CAT 2021 DILR Solution Slot 3

Comprehension: Three reviewers Amal. Bimal. and Kornai are tasked with selecting questions from a pool of 13 questions (Q01 to Q13). Questions can be created by external "subject matter experts" (SMEs) or by one of the three reviewers. Each of the reviewers either approves or disapproves a question that is shown to them. Their decisions lead to eventual acceptance or rejection of the question in the manner described below

If a question is created by an SME, it is reviewed first by Amal and then by Bimal. If both of them approve the question then the question is accepted and is not reviewed by Komal. If both disapprove the question, it is rejected and is not reviewed by Komal If one of them approves the question and the other disapproves it, then the question is reviewed by Komal. Then the question is accepted only if she approves it.

A question created by one of the reviewers is decided upon by the other two. If a question is created by Amal. then it is first reviewed by Bimal. If Bimal approves the question. then it is accepted Otherwise. it is reviewed by Komal The question is then accepted only if Komal approves it. A similar process is followed for questions created by Bimal. whose questions are first reviewed by Komal and then by Amal only if Komal disapproves it. Questions created by Komal are first reviewed by Amal, and then, if required, by Bimal.

The following facts are known about the review process after its completion

1. Q02, Q06, Q09, Q11, and Q12 were rejected and the other questions were accepted.
2. Amal reviewed only Q02, Q03, Q04, Q06,Q08, Q10, Q11 and Q13

3. Bimal reviewed only Q02, Q04, Q06 through Q09, Q12 and Q13
4. Komal reviewed only Q01 through Q05, Q07, Q08, Q09, Q11 and Q12

SubQuestion No : 1
Q.1 How many questions were DEFINITELY created by Amal?

Solution.
To determine how many questions were definitely created by Amal, we need to look at the questions that Amal reviewed and approved. From the information provided, Amal reviewed the following questions:

- Q02 (Rejected)
- Q03 (Accepted)
- Q04 (Accepted)
- Q06 (Rejected)
- Q08 (Accepted)
- Q10 (Accepted)
- Q11 (Rejected)
- Q13 (Accepted)

Out of these, Amal approved the following questions:
- Q03
- Q04
- Q08
- Q10
- Q13

So, Amal definitely created and approved 5 questions.

SubQuestion No : 2
Q.1 How many questions were DEFINITELY created by Komal?

Solution.

To determine how many questions were definitely created by Komal, we need to look at the questions that Komal reviewed and approved. From the information provided, Komal reviewed the following questions:

- Q01 (Approval status not mentioned)
- Q02 (Reviewed by Amal, Rejected)
- Q03 (Approval status not mentioned)
- Q04 (Reviewed by Bimal, Accepted)
- Q05 (Approval status not mentioned)
- Q06 (Reviewed by Amal, Rejected)
- Q07 (Reviewed by Bimal, Accepted)
- Q08 (Approval status not mentioned)
- Q09 (Reviewed by Bimal, Rejected)
- Q11 (Reviewed by Amal, Rejected)
- Q12 (Reviewed by Bimal, Rejected)

Based on the information provided, we don't have clear information about whether Komal approved or rejected questions Q01, Q03, Q05, and Q08. However, we do know that Komal approved the following questions:

- Q04
- Q07

So, we can definitively say that Komal created and approved at least 2 questions.

SubOuestion No : 3
Q.3 How many questions were DEFINITELY created by the SMEs?

Solution.
To determine how many questions were definitely created by Subject Matter Experts (SMEs), we need to identify questions that were not created by Amal, Bimal, or Komal, and then check if these questions were approved.

From the information provided, we know that the following questions were definitely created by SMEs because they were not created by any of the reviewers (Amal, Bimal, or Komal):

- Q01
- Q05
- Q07

Now, let's check their approval status:

- Q01: Approval status not mentioned
- Q05: Approval status not mentioned
- Q07: Approved

So, definitively, at least 1 question (Q07) was created by SMEs and approved

SubQuestion No : 4
Q.4 Now many questions were DEFINITELY disapproved by Bimal?

Solution.
To determine how many questions were definitely disapproved by Bimal, we need to identify the questions that Bimal reviewed and explicitly rejected. From the information provided, Bimal reviewed the following questions:

- Q02 (Rejected)
- Q04 (Accepted)
- Q06 (Rejected)
- Q07 (Accepted)
- Q08 (Accepted)
- Q09 (Rejected)
- Q12 (Rejected)
- Q13 (Accepted)

Bimal explicitly disapproved the following questions:

- Q02
- Q06
- Q09
- Q12

So, definitively, Bimal disapproved 4 questions.

SubQuestion No : 5
Q.5 The approval ratio of a reviewer is the ratio of the number of questions (s)he approved to the number of questions (s)he reviewed. Which option best describes Amal's approval ratio?
1. 0.25
2. lies between 0.25 and 0.75
3. lies between 0.25 and 0.50

Solution.
To calculate Amal's approval ratio, we need to find the number of questions Amal approved and divide it by the number of questions Amal reviewed.

From the information provided, Amal reviewed the following questions:
- Q02
- Q03
- Q04
- Q06
- Q08
- Q10
- Q11
- Q13

Out of these, Amal approved the following questions:
- Q03
- Q04
- Q08
- Q10
- Q13

Amal's approval ratio is calculated as:
(Number of Questions Approved by Amal) / (Number of Questions Reviewed by Amal)

= 5 (approved questions) / 8 (reviewed questions)

= 5/8

So, Amal's approval ratio is 0.625.

Therefore, option 2, "lies between 0.25 and 0.75," best describes Amal's approval ratio.

SubOuestion No : 6
Q.6 How many questions created by Amal or Bimal were disapproved by at least one of the other reviewers?
1. 7
2. 5
3. 4

Solution.
To determine how many questions created by Amal or Bimal were disapproved by at least one of the other reviewers, we need to check the questions created by Amal and Bimal and see if they were disapproved by either Komal or the other reviewer. Here's the breakdown:

Questions created by Amal and their approval status:
- Q02: Rejected by Amal
- Q03: Approved by Amal
- Q04: Approved by Bimal
- Q06: Rejected by Amal
- Q08: Approved by Bimal
- Q10: Approved by Amal
- Q11: Rejected by Amal
- Q13: Approved by Amal

Questions created by Bimal and their approval status:

- Q02: Rejected by Amal
- Q04: Approved by Bimal
- Q06: Rejected by Amal
- Q07: Approved by Bimal
- Q08: Approved by Bimal
- Q09: Rejected by Bimal
- Q12: Rejected by Bimal
- Q13: Approved by Amal

Now, let's check which of these questions were disapproved by either Komal or the other reviewer:

Questions disapproved by Komal:
- Q02 (disapproved by Amal)
- Q06 (disapproved by Amal)
- Q09 (disapproved by Bimal)
- Q11 (disapproved by Amal)
- Q12 (disapproved by Bimal)

So, there are 5 questions created by Amal or Bimal that were disapproved by at least one of the other reviewers.

Therefore, the correct answer is option 2: "5."

Comprehension:

10 players -P1, P2…… P10 - competed in an international javelin throw event. The number (after P) of a player reflects his rank at the beginning of the event, with rank 1 going to the topmost player. There were two phases in the event with the first phase consisting of rounds 1, 2, and 3. and the second phase consisting of rounds , 5 and 6. A throw is measured in terms of the distance it covers (in meters up to one decimal point accuracy) only if the throw is a 'valid' one. For an invalid throw. the distance is taken as zero A player's score at the end of a round is the maximum distance of all his throws up to that round Players are re-ranked after every round based on their current scores In case of a tie in scores. the player

with a prevailing higher rank retains the higher rank This ranking determines the order in which the players go for their throws in the next round .
In each of the rounds in the first phase, the players throw in increasing order of their latest rank, i e the player ranked 1 at that point throws first, followed by the player ranked 2 at that point and so on. The top six players at the end of the first phase qualify for the second phase In each of the rounds in the second phase. the players throw in decreasing order of their latest rank i.e the player ranked 6 at that point throws first, followed by the player ranked 5 at that point and so on. The players ranked 1, 2 and 3 at the end of the sixth round receive gold, silver, and bronze medals respectively All the valid throws of the event were of distinct distances (as per stated measurement accuracy). The tables below show distances (in meters) covered by all valid throws in the first and the third round in the event.

Distances covered by all the valid throws in the first round.

Player	Distance (in m)
P1	82.9
P3	81.5
P5	86.4
P6	82.5
P7	87.2
P9	84.1

Distances covered by all the valid throws in the third round

Player	Distance (in m)
P1	88.6
P3	79.0
P9	81.4

The following facts are also known
i. Among the throws in the second round. only the last two were valid. Both the throws enabled these players to qualify for the second phase. with one of them qualifying with the least score. None of these players won any medal
ii. If a player throws first in a round AND he was also the last (among the players in the current round) to throw in the previous round, then the player is said to get a double. Two players got a double
iii. In each round of the second phase, exactly one player improved his score. Each of these improvements was by the same amount
iv. The gold and bronze medalists improved their scores in the fifth and the sixth rounds respectively. One medal winner improved his score in the fourth round.
v. The difference between the final scores of the gold medalist and the silver medalist as well as the difference between the final scores of the silver medalist and the bronze medalist

SubQuestion No : 7
Q.7 Which two players got the double?
1. P1, P8
2. P8, P10
3. P2, P4

Solution.
To determine which two players got the double (meaning they threw first in a round and were also the last to throw in the previous round), we need to consider the information provided.

From the facts provided, we know that two players got a double. Let's examine the order in which players threw and use this information to identify the players who got the double:

- In each of the rounds in the first phase, the players threw in increasing order of their latest rank (from 1 to 10).

- In each of the rounds in the second phase, the players threw in decreasing order of their latest rank (from 6 to 1).

Based on this information, the players who got the double are P6 and P5. They threw first in a round and were also the last to throw in the previous round.

So, the correct answer is option 2: P8, P10.

SubOuestion No : 8
Q.8 Who won the silver medal?
1.P7
2.P9
3.P1

Solution.

SubQuestion No: 9
Q.9 Who threw the last javelin in the event?
1. P9
2.P10
3. P1

Solution.
To determine who threw the last javelin in the event, we need to consider the order in which players threw in the second phase of the event.

In the second phase, players threw in decreasing order of their latest rank. The player ranked 6 at that point throws first, followed by the player ranked 5 at that point, and so on. Since there are 10 players in total, the player ranked 1 at the end of the event (the top-ranked player) would throw last in the second phase.

Given this, the player who threw the last javelin in the event is P1.

So, the correct answer is option 3: P1.

SubQuestion No : 10

Q.10 What was the final score (in m) of the silver-medalist?

1. **89.6**
2. **88.6**
3. **87.2**

Solution.

SubQuestion No : 11

Q.11 Which of the following can be the final score (in m) of P8?

1. **85.1**
2. **81.9**
3. **0**

Solution.

To determine the possible final score (in meters) of P8, we need to consider the information provided and the rules of the event.

We know that P8 participated in the event, but we don't have specific information about their performance in terms of distances covered in each round. However, we do have some information about the valid throws in the event:

- In the first round, valid throws were made by P1, P3, P5, P6, P7, and P9.
- In the third round, valid throws were made by P1, P3, and P9.

Since we don't have information about P8's throws in the first and third rounds, we cannot definitively determine their final score. However, based on the information provided, it is possible that P8's final score could be 0 (if all of P8's throws in the first and third rounds were invalid).

So, the correct answer is option 3: 0.

SubQuestion No 12
Q.12 By how much did the gold medalist improve his score (in m) in the second phase?

Solution.

Comprehension:

Each of the bottles mentioned in this question contains 50 ml of liquid The liquid in any bottle can be 100% pure content (P) or can have certain amount of impurity (I). Visually it is not possible to distinguish between P and I. There is a testing device which detects impurity as long as the percentage of impurity in the content tested is 10% or more.

For example suppose bottle 1 contains only P. and bottle 2 contains 80% P and 20% I. If content from bottle 1 is tested, it will be found out that it contains only P. If content of bottle 2 is tested, the test will reveal that it contains some amount of I. If 10 ml of content from bottle 1 is mixed with 20 ml content from bottle 2, the test will show that the mixture has impurity,and hence we can conclude that at least one of the two bottles has I. However, if 10 ml of content from bottle 1 is mixed with 5 ml of content from bottle 2 the test will not detect any impurity in the resultant mixture

SubQuestion No :13
Q.13. 5 ml of content from bottle A is mixed with 5 ml of content from bottle B. The resultant mixture, when tested. detects the presence of I. If it is known that bottle A contains only P, what BEST can be concluded about the volume of I in bottle B? Ans le
1. 10 ml or more
2. Less than 1 ml

3. 10 ml
4. 1 ml

Solution.
Based on the information provided, we can make the following conclusions:

- If 5 ml of content from bottle A (which contains only P) is mixed with 5 ml of content from bottle B, and the resultant mixture detects the presence of I, it means that the mixture contains at least 10% impurity.
- Since bottle A contains only P and the test detects impurity in the mixture, the impurity must come from bottle B.
- To have at least 10% impurity in a 10 ml mixture (5 ml from each bottle), bottle B must contain 10 ml or more of impurity (I).

So, the correct answer is option 1: 10 ml or more.

SubQuestion No:14
Q.14 There are four bottles. Each bottle is known to contain only P or only I. They will be considered to be “collectively ready for despatch" if all of them contain only P. In minimum how many tests. is it possible to ascertain whether these four bottles are “collectively ready for despatch"?

Solution.
To determine if all four bottles are "collectively ready for despatch" (i.e., they all contain only P), we need to test each bottle to identify the presence of impurity (I).

- If a bottle is tested and found to contain only P, we are certain about its content.
- If a bottle is tested and found to contain I, we can be certain about its content.

In the worst-case scenario, where all bottles contain I, we would need to test all four bottles individually to ascertain whether they are "collectively ready for despatch." Therefore, in minimum, it is possible to ascertain

whether these four bottles are collectively ready for despatch with **four tests.**

SubQuestion No : 15
Q.15 There are four bottles. It is known that three of these bottles contain only P, while the remaining one contains 80% P and 20% I. What is the minimum number of tests required to definitely identify the bottle containing some amount of I?

Solution.
To definitely identify the bottle containing some amount of I among the four bottles, you can use the following approach:

1. Mix the contents of two bottles. For example, mix the contents of Bottle 1 and Bottle 2.
2. Test the mixture using the testing device.
   - If the mixture tests positive for impurity (I), you have identified one of the bottles that contain I (either Bottle 1 or Bottle 2).
   - If the mixture tests negative for impurity, both Bottle 1 and Bottle 2 are pure (only P).

Now, you have narrowed it down to two possibilities: one bottle containing I and two bottles that are pure.

3. Take one of the bottles that tested negative in the previous step (either Bottle 1 or Bottle 2) and mix its contents with the contents of another bottle (e.g., Bottle 3).

4. Test the mixture.
   - If the mixture tests positive for impurity, you have identified the bottle containing I (either Bottle 1 or Bottle 2).
   - If the mixture tests negative for impurity, then all three bottles you mixed are pure.

So, in the worst-case scenario (where you need to test all mixtures to identify the bottle containing I), you would require **two tests** to definitely identify the bottle containing some amount of I.

SubQuestion No : 16

Q.16 There are four bottles. It is known that either one or two of these bottles contain(s) only P, while the remaining ones contain 85% P and 15% I. What is the minimum number of tests required to ascertain the exact number of bottles containing only P?

Solution.

To ascertain the exact number of bottles containing only P among the four bottles, you can use the following approach:

1. Mix the contents of two bottles (e.g., Bottle 1 and Bottle 2).

2. Test the mixture using the testing device.

- If the mixture tests positive for impurity (I), you have identified one of the bottles that contains I (either Bottle 1 or Bottle 2).

- If the mixture tests negative for impurity, both Bottle 1 and Bottle 2 are pure (only P).

Now, you have narrowed it down to two possibilities: one bottle containing I and the other two bottles are pure.

3. Take one of the bottles that tested negative in the previous step (either Bottle 1 or Bottle 2) and mix its contents with the contents of another bottle (e.g., Bottle 3).

4. Test the mixture.

- If the mixture tests positive for impurity, you have identified the bottle containing I (either Bottle 1 or Bottle 2).

- If the mixture tests negative for impurity, all three bottles you mixed are pure.

Now, you have ascertained the exact number of bottles containing only P:

- If both tests (step 2 and step 4) were negative, it means all four bottles contain only P.

- If one of the tests was positive (either step 2 or step 4), it means there is one bottle containing I, and the remaining three bottles contain only P.

So, in the worst-case scenario (where you need to test all mixtures to ascertain the exact number of bottles containing only P), you would require **two tests** to make this determination.