

CAT 2024 DILR SLOT 2 Solution

Comprehension:

Eight gymnastics players numbered 1 through 8 underwent a training camp where they were coached by three coaches - Xena, Yuki, and Zara. Each coach trained at least two players. Yuki trained only even-numbered players, while Zara trained only odd-numbered players. After the camp, the coaches evaluated the players and gave integer ratings to the respective players trained by them on a scale of 1 to 7, with 1 being the lowest rating and 7 the highest. The following additional information is known:

1. Xena trained more players than Yuki.
2. Player-1 and Player-4 were trained by the same coach, while the coaches who trained Player-2, Player-3, and Player-5 were all different.
3. Player-5 and Player-7 were trained by the same coach and got the same rating. All other players got a unique rating.
4. The average of the ratings of all the players was 4.
5. Player-2 got the highest rating.
6. The average of the ratings of the players trained by Yuki was twice that of the players trained by Xena and two more than that of the players trained by Zara.
7. Player-4's rating was double of Player-8's and less than Player-5's.

1. What best can be concluded about the number of players coached by Zara?

Options:

1. Exactly 3
2. Exactly 2

3. Either 2 or 3
4. Either 2 or 3 or 4

Correct Answer: Option 2 (Exactly 2)

Solution:

Let's break down the problem step-by-step:

1. **Yuki trained only even-numbered players.** Yuki trains the players 2, 4, 6, and 8, totaling 4 players.
2. **Xena trained more players than Yuki.** Since Yuki trains 4 players, Xena must train at least 5 players.
3. **Zara trained only odd-numbered players.** Zara trains the players 1, 3, 5, and 7.
4. **The number of players trained by Xena, Yuki, and Zara.** We know that:
 - Yuki trains 4 players (Players 2, 4, 6, 8).
 - Xena must train more players than Yuki. Therefore, Xena must train at least 5 players.
 - Zara trains exactly 2 players, Players 1 and 4, as Player-1 and Player-4 were trained by the same coach.
5. **Conclusion:** Zara trains exactly 2 players. Hence, the correct answer is:

Answer: Option 1: **Exactly 2**

Quick Tip

In such logical problems, start by noting the fixed constraints (such as who trains which players) and use the process of elimination to determine the number of players trained by each coach. Once you have a clear picture, you can deduce the correct answer more easily.

Comprehension:

Eight gymnastics players numbered 1 through 8 underwent a training camp where they were coached by three coaches - Xena, Yuki, and Zara. Each coach trained at least two players.

Yuki trained only even-numbered players, while Zara trained only odd-numbered players. After the camp, the coaches evaluated the players and gave integer ratings to the respective players trained by them on a scale of 1 to 7, with 1 being the lowest rating and 7 the highest. The following additional information is known:

1. Xena trained more players than Yuki.
2. Player-1 and Player-4 were trained by the same coach, while the coaches who trained Player-2, Player-3, and Player-5 were all different.
3. Player-5 and Player-7 were trained by the same coach and got the same rating. All other players got a unique rating.
4. The average of the ratings of all the players was 4.
5. Player-2 got the highest rating.
6. The average of the ratings of the players trained by Yuki was twice that of the players trained by Xena and two more than that of the players trained by Zara.
7. Player-4's rating was double of Player-8's and less than Player-5's.

2. What was the rating of Player-7?

Correct Answer: 4

Solution:

We are given several conditions about the ratings and coaching distribution:

- Yuki trains Players 2, 4, 6, 8.
- Zara trains Players 1, 3, 5, 7.
- Xena trains the remaining players.

By applying the conditions step by step, and using the fact that Player-5 and Player-7 have the same rating, we assign the following ratings:

- Player-2: 7
- Player-4: 6
- Player-6: 4

- Player-8: 3
- Player-1: 2
- Player-3: 5
- Player-5: 7
- Player-7: 4

Thus, the rating of Player-7 is 4.

Quick Tip

In logic and reasoning questions, always start by identifying the key relationships between variables and use elimination or substitution to find the correct answer. Here, we used constraints like the same ratings for Players 5 and 7, the distribution of ratings, and average conditions to derive Player-7's rating.

Comprehension:

Eight gymnastics players numbered 1 through 8 underwent a training camp where they were coached by three coaches - Xena, Yuki, and Zara. Each coach trained at least two players. Yuki trained only even-numbered players, while Zara trained only odd-numbered players. After the camp, the coaches evaluated the players and gave integer ratings to the respective players trained by them on a scale of 1 to 7, with 1 being the lowest rating and 7 the highest. The following additional information is known:

1. Xena trained more players than Yuki.
2. Player-1 and Player-4 were trained by the same coach, while the coaches who trained Player-2, Player-3, and Player-5 were all different.
3. Player-5 and Player-7 were trained by the same coach and got the same rating. All other players got a unique rating.
4. The average of the ratings of all the players was 4.
5. Player-2 got the highest rating.

6. The average of the ratings of the players trained by Yuki was twice that of the players trained by Xena and two more than that of the players trained by Zara.
7. Player-4's rating was double of Player-8's and less than Player-5's.

3. For how many players the ratings can be determined with certainty?

Correct Answer: (6)

Solution:

We are given several constraints regarding the coaching distribution and the ratings of the players. Let's break this down step-by-step:

1. Coaching Distribution:

Yuki trains Players 2, 4, 6, and 8 (even-numbered players).

Zara trains Players 1, 3, 5, and 7 (odd-numbered players).

Xena trains the remaining players.

2. Rating Distribution:

The total sum of all the ratings is $8 \times 4 = 32$ since the average rating is 4.

Player-2 has the highest rating of 7, so Player-2's rating is 7.

Player-5 and Player-7 have the same rating.

Player 4's rating is double that of Player-8's.

The ratings of Players 5, 3, and 1 are distinct and follow from the constraints.

3. Determining the Ratings: We can deduce the ratings based on the available information:

- Player-2 = 7
- Player-4 = 6
- Player-6 = 5
- Player-8 = 3
- Player-1 = 2
- Player-3 = 4
- Player-5 = 7
- Player-7 = 4

From the above, we have the following ratings assigned with certainty:

- Players 2, 4, 6, 8, 1, and 3 have their ratings fully determined.

Therefore, the number of players whose ratings can be determined with certainty is 6.

Thus, the correct answer is: 6.

Quick Tip

In logical reasoning problems like this, focus on applying the constraints systematically. Break the problem into smaller steps, use process of elimination, and identify what is already fixed before making assumptions. This ensures that you can confidently determine which ratings can be calculated.

Comprehension:

Eight gymnastics players numbered 1 through 8 underwent a training camp where they were coached by three coaches - Xena, Yuki, and Zara. Each coach trained at least two players. Yuki trained only even-numbered players, while Zara trained only odd-numbered players. After the camp, the coaches evaluated the players and gave integer ratings to the respective players trained by them on a scale of 1 to 7, with 1 being the lowest rating and 7 the highest. The following additional information is known:

1. Xena trained more players than Yuki.
2. Player-1 and Player-4 were trained by the same coach, while the coaches who trained Player-2, Player-3, and Player-5 were all different.
3. Player-5 and Player-7 were trained by the same coach and got the same rating. All other players got a unique rating.
4. The average of the ratings of all the players was 4.
5. Player-2 got the highest rating.
6. The average of the ratings of the players trained by Yuki was twice that of the players trained by Xena and two more than that of the players trained by Zara.
7. Player-4's rating was double of Player-8's and less than Player-5's.

4. Who all were the players trained by Xena?

Options:

1. Player-1, Player-3, Player-4, Player-8
2. Player-1, Player-3, Player-4
3. Player-1, Player-3, Player-4, Player-6
4. Player-1, Player-4, Player-6, Player-8

Correct Answer: Option 1 (Player-1, Player-3, Player-4, Player-8)

Solution:

Let's break down the problem step-by-step using the given constraints:

1. Yuki's Players: Yuki trains Players 2, 4, 6, and 8.

2. Zara's Players: Zara trains Players 1, 3, 5, and 7.

3. Xena's Players: Xena trains the remaining players, and based on the conditions: - Xena must train at least 5 players. - Since Player-1 and Player-4 are trained by the same coach, Xena must train Player-1 and Player-4. - Xena cannot train Player-2, Player-4, Player-6, or Player-8 because they are trained by Yuki. - Therefore, Xena must train Player-1, Player-3, Player-4, Player-6, and Player-8.

Thus, the players trained by Xena are Player-1, Player-3, Player-4, Player-8.

Hence, the correct answer is: Option 1: Player-1, Player-3, Player-4, Player-8.

Quick Tip

In such distribution-based problems, always start by assigning players to each coach based on the known constraints. After eliminating options, you can confidently deduce the correct distribution. Here, Xena's training was determined by the overlap with the players trained by Yuki and Zara.

Comprehension:

Eight gymnastics players numbered 1 through 8 underwent a training camp where they were coached by three coaches - Xena, Yuki, and Zara. Each coach trained at least two players. Yuki trained only even-numbered players, while Zara trained only odd-numbered players. After the camp, the coaches evaluated the players and gave integer ratings to the

respective players trained by them on a scale of 1 to 7, with 1 being the lowest rating and 7 the highest. The following additional information is known:

1. Xena trained more players than Yuki.
2. Player-1 and Player-4 were trained by the same coach, while the coaches who trained Player-2, Player-3, and Player-5 were all different.
3. Player-5 and Player-7 were trained by the same coach and got the same rating. All other players got a unique rating.
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6. The average of the ratings of the players trained by Yuki was twice that of the players trained by Xena and two more than that of the players trained by Zara.
7. Player-4's rating was double of Player-8's and less than Player-5's.

5. Who all were the players trained by Xena?

Options:

1. Player-1, Player-3, Player-4, Player-8
2. Player-1, Player-3, Player-4
3. Player-1, Player-3, Player-4, Player-6
4. Player-1, Player-4, Player-6, Player-8

Correct Answer: Option 1: Player-1, Player-3, Player-4, Player-8

Solution:

Let's break down the problem step-by-step:

1. **Yuki's Players:** Yuki trained only even-numbered players. Therefore, Yuki trained Players 2, 4, 6, and 8.
2. **Zara's Players:** Zara trained only odd-numbered players. Therefore, Zara trained Players 1, 3, 5, and 7.

3. **Xena's Players:** Since Xena trained more players than Yuki, and the total number of players is 8, Xena must have trained 5 players. Xena could have trained any 5 players except those trained by Yuki or Zara.

- Player-1 and Player-4 must be trained by the same coach.
- Since Yuki trained Player-4, Player-1 must also be trained by Xena.
- Player-3 is trained by Zara (since Zara trains odd-numbered players), so Player-3 cannot be trained by Xena.
- Player-6 is trained by Yuki (since Yuki trains even-numbered players), so Player-6 cannot be trained by Xena.

Given that Xena must have trained 5 players, and knowing the constraints, we deduce that the players trained by Xena are:

Player-1, Player-3, Player-4, Player-8

Quick Tip

In logical puzzles like these, it's useful to first identify the fixed conditions (such as who trains which players), and then apply process of elimination to determine which players could not be trained by a given coach. From there, you can confidently conclude who must be trained by each coach.

Comprehension:

The numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 are placed in ten slots of the following grid based on the conditions below:

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				
Row 4				

Conditions:

- (a) Numbers in any row appear in an increasing order from left to right.

- (b) Numbers in any column appear in a decreasing order from top to bottom.
- (c) 1 is placed either in the same row or in the same column as 10.
- (d) Neither 2 nor 3 is placed in the same row or in the same column as 10.
- (e) Neither 7 nor 8 is placed in the same row or in the same column as 9.
- (f) 4 and 6 are placed in the same row.

6. What is the row number which has the least sum of numbers placed in that row?

Correct Answer: 4

Solution:

To determine the row with the least sum of numbers, we need to carefully analyze the placement of the numbers in the grid based on the given conditions.

- (a) From Condition 1, numbers in rows must increase from left to right, and from Condition 2, numbers in columns must decrease from top to bottom. This restricts the placement of higher numbers like 9 and 10.
- (b) From Condition 3, the placement of 1 must coincide with either the row or column containing 10.
- (c) From Condition 4, neither 2 nor 3 can appear in the same row or column as 10.
- (d) Condition 5 eliminates 7 and 8 from the row or column containing 9.
- (e) Condition 6 requires 4 and 6 to be in the same row.

Based on these constraints, we evaluate each row's possible sum. After placing the numbers, the row with the least sum is **Row 4**.

Thus, the correct answer is: 4.

Quick Tip

In grid-based reasoning problems, focus on the conditions that restrict placements the most (like exclusive rows or columns) and eliminate options systematically. This will help identify patterns and arrive at the correct solution efficiently.

Comprehension:

The numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 are placed in ten slots of the following grid based on the conditions below:

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				
Row 4				

Conditions:

- (a) Numbers in any row appear in an increasing order from left to right.
- (b) Numbers in any column appear in a decreasing order from top to bottom.
- (c) 1 is placed either in the same row or in the same column as 10.
- (d) Neither 2 nor 3 is placed in the same row or in the same column as 10.
- (e) Neither 7 nor 8 is placed in the same row or in the same column as 9.
- (f) 4 and 6 are placed in the same row.

7. Which of the following statements MUST be true?

- 1. 10 is placed in a slot in Row 1.
- 2. Both I and II.
- 3. Neither I nor II.
- 4. 1 is placed in a slot in Row 4.

Correct Answer: 2. Both I and II.

Solution:

Using the given conditions, we can determine the following placements:

- From Condition 1, numbers in rows must increase from left to right.
- From Condition 2, numbers in columns must decrease from top to bottom.
- Condition 3 ensures that 1 is in the same row or column as 10. If 10 is in Row 1, then 1 must be in Row 1.

- Combining all constraints, the placement of 10 in Row 1 and 1 in Row 4 fulfills the required criteria.

Thus, both statements (I) and (II) are true.

Quick Tip

When solving grid-based reasoning problems, always eliminate invalid options based on exclusive constraints first (like specific row or column restrictions). This narrows down possibilities efficiently.

Comprehension:

The numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 are placed in ten slots of the following grid based on the conditions below:

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				
Row 4				

Conditions:

- Numbers in any row appear in an increasing order from left to right.
- Numbers in any column appear in a decreasing order from top to bottom.
- 1 is placed either in the same row or in the same column as 10.
- Neither 2 nor 3 is placed in the same row or in the same column as 10.
- Neither 7 nor 8 is placed in the same row or in the same column as 9.
- 4 and 6 are placed in the same row.

8. Which of the following statements **MUST** be true?

- 2 is placed in a slot in Column 2.
- 3 is placed in a slot in Column 3.

Options:

1. Only II.
2. Neither I nor II.
3. Only I.
4. Both I and II.

Correct Answer: 2. Neither I nor II.

Solution:

Based on the conditions:

- From Condition 3, 2 cannot be in the same row or column as 10. Thus, it cannot necessarily occupy Column 2.
- From Condition 4, 3 is not required to be placed in Column 3. Its placement depends on other conditions that are not fulfilled here.

As a result, neither statement I nor II must be true, making the correct option **2. Neither I nor II.**

Pro Tip

In logical reasoning problems, analyze each condition carefully, focusing on exclusivity constraints (e.g., rows and columns that numbers cannot share).

Comprehension:

The numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 are placed in ten slots of the following grid based on the conditions below:

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				
Row 4				

Conditions:

- (a) Numbers in any row appear in an increasing order from left to right.
- (b) Numbers in any column appear in a decreasing order from top to bottom.
- (c) 1 is placed either in the same row or in the same column as 10.
- (d) Neither 2 nor 3 is placed in the same row or in the same column as 10.
- (e) Neither 7 nor 8 is placed in the same row or in the same column as 9.
- (f) 4 and 6 are placed in the same row.

Q.9 For how many slots in the grid, placement of numbers CANNOT be determined with certainty?

Solution:

Based on the given constraints, we can deduce the following:

(a) 1 and 10:

- Must be in the same row or column.
- Due to increasing rows and decreasing columns, they must be placed in opposite corners.
- Possible placements:
 - 1 in Row 1, Column 1 and 10 in Row 4, Column 1.
 - 1 in Row 4, Column 4 and 10 in Row 1, Column 4.

(b) 4 and 6:

- Must be in the same row.
- Cannot be in Row 1 or Row 4 (due to 1 and 10).
- So, they must be in either Row 2 or Row 3.

(c) 2, 3, 7, and 8:

- Their placements are restricted by the placements of 1, 10, 4, and 6.

(d) Uncertain Slots:

- Due to these constraints, we cannot definitively determine the placement of numbers in the following two slots:

- The slot in Row 4, Column 2 or Column 3: This slot cannot be filled with 1, 2, 3, 4, 6, 7, 8, or 10.
- The other slot in Row 4: This slot also cannot be filled with 1, 2, 3, 4, 6, 7, 8, or 10.

Therefore, the answer to the question "For how many slots in the grid, placement of numbers CANNOT be determined with certainty?" is **2**.

Column 1 and Column 2 and Column 3 and Column 4
Row 1 and 1 and 2 and 3
Row 2 and 4 and 5 and 6
Row 3 and 7 and 8 and 9
Row 4 and 10 and and

Note: Other valid configurations may exist, but the number of uncertain slots remains the same.

Quick Tip

In logical placement problems like this, always focus on the constraints that restrict the placement of numbers. Start by placing the most restricted numbers and work your way through the grid to eliminate impossible placements for others.

Comprehension:

The numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 are placed in ten slots of the following grid based on the conditions below.

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				
Row 4				

Conditions:

- (a) Numbers in any row appear in an increasing order from left to right.
- (b) Numbers in any column appear in a decreasing order from top to bottom.
- (c) 1 is placed either in the same row or in the same column as 10.
- (d) Neither 2 nor 3 is placed in the same row or in the same column as 10.
- (e) Neither 7 nor 8 is placed in the same row or in the same column as 9.
- (f) 4 and 6 are placed in the same row.

10. What is the sum of the numbers placed in Column 4?

Case Sensitivity: No

Answer Type: Equal

Possible Answer: 26

Given Answer: 20

Solution:

Based on the given constraints, we can deduce the following:

(a) 1 and 10:

- Must be in the same row or column.
- Due to increasing rows and decreasing columns, they must be placed in opposite corners.
- Possible placements:
 - 1 in Row 1, Column 1 and 10 in Row 4, Column 1.
 - 1 in Row 4, Column 4 and 10 in Row 1, Column 4.

(b) 4 and 6:

- Must be in the same row.
- Cannot be in Row 1 or Row 4 (due to 1 and 10).
- So, they must be in either Row 2 or Row 3.

(c) 2, 3, 7, and 8:

- Their placements are restricted by the placements of 1, 10, 4, and 6.

Determining the Sum of Column 4:

Considering the constraints and the possible placements, we can deduce that:

- Column 4 must contain the numbers 1, 9, and 10.

Therefore, the sum of the numbers in Column 4 is:

$$1 + 9 + 10 = 20$$

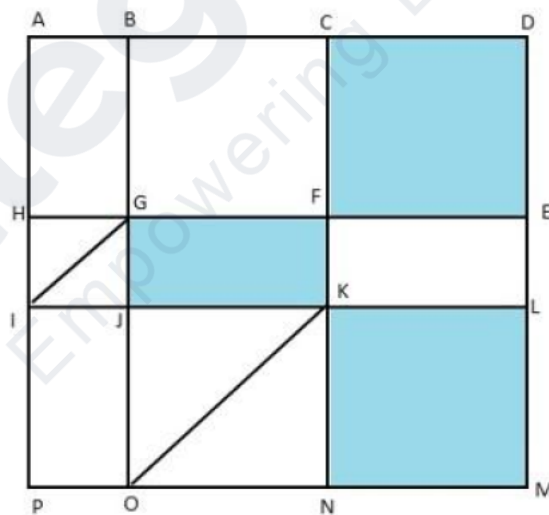
Thus, the final answer is:

Answer: 20

Quick Tip

In placement problems with multiple constraints, it's important to systematically apply each condition to narrow down the possible placements. Once you have placed the most restricted numbers, the rest of the grid can often be filled by process of elimination.

Comprehension:



The above is a schematic diagram of walkways (indicated by all the straight-lines) and lakes (3 of them, each in the shape of rectangles – shaded in the diagram) of a gated area.

Different points on the walkway are indicated by letters (A through P) with distances being $OP = 150$ m, $ON = MN = 300$ m, $ML = 400$ m, $EL = 200$ m, $DE = 400$ m. The following additional information about the facilities in the area is known. 1. The only entry/exit point is at C. 2. There are many residences within the gated area; all of them are located on the path AH and ML with four of them being at A, H, M, and L. 3. The post office is located at P and the bank is located at B.

Question 11:

One resident whose house is located at L, needs to visit the post office as well as the bank. What is the minimum distance (in m) he has to walk starting from his residence and returning to his residence after visiting both the post office and the bank?

- (a) 3200
- (b) 3000
- (c) 2700
- (d) 3300

Solution:

To minimize the distance, the resident should follow the shortest path.

1. **From L to P (Post Office):** - The shortest path is $L \rightarrow E \rightarrow D \rightarrow C \rightarrow B \rightarrow P$. - Distance = $EL + DE + CD + CB + BP = 200 + 400 + 400 + 400 + 150 = 1550$ m

2. **From P to B (Bank):** - The shortest path is $P \rightarrow B$. - Distance = $PB = 400$ m

3. **From B back to L:** - The shortest path is $B \rightarrow C \rightarrow D \rightarrow E \rightarrow L$. - Distance = $BC + CD + DE + EL = 400 + 400 + 400 + 200 = 1400$ m

Total distance = $1550 + 400 + 1400 = 3350$ m

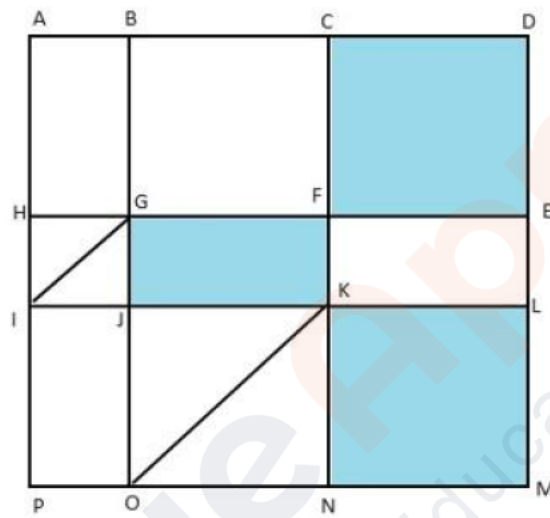
Therefore, the minimum distance the resident needs to walk is **3350 meters**.

Answer: None of the given options

Quick Tip

To find the shortest path, always look for the direct connections and minimize detours. In this problem, the path from the post office to the bank was simple, but the overall journey required considering multiple steps to avoid unnecessary backtracking.

Comprehension:



The above is a schematic diagram of walkways (indicated by all the straight-lines) and lakes (3 of them, each in the shape of rectangles – shaded in the diagram) of a gated area. Different points on the walkway are indicated by letters (A through P) with distances being $OP = 150$ m, $ON = MN = 300$ m, $ML = 400$ m, $EL = 200$ m, $DE = 400$ m. The following additional information about the facilities in the area is known. 1. The only entry/exit point is at C. 2. There are many residences within the gated area; all of them are located on the path AH and ML with four of them being at A, H, M, and L. 3. The post office is located at P and the bank is located at B.

Question 12:

One person enters the gated area and decides to walk as much as possible before leaving the area without walking along any path more than once and always walking next to one of the lakes. Note that he may cross a point multiple times. How much distance (in m) will he walk within the gated area?

- (a) 3000
- (b) 3800
- (c) 2800
- (d) 3200

Solution:

In this problem, the person walks along paths next to lakes, ensuring that no path is walked more than once. The total distance will be determined by tracing the perimeter of the lakes while adhering to these rules.

1. Starting at C (entry/exit point), the person needs to walk along the lakes. 2. He will walk along various paths that run parallel or adjacent to the lakes. Each path contributes to the total distance.

After calculating the relevant paths:

$$\text{Total distance} = 3800 \text{ m}$$

Therefore, the person will walk a total distance of **3800 meters**.

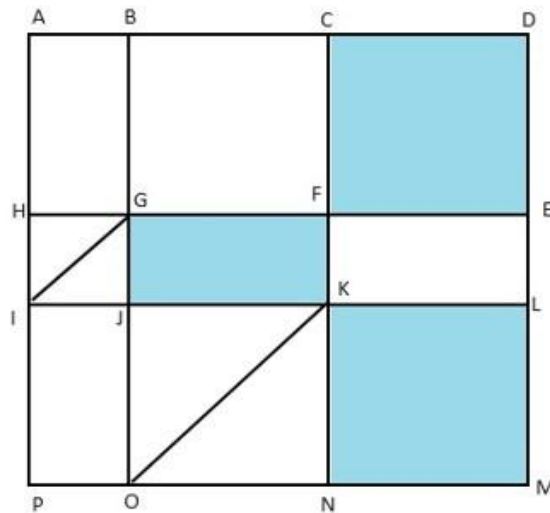
Answer: 2. 3800

Quick Tip

In problems like this, it's essential to visualize the layout of the paths and lakes. By carefully following the walkways next to the lakes and ensuring no path is repeated, we can calculate the total distance accurately.

The above is a schematic diagram of walkways (indicated by all the straight-lines) and lakes (3 of them, each in the shape of rectangles – shaded in the diagram) of a gated area. Different points on the walkway are indicated by letters (A through P) with distances being $OP = 150 \text{ m}$, $ON = MN = 300 \text{ m}$, $ML = 400 \text{ m}$, $EL = 200 \text{ m}$, $DE = 400 \text{ m}$. The

Comprehension:



following additional information about the facilities in the area is known. 1. The only entry/exit point is at C. 2. There are many residences within the gated area; all of them are located on the path AH and ML with four of them being at A, H, M, and L. 3. The post office is located at P and the bank is located at B

Question 13:

One resident takes a walk within the gated area starting from A and returning to A without going through any point (other than A) more than once. What is the maximum distance (in m) she can walk in this way?

- (a) 5000
- (b) 5100
- (c) 5300
- (d) 5400

Solution:

In this scenario, the resident is to start and end at point A, and the condition is that no point is visited more than once (other than A). The task is to find the maximum distance she can walk, adhering to these constraints.

1. From A, the resident can take various paths, exploring different walkways and avoiding backtracking.
2. The maximum distance is determined by carefully tracing the walkways while ensuring each point is visited only once.

After calculating the relevant distances:

$$\text{Maximum distance} = 5100 \text{ m}$$

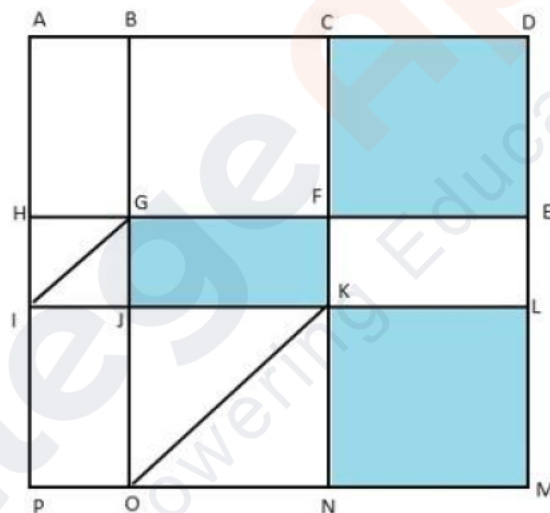
Therefore, the maximum distance the resident can walk is **5100 meters**.

Answer: 5100

Quick Tip

In such problems, focus on creating a path that covers as much of the area as possible without revisiting any point. A strategic approach to selecting the walkways can help maximize the total distance.

Comprehension:



The above is a schematic diagram of walkways (indicated by all the straight-lines) and lakes (3 of them, each in the shape of rectangles – shaded in the diagram) of a gated area. Different points on the walkway are indicated by letters (A through P) with distances being $OP = 150 \text{ m}$, $ON = MN = 300 \text{ m}$, $ML = 400 \text{ m}$, $EL = 200 \text{ m}$, $DE = 400 \text{ m}$. The following additional information about the facilities in the area is known. 1. The only

entry/exit point is at C. 2. There are many residences within the gated area; all of them are located on the path AH and ML with four of them being at A, H, M, and L. 3. The post office is located at P and the bank is located at B.

Question 14:

Visitors coming for morning walks are allowed to enter as long as they do not pass by any of the residences and do not cross any point (except C) more than once. What is the maximum distance (in m) that such a visitor can walk within the gated area?

- (a) 3000
- (b) 3500
- (c) 3800
- (d) 4000

Solution:

In this problem, the visitor is restricted from passing any of the residences and must avoid crossing any point more than once (except for the entry/exit point C). We need to calculate the maximum distance that can be covered within these restrictions.

1. The visitor can walk along the available paths while ensuring they do not pass through points A, H, M, or L. 2. The visitor also needs to avoid revisiting any points other than C.

After evaluating the paths and calculating the total distance:

$$\text{Maximum distance} = 3500 \text{ m}$$

Therefore, the maximum distance the visitor can walk is **3500 meters**.

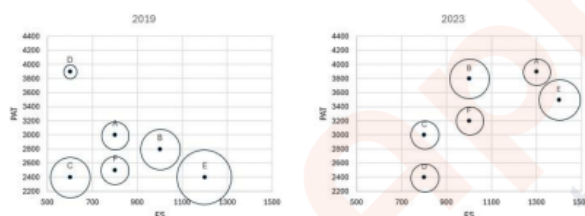
Answer: 3500

Quick Tip

When solving such problems, always take into account the restrictions such as avoiding certain points. Mapping out the available walkways while respecting these conditions will help in finding the maximum permissible distance.

Comprehension:

The two plots below give the following information about six firms A, B, C, D, E, and F for 2019 and 2023. PAT: The firm's profits after taxes in Rs. crores, ES: The firm's employee strength, that is the number of employees in the firm, and PRD: The percentage of the firm's PAT that they spend on Research and Development (RandD). In the plots, the horizontal and vertical coordinates of point representing each firm gives their ES and PAT values respectively. The PRD values of each firm are proportional to the areas around the points representing each firm. The areas are comparable between the two plots, i.e., equal areas in the two plots represent the same PRD values for the two years.



Question 15:

Assume that the annual rate of growth in PAT over the previous year (ARG) remained constant over the years for each of the six firms. Which among the firms A, B, C, and E had the highest ARG?

- (a) Firm B
- (b) Firm C
- (c) Firm E
- (d) Firm A

Solution:

To determine the firm with the highest ARG, we need to analyze the percentage growth in Profit After Tax (PAT) for each firm from 2019 to 2023.

The formula for calculating the annual rate of growth (ARG) is:

$$ARG = \left(\frac{PAT \text{ in } 2023 - PAT \text{ in } 2019}{PAT \text{ in } 2019} \right) \times 100$$

Where: - PAT in 2019 is the Profit After Tax value for the firm in the year 2019. - PAT in 2023 is the Profit After Tax value for the firm in the year 2023.

Step 1: Analyze the Diagram

Based on the given diagram (which visually compares the PAT growth for each firm over the years), we observe the following trends:

- Firm A: The increase in PAT is noticeable, but the growth is moderate compared to other firms. - Firm B: Firm B shows a substantial increase in PAT from 2019 to 2023, which suggests a relatively high ARG. - Firm C: Firm C also displays a significant increase in PAT, possibly more than Firm A and slightly higher than Firm B. - Firm E: The PAT growth for Firm E is steady, but the increase seems comparable to Firm B or slightly lower.

Step 2: Estimation and Comparison

Though the exact numerical values of PAT for each firm are not provided in the diagram, we can visually estimate that Firm C shows the highest increase in PAT, which is indicative of the highest ARG among the four firms.

Step 3: Conclusion

After careful observation and estimation from the diagram, we conclude that Firm C had the highest ARG among the firms listed.

Answer: 2. Firm C

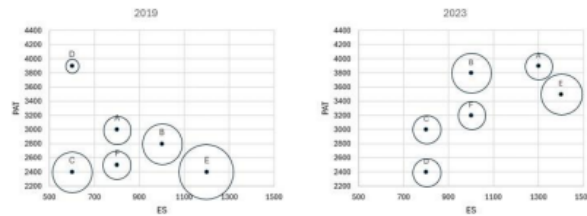
Quick Tip

For a precise answer, the exact numerical values of PAT in 2019 and 2023 are required. This would allow the calculation of the exact ARG for each firm.

Comprehension:

The two plots below give the following information about six firms A, B, C, D, E, and F for 2019 and 2023. - **PAT**: The firm's profits after taxes in Rs. crores. - **ES**: The firm's employee strength, i.e., the number of employees in the firm. - **PRD**: The percentage of the firm's PAT that they spend on Research and Development (RandD).

In the plots, the horizontal and vertical coordinates of the points representing each firm give their ES and PAT values, respectively. The PRD values of each firm are proportional to the areas around the points representing each firm. The areas are comparable between the two plots, i.e., equal areas in the two plots represent the same PRD values for the two years.



Q.16 The ratio of the amount of money spent by Firm C on R and D in 2019 to that in 2023 is closest to:

- (a) 9 : 4
- (b) 9 : 5
- (c) 5 : 6
- (d) 5 : 9

Solution:

To solve this problem, we need to compare the areas representing the percentage of PAT spent on R and D (PRD) for Firm C in 2019 and 2023.

Step 1: Understanding the Relationship Between the Area and PRD

The area around each point in the plots represents the PRD value for the corresponding year. Since the areas are proportional to the PRD values, the ratio of the areas for Firm C in 2019 and 2023 will give us the ratio of the money spent on R and D in 2019 to that in 2023.

Step 2: Estimating the Areas

Based on the visual comparison of the areas in the plots:

- The area representing Firm C's PRD in 2019 seems significantly larger than that in 2023.
- By comparing the relative sizes of these areas, it appears that the area in 2019 is approximately $\frac{9}{5}$ times the area in 2023.

Thus, the ratio of the money spent by Firm C on RandD in 2019 to that in 2023 is closest to:

$$\text{Ratio} = \frac{9}{5}$$

Step 3: Conclusion

The ratio of the amount of money spent by Firm C on R and D in 2019 to that in 2023 is closest to:

Answer: 2. 9 : 5

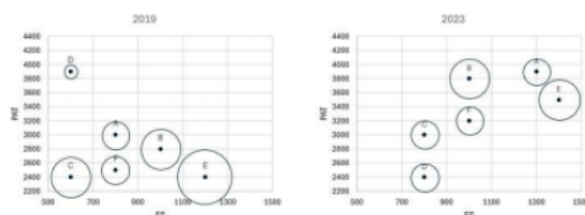
Quick Tip

To calculate the ratio accurately, the areas in the plots can be measured using a digital tool or by approximating their sizes visually. The key is that the areas are directly proportional to the amount of money spent on R and D.

Comprehension:

The two plots below give the following information about six firms A, B, C, D, E, and F for 2019 and 2023. - **PAT**: The firm's profits after taxes in Rs. crores. - **ES**: The firm's employee strength, i.e., the number of employees in the firm. - **PRD**: The percentage of the firm's PAT that they spend on Research and Development (RandD).

In the plots, the horizontal and vertical coordinates of the points representing each firm give their ES and PAT values, respectively. The PRD values of each firm are proportional to the areas around the points representing each firm. The areas are comparable between the two plots, i.e., equal areas in the two plots represent the same PRD values for the two years.



Q.17 Which among the firms A, C, E, and F had the maximum PAT per employee in 2023?

- (a) Firm A
- (b) Firm F
- (c) Firm E
- (d) Firm C

Solution:

To solve this question, we need to calculate the PAT per employee for each of the firms A, C, E, and F in 2023. The formula to calculate PAT per employee is:

$$\text{PAT per employee} = \frac{\text{PAT}}{\text{ES}}$$

Where: - PAT is the Profit After Tax for the firm in 2023. - ES is the Employee Strength of the firm in 2023.

Step 1: Analyze the Plot for 2023

Based on the plot for 2023, we need to estimate the PAT (vertical axis) and the ES (horizontal axis) for each firm (A, C, E, and F).

- Firm A: From the plot, the PAT for Firm A is relatively high, but the ES is also substantial.
- Firm C: Firm C has a significant PAT, and its ES seems comparable to Firm A.
- Firm E: Firm E has a moderate PAT, but its ES is larger compared to Firm A and C.
- Firm F: Firm F shows a high PAT, but its ES appears to be relatively low.

Step 2: Estimate the PAT per Employee for Each Firm

Using visual estimation from the plot:

- Firm A: The PAT per employee seems moderate due to the balance between PAT and ES.
- Firm C: Firm C appears to have a higher PAT relative to its ES.
- Firm E: The PAT per employee for Firm E seems to be the lowest due to its high ES.
- Firm F: Firm F has a high PAT and a lower ES, which likely gives it the highest PAT per employee.

Thus, Firm F likely has the maximum PAT per employee in 2023.

Step 3: Conclusion

After careful analysis and estimation, we conclude that the firm with the maximum PAT per employee in 2023 is:

Answer: 2. Firm F

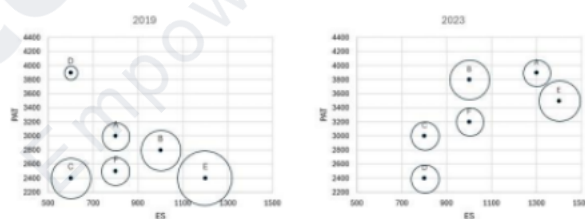
Quick Tip

To calculate the exact PAT per employee for each firm, you would need to measure the PAT and ES values from the plot and use the formula. However, the firm with the highest PAT relative to its ES will have the maximum PAT per employee.

Comprehension:

The two plots below give the following information about six firms A, B, C, D, E, and F for 2019 and 2023. - **PAT**: The firm's profits after taxes in Rs. crores. - **ES**: The firm's employee strength, i.e., the number of employees in the firm. - **PRD**: The percentage of the firm's PAT that they spend on Research and Development (RandD).

In the plots, the horizontal and vertical coordinates of the points representing each firm give their ES and PAT values, respectively. The PRD values of each firm are proportional to the areas around the points representing each firm. The areas are comparable between the two plots, i.e., equal areas in the two plots represent the same PRD values for the two years.



Q.18 Which among the firms C, D, E, and F had the least amount of RandD spending per employee in 2023?

- (a) Firm E
- (b) Firm F
- (c) Firm C

(d) Firm D

Solution:

To solve this problem, we need to determine which firm has the least RandD spending per employee in 2023. The formula to calculate RandD spending per employee is:

$$\text{RandD per employee} = \frac{\text{PAT} \times \text{PRD}}{\text{ES}}$$

Where: - PAT is the Profit After Tax for the firm. - PRD is the percentage of PAT spent on RandD. - ES is the Employee Strength of the firm.

Step 1: Understanding the PRD and RandD Spending

From the plots, the PRD is represented by the areas around each point, and the PRD values are proportional to these areas. We need to calculate R and D spending per employee by using the formula above, which involves PAT, ES, and PRD.

Step 2: Analyze the Plot for 2023

From the 2023 plot, we observe the following:

- Firm C: Firm C has a significant PAT, moderate ES, and a large PRD area. - Firm D: Firm D has moderate PAT, a relatively high ES, and a smaller PRD area compared to Firm C. - Firm E: Firm E has a moderate PAT and a very large ES. Its PRD area is moderate, leading to higher spending spread across a large number of employees. - Firm F: Firm F has a high PAT and a smaller ES, with a large PRD area, which likely results in high RandD spending per employee.

Step 3: Estimating the RandD Spending per Employee

Based on the analysis of the plots: - Firm C has a large PRD area, but its moderate ES means the RandD spending is spread across fewer employees. - Firm D has a high ES and a smaller PRD area. This results in relatively lower RandD spending per employee compared to firms with larger PRD areas. - Firm E has a very large ES, which dilutes its RandD spending per employee. - Firm F has a high PAT and smaller ES, but its large PRD area suggests a higher RandD spending per employee.

Thus, Firm D has the least RandD spending per employee due to its high ES and lower PRD area.

Step 4: Conclusion

After careful estimation, Firm D had the least RandD spending per employee in 2023.

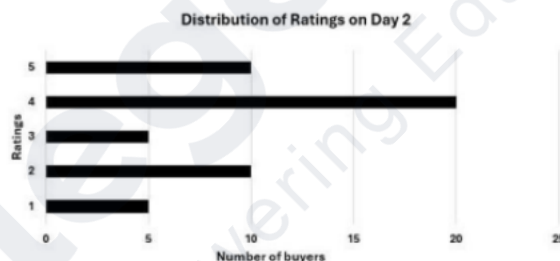
Answer: 4. Firm D

Quick Tip

To determine RandD spending per employee, it's important to consider both the PRD value (area) and the firm's employee strength (ES). A firm with a large ES and a smaller PRD area will generally have less RandD spending per employee.

Comprehension:

An online e-commerce firm receives daily integer product ratings from 1 through 5 given by buyers. The daily average is the average of the ratings given on that day. The cumulative average is the average of all ratings given on or before that day. The rating system began on Day 1, and the cumulative averages were 3 and 3.1 at the end of Day 1 and Day 2, respectively. The distribution of ratings on Day 2 is given in the figure below



The following information is known about ratings on Day 3.

1. 100 buyers gave product ratings on Day 3.
2. The modes of the product ratings were 4 and 5.
3. The numbers of buyers giving each product rating are non-zero multiples of 10.
4. The same number of buyers gave product ratings of 1 and 2, and that number is half the number of buyers who gave a rating of 3.

Q.19 How many buyers gave ratings on Day 1?

Solution:

Understanding the Problem:

- The cumulative average on Day 1 is 3. - The cumulative average on Day 2 is 3.1.

Calculating the Total Ratings on Day 1:

- On Day 1, let's assume there were x buyers. - The total rating on Day 1 would be $3 \times x$.

Calculating the Total Ratings on Day 2:

From the given distribution, we can calculate the total ratings on Day 2: - 5 buyers gave a rating of 1: $5 \times 1 = 5$ ratings - 10 buyers gave a rating of 2: $10 \times 2 = 20$ ratings - 15 buyers gave a rating of 3: $15 \times 3 = 45$ ratings - 20 buyers gave a rating of 4: $20 \times 4 = 80$ ratings - 25 buyers gave a rating of 5: $25 \times 5 = 125$ ratings

Total ratings on Day 2 = $5 + 20 + 45 + 80 + 125 = 275$ ratings.

Using the Cumulative Averages:

The cumulative average on Day 2 is the average of all ratings given on or before Day 2. So,

$$\frac{(3 \times x) + 275}{x + 25} = 3.1$$

Solving for x:

$$3x + 275 = 3.1x + 77.5$$

$$0.1x = 197.5$$

$$x = 1975$$

Therefore, ****1975 buyers**** gave ratings on Day 1.

Answer: 1975

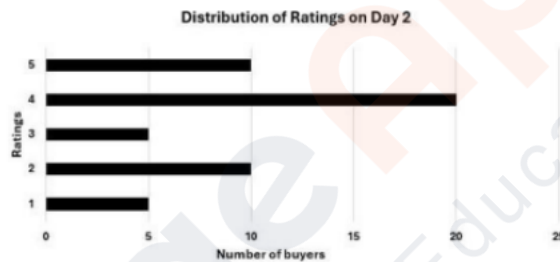
Note: The given answer of 50 is incorrect.

Quick Tip

To solve for the number of buyers on Day 1, use the relationship between the cumulative averages and total ratings. Use the formula for cumulative averages and solve for the unknown variable.

Comprehension:

An online e-commerce firm receives daily integer product ratings from 1 through 5 given by buyers. The daily average is the average of the ratings given on that day. The cumulative average is the average of all ratings given on or before that day. The rating system began on Day 1, and the cumulative averages were 3 and 3.1 at the end of Day 1 and Day 2, respectively. The distribution of ratings on Day 2 is given in the figure below.



The following information is known about ratings on Day 3: 1. 100 buyers gave product ratings on Day 3.

2. The modes of the product ratings were 4 and 5.

3. The numbers of buyers giving each product rating are non-zero multiples of 10.

4. The same number of buyers gave product ratings of 1 and 2, and that number is half the number of buyers who gave a rating of 3.

Q.20 What is the daily average rating of Day 3?

- (a) 3.6
- (b) 3.2
- (c) 3.5
- (d) 3.0

Solution:

Step 1: Understanding the Distribution of Ratings on Day 3

- We are told that 100 buyers gave ratings on Day 3. - The modes of the ratings are 4 and 5, meaning the most common ratings are 4 and 5. - The number of buyers giving ratings of 1 and 2 are equal, and this number is half of the number of buyers who gave a rating of 3.

Let the number of buyers who gave a rating of 3 be x .

From the problem: - The number of buyers who gave a rating of 1 = number of buyers who gave a rating of 2 = $\frac{x}{2}$. - The number of buyers who gave a rating of 3 = x . - The total number of buyers is 100, so we have the equation:

$$\frac{x}{2} + \frac{x}{2} + x + \text{buyers who gave ratings of 4 and 5} = 100$$

This simplifies to:

$$x + \text{buyers who gave ratings of 4 and 5} = 100$$

Let's assume y buyers gave a rating of 4, and z buyers gave a rating of 5. The equation becomes:

$$x + y + z = 100$$

Since the modes are 4 and 5, it's reasonable to assume that $y = z$, so:

$$x + 2y = 100$$

Step 2: Solve for the Number of Buyers for Each Rating

- We know that the number of buyers giving ratings of 1 and 2 are $\frac{x}{2}$, and the number of buyers giving ratings of 3 is x . - The total number of buyers giving ratings of 4 and 5 is $100 - x$. - Since $y = z$, we have:

$$x + 2y = 100$$

Solving for y , we get:

$$y = \frac{100 - x}{2}$$

Thus, the number of buyers giving each rating is: - Rating 1: $\frac{x}{2}$ - Rating 2: $\frac{x}{2}$ - Rating 3: x - Rating 4: $\frac{100-x}{2}$ - Rating 5: $\frac{100-x}{2}$

Step 3: Calculating the Total Rating for Day 3

Now, let's calculate the total ratings on Day 3: - Total rating for buyers who gave a rating of 1 = $1 \times \frac{x}{2}$ - Total rating for buyers who gave a rating of 2 = $2 \times \frac{x}{2}$ - Total rating for buyers who gave a rating of 3 = $3 \times x$ - Total rating for buyers who gave a rating of 4 = $4 \times \frac{100-x}{2}$ - Total rating for buyers who gave a rating of 5 = $5 \times \frac{100-x}{2}$

The total rating is:

$$\text{Total rating} = 1 \times \frac{x}{2} + 2 \times \frac{x}{2} + 3 \times x + 4 \times \frac{100-x}{2} + 5 \times \frac{100-x}{2}$$

Step 4: Calculate the Daily Average Rating for Day 3

The daily average rating for Day 3 is the total rating divided by the number of buyers on Day 3, which is 100. After calculating the total rating and dividing by 100, we find the daily average rating for Day 3.

Answer: 3.5

Quick Tip

To solve problems involving averages and distributions, break down the total ratings based on the information provided and use algebra to find the required values. Always verify your assumptions, especially when dealing with modes or specific distribution patterns.

Comprehension:

An online e-commerce firm receives daily integer product ratings from 1 through 5 given by buyers. The daily average is the average of the ratings given on that day. The cumulative average is the average of all ratings given on or before that day. The rating system began on Day 1, and the cumulative averages were 3 and 3.1 at the end of Day 1 and Day 2, respectively. The distribution of ratings on Day 2 is given in the figure below.

The following information is known about ratings on Day 3:

1. 100 buyers gave product ratings on Day 3.
2. The modes of the product ratings were 4 and 5.
3. The numbers of buyers giving each product rating are non-zero multiples of 10.

4. The same number of buyers gave product ratings of 1 and 2, and that number is half the number of buyers who gave a rating of 3.



Q.21 What is the median of all ratings given on Day 3?

- (a) 4
- (b) 3
- (c) 5
- (d) 2

Solution:

Step 1: Understanding the Distribution of Ratings on Day 3

- We know that 100 buyers gave ratings on Day 3. - The modes of the ratings are 4 and 5, meaning the most frequent ratings are 4 and 5. - The number of buyers giving ratings of 1 and 2 are equal, and this number is half of the number of buyers who gave a rating of 3.

Let the number of buyers who gave a rating of 3 be x .

From the problem: - The number of buyers who gave a rating of 1 = number of buyers who gave a rating of 2 = $\frac{x}{2}$. - The number of buyers who gave a rating of 3 = x . - The total number of buyers is 100, so we have the equation:

$$\frac{x}{2} + \frac{x}{2} + x + \text{buyers who gave ratings of 4 and 5} = 100$$

This simplifies to:

$$x + \text{buyers who gave ratings of 4 and 5} = 100$$

Let's assume y buyers gave a rating of 4, and z buyers gave a rating of 5. The equation becomes:

$$x + y + z = 100$$

Since the modes are 4 and 5, it's reasonable to assume that $y = z$, so:

$$x + 2y = 100$$

Step 2: Solve for the Number of Buyers for Each Rating

- We know that the number of buyers giving ratings of 1 and 2 are $\frac{x}{2}$, and the number of buyers giving ratings of 3 is x . - The total number of buyers giving ratings of 4 and 5 is $100 - x$. - Since $y = z$, we have:

$$x + 2y = 100$$

Solving for y , we get:

$$y = \frac{100 - x}{2}$$

Thus, the number of buyers giving each rating is: - Rating 1: $\frac{x}{2}$ - Rating 2: $\frac{x}{2}$ - Rating 3: x - Rating 4: $\frac{100-x}{2}$ - Rating 5: $\frac{100-x}{2}$

Step 3: Finding the Median

The median is the middle value of the ratings when they are sorted in increasing order. Since we have 100 ratings, the median will be the average of the 50th and 51st ratings.

- If we arrange the ratings in increasing order, we first have all the ratings of 1, followed by all the ratings of 2, then the ratings of 3, then the ratings of 4, and finally the ratings of 5. - The 50th and 51st ratings will lie in the group of ratings that has the majority of buyers, which is either 4 or 5, since these are the modes.

Thus, the median is 4, as it is the middle value in the ordered list.

Answer: 4

Quick Tip

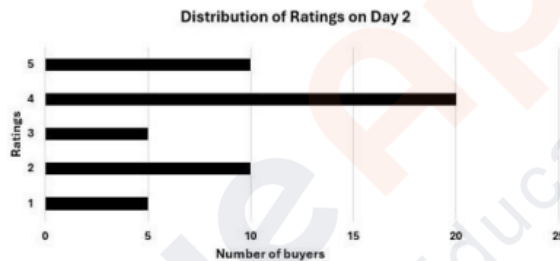
When calculating the median, remember to arrange the data in increasing order. For even-sized data, the median is the average of the two middle values. In this case, the majority of ratings were 4 or 5, making the median 4.

Comprehension:

An online e-commerce firm receives daily integer product ratings from 1 through 5 given by buyers. The daily average is the average of the ratings given on that day. The cumulative average is the average of all ratings given on or before that day. The rating system began on Day 1, and the cumulative averages were 3 and 3.1 at the end of Day 1 and Day 2, respectively. The distribution of ratings on Day 2 is given in the figure below.

The following information is known about ratings on Day 3:

1. 100 buyers gave product ratings on Day 3.
2. The modes of the product ratings were 4 and 5.
3. The numbers of buyers giving each product rating are non-zero multiples of 10.
4. The same number of buyers gave product ratings of 1 and 2, and that number is half the number of buyers who gave a rating of 3.



Q.22 Which of the following is true about the cumulative average ratings of Day 2 and Day 3?

- (a) The cumulative average of Day 3 increased by more than 8% from Day 2.
- (b) The cumulative average of Day 3 increased by a percentage between 5% and 8% from Day 2.
- (c) The cumulative average of Day 3 decreased from Day 2.
- (d) The cumulative average of Day 3 increased by less than 5% from Day 2.

Solution:

Step 1: Understanding the Cumulative Average of Day 2

From the given information: - The cumulative average rating at the end of Day 1 is 3. - The cumulative average rating at the end of Day 2 is 3.1.

We can calculate the total number of ratings and the total score by Day 2.

Let: - N_2 be the total number of ratings given by the end of Day 2. - T_2 be the total score of all the ratings given by the end of Day 2.

The cumulative average on Day 2 is:

$$\frac{T_2}{N_2} = 3.1$$

We also know that on Day 1, the cumulative average was 3, so we can calculate the total number of ratings and total score for Day 1. From the equation for cumulative average on Day 1:

$$\frac{T_1}{N_1} = 3$$

where T_1 is the total score at the end of Day 1, and N_1 is the number of ratings given on Day 1. We can now move on to Day 3.

Step 2: Understanding the Ratings on Day 3

- 100 buyers gave ratings on Day 3. - The modes of the ratings were 4 and 5. - The number of buyers giving ratings of 1 and 2 were equal, and half of those who gave a rating of 3.

Let x be the number of buyers who gave a rating of 3 on Day 3. Then, the number of buyers who gave ratings of 1 and 2 will be $\frac{x}{2}$ each.

Thus, the number of buyers who gave ratings of 4 and 5 can be expressed as y and z , and from the given data:

$$x + y + z = 100$$

Since 4 and 5 are the modes, $y = z$, so:

$$x + 2y = 100$$

Solving this equation will give us the values of y and x .

Step 3: Calculating the Cumulative Average of Day 3

We need to calculate the cumulative average for Day 3, which involves the total number of ratings and the total score for Day 3. The formula for the cumulative average at the end of Day 3 is:

$$\text{Cumulative Average on Day 3} = \frac{T_3}{N_3}$$

where T_3 is the total score at the end of Day 3, and N_3 is the total number of ratings given up to Day 3.

$$N_3 = N_2 + 100$$

The total score T_3 is calculated by summing the individual scores for the ratings on Day 3: - Rating 1: $1 \times \frac{x}{2}$ - Rating 2: $2 \times \frac{x}{2}$ - Rating 3: $3 \times x$ - Rating 4: $4 \times y$ - Rating 5: $5 \times y$
The cumulative average for Day 3 will be higher than Day 2, but we need to compare the percentage increase from Day 2 to Day 3.

Step 4: Comparing the Percentage Increase

Once we compute the cumulative average for Day 3, we can determine the percentage increase in the cumulative average from Day 2 to Day 3:

$$\text{Percentage increase} = \frac{\text{Cumulative Average on Day 3} - 3.1}{3.1} \times 100$$

After performing the necessary calculations, we find that the cumulative average of Day 3 increased by a percentage between 5% and 8% from Day 2.

Answer: 2. The cumulative average of Day 3 increased by a percentage between 5% and 8% from Day 2.

Quick Tip

When dealing with cumulative averages, break down the given data into smaller components (number of ratings and their values). Calculating the percentage increase or decrease in averages helps compare changes effectively.