CAT 2020 Slot 1 DILR

1. **Answer the following questions based on the given caselet:**

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 multiyear 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, each institute 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

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

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

A. **Which institutes and vendors had more than one contract in any year?**

> **A**   B, W, X, and Z

B	B, D, W, and X

C	**A, B, W, and X**

D	A, D, W, and Z

Solution

From statement v, institutes A, B, C, and D have one 3-, 7-, 3-, and 4-year contract, respectively.
The remaining four contracts are one-year contracts.

From statement i, Vendor Z had a contract every year. Therefore, he must have 2 multi-year contracts, which must include a 7-year contract with B.

From statement ii, Vendor X had one or more contracts from 2010 to 2015. Hence, he must have 2 multi-year contracts.
Both X and Z must have a contract in 2010, which means two of the four multi-year contracts must start in 2010.

From statement vii, D did not have a contract in 2010.

From statement vi, C did not have a contract in 2011.

Hence, both institutes C and D cannot start a multi-year contract in 2010. Therefore, the only possibility is that B had a 7-year contract with Z and A had a 3- year contract with X in 2010.
X and Z have 2 multi-year contracts each; hence, W and Y must have only singleyear contracts.

From statement iii, Y had contracts in 2010 and 2019. Hence, Y had single-year contracts in 2010 and 2019. In the remaining years, Y did not have a contract. Similarly, W had contracts only in 2012 (from statement iii).

He must have 2 single-year contracts in 2012 and no contract in the remaining years.

Substituting the above values, we can complete the table as given below:

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

Using the table, we can say that institutes A and B and vendors X and W had multiple contracts in the same year.

B. Which institutes had multiple contracts during the same year?

A) A only

B) B only

| C | A and B only |

| D | B and C only |

Solution

From statement v, institutes A, B, C, and D have one 3-, 7-, 3-, and 4-year contract, respectively.
The remaining four contracts are one-year contracts.

From statement i, Vendor Z had a contract every year. Therefore, he must have 2 multi-year contracts, which must include a 7-year contract with B.

From statement ii, Vendor X had one or more contracts from 2010 to 2015. Hence, he must have 2 multi-year contracts.
Both X and Z must have a contract in 2010, which means two of the four multi-year contracts must start in 2010.

From statement vii, D did not have a contract in 2010.

From statement vi, C did not have a contract in 2011.

Hence, both institutes C and D cannot start a multi-year contract in 2010. Therefore, the only possibility is that B had a 7-year contract with Z and A had a 3- year contract with X in 2010.
X and Z have 2 multi-year contracts each; hence, W and Y must have only singleyear contracts.

From statement iii, Y had contracts in 2010 and 2019. Hence, Y had single-year contracts in 2010 and 2019. In the remaining years, Y did not have a contract. Similarly, W had contracts only in 2012 (from statement

iii).

He must have 2 single-year contracts in 2012 and no contract in the remaining years.

Substituting the above values, we can complete the table as given below:

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

From the table, we can say that Institute A had multiple contracts in 2012 and Institute B had multiple contracts in 2010.

C. **What best can be concluded about the number of contracts in 2010?**

A. Exactly 4

B. Exactly 3

C. At least 3

Solution

From statement v, institutes A, B, C, and D have one 3-, 7-, 3-, and 4-year contract, respectively.
The remaining four contracts are one-year contracts.

From statement i, Vendor Z had a contract every year. Therefore, he must have 2 multi-year contracts, which must include a 7-year contract with B.

From statement ii, Vendor X had one or more contracts from 2010 to 2015. Hence, he must have 2 multi-year contracts.
Both X and Z must have a contract in 2010, which means two of the four multi-year contracts must start in 2010.

From statement vii, D did not have a contract in 2010.

From statement vi, C did not have a contract in 2011.

Hence, both institutes C and D cannot start a multi-year contract in 2010. Therefore, the only possibility is that B had a 7-year contract with Z and A had a 3- year contract with X in 2010.
X and Z have 2 multi-year contracts each; hence, W and Y must have only singleyear contracts.

From statement iii, Y had contracts in 2010 and 2019. Hence, Y had single-year contracts in 2010 and 2019. In the remaining years, Y did not have a contract. Similarly, W had contracts only in 2012 (from statement iii).

He must have 2 single-year contracts in 2012 and no contract in the remaining years.

Substituting the above values, we can complete the table as given below:

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

So, there were exactly three contracts in the year 2010.

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

A) 2

B) 5

C) 4

D) 3

Solution

From statement v, institutes A, B, C, and D have one 3-, 7-, 3-, and 4-year contract, respectively.
The remaining four contracts are one-year contracts.

From statement i, Vendor Z had a contract every year. Therefore, he must have 2 multi-year contracts, which must include a 7-year contract with B.

From statement ii, Vendor X had one or more contracts from 2010 to 2015. Hence, he must have 2 multi-year contracts.
Both X and Z must have a contract in 2010, which means two of the four multi-year contracts must start in 2010.

From statement vii, D did not have a contract in 2010.

From statement vi, C did not have a contract in 2011.

Hence, both institutes C and D cannot start a multi-year contract in 2010. Therefore, the only possibility is that B had a 7-year contract with Z and A had a 3- year contract with X in 2010.
X and Z have 2 multi-year contracts each; hence, W and Y must have only singleyear contracts.

From statement iii, Y had contracts in 2010 and 2019. Hence, Y had single-year contracts in 2010 and 2019. In the remaining years, Y did not have a contract. Similarly, W had contracts only in 2012 (from statement iii).

He must have 2 single-year contracts in 2012 and no contract in the remaining years.

Substituting the above values, we can complete the table as given below:

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

There was only one contract in the years 2016, 2017, and 2018.

E. **Which of the following is true?**

A B had a contract with Y in 2019.

B B had a contract with Z in 2017.

C D had a contract with X in 2011.

D **D had a contract with Y in 2019.**

Solution

From statement v, institutes A, B, C, and D have one 3-, 7-, 3-, and 4-year contract, respectively.
The remaining four contracts are one-year contracts.

From statement i, Vendor Z had a contract every year. Therefore, he must have 2 multi-year contracts, which must include a 7-year contract with B.

From statement ii, Vendor X had one or more contracts from 2010 to 2015. Hence, he must have 2 multi-year contracts.
Both X and Z must have a contract in 2010, which means two of the four multi-year contracts must start in 2010.

From statement vii, D did not have a contract in 2010.

From statement vi, C did not have a contract in 2011.

Hence, both institutes C and D cannot start a multi-year contract in 2010. Therefore, the only possibility is that B had a 7-year contract with Z and A had a 3- year contract with X in 2010.
X and Z have 2 multi-year contracts each; hence, W and Y must have only singleyear contracts.

From statement iii, Y had contracts in 2010 and 2019. Hence, Y had single-year contracts in 2010 and 2019. In the remaining years, Y did not have a contract. Similarly, W had contracts only in 2012 (from statement iii).

He must have 2 single-year contracts in 2012 and no contract in the remaining years.

Substituting the above values, we can complete the table as given below:

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

From the table, we can say that only statement D is true.

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

A   2015

B   2018

C   2017

D   2016

Solution

From statement v, institutes A, B, C, and D have one 3-, 7-, 3-, and 4-year contract, respectively.

The remaining four contracts are one-year contracts.

From statement i, Vendor Z had a contract every year. Therefore, he must have 2 multi-year contracts, which must include a 7-year contract with B.

From statement ii, Vendor X had one or more contracts from 2010 to 2015. Hence, he must have 2 multi-year contracts.

Both X and Z must have a contract in 2010, which means two of the four multi-year contracts must start in 2010.

From statement vii, D did not have a contract in 2010.

From statement vi, C did not have a contract in 2011.

Hence, both institutes C and D cannot start a multi-year contract in 2010. Therefore, the only possibility is that B had a 7-year contract with Z and A had a 3- year contract with X in 2010.

X and Z have 2 multi-year contracts each; hence, W and Y must have only singleyear contracts.

From statement iii, Y had contracts in 2010 and 2019. Hence, Y had single-year contracts in 2010 and 2019. In the remaining years, Y did not have a contract. Similarly, W had contracts only in 2012 (from statement iii).

He must have 2 single-year contracts in 2012 and no contract in the remaining years.

Substituting the above values, we can complete the table as given below:

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

From the options, in 2015, there were 2 or more contracts.

2. **Answer the questions based on the information given below:**

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.

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

A. J

B. B

C. G

Solution

From statement i, exactly one of A or B is an expert in only mridangam, and the other one is an expert in tabla and mridangam but not ghatam.

From statement ii, D is the only person who is an expert in tabla and ghatam but not mridangam.

From statement iii, one of F and G is an expert in only tabla, while the other is an expert in tabla and mridangam but not ghatam.

From statements iv and v, I is not an expert in tabla and mridangam; hence, I is an expert in only ghatam.

From statement v, H is not an expert in mridangam. Hence, the only possibility left is that H is an expert in only tabla.

From statement iv, J is not an expert in tabla. Hence, he must be an expert in only mridangam.

For the remaining two persons C and E, one should be an expert in only tabla, while the other should be an expert in only mridangam.

Using this data, we can get the venn diagram as given below:

Tabla

Ghatam

a = 3

d = 1

b = 3

g = 0

f = 2

n = 0

c = 3

Mridhangam

Regions: a = G/F, H, C/E; b = I, c = A/B, C/E, J; d = D; f = A/B, G/F

J is definitely an expert in mridangam but not in tabla or ghatam.

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

A **C and E**

B A and B

C C and F

D F and G

Solution

From statement i, exactly one of A or B is an expert in only mridangam, and the other one is an expert in tabla and mridangam but not ghatam.

From statement ii, D is the only person who is an expert in tabla and ghatam but not mridangam.

From statement iii, one of F and G is an expert in only tabla, while the other is an expert in tabla and mridangam but not ghatam.
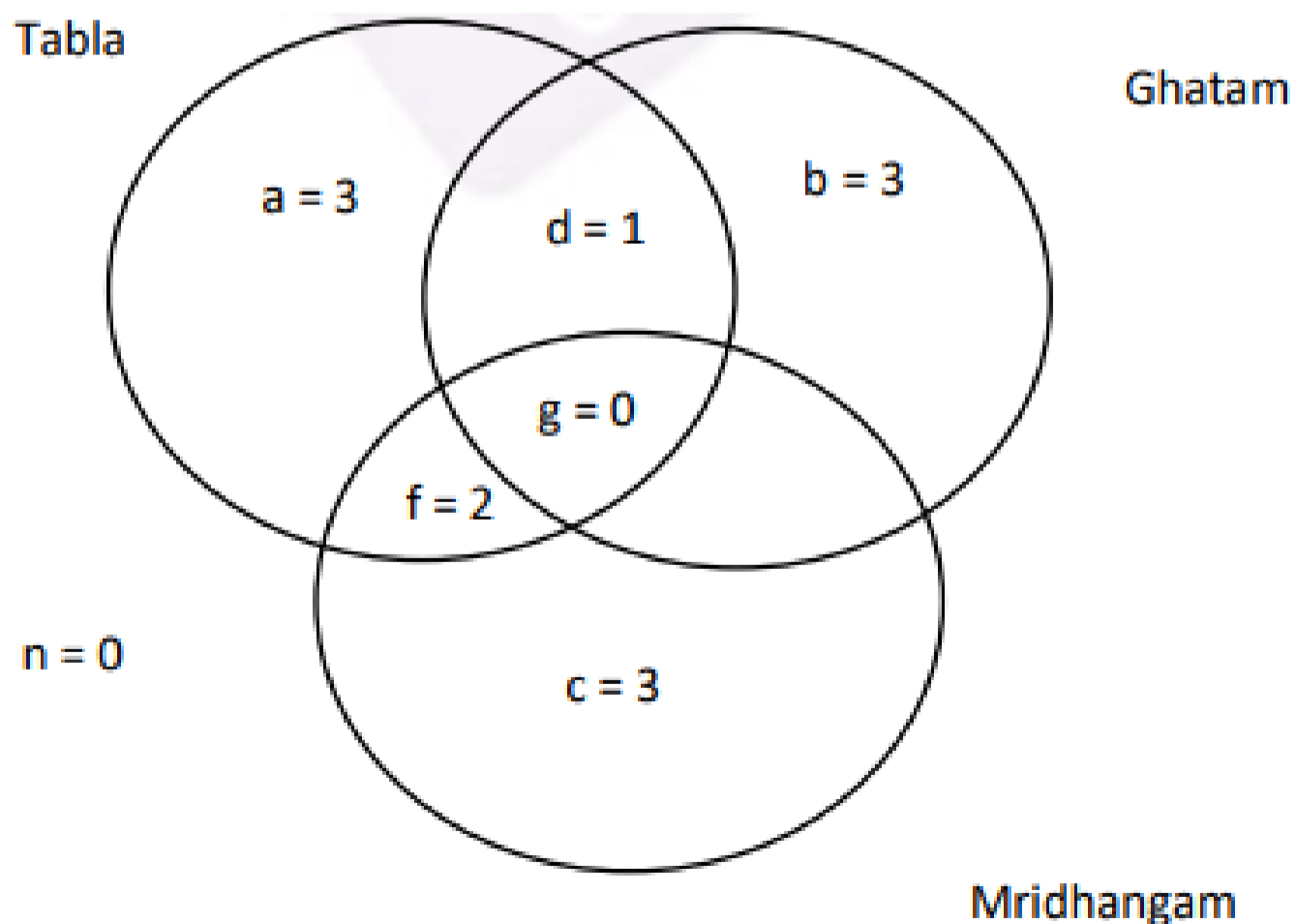
From statements iv and v, I is not an expert in tabla and mridangam; hence, I is an expert in only ghatam.

From statement v, H is not an expert in mridangam. Hence, the only possibility left is that H is an expert in only tabla.

From statement iv, J is not an expert in tabla. Hence, he must be an expert in only mridangam.

For the remaining two persons C and E, one should be an expert in only tabla, while the other should be an expert in only mridangam.

Using this data, we can get the venn diagram as given below:

Regions: a = G/F, H, C/E; b = I, c = A/B, C/E, J; d = D; f = A/B, G/F

Neither C nor E is an expert in both tabla and mridangam but not in ghatam.

C. **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, G, and H

B C, E, and G

C **E, F, and H**

D C, G, and H

Solution

From statement i, exactly one of A or B is an expert in only mridangam, and the other one is an expert in tabla and mridangam but not ghatam.

From statement ii, D is the only person who is an expert in tabla and ghatam but not mridangam.

From statement iii, one of F and G is an expert in only tabla, while the other is an expert in tabla and mridangam but not ghatam.
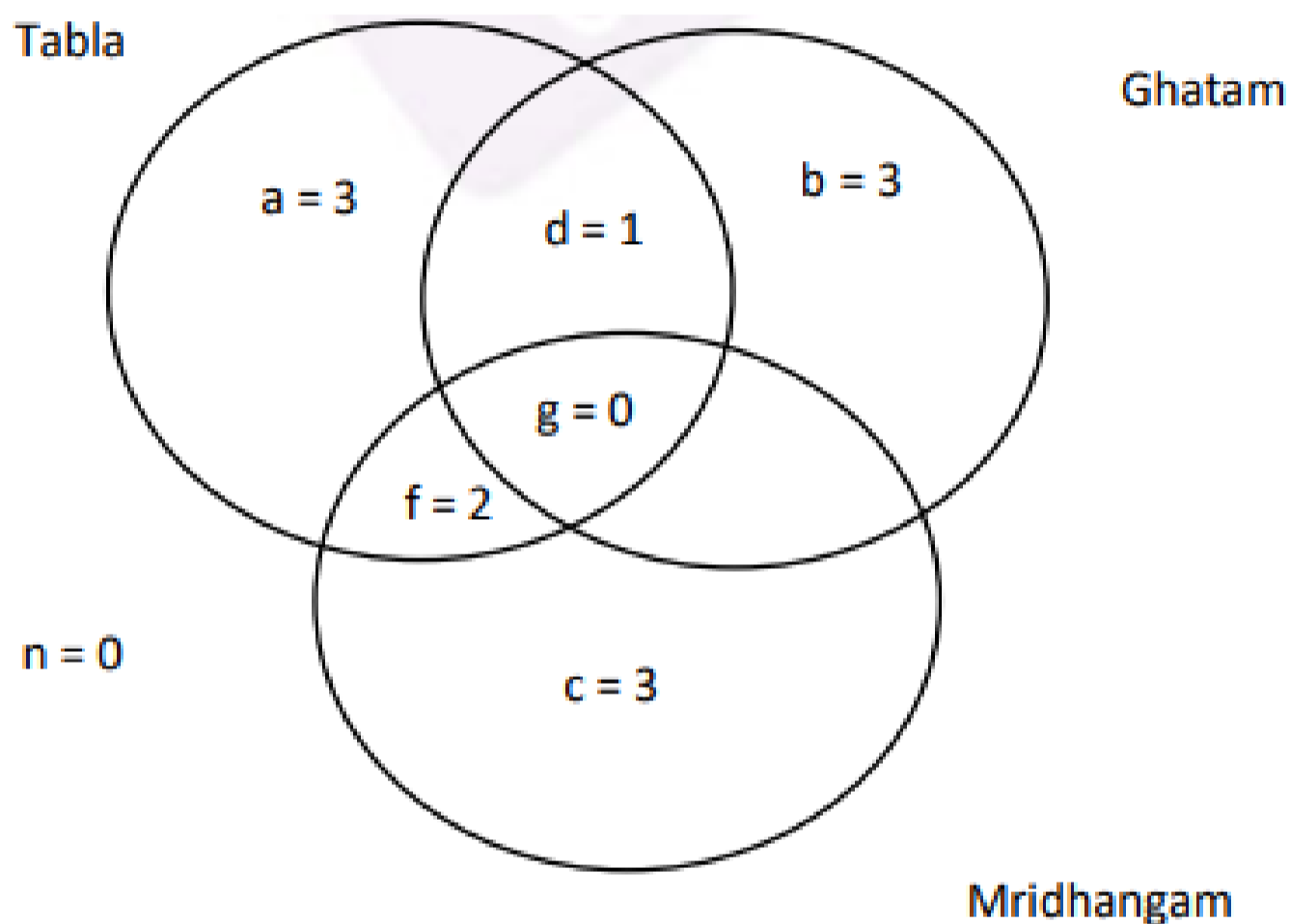
From statements iv and v, I is not an expert in tabla and mridangam; hence, I is an expert in only ghatam.

From statement v, H is not an expert in mridangam. Hence, the only possibility left is that H is an expert in only tabla.

From statement iv, J is not an expert in tabla. Hence, he must be an expert in only mridangam.

For the remaining two persons C and E, one should be an expert in only tabla, while the other should be an expert in only mridangam.

Using this data, we can get the venn diagram as given below:

Regions: a = G/F, H, C/E; b = I, c = A/B, C/E, J; d = D; f = A/B, G/F

So, E, F, and H are the three musicians who are experts in tabla but not in either mridangam or ghatam.

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

> **A**   **H**

B   A

C   F

D   C

Solution

From statement i, exactly one of A or B is an expert in only mridangam, and the other one is an expert in tabla and mridangam but not ghatam.

From statement ii, D is the only person who is an expert in tabla and ghatam but not mridangam.

From statement iii, one of F and G is an expert in only tabla, while the other is an expert in tabla and mridangam but not ghatam.

From statements iv and v, I is not an expert in tabla and mridangam; hence, I is an expert in only ghatam.

From statement v, H is not an expert in mridangam. Hence, the only possibility left is that H is an expert in only tabla.
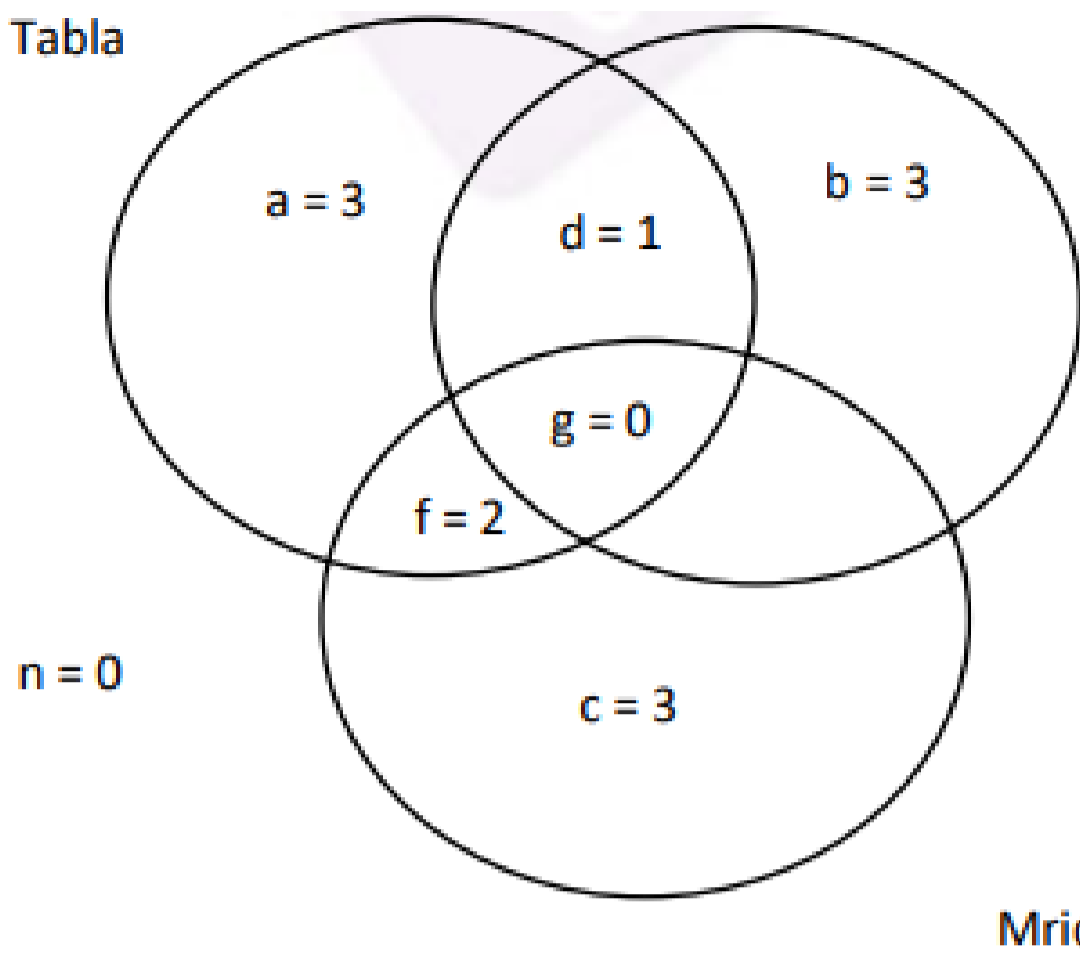
From statement iv, J is not an expert in tabla. Hence, he must be an expert in only mridangam.

For the remaining two persons C and E, one should be an expert in only tabla, while the other should be an expert in only mridangam.

Using this data, we can get the venn diagram as given below:

Regions: a = G/F, H, C/E; b = I, c = A/B, C/E, J; d = D; f = A/B, G/F

From the above venn diagram, we can see that H is definitely an expert in tabla but not in mridangam or ghatam.

3. Answer the following questions based on the given information.

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: behavior

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 also 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 the drivers has got the same rating in three parameters.

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

| A | 3.4 |

| B | 2.8 |

| C | 3.2 |

| **D** | **3.0** |

Solution

From the table, we can see that Eman gets a bonus; hence, he got a rating of 5 in one of the parameters, and he did not get a rating of 1 in any of the parameters.

Now, to minimize his final rating, his ratings in the remaining three parameters should be as low as possible.

Minimum possible ratings for the remaining three parameters can be 2, 3, and 3.

Highest possible final rating $= \frac{5+2+2+3+3}{5} = 3$

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

| A | 1950 |

| | B | 2050 |

| | C | **1960** |

| | D | 1900 |

Solution

To get the maximum payment of drivers, we need to keep the final rating as high as possible.

Considering statements 1 and 2 and the condition that no driver will get a rating of 1 as all the drivers got a bonus, we can create the below table that shows the maximum possible value of final ratings and the maximum possible value of monthly payment that the given drivers can get.

		Bonus		Total
A	5 + 4 + 4 + 3 + 3 =19	3.8(250)=950	1000	1950
B	5 + 4 + 4 + 3 + 3 =19	3.8(200)=760	1200	1960
C	5 + 5 + 4 + 4 + 2 =20	4(100)=400	1400	1800
D	5 + 5 + 3 + 4 + 4 =21	4.2(150)=630	1300	1930
E	5 + 5 + 4 + 4 + 2 =20	4(200)=800	1100	1900

Hence, the maximum possible value of the monthly payment (in rupees) that a driver gets is Rs. 1960.

C. **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 1740

C **1700**

D 1600

Solution

To get the minimum payment of drivers, we need to keep the final rating as low as possible.

Considering statements 1 and 2 and the condition that no driver will get a rating of 1 as all the drivers got a bonus, we can create the below table that shows the minimum possible final ratings and the minimum possible value of monthly payment that the given drivers can get.

		Bonus		Total
A	5 + 4 + 2 + 2 +3=16	3.2(250)=800	1000	1800
B	5 + 3 + 2 + 2+3=15	3(200)=600	1200	1800
C	5 + 5 + 2 + 2+3=17	3.4(100)=340	1400	1740

		Bonus		Total
D	5 + 3 + 2 + 2+3=15	3(150)=450	1300	1750
E	5 + 2 + 2 + 3+3=15	3(200)=600	1100	1700

Hence, the minimum possible value of the monthly payment (in rupees) that a driver gets is Rs. 1700.

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

A   3.4

B   3.2

C   3.8

D   **3.6**

Solution

From the table, we can see that Damodaran did not get a bonus; hence, we can say that he got a rating of 1 in one of the parameters.

Now, to maximize his final rating, his ratings in the remaining three parameters should be as high as possible.

Highest possible ratings for the remaining three parameters can be 5, 5,

and 4.

Highest possible final rating of Damodaran $= \frac{5+5+3+4+1}{5}=3.6$

4. Answer the questions based on information given below:

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.
Ill. 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.

A. Which students did not appear for the English examination?

A   Alva and Bithi

B   Cannot be determined

C   **Esha and Foni**

D   Carl and Deep

Solution

From statement ii, the student who missed the Mathematics examination did not miss any other examination. From the given table, we can notice that only for Carl, the score in Mathematics is the average of the best three among the remaining four scores. Hence, Carl missed the Mathematics exam.

From statement iii, only Deep or Alva has equal scores in Hindi and Science and only for these two, the score in Hindi is the average of the best three among the remaining four scores. Hence, both Deep and Alva missed the Hindi exam and one of them also missed the Science exam.

From statement i, 4 students appeared in each of the English, Hindi, Science, and Social Science examinations. Hence, exactly two students missed each of the four subjects, English, Hindi, Science, and Social Science.

Alva, Carl, and Deep have taken the English exam. Now, only one of the remaining three students has taken the English exam. Since Bithi's score in English cannot be the average of the best two or best three from the remaining scores, he must have taken the English exam.

For Hindi exam:
We already knew that Alva and Deep missed the Hindi exam.

For Mathematics exam:
Only Carl missed the Mathematics exam.

For Science exam:

One of Alva or Deep missed the Science exam. From the remaining persons, only Bithi's score can be the average of the best two or best three scores. Hence, the second person who missed the Science exam must be Bithi.

Only Bithi and Foni are the two persons who can miss the Social Science exam and satisfy the given conditions. Hence, only Bithi and Foni missed the Social Science exam.

Now, we can make the following table about the students who missed a particular subject.

Alwa	Only Hindi or Hindi and Science
Bithi	Science and Social Science
Carl	Only Mathematics
Deep	Only Hindi or Hindi and Science
Foni	Social Science and English

Therefore, Esha and Foni missed the English exam.

B. 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 Two among Alva, Deep, and Esha

D Alva and Esha

Solution

From statement ii, the student who missed the Mathematics examination did not miss any other examination. From the given table, we can notice that only for Carl, the score in Mathematics is the average of the best three among the remaining four scores. Hence, Carl missed the Mathematics exam.

From statement iii, only Deep or Alva has equal scores in Hindi and Science and only for these two, the score in Hindi is the average of the best three among the remaining four scores. Hence, both Deep and Alva missed the Hindi exam and one of them also missed the Science exam.

From statement i, 4 students appeared in each of the English, Hindi, Science, and Social Science examinations. Hence, exactly two students missed each of the four subjects, English, Hindi, Science, and Social Science.

Alva, Carl, and Deep have taken the English exam. Now, only one of the remaining three students has taken the English exam. Since Bithi's score in English cannot be the average of the best two or best three from the remaining scores, he must have taken the English exam.

For Hindi exam:
We already knew that Alva and Deep missed the Hindi exam.

For Mathematics exam:
Only Carl missed the Mathematics exam.

For Science exam:

One of Alva or Deep missed the Science exam. From the remaining persons, only Bithi's score can be the average of the best two or best three scores. Hence, the second person who missed the Science exam must be Bithi.

Only Bithi and Foni are the two persons who can miss the Social Science exam and satisfy the given conditions. Hence, only Bithi and Foni missed the Social Science exam.

Now, we can make the following table about the students who missed a particular subject.

Alwa	Only Hindi or Hindi and Science
Bithi	Science and Social Science
Carl	Only Mathematics
Deep	Only Hindi or Hindi and Science
Foni	Social Science and English

So, Alva and Deep missed the Hindi exam.

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

A   Deep and Bithi

B   Alva and Bithi

C   **Bithi and one out of Alva and Deep**

D   Alva and Deep

Solution

From statement ii, the student who missed the Mathematics examination did not miss any other examination. From the given table, we can notice that only for Carl, the score in Mathematics is the average of the best three

among the remaining four scores. Hence, Carl missed the Mathematics exam.

From statement iii, only Deep or Alva has equal scores in Hindi and Science and only for these two, the score in Hindi is the average of the best three among the remaining four scores. Hence, both Deep and Alva missed the Hindi exam and one of them also missed the Science exam.

From statement i, 4 students appeared in each of the English, Hindi, Science, and Social Science examinations. Hence, exactly two students missed each of the four subjects, English, Hindi, Science, and Social Science.

Alva, Carl, and Deep have taken the English exam. Now, only one of the remaining three students has taken the English exam. Since Bithi's score in English cannot be the average of the best two or best three from the remaining scores, he must have taken the English exam.

For Hindi exam:
We already knew that Alva and Deep missed the Hindi exam.

For Mathematics exam:
Only Carl missed the Mathematics exam.

For Science exam:

One of Alva or Deep missed the Science exam. From the remaining persons, only Bithi's score can be the average of the best two or best three scores. Hence, the second person who missed the Science exam must be Bithi.

Only Bithi and Foni are the two persons who can miss the Social Science exam and satisfy the given conditions. Hence, only Bithi and Foni missed the Social Science exam.

Now, we can make the following table about the students who missed a particular subject.

Alwa	Only Hindi or Hindi and Science
Bithi	Science and Social Science
Carl	Only Mathematics
Deep	Only Hindi or Hindi and Science
Foni	Social Science and English

Bithi and one of Alva or Deep missed the Science examination.

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

A   1

B   2

C   3

D   4

Solution

From statement ii, the student who missed the Mathematics examination did not miss any other examination. From the given table, we can notice that only for Carl, the score in Mathematics is the average of the best three among the remaining four scores. Hence, Carl missed the Mathematics exam.

From statement iii, only Deep or Alva has equal scores in Hindi and Science and only for these two, the score in Hindi is the average of the best three among the remaining four scores. Hence, both Deep and Alva missed the Hindi exam and one of them also missed the Science exam.

From statement i, 4 students appeared in each of the English, Hindi, Science, and Social Science examinations. Hence, exactly two students missed each of the four subjects, English, Hindi, Science, and Social Science.

Alva, Carl, and Deep have taken the English exam. Now, only one of the remaining three students has taken the English exam. Since Bithi's score in English cannot be the average of the best two or best three from the remaining scores, he must have taken the English exam.

For Hindi exam:
We already knew that Alva and Deep missed the Hindi exam.

For Mathematics exam:
Only Carl missed the Mathematics exam.

For Science exam:

One of Alva or Deep missed the Science exam. From the remaining persons, only Bithi's score can be the average of the best two or best three scores. Hence, the second person who missed the Science exam must be Bithi.

Only Bithi and Foni are the two persons who can miss the Social Science exam and satisfy the given conditions. Hence, only Bithi and Foni missed the Social Science exam.

Now, we can make the following table about the students who missed a particular subject.

Alwa	Only Hindi or Hindi and Science
Bithi	Science and Social Science
Carl	Only Mathematics
Deep	Only Hindi or Hindi and Science
Foni	Social Science and English

From the above table, we can notice that the students who missed only one exam are Carl, Esha, and one of Alva or Deep. Hence, only 3 students missed only one exam.

E. **For how many students can we be sure about which examinations they missed?**

A   4

B   3

C   2

Solution

From statement ii, the student who missed the Mathematics examination did not miss any other examination. From the given table, we can notice that only for Carl, the score in Mathematics is the average of the best three among the remaining four scores. Hence, Carl missed the Mathematics exam.

From statement iii, only Deep or Alva has equal scores in Hindi and Science and only for these two, the score in Hindi is the average of the best three among the remaining four scores. Hence, both Deep and Alva missed the Hindi exam and one of them also missed the Science exam.

From statement i, 4 students appeared in each of the English, Hindi, Science, and Social Science examinations. Hence, exactly two students missed each of the four subjects, English, Hindi, Science, and Social Science.

Alva, Carl, and Deep have taken the English exam. Now, only one of the remaining three students has taken the English exam. Since Bithi's score in English cannot be the average of the best two or best three from the remaining scores, he must have taken the English exam.

For Hindi exam:
We already knew that Alva and Deep missed the Hindi exam.

For Mathematics exam:
Only Carl missed the Mathematics exam.

For Science exam:

One of Alva or Deep missed the Science exam. From the remaining persons, only Bithi's score can be the average of the best two or best three scores. Hence, the second person who missed the Science exam must be Bithi.

Only Bithi and Foni are the two persons who can miss the Social Science exam and satisfy the given conditions. Hence, only Bithi and Foni missed the Social Science exam.

Now, we can make the following table about the students who missed a particular subject.

Alwa	Only Hindi or Hindi and Science
Bithi	Science and Social Science
Carl	Only Mathematics
Deep	Only Hindi or Hindi and Science
Foni	Social Science and English

For all the students except Alva and Deep, we are sure about the examinations they missed. Hence, there are 4 students.

F. **Who among the following did not appear for the Mathematics examination?**

A Foni

B Alva

C	**Carl**

D	Esha

Solution

From statement ii, the student who missed the Mathematics examination did not miss any other examination. From the given table, we can notice that only for Carl, the score in Mathematics is the average of the best three among the remaining four scores. Hence, Carl missed the Mathematics exam.

From statement iii, only Deep or Alva has equal scores in Hindi and Science and only for these two, the score in Hindi is the average of the best three among the remaining four scores. Hence, both Deep and Alva missed the Hindi exam and one of them also missed the Science exam.

From statement i, 4 students appeared in each of the English, Hindi, Science, and Social Science examinations. Hence, exactly two students missed each of the four subjects, English, Hindi, Science, and Social Science.

Alva, Carl, and Deep have taken the English exam. Now, only one of the remaining three students has taken the English exam. Since Bithi's score in English cannot be the average of the best two or best three from the remaining scores, he must have taken the English exam.

For Hindi exam:
We already knew that Alva and Deep missed the Hindi exam.

For Mathematics exam:

Only Carl missed the Mathematics exam.

For Science exam:

One of Alva or Deep missed the Science exam. From the remaining persons, only Bithi's score can be the average of the best two or best three scores. Hence, the second person who missed the Science exam must be Bithi.

Only Bithi and Foni are the two persons who can miss the Social Science exam and satisfy the given conditions. Hence, only Bithi and Foni missed the Social Science exam.

Now, we can make the following table about the students who missed a particular subject.

Alwa	Only Hindi or Hindi and Science
Bithi	Science and Social Science
Carl	Only Mathematics
Deep	Only Hindi or Hindi and Science
Foni	Social Science and English

5. **Answer the following questions based on the information given below.**

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.

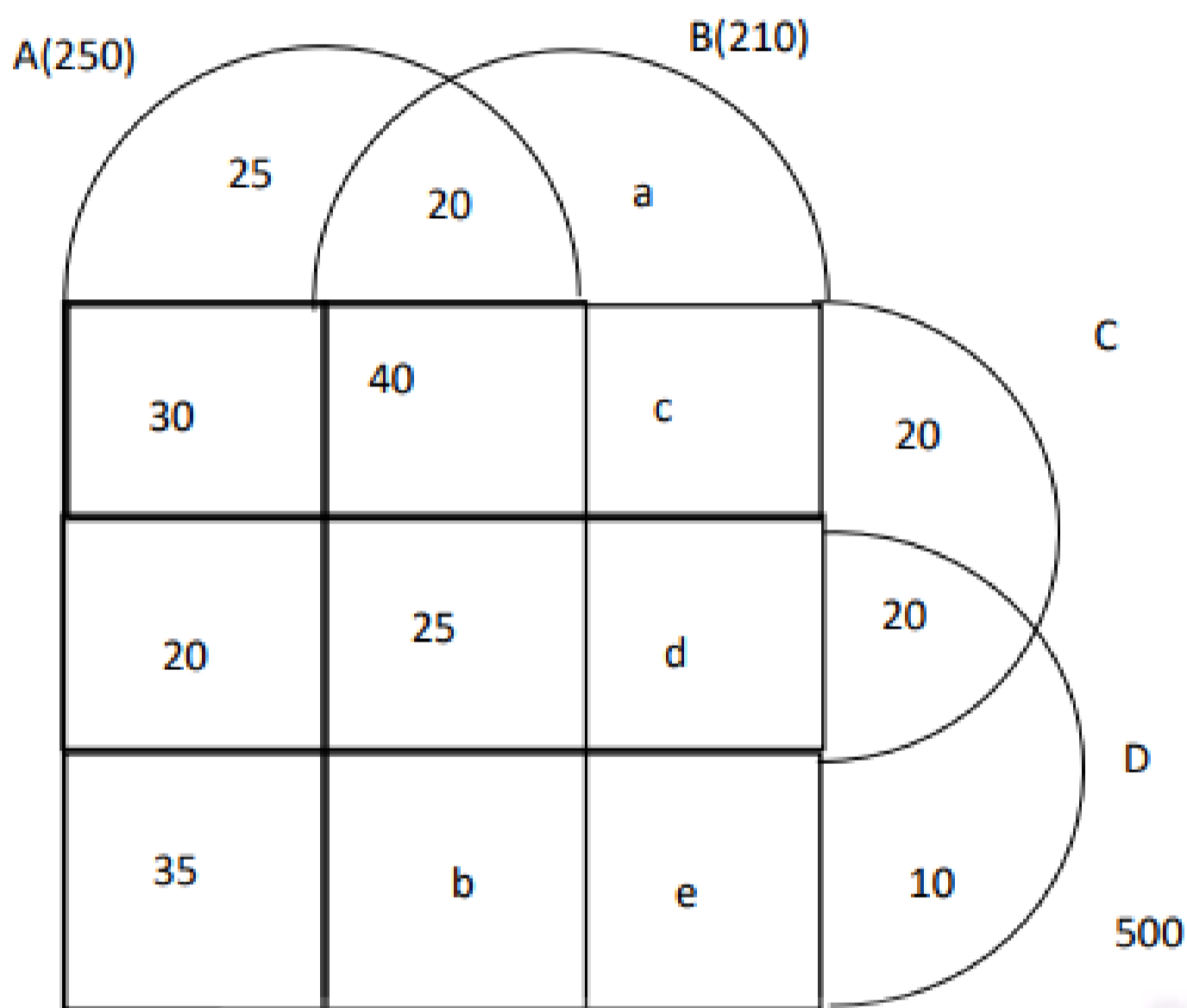**A.** **How many patients were treated with medicine types B and D only?**
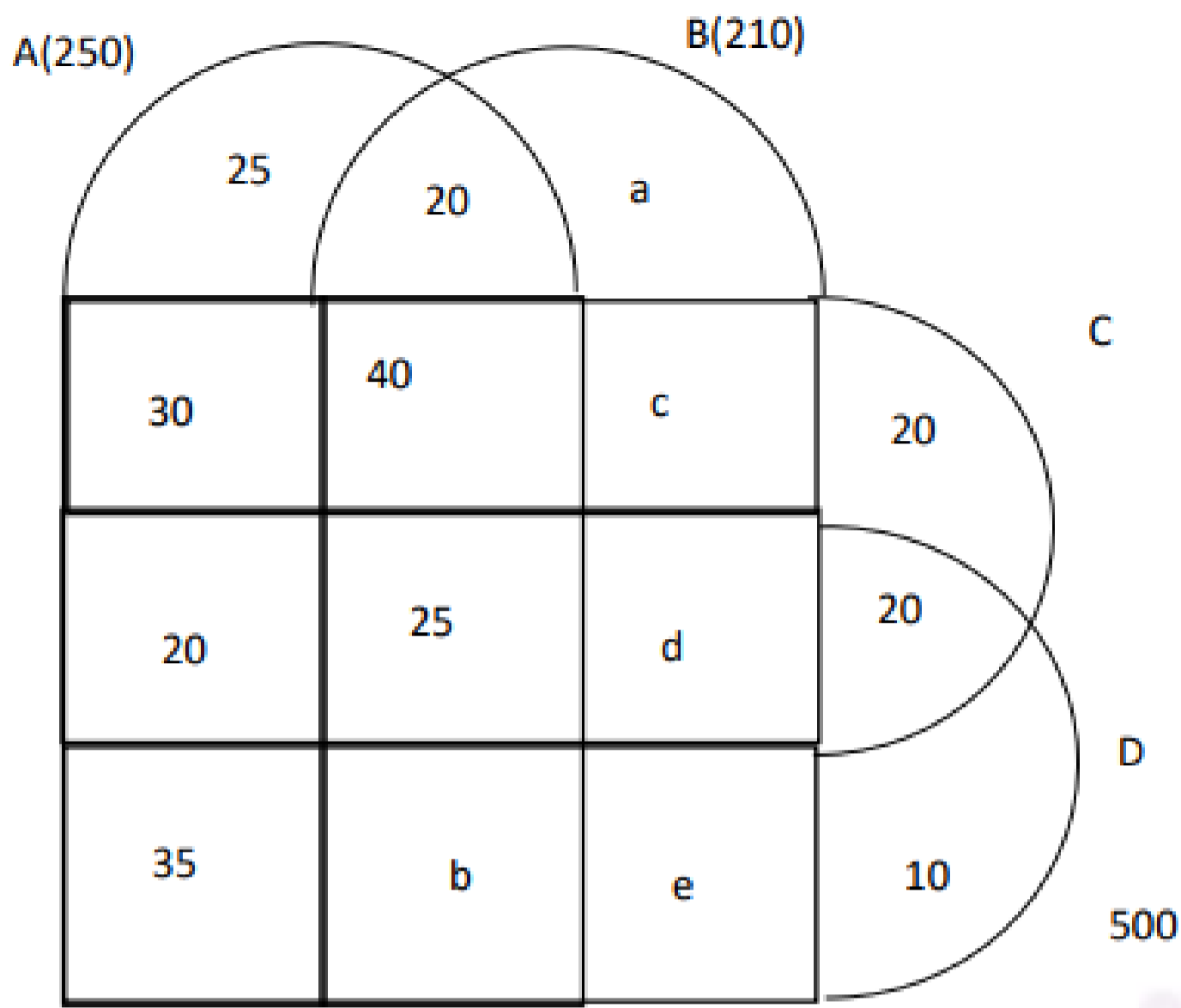
A 100

B 200

Solution

Using the given statements, we can create the following venn diagram:

Number of people treated with exactly one type of medicine = 75

$\Rightarrow 25 + a + 20 + 10 = 75$

$\Rightarrow a = 20$

Number of people treated with medicine A = 250

$\Rightarrow 25 + 20 + 30 + 40 + 20 + 50 + 35 + b = 250$

$\Rightarrow b = 30$

Number of people treated with exactly three types of medicine = 100

$\Rightarrow 40 + 20 + b + d = 100$

$\Rightarrow 40 + 20 + 30 + d = 100$

$\Rightarrow d = 10$

Number of people treated with medicine C = 210

$\Rightarrow 30 + 20 + 50 + 40 + c + d + 20 + 20 = 210$

$\Rightarrow 30 + 20 + 50 + 40 + c + 10 + 20 + 20 = 210$

$\Rightarrow c = 20$

Total number of people = 1000

$\Rightarrow 25 + 20 + a + 30 + 40 + c + 20 + 20 + 50 + d + 20 + 35 + b + e + 10 + 500 = 100$

$\Rightarrow 25 + 20 + 20 + 30 + 40 + 20 + 20 + 20 + 50 + 10 + 20 + 35 + 30 + e + 10 + 500 = 1000$

$\Rightarrow e = 150$

Number of patients treated with medicine type B and D only = e = 150

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

A **325**

B 350

C 375

D 400

Solution

Using the given statements, we can create the following venn diagram:

Number of people treated with exactly one type of medicine = 75

$\Rightarrow 25 + a + 20 + 10 = 75$

$\Rightarrow a = 20$

Number of people treated with medicine A = 250

$\Rightarrow 25 + 20 + 30 + 40 + 20 + 50 + 35 + b = 250$

$\Rightarrow b = 30$

Number of people treated with exactly three types of medicine = 100

$\Rightarrow 40 + 20 + b + d = 100$

$\Rightarrow 40 + 20 + 30 + d = 100$

$\Rightarrow d = 10$

Number of people treated with medicine C = 210

$\Rightarrow 30 + 20 + 50 + 40 + c + d + 20 + 20 = 210$

$\Rightarrow 30 + 20 + 50 + 40 + c + 10 + 20 + 20 = 210$

$\Rightarrow c = 20$

Total number of people = 1000

$\Rightarrow 25 + 20 + a + 30 + 40 + c + 20 + 20 + 50 + d + 20 + 35 + b + e + 10 + 500 = 100$

$\Rightarrow 25 + 20 + 20 + 30 + 40 + 20 + 20 + 20 + 50 + 10 + 20 + 35 + 30 + e + 10 + 500 = 1000$

$\Rightarrow e = 150$

Number of patients treated with medicine type $D = 20 + 35 + 50 + 30 + 10 + 150 + 20 + 10 = 325$

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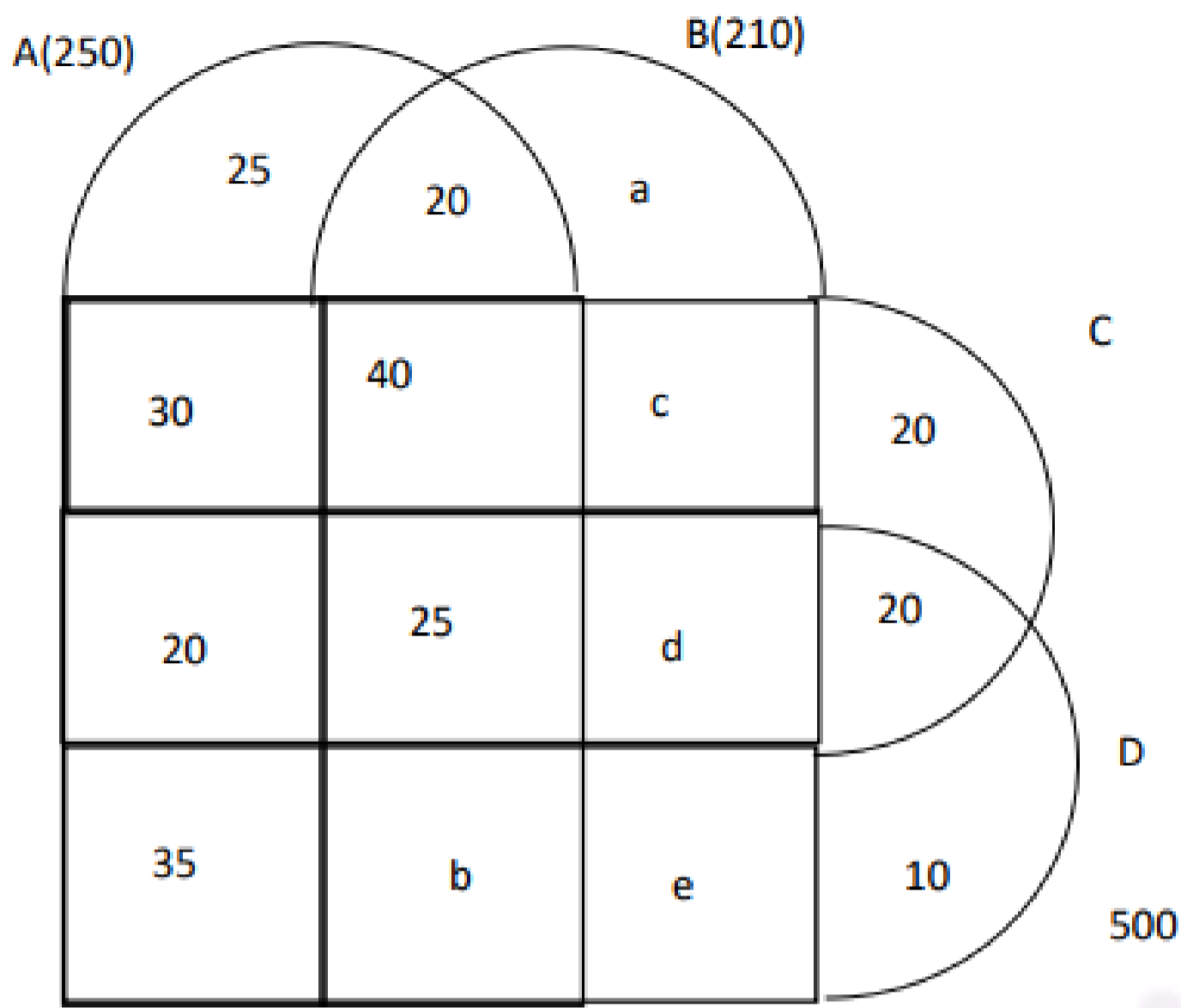
A   **10**

B   20

C   30

D   40

Solution

Using the given statements, we can create the following venn diagram:

Number of people treated with exactly one type of medicine = 75

$\Rightarrow 25 + a + 20 + 10 = 75$

$\Rightarrow a = 20$

Number of people treated with medicine A = 250

$\Rightarrow 25 + 20 + 30 + 40 + 20 + 50 + 35 + b = 250$

$\Rightarrow b = 30$

Number of people treated with exactly three types of medicine = 100

$\Rightarrow 40 + 20 + b + d = 100$

$\Rightarrow 40 + 20 + 30 + d = 100$

$\Rightarrow d = 10$

Number of people treated with medicine C = 210

$\Rightarrow 30 + 20 + 50 + 40 + c + d + 20 + 20 = 210$

$\Rightarrow 30 + 20 + 50 + 40 + c + 10 + 20 + 20 = 210$

$\Rightarrow c = 20$

Total number of people = 1000

$\Rightarrow 25 + 20 + a + 30 + 40 + c + 20 + 20 + 50 + d + 20 + 35 + b + e + 10 + 500 = 100$

$\Rightarrow 25 + 20 + 20 + 30 + 40 + 20 + 20 + 20 + 50 + 10 + 20 + 35 + 30 + e + 10 + 500 = 1000$

$\Rightarrow e = 150$

The number of patients who were treated with medicine types B, C, and D, but not type A $= d = 10$.

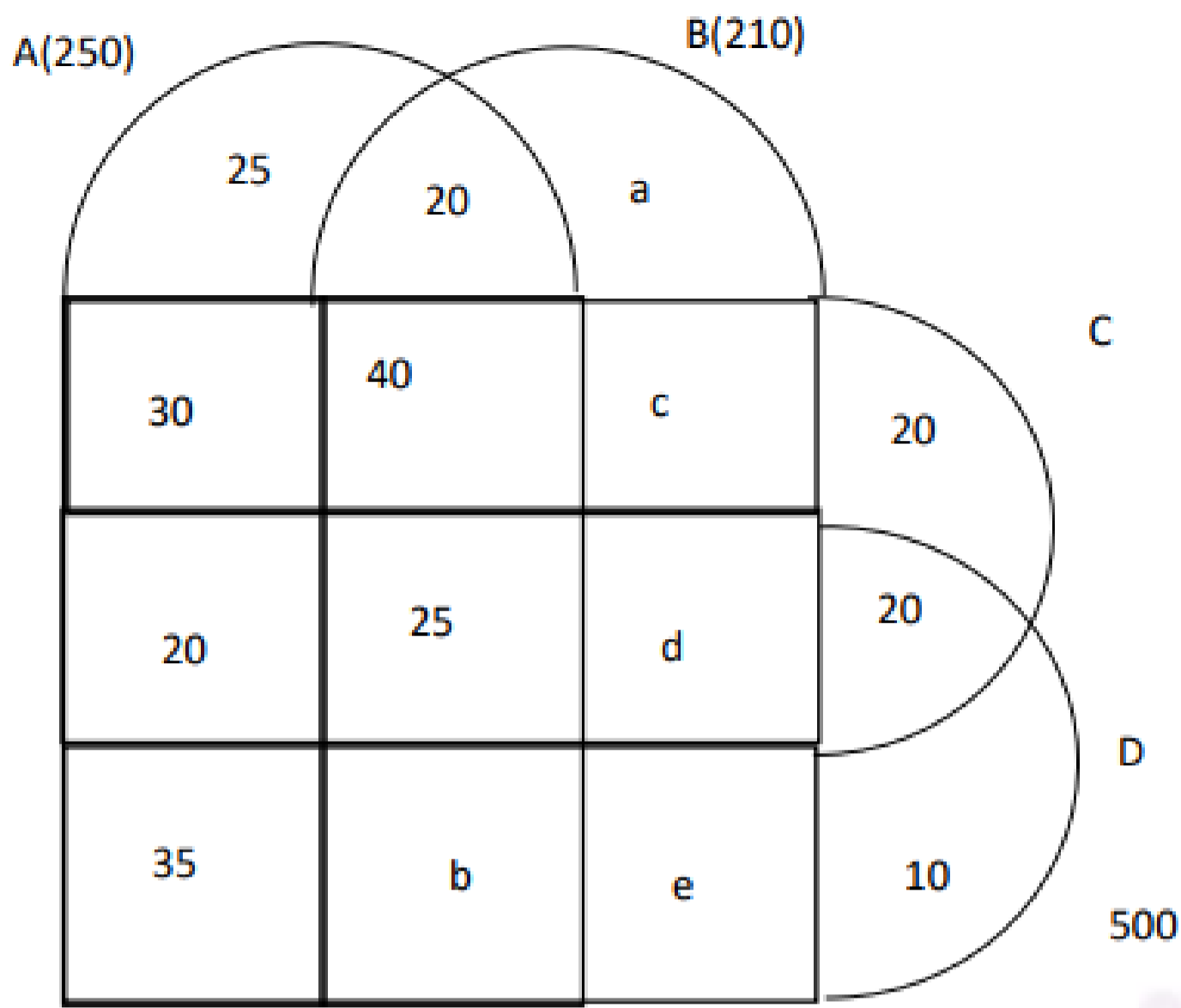**D. How many patients were treated with medicine of type B?**

A   360

B   300

C   320

D   340

Solution

Using the given statements, we can create the following venn diagram:

Number of people treated with exactly one type of medicine = 75

$\Rightarrow 25 + a + 20 + 10 = 75$

$\Rightarrow a = 20$

Number of people treated with medicine A = 250

$\Rightarrow 25 + 20 + 30 + 40 + 20 + 50 + 35 + b = 250$

$\Rightarrow b = 30$

Number of people treated with exactly three types of medicine = 100

$\Rightarrow 40 + 20 + b + d = 100$

$\Rightarrow 40 + 20 + 30 + d = 100$

$\Rightarrow d = 10$

Number of people treated with medicine C = 210

$\Rightarrow 30 + 20 + 50 + 40 + c + d + 20 + 20 = 210$

$\Rightarrow 30 + 20 + 50 + 40 + c + 10 + 20 + 20 = 210$

$\Rightarrow c = 20$

Total number of people = 1000

$\Rightarrow 25 + 20 + a + 30 + 40 + c + 20 + 20 + 50 + d + 20 + 35 + b + e + 10 + 500 = 100$

$\Rightarrow 25 + 20 + 20 + 30 + 40 + 20 + 20 + 20 + 50 + 10 + 20 + 35 + 30 + e +$

10 + 500 = 1000

$\Rightarrow$ e = 150

Number of patients treated with medicine type B = 20 + 20 + 40 + 20 + 50 + 10 + 30 + 150 = 340

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