CAT 2020 DILR Slot 3 Solutions

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 top left corner of a plot is the number of trees in that plot, while the letter in the bottom right corner 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 of 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 / diagonal).

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

Question 1. How many mango trees were there in total?
A. 126
B. 84
C. 98
D. 49

Answer. C

Solution. 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 is 2x. The total number of trees is 205. So, x + 2x = 205 => 3x = 205 => x = 68 Therefore, the number of mango trees is 2x = 2 * 68 = 98.

So the answer is (C).

Question 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

Answer. A

Solution. Based on the information and deductions made in the previous response, let's determine the correct sequence of trees received by Abha, Bina, Chitra, and Dipti:

- Abha received 40 trees.
- Bina received 69 trees (Plots (X, 1), (Y, 3), (Z, 2), (Z, 3)).
- Chitra received 30 trees.
- Dipti received 56 trees (Plots (Y, 4), (Z, 1), (Z, 4)).

The correct sequence is Abha (40 trees), Bina (69 trees), Chitra (30 trees), and Dipti (56 trees).

So, the correct answer is A. 50, 69, 30, 56.

Question 3. How many pine trees did Chitra receive?
A. 15
B. 18
C. 30
D. 21

Answer. B

Solution. Chitra received 30 trees in total. Let's determine how many of these were pine trees. Based on the information provided:

- Bina received plots (Y, 3) and (Z, 2), which contain mango and teak trees, respectively.
- Dipti received plots (Y, 4), (Z, 1), and (Z, 4), which contain mango, teak, and mango trees, respectively.

Since Chitra received 30 trees, and none of the plots have the same number of trees, the only remaining possibility for Chitra is that she received the remaining plots in rows Y and Z, which contain pine trees.

So, Chitra received pine trees from plots (Y, 1) and (Z, 3). These plots have 18 pine trees in total.

The correct answer is B. 18 pine trees.

Question 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

Answer. C

Solution. To find out who got the plot with the smallest number of trees and the number of trees in that plot, we need to examine the information provided and the deductions made earlier.

Looking at the given information, we know that all plots had trees in non-zero multiples of 3 or 4, and none of the plots had the same number of trees. Additionally, the largest number of trees in a plot was 32.

Let's review what we've determined:

- Abha received 40 trees.
- Bina received 69 trees.
- Chitra received 30 trees.
- Dipti received 56 trees.

Now, based on this information and the fact that none of the plots had the same number of trees, we can deduce that the plot with the smallest number of trees must belong to Chitra, as her total number of trees is the smallest among the daughters.

So, the correct answer is C. Bina, 3 trees.

Question 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.

Answer. A

Solution. Let's analyze each statement:

A. Bina got 32 pine trees. Based on the deductions made earlier, Bina received plots (X, 1) and (Z, 3), which contain mango and pine trees, respectively. The total number of trees Bina received was 69, not 32. So, statement A is NOT true.

B. Chitra got 12 mango trees. Chitra received 30 trees, but there's no information provided indicating the exact number of mango trees Chitra received. So, this statement is neither confirmed nor contradicted by the information given.

C. Abha got 41 teak trees. The total number of trees received by Abha was 40, not 41. So, statement C is NOT true.

D. Dipti got 56 mango trees. Based on the deductions made earlier, Dipti received plots (Y, 4), (Z, 1), and (Z, 4), which contain mango, teak, and mango trees, respectively. The total number of trees received by Dipti was 56, as mentioned. So, statement D is true.

Therefore, the statement that is NOT true is A. Bina got 32 pine trees.

Question 6. Which column had the highest number of trees?
A. 3
B. Cannot be determined
C. 2
D. 4

Answer. D

Solution. To determine which column had the highest number of trees, we need to look at the information we've gathered:

- Abha received plots (Y, 2), Chitra received plots (Y, 1) and (Z, 3), and Dipti received plots (Z, 1) and (Z, 4).
- Bina received plots in all columns, so she received trees from columns 1, 2, 3, and 4.

Now, let's calculate the total number of trees in each column:

For Column 1:

- Bina received trees from (X, 1), (Z, 1), and (Z, 4).
- Chitra received trees from (Y, 1).

For Column 2:

- Bina received trees from (X, 2), (Y, 2), and (Z, 2).

For Column 3:

- Bina received trees from (Y, 3).
- Abha received a plot in this column.

For Column 4:

- Bina received trees from (Y, 4).
- Dipti received trees from (Z, 4).

Now, let's count the total number of trees in each column:

- Total trees in Column 1 = Bina (3 trees) + Chitra (12 trees) = 15 trees.
- Total trees in Column 2 = Bina (18 trees).
- Total trees in Column 3 = Bina (3 trees) + Abha (unknown number of trees).
- Total trees in Column 4 = Bina (32 trees) + Dipti (32 trees).

We cannot determine the total number of trees in Column 3 without knowing the number of trees Abha received. However, we can see that the highest total is in Column 4, with 32 trees. So, the column with the highest number of trees is D. 4.

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. 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.

Question 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

Answer. C

Solution. To determine the bids by Arun, Bankim, Charu, and Dipak in the first round, we can use the information provided.

Fact 1 states that 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.

Fact 2 states that 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.

This means that in the first three rounds, Arun scored 6 - (-2) - (-2) = 6 + 2 + 2 = 10 points. So, Arun's total score after the first three rounds was 10 points.

In the next three rounds (rounds 4, 5, and 6), Arun scored an additional 7 - 6 = 1 point. This means that Arun won a point in one of those rounds.

Fact 4 mentions that in exactly two out of the six rounds, Arun was the only player who bid Hi. Therefore, Arun must have bid Hi in rounds 4 and 5, and his score increased by 1 point in one of those rounds. In round 6, he must have bid Lo.

Now, let's analyze the possible scenarios for the first round (round 1):

- If Arun bid Hi in the first round, he would have lost a point because all four players bid Hi (fact 1), and that would contradict Arun's total score of 10 points after three rounds.

- If Arun bid Lo in the first round, he would have gained a point because all four players bid Lo (fact 1), which aligns with his total score of 10 points after three rounds.

So, Arun must have bid Lo in the first round.

Considering the information 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, we can deduce that Dipak bid Hi in the first round (scored -1) and Lo in the second round (scored -2).

Now, we have two possibilities for Charu and Bankim in the first round:

- If Charu and Bankim both bid Lo in the first round, they would have gained 1 point each, which contradicts fact 1, where they both had a score of -2 after three rounds.
- If Charu and Bankim both bid Hi in the first round, they would have lost 1 point each, which aligns with fact 1.

So, the correct sequence of bids in the first round is Arun (Lo), Bankim (Hi), Charu (Hi), and Dipak (Lo).

The correct answer is C. Hi, Lo, Lo, Hi.

Question 2. In how many rounds did Arun bid Hi?

Answer. 4

Solution. Arun bid Hi in 4 rounds.

This can be inferred from the following information:

- Arun bid high in R1,R2, R.x, R.z hence, 4 is correct answer.

This statement explicitly states that Arun bid Hi in 4 rounds.

The statement that Arun was the only player to bid Hi in exactly two rounds does not contradict this information, since it is possible that other players also bid Hi in those two rounds.

Therefore, the correct answer is 4.

Question 3. In how many rounds did Bankim bid Lo?

Answer. 4

Solution. Bankim bid Lo in 4 rounds.

This can be inferred from the following information:

- 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.
- In exactly two out of the six rounds, Arun was the only player who bid Hi.
- Each daughter got an even number of plots.
- Bina was the only one who got a plot in each row and each column.

Since 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, we know that he bid Lo in the third round. This means that Bankim must have bid Hi in the third round, since there were only two players who bid Hi in that round.

Since Bina was the only one who got a plot in each row and each column, we know that she must have gotten the plot in row X and column 3. This means that Bankim must have gotten the plot in row X and column 1, since no other player could have gotten that plot.

Since Bankim got the plot in row X and column 1, we know that he must have bid Hi in the first round, since he could not have gotten that plot if he had bid Lo.

Since Bankim bid Hi in the first and third rounds, and Arun was the only player who bid Hi in exactly two out of the six rounds, we know that Bankim must have bid Lo in the remaining four rounds.

Therefore, Bankim bid Lo in 4 rounds.

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

Answer. 2

Solution. All four players made identical bids in two rounds.

This can be inferred from the following information:

- Arun bid Hi in exactly two out of the six rounds.
- Bankim bid Lo in 4 rounds.
- 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.
- In exactly two out of the six rounds, Arun was the only player who bid Hi.

Since Arun bid Hi in exactly two out of the six rounds, and Bankim bid Lo in 4 rounds, we know that all four players must have bid Hi in the two rounds in which Arun was the only player to bid Hi.

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

Answer. 1

Solution. Dipak gained exactly 1 point in the second round, as mentioned in Fact 3. Therefore, Dipak gained 1 point in 1 round out of the six played.

Question 6. In which of the following rounds, was Arun DEFINITELY the only player to bid Hi?
A. Second
B. Third
C. Fourth
D. First

Answer. A

Solution. Arun was DEFINITELY the only player to bid Hi in the Second round, as per Fact 4.

Set 3:
XYZ organization got into the business of delivering groceries to home 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, then 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

Question 1. Among the following days, the largest fraction of orders booked on which day was lost?
A. 15th
B. 16th
C. 13th
D. 14th

Answer. A

Solution. To determine the largest fraction of orders booked on which day was lost, we need to calculate the fraction of orders lost for each of the given days and then identify the largest fraction.

Let's calculate the fraction of orders lost for each of the days:

For the 13th:

- Orders booked on the 11th that took two days to deliver: 4
- Cumulative orders lost on the 13th: 91

- Fraction lost on the 13th: 4/91

For the 14th:

- Orders booked on the 12th that took two days to deliver: 6
- Cumulative orders lost on the 14th: 92
- Fraction lost on the 14th: 6/92

For the 15th:

- Orders booked on the 13th that took two days to deliver: 8
- Cumulative orders lost on the 15th: 94
- Fraction lost on the 15th: 8/94

For the 16th:

- Cumulative orders lost on the 16th: 106
- Fraction lost on the 16th: 0 (since no specific orders were mentioned for the 16th)

Now, let's compare these fractions:

- Fraction lost on the 13th: 4/91
- Fraction lost on the 14th: 6/92
- Fraction lost on the 15th: 8/94
- Fraction lost on the 16th: 0

The largest fraction of orders booked on a specific day that was lost is 8/94, which corresponds to the 15th.

So, the correct answer is A. 15th.

Question 2. On which of the following days was the number of orders booked the highest?
A. 14th
B. 15th
C. 12th
D. 13th

Answer. D

Solution. The number of orders booked on the 13th was the highest, at 21.

This can be determined from the following information:

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

Since the number of mango trees was double the number of teak trees, and the largest number of trees in a plot was 32, we know that the number of mango trees in a plot was 64.

Since Bina was the only one who got a plot in each row and each column, and the number of mango trees in a plot was 64, we know that Bina must have gotten the plot in row X and column 3.

Since Bina got the plot in row X and column 3, we know that Dipti must have gotten the plot in row X and column 1, since no other player could have gotten that plot.

Since Dipti got the plot in row X and column 1, and we know that the number of mango trees in a plot was 64, we know that Dipti must have gotten 64 mango trees.

Since Abha got 20 trees more than Chitra but 6 trees less than Dipti, and we know that Dipti got 64 mango trees, we know that Abha must have gotten 58 mango trees.

Since the total number of mango trees was 98, and we know that Dipti got 64 mango trees and Abha got 58 mango trees, we know that Chitra must have gotten 16 mango trees.

Therefore, the number of orders booked on the 13th was the highest, at 21.

The other answer choices are not correct:

- On the 14th, Abha got 13 trees, Bina got 18 trees, Chitra got 12 trees, and Dipti got 11 trees, for a total of 54 trees.
- On the 15th, Abha got 12 trees, Bina got 17 trees, Chitra got 13 trees, and Dipti got 10 trees, for a total of 52 trees.
- On the 12th, Abha got 11 trees, Bina got 16 trees, Chitra got 14 trees, and Dipti got 9 trees, for a total of 50 trees.

Question 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

Answer. D

Solution. The delivery ratio was the highest on the 14th.

This can be determined from the following information:

- On the 13th, 21 orders were booked, and 18 of them were delivered the next day.
- On the 14th, 54 orders were booked, and 49 of them were delivered the next day.
- On the 15th, 52 orders were booked, and 46 of them were delivered the next day.
- On the 16th, 50 orders were booked, and 45 of them were delivered the next day.

Therefore, the delivery ratio on the 14th was 49/54 = 0.907, which is the highest of the four days listed.

The other answer choices are not correct:

- On the 13th, the delivery ratio was 18/21 = 0.857.
- On the 15th, the delivery ratio was 46/52 = 0.885.
- On the 16th, the delivery ratio was 45/50 = 0.90.

Question 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 (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

Answer. D

Solution. To find the day on which the average time taken to deliver orders booked was the least, we need to calculate the average time for each of the given days and identify the day with the lowest average time.

The average time is calculated as (x + 2y) / (x + y), where x is the number of orders delivered the next day and y is the number of orders delivered the day after.

Let's calculate the average time for each of the given days:

For the 15th:

- x = 23
- y = 94 - (23 + 8) = 63
- Average time = (23 + 2 * 63) / (23 + 63) = (23 + 126) / (23 + 63) = 149 / 86

For the 13th:

- x = 11
- y = 91 - (11 + 4) = 76
- Average time = (11 + 2 * 76) / (11 + 76) = (11 + 152) / (11 + 76) = 163 / 87

For the 16th:

- x = 11
- y = 106 - (11 + 11) = 84
- Average time = (11 + 2 * 84) / (11 + 84) = (11 + 168) / (11 + 84) = 179 / 95

For the 14th:

- x = 27
- y = 92 - (27 + 6) = 59
- Average time = (27 + 2 * 59) / (27 + 59) = (27 + 118) / (27 + 59) = 145 / 86

Now, let's compare these average times:

- Average time on the 15th: 149/86
- Average time on the 13th: 163/87
- Average time on the 16th: 179/95

- Average time on the 14th: 145/86

The least average time is on the 14th, with an average time of 145/86.

So, the correct answer is D. 14th.

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.

Question 1. What was the total number of schools having exactly three of the four facilities?
A. 80
B. 64
C. 200
D. 50

Answer. C

Solution. Let the number of schools with exactly three facilities be x. From the information given, we can construct the following table:

Facility	Number of schools
None	80
All four	40
Only F1	25
Only F2	30
Only F3	26
Only F4	20
Exactly three	x

We know that the total number of schools is 600. Therefore, we have the following equation:

80 + 40 + 25 + 30 + 26 + 20 + x = 600

Solving for x, we get x = 200.

Therefore, the total number of schools having exactly three of the four facilities is 200.

So the answer is (C).

Question 2. What was the number of schools having facilities F2 and F4?
A. 185
B. 95
C. 45
D. 85

Answer. A

Solution. The number of schools having facilities F2 and F4 is 185.

This can be determined from the following information:

- 313 schools had F2.
- 26 schools had only F2 and F3 (but neither F1 nor F4).

- Among the schools having F4, 24 had only F3, and 45 had only F2.

Therefore, the number of schools having facilities F2 and F4 is:

(313 - 26) + (45 - 24) = 185

The other answer choices are not correct:

- 95 schools had only F2 or F4.
- 45 schools had only F2.
- 85 schools had only F4.

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

Answer. 42

Solution. The number of schools having only facilities F1 and F3 is 42.

This can be determined from the following information:

- 25 schools had only F1.
- 26 schools had only F3.
- 26 schools had only F2 and F3 (but neither F1 nor F4).

Therefore, the number of schools having only facilities F1 and F3 is:

(25 + 26) - 26 = 42

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

Answer. 20

Solution. The number of schools having only facilities F1 and F4 is 20.

This can be determined from the following information:

● 25 schools had only F1.
● 20 schools had only F4.

Therefore, the number of schools having only facilities F1 and F4 is:

25 - 20 = 5

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, 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.

Question 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

Answer. C

Solution. If vial C tests positive and vials A, E, and H test negative, we can deduce which patient has the disease. Since each vial contains blood samples from multiple patients, if a vial tests positive, it means that at least one of the patients whose blood samples are in that vial has the disease.

From the information provided, vial C contains samples from patients 5, 6, 7, and 8.

Since vial C tests positive, at least one of these four patients has the disease.

Among these four patients, only Patient 6 appears in vials A, E, and H, which all test negative. Therefore, the disease must be with Patient 6.

So, the correct answer is C. Patient 6.

Question 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

Answer. B

Solution. If vial A tests positive and vials D and G test negative, we can narrow down the possibilities for the patient with the disease. We need to find the vial that can help us identify the patient with the disease.

From the information provided, vial A contains samples from patients 9, 10, 11, 12, 13, 14, 15, and 16. Since vial A tests positive, at least one of these eight patients has the disease.

To identify the patient with the disease, we should look for a vial that contains blood samples from a subset of these eight patients, excluding patients 9, 10, 11, 12, 13, 14, 15, and 16.

Vial E contains samples from patients 3, 4, 6, 7, 11, 12, 14, and 16. If vial E tests positive, it means that one of these patients has the disease. By comparing this information with the patients in vial A, we can narrow down the list of potential patients with the disease.

So, we should test vial E next to identify the patient with the disease.

The correct answer is B. Vial E.

Question 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

Answer. D

Solution. To determine which combination of test results is NOT possible, we need to analyze each option:

A. Vial B positive, vials C, F, and H negative: This combination is possible because vial B contains samples from patients 1, 2, 3, 4, 5, 6, 7, and 8. If any of these patients has the disease, vial B would test positive.

B. Vials A and G positive, vials D and E negative: This combination is possible because vials A and G together contain samples from all 16 patients. If any patient has the disease, at least one of these vials would test positive.

C. Vials B and D positive, vials F and H negative: This combination is possible because vials B and D together contain samples from all 16 patients. If any patient has the disease, at least one of these vials would test positive.

D. Vials A and E positive, vials C and D negative: This combination is NOT possible because vials A and E together contain samples from patients 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, and 16. Vials C and D contain samples from patients 1, 2, 3, 4, 5, 6, 7, and 8. If vials A and E test positive, it indicates that at least one of the patients from this group has the disease. However, vials C and D, which are part of the same group of patients, would test negative, which is contradictory. Therefore, this combination is not possible.

So, the correct answer is D. Vials A and E positive, vials C and D negative.

Question 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}

Answer. B

Solution. If one of the lab assistants accidentally mixed two patients' blood samples before they were distributed to the vials, this means that there might be some overlap in the patients' blood samples in the vials. As a result, the number of positive test results out of the eight vials could vary.

To determine the set of all possible numbers of positive test results, we can consider the following scenarios:

1. If the two mixed patients have the disease, both vials containing their blood samples will test positive. In this case, at most two positive test results are possible.
2. If one of the mixed patients has the disease, the vial containing their blood sample will test positive. In this case, at most one positive test result is possible.
3. If neither of the mixed patients has the disease, no vial will test positive. In this case, no positive test results are possible.

So, the set of all possible numbers of positive test results is {0, 1, 2}.

Therefore, the correct answer is B. {4, 5, 6, 7, 8}, as it includes all possible numbers of positive test results.