CAT 2020 Slot 1 LRDI

Instructions

In a certain board examination, students were to appear for examination in five subjects:
English, Hindi, Mathematics, Science and Social Science. Due to a certain emergency situation, a few of the examinations could not be conducted for some students. Hence, some students missed one examination and some others missed two examinations. Nobody missed more than two examinations.

The board adopted the following policy for awarding marks to students. If a student appeared in all five examinations, then the marks awarded in each of the examinations were on the basis of the scores obtained by them in those examinations.

If a student missed only one examination, then the marks awarded in that examination was the average of the best three among the four scores in the examinations they appeared for. If a student missed two examinations, then the marks awarded in each of these examinations was the average of the best two among the three scores in the examinations they appeared for. The marks obtained by six students in the examination are given in the table below. Each of them missed either one or two examinations.

	English	Hindi	Mathematics	Science	Social Science
Alva	80	75	70	75	60
Bithi	90	80	55	85	85
Carl	75	80	90	100	90
Deep	70	90	100	90	80
Esha	80	85	95	60	55
Foni	83	72	78	88	83

The following facts are also known.
I. Four of these students appeared in each of the English, Hindi, Science, and Social Science examinations.
II. The student who missed the Mathematics examination did not miss any other examination.
III. One of the students who missed the Hindi examination did not miss any other examination. The other student who missed the Hindi examination also missed the Science examination.

Question 1

Who among the following did not appear for the Mathematics examination?

A Alva

B Carl

C Foni

D Esha

   Answer: B

Explanation:
Based on Condition II, we understand that the student who missed the Mathematics examination did not miss any other examination. This indicates that the Maths score is bound to be the average of the best 3 out of the 4 exam scores obtained by this candidate. Based on this inference, we can proceed with identifying the math score that can be represented as an average of the rest of the scores. We can straightaway eliminate Deep and Esha as potential candidates, given that their Mathematics score is greater than the rest of the exam scores.

For Alva: best 3 out of 4 - 80(English), 75(Hindi), 75(Science)

Avg. = 230/3 = 76.67 $\neq$ 70

For Carl: best 3 out of 4 - 80(Hindi), 90(Social Science), 100(Science)

Avg. = 270/3 = 90 which matches the given value

∴ Carl most likely missed his Mathematics examination.

For Foni: best 3 out of 4 - 83(English), 83(Social Science), 88(Science)

Avg. = 254/3 = 84.67 $\neq$ 78

Hence, we observe that only Carl has missed his Mathematics examination. Hence, Option B is the correct answer.

Question 2

Which students did not appear for the English examination?

A   Carl and Deep

B   Cannot be determined

C   Alva and Bithi

D   Esha and Foni

    Answer: D

Explanation:

Based on Condition II, we understand that the student who missed the Mathematics examination did not miss any other examination. This indicates that the Maths score is bound to be the average of the best 3 out of the 4 exam scores obtained by this candidate. Based on this inference, we can proceed with identifying the math score that can be represented as an average of the rest of the scores. We can straightaway eliminate Deep and Esha as potential candidates, given that their Mathematics score is greater than the rest of the exam scores. After estimating the average scores for the rest of the candidates, we observe that only Carl has missed his Mathematics examination.

For Carl: best 3 out of 4 - 80(Hindi), 90(Social Science), 100(Science)

Avg. = 270/3 = 90 which matches the given value

∴ Carl missed his Mathematics examination.

Further, based on Condition III, we can surmise that the student who missed Hindi and Science should have similar average scores in these two subjects. We notice that Alva has the same score of 75 in both Hindi and Science. The same can be said about Deep, who has a score of 90 in both these subjects. Thus, one out of Alva and Deep missed out on Hindi and Science examination, while the second individual missed out only on the Hindi examination.

Since we know that Carl, Alva and Deep are unlikely to have missed out on the English exam, we can divert our attention to determining which individual out of Bithi, Esha and Foni failed to appear for this subject. However, we notice that Bithi's English score is greater than the rest of her scores, thereby helping us eliminate her as the potential candidate.

For Esha: best 3 out of 4 - 85(Hindi), 95(Mathematics), 60(Science)

Avg. = 240/3 = 80 which matches the given value

∴ Esha most likely missed her English examination.

For Foni: best 3 out of 4 - 78(Mathematics), 83(Social Science), 88(Science)

Avg. = 249/3 = 83 which matches the given value

∴ Foni most likely missed her English examination.

Based on Condition I, we know that exactly two candidates missed the examinations for English, Hindi, Science, and Social Science.

For English, we determined these individuals to be Esha and Foni. For Hindi, we determined these individuals to be Alva and Deep. For Science, we know one of the individuals is either Alva or Deep. Given that Carl, Alva and Deep cannot be a part of the group that missed Science or Social Science exam, we can proceed by carefully scrutinizing the rest of the group that includes Bithi, Esha and Foni.

We notice that Bithi has a similar score in both Science and Social Science examination. Assuming that she did miss these exams, let us proceed to check if this was actually the case.

For Bithi: Best 2 out 3 - 90(English), 80(Hindi)

Avg = 170/2 = 85 which matches the given value

∴ Bithi is likely to have missed her Science and Social Science examinations.

We additionally notice that Foni has a similar score in English and Social Science. On considering the best 2 out of 3 scores, the average value of the score for both the subject holds (equal to 83). Thus, we can conclude that Bithi and Foni missed their Social Science examination.

Thus, the students who missed just one exam were: Carl (Mathematics); Esha (English) and one out of Alva and Deep (Hindi).

Hence of the six students, we can correctly determine the missed subjects for four of them (except Alva and Deep):

Mathematics: Carl ; **English**: Esha & Foni ; **Hindi**: Alva & Deep; **Science**: Bithi & one out of Alva and Deep ; **Social Science**: Foni & Bithi

Hence, the correct answer to this question is Option D: Esha and Foni.

Question 3

What BEST can be concluded about the students who did not appear for the Hindi examination?

A   Deep and Esha

B   Alva and Deep

C   Alva and Esha

D   Two among Alva, Deep and Esha

Answer: B

Explanation:
Based on Condition II, we understand that the student who missed the Mathematics examination did not miss any other examination. This indicates that the Maths score is bound to be the average of the best 3 out of the 4 exam scores obtained by this candidate. Based on this inference, we can proceed with identifying the math score that can be represented as an average of the rest of the scores. We can straightaway eliminate Deep and Esha as potential candidates, given that their Mathematics score is greater than the rest of the exam scores. After estimating the average scores for the rest of the candidates, we observe that only Carl has missed his Mathematics examination.

For Carl: best 3 out of 4 - 80(Hindi), 90(Social Science), 100(Science)

Avg. = 270/3 = 90 which matches the given value

∴ Carl missed his Mathematics examination.

Further, based on Condition III, we can surmise that the student who missed Hindi and Science should have similar average scores in these two subjects. We notice that Alva has the same score of 75 in both Hindi and Science. The same can be said about Deep, who has a score of 90 in both these subjects. Thus, one out of Alva and Deep missed out on Hindi and Science examination, while the second individual missed out only on the Hindi examination.

Since we know that Carl, Alva and Deep are unlikely to have missed out on the English exam, we can divert our attention to determining which individual out of Bithi, Esha and Foni failed to appear for this subject. However, we notice that Bithi's English score is greater than the rest of her scores, thereby helping us eliminate her as the potential candidate.

For Esha: best 3 out of 4 - 85(Hindi), 95(Mathematics), 60(Science)

Avg. = 240/3 = 80 which matches the given value

∴ Esha most likely missed her English examination.

For Foni: best 3 out of 4 - 78(Mathematics), 83(Social Science), 88(Science)

Avg. = 249/3 = 83 which matches the given value

∴ Foni most likely missed her English examination.

Based on Condition I, we know that exactly two candidates missed the examinations for English, Hindi, Science, and Social Science.

For English, we determined these individuals to be Esha and Foni. For Hindi, we determined these individuals to be Alva and Deep. For Science, we know one of the individuals is either Alva or Deep. Given that Carl, Alva and Deep cannot be a part of the group that missed Science or Social Science exam, we can proceed by carefully scrutinizing the rest of the group that includes Bithi, Esha and Foni.

We notice that Bithi has a similar score in both Science and Social Science examination. Assuming that she did miss these exams, let us proceed to check if this was actually the case.

For Bithi: Best 2 out 3 - 90(English), 80(Hindi)

Avg = 170/2 = 85 which matches the given value

∴ Bithi is likely to have missed her Science and Social Science examinations.

We additionally notice that Foni has a similar score in English and Social Science. On considering the best 2 out of 3 scores, the average value of the score for both the subject holds (equal to 83). Thus, we can conclude that Bithi and Foni missed their Social Science examination.

Thus, the students who missed just one exam were: Carl (Mathematics); Esha (English) and one out of Alva and Deep (Hindi).

Hence of the six students, we can correctly determine the missed subjects for four of them (except Alva and Deep):

Mathematics: Carl ; **English**: Esha & Foni ; **Hindi**: Alva & Deep; **Science**: Bithi & one out of Alva and Deep ; **Social Science**: Foni & Bithi

Hence, the correct answer to this question is Option B: Alva and Deep.

Question 4

What BEST can be concluded about the students who missed the Science examination?

A   Bithi and one out of Alva and Deep

B   Alva and Bithi

C   Deep and Bithi

D   Alva and Deep

Answer: A

Explanation:

Based on Condition II, we understand that the student who missed the Mathematics examination did not miss any other examination. This indicates that the Maths score is bound to be the average of the best 3 out of the 4 exam scores obtained by this candidate. Based on this inference, we can proceed with identifying the math score that can be represented as an average of the rest of the scores. We can straightaway eliminate Deep and Esha as potential candidates, given that their Mathematics score is greater than the rest of the exam scores. After estimating the average scores for the rest of the candidates, we observe that only Carl has missed his Mathematics examination.

For Carl: best 3 out of 4 - 80(Hindi), 90(Social Science), 100(Science)

Avg. = 270/3 = 90 which matches the given value

∴ Carl missed his Mathematics examination.

Further, based on Condition III, we can surmise that the student who missed Hindi and Science should have similar average scores in these two subjects. We notice that Alva has the same score of 75 in both Hindi and Science. The same can be said about Deep, who has a score of 90 in both these subjects. Thus, one out of Alva and Deep missed out on Hindi and Science examination, while the second individual missed out only on the Hindi examination.

Since we know that Carl, Alva and Deep are unlikely to have missed out on the English exam, we can divert our attention to determining which individual out of Bithi, Esha and Foni failed to appear for this subject. However, we notice that Bithi's English score is greater than the rest of her scores, thereby helping us eliminate her as the potential candidate.

For Esha: best 3 out of 4 - 85(Hindi), 95(Mathematics), 60(Science)

Avg. = 240/3 = 80 which matches the given value

∴ Esha most likely missed her English examination.

For Foni: best 3 out of 4 - 78(Mathematics), 83(Social Science), 88(Science)

Avg. = 249/3 = 83 which matches the given value

∴ Foni most likely missed her English examination.

Based on Condition I, we know that exactly two candidates missed the examinations for English, Hindi, Science, and Social Science.

For English, we determined these individuals to be Esha and Foni. For Hindi, we determined these individuals to be Alva and Deep. For Science, we know one of the individuals is either Alva or Deep. Given that Carl, Alva and Deep cannot be a part of the group that missed Science or Social Science exam, we can proceed by carefully scrutinizing the rest of the group that includes Bithi, Esha and Foni.

We notice that Bithi has a similar score in both Science and Social Science examination. Assuming that she did miss these exams, let us proceed to check if this was actually the case.

For Bithi: Best 2 out 3 - 90(English), 80(Hindi)

Avg = 170/2 = 85 which matches the given value

∴ Bithi is likely to have missed her Science and Social Science examinations.

We additionally notice that Foni has a similar score in English and Social Science. On considering the best 2 out of 3 scores, the average value of the score for both the subject holds (equal to 83). Thus, we can conclude that Bithi and Foni missed their Social Science examination.

Thus, the students who missed just one exam were: Carl (Mathematics); Esha (English) and one out of Alva and Deep (Hindi).

Hence of the six students, we can correctly determine the missed subjects for four of them (except Alva and Deep):

Mathematics: Carl ; **English**: Esha & Foni ; **Hindi**: Alva & Deep; **Science**: Bithi & one out of Alva and Deep ; **Social Science**: Foni & Bithi

Hence, the correct answer to this question is Option A: Bithi & one out of Alva and Deep.

Question 5

How many out of these six students missed exactly one examination?

Answer: 3

Explanation:
Based on Condition II, we understand that the student who missed the Mathematics examination did not miss any other examination. This indicates that the Maths score is bound to be the average of the best 3 out of the 4 exam scores obtained by this candidate. Based on this inference, we can proceed with identifying the math score that can be represented as an average of the rest of the scores. We can straightaway eliminate Deep and Esha as potential candidates, given that their Mathematics score is greater than the rest of the exam scores. After estimating the average scores for the rest of the candidates, we observe that only Carl has missed his Mathematics examination.

For Carl: best 3 out of 4 - 80(Hindi), 90(Social Science), 100(Science)

Avg. = 270/3 = 90 which matches the given value

∴ Carl missed his Mathematics examination.

Further, based on Condition III, we can surmise that the student who missed Hindi and Science should have similar average scores in these two subjects. We notice that Alva has the same score of 75 in both Hindi and Science. The same can be said about Deep, who has a score of 90 in both these subjects. Thus, one out of Alva and Deep missed out on Hindi and Science examination, while the second individual missed out only on the Hindi examination.

Since we know that Carl, Alva and Deep are unlikely to have missed out on the English exam, we can divert our attention to determining which individual out of Bithi, Esha and Foni failed to appear for this subject. However, we notice that Bithi's English score is greater than the rest of her scores, thereby helping us eliminate her as the potential candidate.

For Esha: best 3 out of 4 - 85(Hindi), 95(Mathematics), 60(Science)

Avg. = 240/3 = 80 which matches the given value

∴ Esha most likely missed her English examination.

For Foni: best 3 out of 4 - 78(Mathematics), 83(Social Science), 88(Science)

Avg. = 249/3 = 83 which matches the given value

∴ Foni most likely missed her English examination.

Based on Condition I, we know that exactly two candidates missed the examinations for English, Hindi, Science, and Social Science.

For English, we determined these individuals to be Esha and Foni. For Hindi, we determined these individuals to be Alva and Deep. For Science, we know one of the individuals is either Alva or Deep. Given that Carl, Alva and Deep cannot be a part of the group that missed Science or Social Science exam, we can proceed by carefully scrutinizing the rest of the group that includes Bithi, Esha and Foni.

We notice that Bithi has a similar score in both Science and Social Science examination. Assuming that she did miss these exams, let us proceed to check if this was actually the case.

For Bithi: Best 2 out 3 - 90(English), 80(Hindi)

Avg = 170/2 = 85 which matches the given value

∴ Bithi is likely to have missed her Science and Social Science examinations.

We additionally notice that Foni has a similar score in English and Social Science. On considering the best 2 out of 3 scores, the average value of the score for both the subject holds (equal to 83). Thus, we can conclude that Bithi and Foni missed their Social Science examination.

Thus, the students who missed just one exam were: Carl (Mathematics); Esha (English) and one out of Alva and Deep (Hindi).

Hence of the six students, we can correctly determine the missed subjects for four of them (except Alva and Deep):

Mathematics: Carl ; **English**: Esha & Foni ; **Hindi**: Alva & Deep; **Science**: Bithi & one out of Alva and Deep ; **Social Science**: Foni & Bithi

Hence, the correct answer to this question is **3**. {Carl (Mathematics); Esha (English) and one out of Alva and Deep (Hindi)}

Question 6

For how many students can we be definite about which examinations they missed?

Answer: 4

Explanation:
Based on Condition II, we understand that the student who missed the Mathematics examination did not miss any other examination. This indicates that the Maths score is bound to be the average of the best 3 out of the 4 exam scores obtained by this candidate. Based on this inference, we can proceed with identifying the math score that can be represented as an average of the rest of the scores. We can straightaway eliminate Deep and Esha as potential candidates, given that their Mathematics score is greater than the rest of the exam scores. After estimating the average scores for the rest of the candidates, we observe that only Carl has missed his Mathematics examination.

For Carl: best 3 out of 4 - 80(Hindi), 90(Social Science), 100(Science)

Avg. = 270/3 = 90 which matches the given value

∴ Carl missed his Mathematics examination.

Further, based on Condition III, we can surmise that the student who missed Hindi and Science should have similar average scores in these two subjects. We notice that Alva has the same score of 75 in both Hindi and Science. The same can be said about Deep, who has a score of 90 in both these subjects. Thus, one out of Alva and Deep missed out on Hindi and Science examination, while the second individual missed out only on the Hindi examination.

Since we know that Carl, Alva and Deep are unlikely to have missed out on the English exam, we can divert our attention to determining which individual out of Bithi, Esha and Foni failed to appear for this subject. However, we notice that Bithi's English score is greater than the rest of her scores, thereby helping us eliminate her as the potential candidate.

For Esha: best 3 out of 4 - 85(Hindi), 95(Mathematics), 60(Science)

Avg. = 240/3 = 80 which matches the given value

∴ Esha most likely missed her English examination.

For Foni: best 3 out of 4 - 78(Mathematics), 83(Social Science), 88(Science)

Avg. = 249/3 = 83 which matches the given value

∴ Foni most likely missed her English examination.

Based on Condition I, we know that exactly two candidates missed the examinations for English, Hindi, Science, and Social Science.

For English, we determined these individuals to be Esha and Foni. For Hindi, we determined these individuals to be Alva and Deep. For Science, we know one of the individuals is either Alva or Deep. Given that Carl, Alva and Deep cannot be a part of the group that missed Science or Social Science exam, we can proceed by carefully scrutinizing the rest of the group that includes Bithi, Esha and Foni.

We notice that Bithi has a similar score in both Science and Social Science examination. Assuming that she did miss these exams, let us proceed to check if this was actually the case.

For Bithi: Best 2 out 3 - 90(English), 80(Hindi)

Avg = 170/2 = 85 which matches the given value

∴ Bithi is likely to have missed her Science and Social Science examinations.

We additionally notice that Foni has a similar score in English and Social Science. On considering the best 2 out of 3 scores, the average value of the score for both the subject holds (equal to 83). Thus, we can conclude that Bithi and Foni missed their Social Science examination.

Thus, the students who missed just one exam were: Carl (Mathematics); Esha (English) and one out of Alva and Deep (Hindi).

Hence of the six students, we can correctly determine the missed subjects for four of them (except Alva and Deep):

Mathematics: Carl ; **English**: Esha & Foni ; **Hindi**: Alva & Deep; **Science**: Bithi & one out of Alva and Deep ; **Social Science**: Foni & Bithi

Except for Alva and Deep, we can conclusively comment of the missed subjects of the rest four. Hence, the correct answer is **4**.

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Instructions

Ten musicians (A, B, C, D, E, F, G, H, I and J) are experts in at least one of the following three percussion instruments: tabla, mridangam, and ghatam. Among them, three are experts in tabla but not in mridangam or ghatam, another three are experts in mridangam but not in

tabla or ghatam, and one is an expert in ghatam but not in tabla or mridangam. Further, two are experts in tabla and mridangam but not in ghatam, and one is an expert in tabla and ghatam but not in mridangam.

The following facts are known about these ten musicians.
1. Both A and B are experts in mridangam, but only one of them is also an expert in tabla.
2. D is an expert in both tabla and ghatam.
3. Both F and G are experts in tabla, but only one of them is also an expert in mridangam.
4. Neither I nor J is an expert in tabla.
5. Neither H nor I is an expert in mridangam, but only one of them is an expert in ghatam.
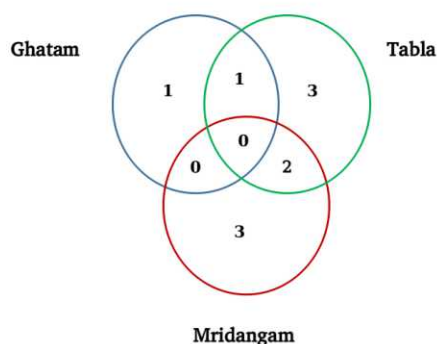
Question 7

Who among the following is DEFINITELY an expert in tabla but not in either mridangam or ghatam?

A F

B C

C A

D H

   Answer: D

Explanation:
Based on the given information, we can form the following Venn-diagram for ease of understanding:

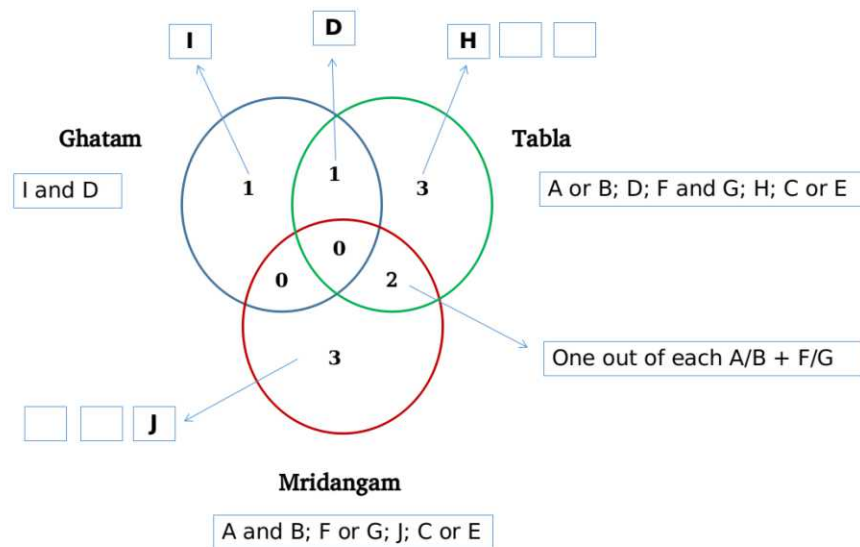The conditions help us to further bifurcate the individuals based on their expertise.

Mridangam: A and B (condition 1); one out of F and G (condition 3)

Tabla: one out of A and B (condition 1); F and G (condition 3); D (condition 2)

Ghatam: D (condition 2)

Based on condition 4, we infer that 'I' and 'J' are either experts in Ghatam or Mridangam. However, condition 5 adds that 'I' is not an expert in Mridangam. This helps us definitively zero-in on 'I' as an expert in Ghatam. Since 'I' is a Ghatam expert, J is an expert in Mridangam and 'H' is an expert in Tabla [based on conditions 4 and 5]. Thus, we can depict our understanding so far as follows:

Mridangam [total: 5] - A and B (condition 1); one out of F and G (condition 3); J (condition 4 and 5); one out of C and E {remaining experts}

Tabla [total: 6] - one out of A and B (condition 1); F and G (condition 3); D (condition 2); H (condition 4 and 5); one out of C and E {remaining experts}

Ghatam [total: 2] - D (condition 2); I (condition 4 and 5)

Thus, we observe that **H** is definitely an expert in tabla but not in either mridangam or ghatam. Hence, Option D is the correct answer.
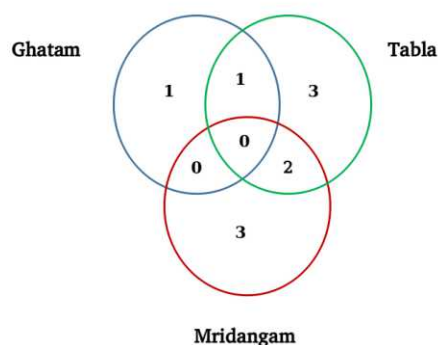
Question 8

Who among the following is DEFINITELY an expert in mridangam but not in either tabla or ghatam?

A   B

B   J

C   G

D   E

   Answer: B

Explanation:
Based on the given information, we can form the following Venn-diagram for ease of understanding:
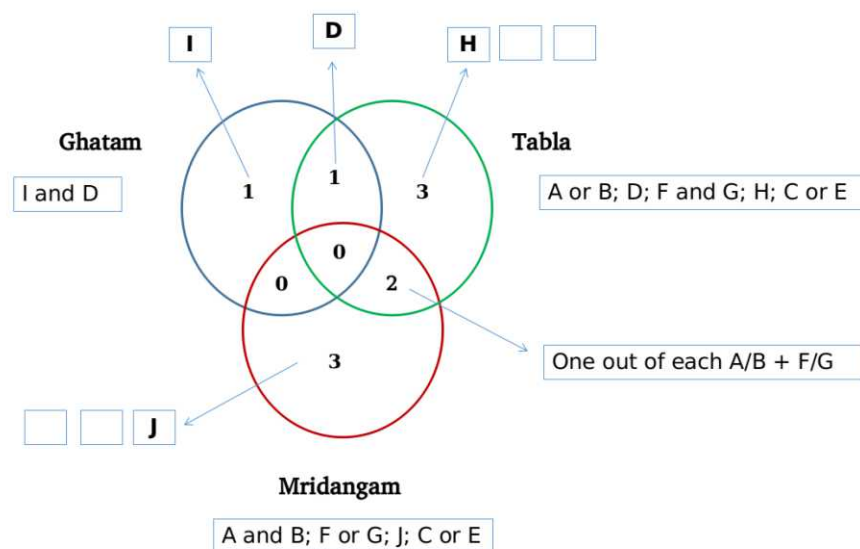

The conditions help us to further bifurcate the individuals based on their expertise.

Mridangam: A and B (condition 1); one out of F and G (condition 3)

Tabla: one out of A and B (condition 1); F and G (condition 3); D (condition 2)

Ghatam: D (condition 2)

Based on condition 4, we infer that 'I' and 'J' are either experts in Ghatam or Mridangam. However, condition 5 adds that 'I' is not an expert in Mridangam. This helps us definitively zero-in on 'I' as an expert in Ghatam. Since 'I' is a Ghatam expert, J is an expert in Mridangam and 'H' is an expert in Tabla [based on conditions 4 and 5]. Thus, we can depict our understanding so far as follows:

Mridangam [total: 5] - A and B (condition 1); one out of F and G (condition 3); J (condition 4 and 5); one out of C and E {remaining experts}

Tabla [total: 6] - one out of A and B (condition 1); F and G (condition 3); D (condition 2); H (condition 4 and 5); one out of C and E {remaining experts}

Ghatam [total: 2] - D (condition 2); I (condition 4 and 5)

Thus, we observe that **J** is definitely an expert in mridangam but not in either tabla or ghatam. Hence, Option B is the correct answer.
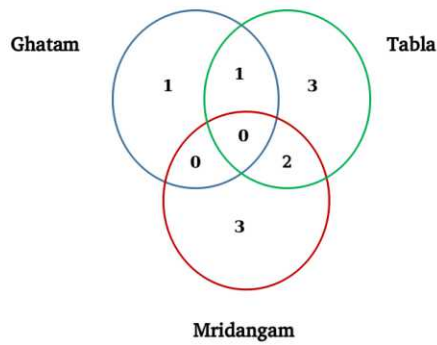
Question 9

Which of the following pairs CANNOT have any musician who is an expert in both tabla and mridangam but not in ghatam?

A   F and G

B   C and E

C   A and B

D   C and F

  Answer: B

Explanation:
Based on the given information, we can form the following Venn-diagram for ease of understanding:
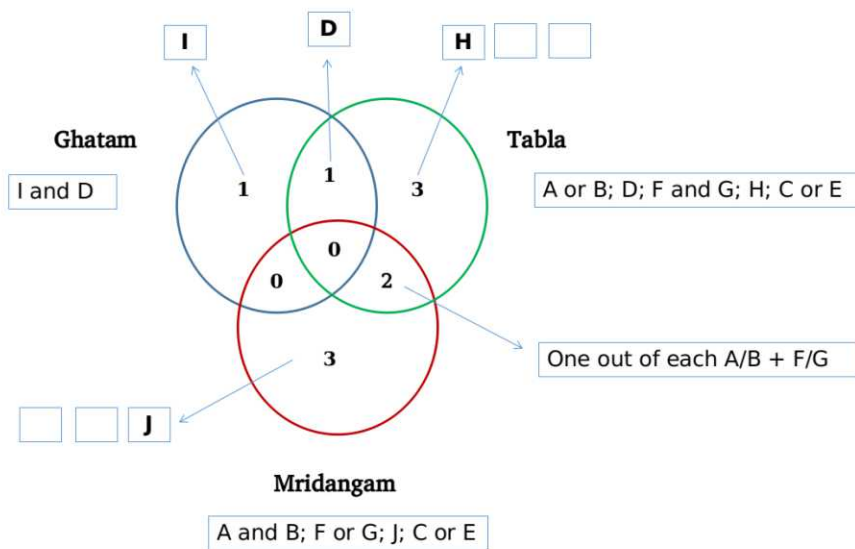
The conditions help us to further bifurcate the individuals based on their expertise.

Mridangam: A and B (condition 1); one out of F and G (condition 3)

Tabla: one out of A and B (condition 1); F and G (condition 3); D (condition 2)

Ghatam: D (condition 2)

Based on condition 4, we infer that 'I' and 'J' are either experts in Ghatam or Mridangam. However, condition 5 adds that 'I' is not an expert in Mridangam. This helps us definitively zero-in on 'I' as an expert in Ghatam. Since 'I' is a Ghatam expert, J is an expert in Mridangam and 'H' is an expert in Tabla [based on conditions 4 and 5]. Thus, we can depict our understanding so far as follows:

Mridangam [total: 5] - A and B (condition 1); one out of F and G (condition 3); J (condition 4 and 5); one out of C and E {remaining experts}

Tabla [total: 6] - one out of A and B (condition 1); F and G (condition 3); D (condition 2); H (condition 4 and 5); one out of C and E {remaining experts}

Ghatam [total: 2] - D (condition 2); I (condition 4 and 5)

We observe that the pair **C and E** cannot have any musician who is an expert in both tabla and mridangam but not in ghatam. Hence, Option B is the correct answer.
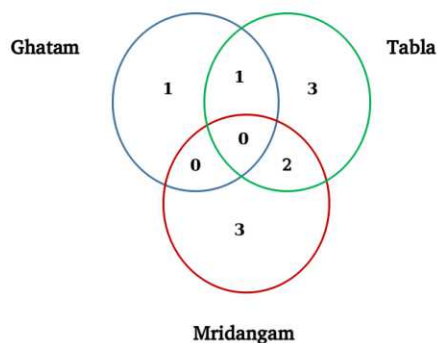
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Question 10

If C is an expert in mridangam and F is not, then which are the three musicians who are experts in tabla but not in either mridangam or ghatam?

A   E, F and H

B   C, G and H

C   E, G and H

D   C, E and G

   Answer: A

Explanation:
Based on the given information, we can form the following Venn-diagram for ease of understanding:
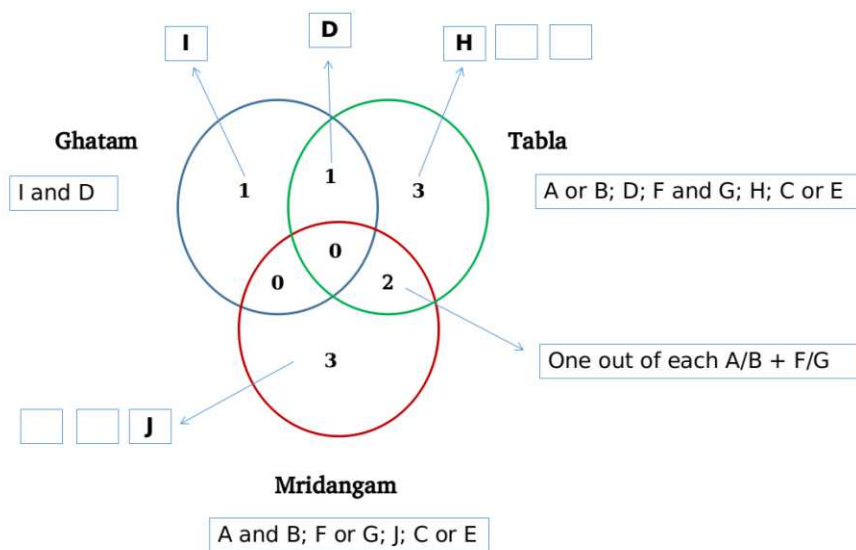

The conditions help us to bifurcate the individuals based on their expertise -

Mridangam: A and B (condition 1); one out of F and G (condition 3)

Tabla: one out of A and B (condition 1); F and G (condition 3); D (condition 2)

Ghatam: D (condition 2)

Based on condition 4, we infer that 'I' and 'J' are either experts in Ghatam or Mridangam. However, condition 5 adds that 'I' is not an expert in Mridangam. This helps us definitively zero-in on 'I' as an expert in Ghatam. Since 'I' is a Ghatam expert, J is an expert in Mridangam, and 'H' is an expert in Tabla [based on conditions 4 and 5]. Thus, we can depict our understanding so far as follows:

Mridangam [total: 5] - A and B (condition 1); one out of F and G (condition 3); J (condition 4 and 5); one out of C and E {remaining experts}

Tabla [total: 6] - one out of A and B (condition 1); F and G (condition 3); D (condition 2); H (condition 4 and 5); one out of C and E {remaining experts}

Ghatam [total: 2] - D (condition 2); I (condition 4 and 5)

If C is an expert in Mridangam, E has to be an expert in Tabla. Additionally, if F is not an expert in Mridangam, he has to be an expert only in Tabla while G will be an expert in both Tabla and Mridangam.

Tabla [total: 6] - one out of A and B (condition 1); F and G (condition 3); D (condition 2); H (condition 4 and 5); E {based on the condition given in the question}

Of these experts, A, B and G are experts of Mridangam and D is an expert of Ghatam as well. Thus, excluding these, we have F, H and E who are the experts solely in Tabla. Thus, Option A is the correct answer.

Instructions

The local office of the APP-CAB company evaluates the performance of five cab drivers, Arun, Barun, Chandan, Damodaran, and Eman for their monthly payment based on ratings in five different parameters (P1 to P5) as given below:
P1: timely arrival
P2: behaviour
P3: comfortable ride
P4: driver's familiarity with the route
P5: value for money

Based on feedback from the customers, the office assigns a rating from 1 to 5 in each of these parameters. Each rating is an integer from a low value of 1 to a high value of 5. The final rating of a driver is the average of his ratings in these five parameters. The monthly payment of the drivers has two parts - a fixed payment and final rating-based bonus. If a driver gets a rating of 1 in any of the parameters, he is not eligible to get bonus. To be eligible for bonus a driver also needs to get a rating of five in at least one of the parameters. The partial information related to the ratings of the drivers in different parameters and the monthly payment structure (in rupees) is given in the table below:

	P1	P2	P3	P4	P5	Fixed Payment	Bonus
Arun				4		Rs.1000	Rs.250× Final Rating
Barun	3					Rs.1200	Rs.200× Final Rating
Chandan			2			Rs.1400	Rs.100× Final Rating
Damodaran		3				Rs.1300	Rs.150× Final Rating
Eman					2	Rs.1100	Rs.200× Final Rating

The following additional facts are known.
1. Arun and Barun have got a rating of 5 in exactly one of the parameters. Chandan has got a rating of 5 in exactly two parameters.
2. None of drivers has got the same rating in three parameters.

Question 11

If Damodaran does not get a bonus, what is the maximum possible value of his final rating?

A 3.4

B 3.2

C 3.6

D 3.8

Answer: C

Explanation:
Based on the given conditions, Damodaran misses out on the bonus if he gets a rating of 1 in any of the five parameters. He additionally needs to obtain a rating of 5 in at least one of the parameters. Thus, the maximum value of the range of ratings that he can acquire would be 1+3(given)+5+5+5. However, based on condition 2, he can have similar ratings in only two of the parameters. Thus, the maximum value of the final rating would be (1+3+5+5+4) /5 = 18/5 = 3.6. Hence, Option C is the correct answer.

Question 12

If Eman gets a bonus, what is the minimum possible value of his final rating?

A 3.2

B 2.8

C 3.4

D 3.0

    Answer: D

Explanation:
Since Eman got a bonus, he must have obtained a rating of 5 in at least one of the parameters. To minimize his final rating we need to consider the following range of values: 5(mandatory)+2(given)+2+3+3 = 15. The least value of his final rating is, therefore, 15/5 = 3. Hence, Option D is the correct answer.

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Question 13

If all five drivers get bonus, what is the minimum possible value of the monthly payment (in rupees) that a driver gets?

A 1750

B 1600

C 1740

D 1700

    Answer: D

Explanation:
Our objective here is to minimize the final ratings in order to find the minimum value of the monthly payment. We cannot have a rating of 1 in any of the parameters since all the drives got the bonus and we need to have at least one parameter with a rating of 5. With this understanding, we obtain the following:

Arun:

Final rating = (5+4+2+2+3)/5 = 16/5 = 3.2; Fixed payment = Rs.1000

Variable payment = 3.2 * Rs. 250 = Rs.800 ; Total = Rs.(1000+800) = Rs. **1800**

Barun:

Final rating = (5+3+2+2+3)/5 = 15/5 = 3; Fixed payment = Rs.1200

Variable payment = 3 * Rs. 200 = Rs.600 ; Total = Rs.(1200+600) = Rs. **1800**

Chandan: {rating of 5 in exactly two parameters based on condition 1}

Final rating = (5+5+2+2+3)/5 = 17/5 = 3.4; Fixed payment = Rs.1400

Variable payment = 3.4 * Rs. 100 = Rs.340 ; Total = Rs.(1400+340) = Rs. **1740**

Damodaran:

Final rating = (5+3+2+2+3)/5 = 15/5 = 3; Fixed payment = Rs.1300

Variable payment = 3 * Rs. 150 = Rs.450 ; Total = Rs.(1300+450) = Rs. **1750**

Eman:

Final rating = (5+3+2+2+3)/5 = 15/5 = 3; Fixed payment = Rs.1100

Variable payment = 3 * Rs. 200 = Rs.600 ; Total = Rs.(1100+600) = Rs. **1700**

Hence, we observe that the minimum value of the monthly payment is Rs. 1700. Option D is the correct answer.

Question 14

If all five drivers get bonus, what is the maximum possible value of the monthly payment (in rupees) that a driver gets?

A 1960

B 2050

C 1950

D 1900

Answer: A

Explanation:

Our objective here is to maximize the final ratings in order to find the maximum possible value of the monthly payment. We cannot have a rating of 1 in any of the parameters since all the drives got the bonus and we need to have at least one parameter with a rating of 5. With this understanding, we obtain the following:

Arun: {can have only one rating of 5 based on condition 1}

Final rating = (5+4+4+3+3)/5 = 19/5 = 3.8; Fixed payment = Rs.1000

Variable payment = 3.8 * Rs. 250 = Rs.950 ; Total = Rs.(1000+950) = Rs. **1950**

Barun: {can have only one rating of 5 based on condition 1}

Final rating = (5+4+4+3+3)/5 = 19/5 = 3.8; Fixed payment = Rs.1200

Variable payment = 3.8 * Rs. 200 = Rs.760 ; Total = Rs.(1200+760) = Rs. **1960**

Chandan:

Final rating = (5+5+2+4+4)/5 = 20/5 = 4; Fixed payment = Rs.1400

Variable payment = 4 * Rs. 100 = Rs.400 ; Total = Rs.(1400+400) = Rs. **1800**

Damodaran:

Final rating = (5+5+4+4+3)/5 = 21/5 = 4.2; Fixed payment = Rs.1300

Variable payment = 4.2 * Rs. 150 = Rs.630 ; Total = Rs.(1300+630) = Rs. **1930**

Eman:

Final rating = (5+5+2+4+4)/5 = 20/5 = 4; Fixed payment = Rs.1100

Variable payment = 4 * Rs. 200 = Rs.800 ; Total = Rs.(1100+800) = Rs. **1900**

Hence, we observe that the maximum possible value of the monthly payment is Rs. 1960. Option A is the correct answer.

Instructions

1000 patients currently suffering from a disease were selected to study the effectiveness of treatment of four types of medicines — A, B, C and D. These patients were first randomly assigned into two groups of equal size, called treatment group and control group. The patients in the control group were not treated with any of these medicines; instead they were given a dummy medicine, called placebo, containing only sugar and starch. The following information is known about the patients in the treatment group.

a. A total of 250 patients were treated with type A medicine and a total of 210 patients were treated with type C medicine.
b. 25 patients were treated with type A medicine only. 20 patients were treated with type C medicine only. 10 patients were treated with type D medicine only.
c. 35 patients were treated with type A and type D medicines only. 20 patients were treated with type A and type B medicines only. 30 patients were treated with type A and type C medicines only. 20 patients were treated with type C and type D medicines only.
d. 100 patients were treated with exactly three types of medicines.
e. 40 patients were treated with medicines of types A, B and C, but not with medicines of type D. 20 patients were treated with medicines of types A, C and D, but not with medicines of type B.
f. 50 patients were given all the four types of medicines. 75 patients were treated with exactly one type of medicine.
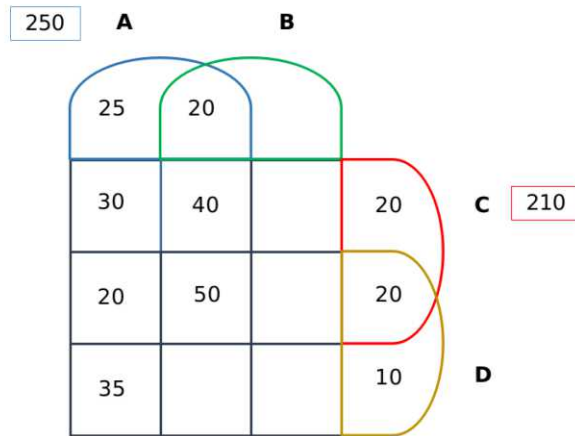
Question 15

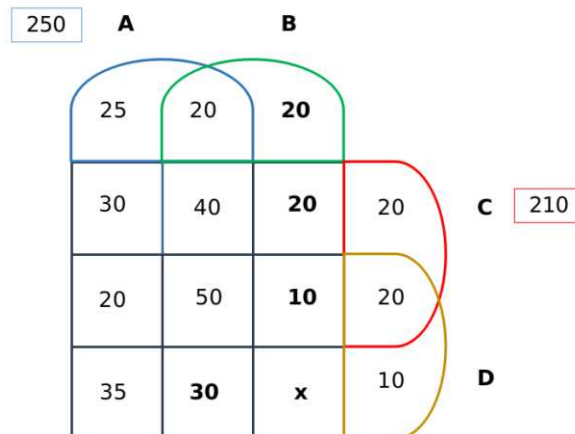How many patients were treated with medicine type B?

Answer: 340

Explanation:
Of the 1000 subjects, only 500 have been considered for the treatment. This constitutes our sample set. Thus the four drugs- A, B, C and D have been administered to this set of 500 individuals, while the rest 500 have been given the placebo. Based on the given information, we can then draw the following 4-set Venn diagram:
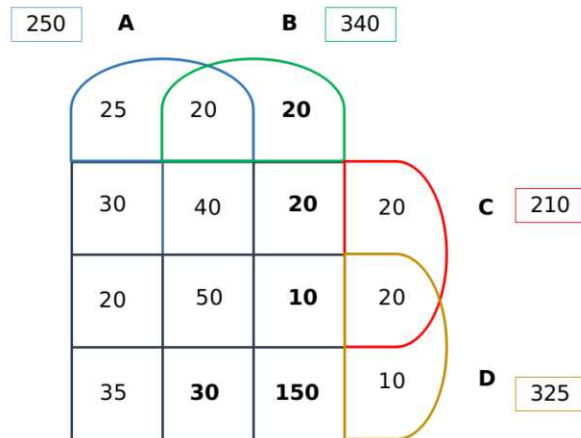
We can solve for the number of patients who were administered the drugs A, B and D excluding C by putting in the values for set A. The required value = 250 - (25+20+30+40+20+50+35) = **30**. Based on condition (c), we know that 100 patients were treated with exactly three types of medicines. Thus, we can fill the slot for the number of patients who were administered only B, C and D excluding A by 100 - (40+20+30) = **10**.

Similarly, based on condition (f), we know that the candidates who were administered only dug B are 75 - (25+20+10) = **20**. Post this, we can easily calculate the number of people administered with only drugs B and C by 210 - (30+20+40+50+10+20+20) = **20**. We can fill in the above values to obtain the following diagram:

The sum of all the values should add up to 500. On solving for 'x' [which represents the number of people who were administered drugs B and D only], we obtain x = **150**. The final representation would appear as follows:

Based on the above, the number of patients who were treated with medicine type B is equal to **340**.
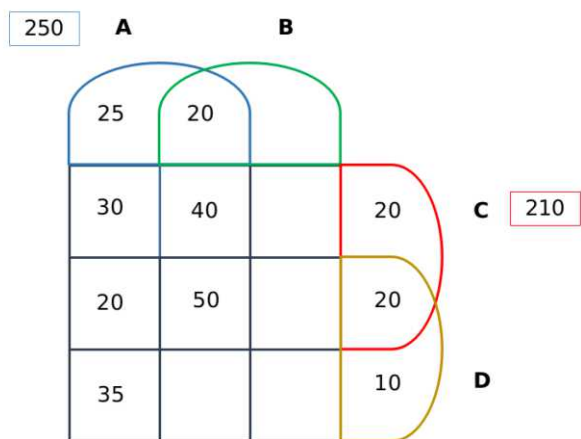
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Question 16

The number of patients who were treated with medicine types B, C and D, but not type A was:
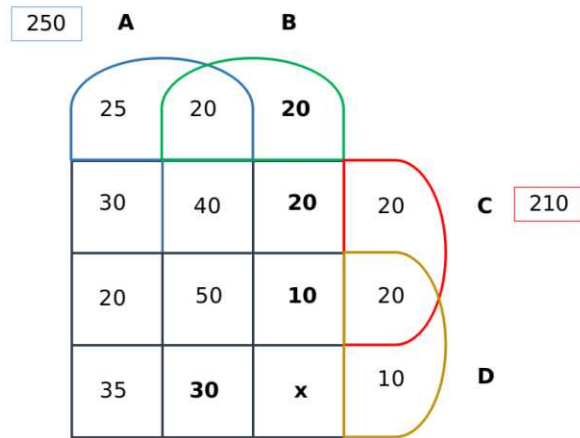
Answer:10

Explanation:
Of the 1000 subjects, only 500 have been considered for the treatment. This constitutes our sample set. Thus the four drugs- A, B, C and D have been administered to this set of 500 individuals, while the rest 500 have been given the placebo. Based on the given information, we can then draw the following 4-set Venn diagram:

We can solve for the number of patients who were administered the drugs A, B and D excluding C by putting in the values for set A. The required value = 250 - (25+20+30+40+20+50+35) = **30**. Based on condition (c), we know that 100 patients were treated with exactly three types of medicines. Thus, we can fill the slot for the number of patients who were administered only B, C and D excluding A by 100 - (40+20+30) = **10**.

Similarly, based on condition (f), we know that the candidates who were administered only dug B are 75 - (25+20+10) = **20**. Post this, we can easily calculate the number of people administered with only drugs B and C by 210 - (30+20+40+50+10+20+20) = **20**. We can fill in the above values to obtain the following diagram:

The sum of all the values should add up to 500. On solving for 'x' [which represents the number of people who were administered drugs B and D only], we obtain x = **150**. The final representation would appear as follows:

The number of patients who were treated with medicine types B, C and D, but not type A was: **10**.

Question 17

How many patients were treated with medicine types B and D only?

Answer:150

Explanation:
Of the 1000 subjects, only 500 have been considered for the treatment. This constitutes our sample set. Thus the four drugs- A, B, C and D have been administered to this set of 500 individuals, while the rest 500 have been given the placebo. Based on the given information, we can then draw the following 4-set Venn diagram:
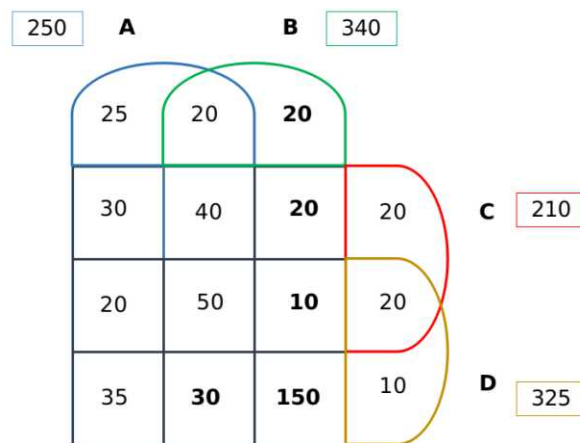
We can solve for the number of patients who were administered the drugs A, B and D excluding C by putting in the values for set A. The required value = 250 - (25+20+30+40+20+50+35) = **30**. Based on condition (c), we know that 100 patients were treated with exactly three types of medicines. Thus, we can fill the slot for the number of patients who were administered only B, C and D excluding A by 100 - (40+20+30) = **10**.

Similarly, based on condition (f), we know that the candidates who were administered only dug B are 75 - (25+20+10) = **20**. Post this, we can easily calculate the number of people administered with only drugs B and C by 210 - (30+20+40+50+10+20+20) = **20**. We can fill in the above values to obtain the following diagram:

The sum of all the values should add up to 500. On solving for 'x' [which represents the number of people who were administered drugs B and D only], we obtain x = **150**. The final representation would appear as follows:

The number of people who were administered drugs B and D only were **150**.

Question 18

The number of patients who were treated with medicine type D was:
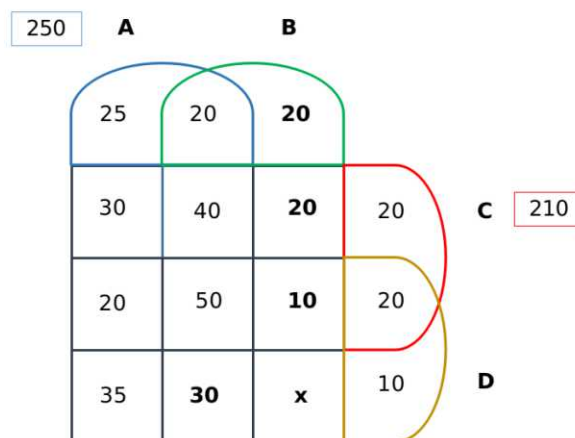
Answer:325

Explanation:
Of the 1000 subjects, only 500 have been considered for the treatment. This constitutes our sample set. Thus the four drugs- A, B, C and D have been administered to this set of 500 individuals, while the rest 500 have been given the placebo. Based on the given information, we can then draw the following 4-set Venn diagram:
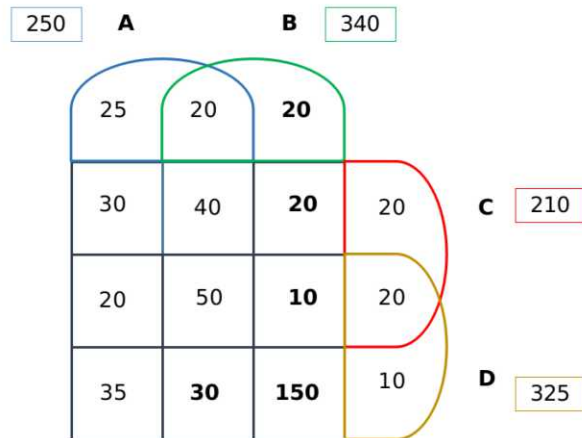

We can solve for the number of patients who were administered the drugs A, B and D excluding C by putting in the values for set A. The required value = 250 - (25+20+30+40+20+50+35) = **30**. Based on condition (c), we know that 100 patients were treated with exactly three types of medicines. Thus, we can fill the slot for the number of patients who were administered only B, C and D excluding A by 100 - (40+20+30) = **10**.

Similarly, based on condition (f), we know that the candidates who were administered only dug B are 75 - (25+20+10) = **20**. Post this, we can easily calculate the number of people administered with only drugs B and C by 210 - (30+20+40+50+10+20+20) = **20**. We can fill in the above values to obtain the following diagram:

The sum of all the values should add up to 500. On solving for 'x' [which represents the number of people who were administered drugs B and D only], we obtain x = **150**. The final representation would appear as follows:

The number of patients who were treated with medicine type D was **325**.

Free CAT Study Material

Instructions

Four institutes, A, B, C, and D, had contracts with four vendors W, X, Y, and Z during the ten calendar years from 2010 to 2019. The contracts were either multi-year contracts running for several consecutive years or single-year contracts. No institute had more than one contract with the same vendor. However, in a calendar year, an institute may have had contracts with multiple vendors, and a vendor may have had contracts with multiple institutes. It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes.

The following facts are also known about these contracts.
I. Vendor Z had at least one contract in every year.
II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that.
III. Vendor Y had contracts in 2010 and 2019. Vendor W had contracts only in 2012.
IV. There were five contracts in 2012.
V. There were exactly four multi-year contracts. Institute B had a 7-year contract, D had a 4-year contract, and A and C had one 3-year contract each. The other four contracts were single-year contracts.
VI. Institute C had one or more contracts in 2012 but did not have any contract in 2011.

VII. Institutes B and D each had exactly one contract in 2012. Institute D did not have any contract in 2010.

Question 19

In which of the following years were there two or more contracts?

A   2017

B   2016

C   2015

D   2018

Answer: C

Explanation:
From IV: A, B, C, D have one 3, 7, 3, 4-year contract respectively and all other contracts are one-year contracts.

From I, Z has at least one contract every year, the only possible combination is 7+3 or 7+4 year contract and that 7-year contract must be from B.

From III, Vendor W had contracts only in 2012 and from VII, Institutes B and D each had exactly one contract in 2012 => W has got contracts from A and C.
From II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that and from VI, VII: C and D didn't have any contract in 2011 and 2010 respectively => A should have X as a 3-year contract from 2010-2012. Now, for 2013-2015 X can't have B for the same. So, X must have got contracts from either C or D in that period.

Case 1:

X has C as a 3-year contract from 2013-2015 but in this case, D can't have any contract in 2012 so, this case is not valid.

Case 2:

X has D for a 4-year contract from 2012-2015 and C must have Z for a three-year contract in the period 2017-2019 such that Z has at least one contract every year.

It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes => A hasn't got any contract from 2013-2019 as it has X, W in the period 2010-2012 and similarly, C shouldn't have any contracts in the years 2010, 2013, 2014, 2015, 2016.

From III, Vendor Y had contracts in 2010 and 2019 and in 2010 D and C hasn't got any contract and A has already got 2 different contracts from two different vendors => Y has a contract from B in 2010 => B hasn't got any contracts in 2017, 2018, 2019.

For Y the only possible contract will be from D => D has got no contracts in the years 2011, 2016, 2017, 2018.

Now, the table looks like:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	X	X	X,W	N	N	N	N	N	N	N
B	Z, Y	Z	Z	Z	Z	Z	Z	N	N	N
C	N	N	W	N	N	N	N	Z	Z	Z
D	N	N	X	X	X	X	N	N	N	Y

'N' represents no contract.

Out of the given options, only 2015 has two contracts and rest have only one contract in that particular year.

Question 20

Which of the following is true?

A   B had a contract with Z in 2017

B   B had a contract with Y in 2019

C   D had a contract with X in 2011

D   D had a contract with Y in 2019

   Answer: D

Explanation:
From IV: A, B, C, D have one 3, 7, 3, 4-year contract respectively and all other contracts are one-year contracts.

From I, Z has at least one contract every year, the only possible combination is 7+3 or 7+4 year contract and that 7-year contract must be from B.

From III, Vendor W had contracts only in 2012 and from VII, Institutes B and D each had exactly one contract in 2012 => W has got contracts from A and C.
From II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that and from VI, VII: C and D didn't have any contract in 2011 and 2010 respectively => A should have X as a 3-year contract from 2010-2012. Now, for 2013-2015 X can't have B for the same. So, X must have got contracts from either C or D in that period.

Case 1:

X has C as a 3-year contract from 2013-2015 but in this case, D can't have any contract in 2012 so, this case is not valid.

Case 2:

X has D for a 4-year contract from 2012-2015 and C must have Z for a three-year contract in the period 2017-2019 such that Z has at least one contract every year.

It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes => A hasn't got any contract from 2013-2019 as it has X, W in the period 2010-2012 and similarly, C shouldn't have any contracts in the years 2010, 2013, 2014, 2015, 2016.

From III, Vendor Y had contracts in 2010 and 2019 and in 2010 D and C hasn't got any contract and A has already got 2 different contracts from two different vendors => Y has a contract from B in 2010 => B hasn't got any contracts in 2017, 2018, 2019.

For Y the only possible contract will be from D => D has got no contracts in the years 2011, 2016, 2017, 2018.

Now, the table looks like:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	X	X	X,W	N	N	N	N	N	N	N
B	Z, Y	Z	Z	Z	Z	Z	Z	N	N	N
C	N	N	W	N	N	N	N	Z	Z	Z
D	N	N	X	X	X	X	N	N	N	Y

'N' represents no contract.

Option D is true.

Question 21

In how many years during this period was there only one contract?

A   3

B   2

C   4

D   5

     Answer: A

Explanation:

From IV: A, B, C, D have one 3, 7, 3, 4-year contract respectively and all other contracts are one-year contracts.

From I, Z has at least one contract every year, the only possible combination is 7+3 or 7+4 year contract and that 7-year contract must be from B.

From III, Vendor W had contracts only in 2012 and from VII, Institutes B and D each had exactly one contract in 2012 => W has got contracts from A and C.

From II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that and from VI, VII: C and D didn't have any contract in 2011 and 2010 respectively => A should have X as a 3-year contract from 2010-2012. Now, for 2013-2015 X can't have B for the same. So, X must have got contracts from either C or D in that period.

Case 1:

X has C as a 3-year contract from 2013-2015 but in this case, D can't have any contract in 2012 so, this case is not valid.

Case 2:

X has D for a 4-year contract from 2012-2015 and C must have Z for a three-year contract in the period 2017-2019 such that Z has at least one contract every year.

It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes => A hasn't got any contract from 2013-2019 as it has X, W in the period 2010-2012 and similarly, C shouldn't have any contracts in the years 2010, 2013, 2014, 2015, 2016.

From III, Vendor Y had contracts in 2010 and 2019 and in 2010 D and C hasn't got any contract and A has already got 2 different contracts from two different vendors => Y has a contract from B in 2010 => B hasn't got any contracts in 2017, 2018, 2019.

For Y the only possible contract will be from D => D has got no contracts in the years 2011, 2016, 2017, 2018.

Now, the table looks like:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	X	X	X,W	N	N	N	N	N	N	N
B	Z, Y	Z	Z	Z	Z	Z	Z	N	N	N
C	N	N	W	N	N	N	N	Z	Z	Z
D	N	N	X	X	X	X	N	N	N	Y

'**N**' represents no contract.

Only during 2016, 2017 and 2018, there was only one contract.

Question 22

What BEST can be concluded about the number of contracts in 2010?

A exactly 4

B exactly 3

C at least 3

D at least 4

   Answer: B

Explanation:
From IV: A, B, C, D have one 3, 7, 3, 4-year contract respectively and all other contracts are one-year contracts.

From I, Z has at least one contract every year, the only possible combination is 7+3 or 7+4 year contract and that 7-year contract must be from B.

From III, Vendor W had contracts only in 2012 and from VII, Institutes B and D each had exactly one contract in 2012 => W has got contracts from A and C.
From II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that and from VI, VII: C and D didn't have any contract in 2011 and 2010 respectively => A should have X as a 3-year contract from 2010-2012. Now, for 2013-2015 X can't have B for the same. So, X must have got contracts from either C or D in that period.

Case 1:

X has C as a 3-year contract from 2013-2015 but in this case, D can't have any contract in 2012 so, this case is not valid.

Case 2:

X has D for a 4-year contract from 2012-2015 and C must have Z for a three-year contract in the period 2017-2019 such that Z has at least one contract every year.

It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes => A hasn't got any contract from 2013-2019 as it has X, W in the period 2010-2012 and similarly, C shouldn't have any contracts in the years 2010, 2013, 2014, 2015, 2016.

From III, Vendor Y had contracts in 2010 and 2019 and in 2010 D and C hasn't got any contract and A has already got 2 different contracts from two different vendors => Y has a contract from B in 2010 => B hasn't got any contracts in 2017, 2018, 2019.

For Y the only possible contract will be from D => D has got no contracts in the years 2011, 2016, 2017, 2018.

Now, the table looks like:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	X	X	X,W	N	N	N	N	N	N	N
B	Z, Y	Z	Z	Z	Z	Z	Z	N	N	N
C	N	N	W	N	N	N	N	Z	Z	Z
D	N	N	X	X	X	X	N	N	N	Y

'N' represents no contract.

The Number of contracts in 2010 is three.

Question 23

Which institutes had multiple contracts during the same year?

A   A only

B   B and C only

C   A and B only

D   B only

  Answer: C

Explanation:

From IV: A, B, C, D have one 3, 7, 3, 4-year contract respectively and all other contracts are one-year contracts.\

From I, Z has at least one contract every year, the only possible combination is 7+3 or 7+4 year contract and that 7-year contract must be from B.

From III, Vendor W had contracts only in 2012 and from VII, Institutes B and D each had exactly one contract in 2012 => W has got contracts from A and C.

From II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that and from VI, VII: C and D didn't have any contract in 2011 and 2010 respectively => A should have X as a 3-year contract from 2010-2012. Now, for 2013-2015 X can't have B for the same. So, X must have got contracts from either C or D in that period.

Case 1:

X has C as a 3-year contract from 2013-2015 but in this case, D can't have any contract in 2012 so, this case is not valid.

Case 2:

X has D for a 4-year contract from 2012-2015 and C must have Z for a three-year contract in the period 2017-2019 such that Z has at least one contract every year.

It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes => A hasn't got any contract from 2013-2019 as it has X, W in the period 2010-2012 and similarly, C shouldn't have any contracts in years 2010, 2013, 2014, 2015, 2016.

From III, Vendor Y had contracts in 2010 and 2019 and in 2010 D and C hasn't got any contract and A has already got 2 different contracts from two different vendors => Y has a contract from B in 2010 => B hasn't got any contracts in 2017, 2018, 2019.

For Y the only possible contract will be from D => D has got no contracts in the years 2011, 2016, 2017, 2018.

Now, the table looks like:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	X	X	X,W	N	N	N	N	N	N	N
B	Z, Y	Z	Z	Z	Z	Z	Z	N	N	N
C	N	N	W	N	N	N	N	Z	Z	Z
D	N	N	X	X	X	X	N	N	N	Y

'N' represents no contract.

B and A have multiple contracts in a single year.

Question 24

Which institutes and vendors had more than one contracts in any year?

A B, W, X, and Z

B A, B, W, and X

C A, D, W, and Z

D B, D, W, and X

Answer: B

Explanation:

From IV: A, B, C, D have one 3, 7, 3, 4-year contract respectively and all other contracts are one-year contracts.\

From I, Z has at least one contract every year, the only possible combination is 7+3 or 7+4 year contract and that 7-year contract must be from B.

From III, Vendor W had contracts only in 2012 and from VII, Institutes B and D each had exactly one contract in 2012 => W has got contracts from A and C.

From II. Vendor X had one or more contracts in every year up to 2015, but no contract in any year after that and from VI, VII: C and D didn't have any contract in 2011 and 2010 respectively => A should have X as a 3-year contract from 2010-2012. Now, for 2013-2015 X can't have B for the same. So, X must have got contracts from either C or D in that period.

Case 1:

X has C as a 3-year contract from 2013-2015 but in this case, D can't have any contract in 2012 so, this case is not valid.

Case 2:

X has D for a 4-year contract from 2012-2015 and C must have Z for a three-year contract in the period 2017-2019 such that Z has at least one contract every year.

It is known that over the decade, the institutes each got into two contracts with two of these vendors, and each vendor got into two contracts with two of these institutes => A hasn't got any contract from 2013-2019 as it has X, W in the period 2010-2012 and similarly, C shouldn't have any contracts in years 2010, 2013, 2014, 2015, 2016.

From III, Vendor Y had contracts in 2010 and 2019 and in 2010 D and C hasn't got any contract and A has already got 2 different contracts from two different vendors => Y has a contract from B in 2010 => B hasn't got any contracts in 2017, 2018, 2019.

For Y the only possible contract will be from D => D has got no contracts in the years 2011, 2016, 2017, 2018.

Now, the table looks like:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	X	X	X,W	N	N	N	N	N	N	N
B	Z, Y	Z	Z	Z	Z	Z	Z	N	N	N
C	N	N	W	N	N	N	N	Z	Z	Z
D	N	N	X	X	X	X	N	N	N	Y

'N' represents no contract.

A, B, W, X had more than one contracts in a single year

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