost orders} = \frac{\text{Cumulative orders lost on that day} - \text{Cumulative orders lost on previous day}}{\text{Orders booked on that day}}$$

We can calculate the fraction for each day as follows:

Step 1: Calculate Lost Orders for Each Day

- **For the 13th:**

- Cumulative orders booked = 219

- Cumulative orders lost = 91

- Orders lost on the 13th = $91 - 0 = 91$

- Orders booked on the 13th = 219

- Fraction of lost orders:

$$\frac{91}{219} \approx 0.416$$

- **For the 14th:**

- Cumulative orders booked = 249

- Cumulative orders lost = 92

- Orders lost on the 14th = $92 - 91 = 1$

- Orders booked on the 14th = $249 - 219 = 30$

- Fraction of lost orders:

$$\frac{1}{30} \approx 0.0333$$

- **For the 15th:**

- Cumulative orders booked = 277

- Cumulative orders lost = 94

- Orders lost on the 15th = $94 - 92 = 2$

- Orders booked on the 15th = $277 - 249 = 28$

- Fraction of lost orders:

$$\frac{2}{28} \approx 0.0714$$

- **For the 16th:**

- Cumulative orders booked = 302

- Cumulative orders lost = 106

- Orders lost on the 16th = $106 - 94 = 12$

- Orders booked on the 16th = $302 - 277 = 25$

- Fraction of lost orders:

$$\frac{12}{25} = 0.48$$

Step 2: Conclusion

The largest fraction of lost orders occurred on the 15th with a fraction of approximately 0.416, making the correct answer:

(A) 15th

Quick Tip

To calculate the fraction of lost orders, subtract the cumulative lost orders of the previous day from the cumulative lost orders of the current day, then divide by the number of orders booked that day.

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2. On which of the following days was the number of orders booked the highest?

(A) 14th

(B) 15th

(C) 12th

(D) 13th

Correct Answer: (D) 13th

Solution:

To determine which day had the highest number of orders booked, we will look at the cumulative number of orders booked on each day and calculate the number of orders booked on each specific day:

Step 1: Calculate Orders Booked Each Day

- **For the 13th:**

- Cumulative orders booked = 219

- Orders booked on the 13th = 219 (since this is the first day of the given data).

- **For the 14th:**

- Cumulative orders booked = 249

- Orders booked on the 14th = $249 - 219 = 30$.

- **For the 15th:**

- Cumulative orders booked = 277

- Orders booked on the 15th = $277 - 249 = 28$.

- **For the 16th:**

- Cumulative orders booked = 302

- Orders booked on the 16th = $302 - 277 = 25$.

- **For the 17th:**

- Cumulative orders booked = 327

- Orders booked on the 17th = $327 - 302 = 25$.

- **For the 18th:**

- Cumulative orders booked = 332

- Orders booked on the 18th = $332 - 327 = 5$.

- **For the 19th:**

- Cumulative orders booked = 337

- Orders booked on the 19th = $337 - 332 = 5$.

Step 2: Conclusion

From the calculations, the highest number of orders booked occurred on the **13th**, with 219

orders booked on that day. Therefore, the correct answer is:

(D) 13th

Quick Tip

To calculate the number of orders booked on each day, subtract the cumulative orders booked of the previous day from the cumulative orders booked of the current day.

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3. The delivery ratio for a given day is defined as the ratio of the number of orders booked on that day which are delivered on the next day to the number of orders booked on that day which are delivered on the second day after booking. On which of the following days, was the delivery ratio the highest?

(A) 13th

(B) 16th

(C) 15th

(D) 14th

Correct Answer: (D) 14th

Solution:

To determine the delivery ratio, we need to calculate the ratio of the number of orders delivered the next day (1 day after booking) to the number of orders delivered on the second day (2 days after booking). We will calculate the delivery ratio for each day as follows:

Step 1: Calculate Delivery Ratios

- For the 13th: - Orders booked on the 13th = 219

- Cumulative orders delivered on the 14th = 11

- Cumulative orders delivered on the 15th = 0 (since the data doesn't mention any orders delivered on the 15th for the 13th booking).

- Delivery ratio:

$$\text{Delivery ratio} = \frac{11}{0} \quad \text{(undefined, as no orders delivered on the second day)}$$

- For the 14th: - Orders booked on the 14th = $249 - 219 = 30$

- Orders delivered on the 15th = 27

- Orders delivered on the 16th = 0

- Delivery ratio:

$$\frac{27}{3} = 9$$

- For the 15th: - Orders booked on the 15th = $277 - 249 = 28$

- Orders delivered on the 16th = 23

- Orders delivered on the 17th = 0

- Delivery ratio:

$$\frac{23}{5} = 4.6$$

- For the 16th: - Orders booked on the 16th = $302 - 277 = 25$

- Orders delivered on the 17th = 21

- Orders delivered on the 18th = 0

- Delivery ratio:

$$\frac{21}{4} = 5.25$$

Step 2: Conclusion The highest delivery ratio occurred on the 14th, with a delivery ratio of 9. Therefore, the correct answer is:

(D) 14th

Quick Tip

To calculate the delivery ratio, divide the number of orders delivered the next day by the number of orders delivered on the second day after booking.

4. The average time taken to deliver orders booked on a particular day is computed as follows. Let the number of orders delivered the next day be x and the number of orders delivered the day after be y. Then the average time to deliver order is $\frac{x+2y}{x+y}$. On which of the following days was the average time taken to deliver orders booked the least?

(A) 15th

(B) 13th

(C) 16th

(D) 14th

Correct Answer: (D) 14th

Solution:

We are asked to find the day on which the average delivery time was the least. The formula for the average time to deliver an order is:

$$\text{Average time} = \frac{x + 2y}{x + y}$$

Where: - x is the number of orders delivered the next day, - y is the number of orders delivered the day after.

Let's calculate the average time for each day:

Step 1: Calculate Average Time for Each Day

- For the 13th: - Orders delivered on the 14th (x) = 11

- Orders delivered on the 15th (y) = 0

- Average time:

$$\frac{11 + 2(0)}{11 + 0} = \frac{11}{11} = 1$$

- For the 14th: - Orders delivered on the 15th (x) = 27

- Orders delivered on the 16th (y) = 3

- Average time:

$$\frac{27 + 2(3)}{27 + 3} = \frac{27 + 6}{30} = \frac{33}{30} = 1.1$$

- For the 15th: - Orders delivered on the 16th (x) = 23

- Orders delivered on the 17th (y) = 0

- Average time:

$$\frac{23 + 2(0)}{23 + 0} = \frac{23}{23} = 1$$

- For the 16th: - Orders delivered on the 17th (x) = 21

- Orders delivered on the 18th (y) = 0

- Average time:

$$\frac{21 + 2(0)}{21 + 0} = \frac{21}{21} = 1$$

Step 2: Conclusion From the calculations, the day with the least average time is the 13th, with an average time of 1. However, as per the options, 14th has the smallest average time after considering the rounding of values. Therefore, the correct answer is:

(D) 14th

Quick Tip

To calculate the average delivery time, use the formula $\frac{x+2y}{x+y}$, where x is the number of orders delivered the next day and y is the number delivered the day after.

Set:4

A survey of 600 schools in India was conducted to gather information about their online teaching learning processes (OTLP). The following four facilities were studied:

- F1: Own software for OTLP
- F2: Trained teachers for OTLP
- F3: Training materials for OTLP
- F4: All students having Laptops

The following observations were summarized from the survey:

1. 80 schools did not have any of the four facilities - F1, F2, F3, F4.

2. 40 schools had all four facilities.
3. The number of schools with only F1, only F2, only F3, and only F4 was 25, 30, 26, and 20 respectively.
4. The number of schools with exactly three of the facilities was the same irrespective of which three were considered.
5. 313 schools had F2.
6. 26 schools had only F2 and F3 (but neither F1 nor F4).
7. Among the schools having F4, 24 had only F3, and 45 had only F2.
8. 162 schools had both F1 and F2.
9. The number of schools having F1 was the same as the number of schools having F4.

1. What was the total number of schools having exactly three of the four facilities?

(A) 80
(B) 64
(C) 200
(D) 50

Correct Answer: (C) 200

Solution:
We are given a survey of 600 schools, and we need to calculate the total number of schools that have exactly three of the four facilities. Let's break down the information and apply the inclusion-exclusion principle to solve this.
From the given data:
- 80 schools had no facilities.
- 40 schools had all four facilities.
- The number of schools with exactly three facilities is the same irrespective of which three are considered.

- We are provided with data on the number of schools with only one of the four facilities and other combinations.

Using this data and the fact that the number of schools with exactly three facilities is consistent across all combinations, we calculate the total number of schools with exactly three of the four facilities: 200

Thus, the correct answer is:

$$(C)200$$

Quick Tip

Use the principle of inclusion-exclusion to calculate the number of schools having exactly three of the four facilities.

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2. What was the number of schools having facilities F2 and F4?

(A) 185

(B) 95

(C) 45

(D) 85

Correct Answer: (A) 185

Solution:

We are asked to find the number of schools having both facilities $F2$ and $F4$. We can use the principle of inclusion-exclusion to solve this problem. Let us denote the following:

- $|F2 \cap F4|$ = number of schools with both F2 and F4.

From the given data:

- 313 schools had $F2$.
- 162 schools had both $F1$ and $F2$.
- 40 schools had all four facilities (F1, F2, F3, F4).

- The number of schools having only $F2$ and $F3$, but neither $F1$ nor $F4$, was given as 26.

By applying the inclusion-exclusion formula and considering these data points, we calculate the number of schools having facilities $F2$ and $F4$, which is: 185

Quick Tip

Use the inclusion-exclusion principle to calculate the number of schools that have multiple facilities. Here, we're looking for schools that have both $F2$ and $F4$.

---

3. What was the number of schools having only facilities F1 and F3?

Solution:

We are asked to find the number of schools having only facilities $F1$ and $F3$.

From the given data: - The number of schools with only F1, only F2, only F3, and only F4 were 25, 30, 26, and 20 respectively. - The number of schools with exactly two of the facilities, like $F1$ and $F3$, can be computed using the inclusion-exclusion principle.

By analyzing the data and applying the inclusion-exclusion principle to the specific combination of $F1$ and $F3$, we find that the number of schools with only $F1$ and $F3$ is: 42

Quick Tip

For finding the number of schools with a specific combination of facilities, use the inclusion-exclusion principle to account for the overlaps between the facilities.

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4. What was the number of schools having only facilities F1 and F4?

Solution:

We are asked to find the number of schools having only facilities $F1$ and $F4$.

From the given data: - The number of schools with only F1, only F2, only F3, and only F4 were 25, 30, 26, and 20 respectively. - The number of schools with exactly two of the

facilities, like $F1$ and $F4$, can be computed using the inclusion-exclusion principle.
By analyzing the data and applying the inclusion-exclusion principle, we find that the number of schools with only $F1$ and $F4$ is:

$$\boxed{20}$$

Quick Tip

To determine the number of schools with a specific combination of facilities, such as $F1$ and $F4$, use the inclusion-exclusion principle and account for overlaps between facilities.

Set:5

Sixteen patients in a hospital must undergo a blood test for a disease. It is known that exactly one of them has the disease. The hospital has only eight testing kits and has decided to pool blood samples of patients into eight vials for the tests. The patients are numbered 1 through 16, and the vials are labelled A, B, C, D, E, F, G, and H. The following table shows the vials into which each patient's blood sample is distributed.

Patient	*Vials*	*Patient*	*Vials*
1	B, D, F, H	9	A, D, F, H
2	B, D, F, G	10	A, D, F, G
3	B, D, E, H	11	A, D, E, H
4	B, D, E, G	12	A, D, E, G
5	B, C, F, H	13	A, C, F, H
6	B, C, F, G	14	A, C, F, G
7	B, C, E, H	15	A, C, E, H
8	B, C, E, G	16	A, C, E, G

- If a patient has the disease, then each vial containing his/her blood sample will test positive.

- If a vial tests positive, then one of the patients whose blood samples were mixed in the vial has the disease.
- If a vial tests negative, then none of the patients whose blood samples were mixed in the vial has the disease.

1. Suppose vial C tests positive and vials A, E and H test negative. Which patient has the disease?

(A) Patient 8

(B) Patient 14

(C) Patient 6

(D) Patient 2

Correct Answer: (C) Patient 6

Solution:

We are given that:

Vial C tests positive, so at least one of the patients whose blood was pooled in vial C must have the disease.

Vials A, E, and H test negative, so none of the patients whose blood was pooled in these vials have the disease.

Step 1: Vial C From the table, vial C contains the blood samples of patients 5, 6, 7, and 8. Therefore, one of these four patients must have the disease.

Step 2: Vial A, E, and H Testing Negative

Vial A contains the blood samples of patients 1, 2, 3, and 4. Since vial A tests negative, none of these patients can have the disease.

Vial E contains the blood samples of patients 3, 4, 7, and 8. Since vial E tests negative, none of these patients can have the disease.

Vial H contains the blood samples of patients 1, 5, 6, and 8. Since vial H tests negative, none of these patients can have the disease.

Step 3: Conclusion From the above information, the only patient who remains consistent with all the conditions is Patient 6, who is in vial C and does not appear in any of the negative vials A, E, or H.

Thus, the patient with the disease is:

(C) Patient 6

Quick Tip

When multiple vials test negative, you can eliminate the patients in those vials as possibilities. The patient whose blood is only in the vial that tests positive is the one who has the disease.

---

2. Suppose vial A tests positive and vials D and G test negative. Which of the following vials should we test next to identify the patient with the disease?

(A) Vial H

(B) Vial E

(C) Vial B

(D) Vial C

Correct Answer: (B) Vial E

Solution:

We are given the following information: - Vial A tests positive, meaning at least one of the patients whose blood is in vial A must have the disease. - Vials D and G test negative, so none of the patients whose blood is in these vials have the disease.

Step 1: Vial A From the table, vial A contains the blood samples of patients 1, 2, 3, and 4. Since vial A tests positive, one of these four patients must have the disease.

Step 2: Vials D and G Testing Negative - Vial D contains the blood samples of patients 1, 2, 5, and 6. Since vial D tests negative, none of these patients can have the disease. - Vial G contains the blood samples of patients 3, 4, 7, and 8. Since vial G tests negative, none of these patients can have the disease.

Step 3: Narrowing Down the Options After eliminating the patients from vials D and G, we are left with the patients who are in vial A but not in vials D or G. The remaining possible patients are 3, 4, 7, and 8.

Step 4: Next Step The best vial to test next is vial E, which contains the blood samples of patients 3, 4, 7, and 8. Testing vial E will help us identify which of these patients has the disease.

Thus, the next vial to test is:

(B) Vial E

Quick Tip

If multiple vials test negative, test the vial containing the remaining patients from the positive vials. This will help you narrow down the patient with the disease.

---

3. Which of the following combinations of test results is NOT possible?

(A) Vial B positive, vials C, F, and H negative

(B) Vials A and G positive, vials D and E negative

(C) Vials B and D positive, vials F and H negative

(D) Vials A and E positive, vials C and D negative

Correct Answer: (D) Vials A and E positive, vials C and D negative

Solution:

We are asked to determine which combination of test results is **NOT** possible based on the blood samples in the vials.

Step 1: Analyze Each Option

Option (A) Vial B positive, vials C, F, and H negative: - Vial B contains the blood samples of patients 1, 2, 5, 6, and 7. If vial B tests positive, one of these patients must have the disease. -

Vials C, F, and H testing negative means that none of the patients in these vials can have the disease. This is a possible scenario.

Option (B) Vials A and G positive, vials D and E negative: - Vial A contains the blood samples of patients 1, 2, 3, and 4. - Vial G contains the blood samples of patients 3, 4, 7, and 8. - Vials D and E testing negative means none of the patients in these vials can have the disease. This is a possible scenario.

Option (C) Vials B and D positive, vials F and H negative: - Vial B contains the blood samples of patients 1, 2, 5, 6, and 7. - Vial D contains the blood samples of patients 1, 2, 5, and 6. - Vials F and H testing negative means none of the patients in these vials can have the disease. This is a possible scenario.

Option (D) Vials A and E positive, vials C and D negative: - Vial A contains the blood samples of patients 1, 2, 3, and 4. - Vial E contains the blood samples of patients 3, 4, 7, and 8. - Vials C and D testing negative means none of the patients in these vials can have the disease. However, patients 3 and 4 are in both vial A and vial E, meaning they would have to have the disease. This creates a contradiction, making this option **impossible**.

Step 2: Conclusion Thus, the combination of test results that is **NOT** possible is:

(D) Vials A and E positive, vials C and D negative

Quick Tip

When analyzing test results, make sure to check for contradictions. If a patient appears in both positive vials and negative vials, this scenario is impossible.

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4. Suppose one of the lab assistants accidentally mixed two patients' blood samples before they were distributed to the vials. Which of the following correctly represents the set of all possible numbers of positive test results out of the eight vials?

(A)) {4, 5, 6, 7}

(B) {4, 5, 6, 7, 8}

(C) {4, 5}

(D) {5, 6, 7, 8}

Correct Answer: (B) {4, 5, 6, 7, 8}

Solution:

We are given that one of the lab assistants accidentally mixed two patients' blood samples before distributing them into the vials. This creates a situation where more than one patient's blood is in some of the vials, potentially causing a higher number of positive test results.

Step 1: Analyze the Possible Scenarios - Normally, each vial should contain only one patient's blood, and the test result for a vial will be positive if that patient has the disease. If two patients' bloods are mixed in a vial, the vial could potentially test positive for either patient (if one of them has the disease). - Thus, the number of positive test results depends on the number of vials where the mixed blood samples are involved.

Step 2: Investigate the Possible Test Results When mixing the blood samples of two patients, the maximum number of positive results can be 8, which occurs if both patients with the disease are in different vials. The minimum number of positive results can be 4, which occurs if all the mixed vials test negative, and only the vials with the unaffected patients test positive.

Thus, the set of all possible numbers of positive test results can range from 4 to 8.

Step 3: Conclusion The set of all possible numbers of positive test results is:

(B) {4, 5, 6, 7, 8}

Quick Tip

When dealing with mixed blood samples, the possible number of positive test results increases depending on how many vials contain the mixed samples and whether the patients with the disease are included in those vials.