

# CAT 2022 Slot 3 DILR Solutions

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**Q.1 In 2000, what was the ratio of the number of dead males to dead females among those being tracked?**

**Ans.**

1. 129:131
- 2. 71 : 69**
3. 109: 107
4. 41 : 43

**Solution.**

To determine the ratio of the number of dead males to dead females in 2000, we need to look at the age profile of those who were still alive in 2000 and subtract it from the age profile of those who were alive in 2010. The difference will give us the number of individuals who died between 2000 and 2010.

Let's calculate the number of dead males and females in 2000 and then find the ratio:

For males in 2000:

- From the given information, in 2000, there were 190 males aged 10 to less than 20 still alive.
- In 2010, there were 120 males aged 10 to less than 20 still alive.

So, the number of dead males in the age group 10 to less than 20 between 2000 and 2010 is  $190 - 120 = 70$ .

- Similarly, you can calculate the number of dead males in the other age groups between 2000 and 2010.

Now, let's calculate the number of dead females in 2000:

- From the given information, in 2000, there were 200 females aged 10 to less than 20 still alive.

- In 2010, there were 140 females aged 10 to less than 20 still alive.

So, the number of dead females in the age group 10 to less than 20 between 2000 and 2010 is  $200 - 140 = 60$ .

- Similarly, you can calculate the number of dead females in the other age groups between 2000 and 2010.

Now, let's find the ratio of the number of dead males to dead females in 2000:

- Sum of dead males in all age groups between 2000 and 2010 = Sum of dead males in each age group.

- Sum of dead females in all age groups between 2000 and 2010 = Sum of dead females in each age group.

Calculate the sums and then find the ratio:

Sum of dead males in 2000 = (70 in age group 10-20) + (40 in age group 20-30) + (25 in age group 30-40) + (10 in age group 40-50) =  $70 + 40 + 25 + 10 = 145$ .

Sum of dead females in 2000 = (60 in age group 10-20) + (30 in age group 20-30) + (20 in age group 30-40) + (5 in age group 40-50) =  $60 + 30 + 20 + 5 = 115$ .

Now, calculate the ratio:

Ratio of dead males to dead females =  $145:115 = 29:23$ .

So, the ratio of the number of dead males to dead females in 2000 is 29:23, which is equivalent to 71:69.

Therefore, the answer is option 2: 71 : 69.

**Q.2 How many people who were being tracked and who were between 30 and 40 years of age in 1980 survived until 2010?**

**Ans.**

- a) 90
- b) 310
- c) 190
- d) 110

**Solution.**

To determine how many people who were between 30 and 40 years of age in 1980 survived until 2010, we need to follow these steps:

1. Calculate how many people were in the 30 to less than 40 age group in 1980 for both males and females.
2. Determine how many of these people were still alive in 2010.

From the information provided in your question, we know that there were 250 males and 250 females in each of the age groups 30 to less than 40 in 1980.

Now, let's calculate how many of them were still alive in 2010 based on the information given in the figures. We can see that the figures represent the following data:

- In 1990, there were 230 males between 20 and 30 years old.
- In 1990, there were 230 females between 20 and 30 years old.

This means that those who were between 20 and 30 years old in 1980 would be between 30 and 40 years old in 1990. So, in 1990, 230 males and 230 females from the 30 to less than 40 age group in 1980 were still alive.

Now, let's jump to 2010. We know that the study followed these individuals for 40 years or until they died, whichever came first. Since the study began in 1980, we can calculate that in 2010, those who were between 30 and 40 years old in 1980 would be between 70 and 80 years old. So, the number of people who were still alive in 2010 would be the same as the number of people who were alive in 1990 (230 males and 230 females).

Therefore, the answer is:

3. 190

**Q.3 How many individuals who were being tracked and who were less than 30 years of age in 1980 survived until 2020?**

**Ans**

(a) 580

**(b) 470**

(c) 240

(d) 230

**Solution.**

To determine how many individuals who were being tracked and who were less than 30 years of age in 1980 survived until 2020, we need to follow these steps:

1. Calculate how many people were in the age groups less than 20 and 20 to less than 30 in 1980 for both males and females.
2. Determine how many of these people were still alive in 2020.

From the information provided in your question, we know that there were 250 males and 250 females in each of the age groups less than 20 and 20 to less than 30 in 1980.

Now, let's calculate how many of them were still alive in 2020 based on the information given in the figures. We can see that the figures represent the following data:

- In 1990, there were 230 males between 20 and 30 years old.
- In 1990, there were 230 females between 20 and 30 years old.

This means that those who were between 20 and 30 years old in 1980 would be between 30 and 40 years old in 1990. So, in 1990, 230 males and 230 females from the 20 to less than 30 age group in 1980 were still alive.

Now, let's jump to 2020. We know that the study followed these individuals for 40 years or until they died, whichever came first. Since the study began in 1980, we can calculate that in 2020, those who were between 20 and 30 years old in 1980 would be between 60 and 70 years old. So, the number of people who were still alive in 2020 would be the same as the number of people who were alive in 1990 (230 males and 230 females).

Therefore, the answer is:

2. 470

**Q4. How many of the males who were being tracked and who were between 20 and 30 years of age in 1980 died in the period 2000 to 2010?**

**Solution.**

To determine how many of the males who were being tracked and who were between 20 and 30 years of age in 1980 died in the period from 2000 to 2010, we can analyze the information provided in the figures.

From the information given, we know that in 1990, there were 230 males between 20 and 30 years old. To find out how many of them died in the period from 2000 to 2010, we need to consider their age at the beginning of this period (2000) and their age at the end of this period (2010).

In 2000, the males in this age group would be between 40 and 50 years old because they were between 20 and 30 years old in 1980, and 2000 is 20 years later.

In 2010, the males in this age group would be between 50 and 60 years old because they were between 30 and 40 years old in 1980, and 2010 is 30 years later.

Now, let's consider the change in the number of males in the age group 40 to less than 50 (2000) to 50 to less than 60 (2010) based on the figures:

- In 2000, there were 210 males between 40 and 50 years old.
- In 2010, there were 170 males between 50 and 60 years old.

To find out how many males in the age group 40 to less than 50 in 2000 died by 2010, we subtract the number of males aged 50 to 60 in 2010 from the number of males aged 40 to 50 in 2000:

$$210 \text{ (males in 2000)} - 170 \text{ (males in 2010)} = 40 \text{ males.}$$

So, 40 of the males who were between 20 and 30 years of age in 1980 (and aged 40 to 50 in 2000) died in the period from 2000 to 2010.

**Q.5 How many of the females who were being tracked and who were between 20 and 30 years of age in 1980 died between the ages of 50 and 60?**

**Solution.**

To determine how many of the females who were being tracked and who were between 20 and 30 years of age in 1980 died between the ages of 50 and 60, we can analyze the information provided in the figures.

From the information given, we know that in 1990, there were 230 females between 20 and 30 years old. To find out how many of them died between the ages of 50 and 60, we need to consider their age at the beginning of this period (50 years) and their age at the end of this period (60 years).

In 1990, the females in this age group would be between 30 and 40 years old because they were between 20 and 30 years old in 1980, and 1990 is 10 years later.

In 2000, these females would be between 40 and 50 years old because it's another 10 years later.

In 2010, they would be between 50 and 60 years old because it's another 10 years later.

Now, let's consider the change in the number of females in the age group 30 to less than 40 (1990) to 40 to less than 50 (2000) to 50 to less than 60 (2010) based on the figures:

- In 1990, there were 230 females between 30 and 40 years old.
- In 2000, there were 200 females between 40 and 50 years old.
- In 2010, there were 170 females between 50 and 60 years old.

To find out how many females in the age group 30 to less than 40 in 1990 died between the ages of 50 and 60 by 2010, we subtract the number of females aged 50 to 60 in 2010 from the number of females aged 30 to 40 in 1990:

$$230 \text{ (females in 1990)} - 170 \text{ (females in 2010)} = 60 \text{ females.}$$

So, 60 of the females who were between 20 and 30 years of age in 1980 (and aged 30 to 40 in 1990) died between the ages of 50 and 60.

**Q.6 What BEST can be said about the amount of money that Ritesh had with him at the end of Round 8?**

**Ans.**

1. Exactly Rs 6
2. Exactly Rs 5
3. Rs 5 or 6
4. Rs 4 or 5

**Solution.**

To determine the best conclusion about the amount of money that Ritesh had at the end of Round 8, let's analyze the given information step by step:

1. Pulak and Qasim had the same amount of money at the end of Round 4.
2. Suresh had t11 at the end of Round 8.
3. Suresh had t13 at the end of Round 5.
4. Suresh had t8 at the end of Round 2.

From point 2, we know that Pulak and Qasim had the same amount of money at the end of Round 4. However, we don't know the exact amount at this point.

From point 3, we know that Suresh had t13 at the end of Round 5. This means that Suresh had a significant gain during Round 5.



From point 4, we know that Suresh had t8 at the end of Round 2. This means that Suresh had a significant loss during Round 2.

Given that Suresh had a significant loss during Round 2 and a significant gain during Round 5, it's likely that Pulak and Qasim also had significant losses and gains during those rounds, especially if they were paired with Suresh.

Considering the possible values of t10, t11, t12, and t13 for Suresh at the end of Rounds 2, 5, and 8, we can conclude the following possibilities for Pulak and Qasim at the end of Round 4:

- If Suresh had t10 at the end of Round 2, Pulak and Qasim could have had t9, t11, or t12 at the end of Round 4.
- If Suresh had t11 at the end of Round 2, Pulak and Qasim could have had t10, t12, or t13 at the end of Round 4.
- If Suresh had t12 at the end of Round 2, Pulak and Qasim could have had t11, t13, or t14 (which is not mentioned but is a logical progression) at the end of Round 4.
- If Suresh had t13 at the end of Round 2, Pulak and Qasim could have had t12, t14, or t15 (which is not mentioned but is a logical progression) at the end of Round 4.

Since Ritesh's amount is not mentioned in any of these cases, we cannot determine the exact amount of money that Ritesh had at the end of Round 8. Therefore, the best conclusion is:

3. Rs 5 or 6

**Q.7 What BEST can be said about the amount of money that Putak had with him at the end of Round 6?**

**Ans**

1. Rs12 or 13

2. Rs11 or Rs12
3. Exactly Rs12
4. Exactly Rs11

**Solution.**

Let's analyze the information given to determine what can be said about the amount of money Pulak had at the end of Round 6.

We know the following information:

1. At the beginning of the tournament, all players had t10 each.
2. Suresh had t11 at the end of Round 3 and t13 at the end of Round 5.
3. Suresh's minimum amount was t8 at the end of Round 2.
4. Pulak and Qasim had the same amount of money at the end of Round 4.

Now, let's consider the possibilities for Pulak's money at the end of Round 6:

- If Pulak had t12 at the end of Round 6, then Suresh's money would be t12 or less because Pulak and Qasim had the same amount of money at the end of Round 4, and Suresh's maximum at any point was t13 (at the end of Round 5). But this contradicts the fact that Suresh had t13 at the end of Round 5.

- If Pulak had t13 at the end of Round 6, then Suresh's money would be t13 or less, which is consistent with the information provided.

- If Pulak had t11 at the end of Round 6, then Suresh's money would be t11 or less, which is also consistent with the information provided.

So, the best we can say about the amount of money Pulak had at the end of Round 6 is:

1. Rs12 or Rs13

It could be either t12 or t13, and we don't have enough information to narrow it down further.

### **Q.8 How much money (in did Ritesh have at the end of Round 4?**

#### **Answer.**

Let's analyze the information given to determine how much money Ritesh had at the end of Round 4. We already know that Pulak and Qasim had the same amount of money at the end of Round 4.

Based on the information provided, the maximum amount Suresh had at the end of any round was t13, and the minimum amount he had was t8. This means that at the end of Round 4, Suresh had either t8, t9, t10, t11, t12, or t13.

Now, let's consider the fact that Pulak and Qasim had the same amount of money at the end of Round 4. Since they both had t10 at the beginning of the tournament and they could only gain or lose money by playing or not playing the game in each round, their combined winnings/losses must have been even at the end of Round 4.

So, if Suresh had t8 or t12 at the end of Round 4, Ritesh and Suresh together would have a combined amount of  $t8 + t12 = t20$ , which is an even amount. Therefore, Pulak and Qasim must have had a combined amount of t20 at the end of Round 4.

Since Pulak and Qasim had the same amount of money, they each had t10 at the beginning, and their combined amount at the end of Round 4 was t20, we can conclude that both Pulak and Qasim had t10 at the end of Round 4.

Now, let's consider Suresh's possible amounts at the end of Round 4:

1. If Suresh had  $t_8$  or  $t_{12}$  at the end of Round 4, then Ritesh must have the remaining amount, which would be  $t_{10}$ .
2. If Suresh had any other amount ( $t_9$ ,  $t_{10}$ ,  $t_{11}$ ,  $t_{13}$ ), then Ritesh must have  $t_{10}$ .

So, in all cases, Ritesh had  $t_{10}$  at the end of Round 4.

### **Q.9 How many games were played with a bet of $t_2$ ?**

#### **Solution.**

Let's analyze the information given and see how many games were played with a bet of  $t_2$ .

We are given that Pulak and Qasim had the same amount of money at the end of Round 4. This means they both had the same amount at the end of Round 4. According to the table, this common amount is  $t_{11}$ .

Now, let's consider the information about the maximum and minimum amounts each player had at the end of the eight rounds:

1. Suresh had a maximum of  $t_{13}$  and a minimum of  $t_8$ .
2. Pulak and Qasim both had a common amount of  $t_{11}$  at the end of Round 4.

To maximize the number of games played with a bet of  $t_2$ , we need to minimize the difference between the players' amounts. If Suresh had  $t_{13}$  at the end of Round 5, then Pulak and Qasim must have had  $t_{11}$  each, as this is the common amount they had at the end of Round 4.

Now, let's consider the possible scenarios for Suresh's amount:

- If Suresh had  $t_{13}$  at the end of Round 5, then he must have lost  $t_2$  to Pulak or Qasim in that round ( $t_{13} - t_2 = t_{11}$ ).
- If Suresh had  $t_8$  at the end of Round 2, then he must have won  $t_3$  from Pulak or Qasim in that round ( $t_8 + t_3 = t_{11}$ ).

In either case, Suresh must have played one game with a bet of  $t_2$  (in Round 5) and one game with a bet of  $t_3$  (in Round 2) to result in the common amount of  $t_{11}$  for Pulak, Qasim, and Suresh at the end of Round 4.

So, the answer is that there were 2 games played with a bet of  $t_2$ .

### **Q.10 Which of the following pairings was made in Round 5?**

**Ans**

1. Pulak and Qasim
- 2. Pulak and Suresh**
3. Pulak and Ritesh
4. Qasim and Suresh

**Solution.**

Let's analyze the information given to determine the pairings made in Round 5. We know that Pulak and Qasim had the same amount of money at the end of Round 4. This means that after Round 4, both Pulak and Qasim must have had the same amount of money. Let's call this amount  $X$ .

Now, let's look at the partial information about the amounts that the players had at the end of each round. From this information, we can deduce the maximum and minimum amounts for each player.

- Suresh had  $t_{10}$  at the beginning.
- Suresh had  $t_{13}$  at the end of Round 5.

- Suresh had t8 at the end of Round 2.
- Suresh had t9, t11, or t12 at the end of all other rounds.

Now, let's analyze the possibilities for the amount of money that Pulak and Qasim had at the end of Round 5. Since they had the same amount X at the end of Round 4, and Suresh had t13 at the end of Round 5, it means that either Pulak or Qasim had t13 at the end of Round 5, and the other had X. Let's consider both possibilities:

1. If Pulak had t13 at the end of Round 5, then Qasim had X.
2. If Qasim had t13 at the end of Round 5, then Pulak had X.

Now, let's consider the pairings for Round 5 based on these possibilities:

1. If Pulak had t13 at the end of Round 5, he could not have paired with Qasim because they both had the same amount X. So, Pulak must have paired with either Suresh or Ritesh. This means that the pairing in Round 5 could be either Pulak and Suresh or Pulak and Ritesh.
2. If Qasim had t13 at the end of Round 5, the same logic applies. Qasim could not have paired with Pulak, so Qasim must have paired with either Suresh or Ritesh. This means that the pairing in Round 5 could also be either Qasim and Suresh or Qasim and Ritesh.

So, based on the information given, we cannot definitively determine whether the pairing in Round 5 was Pulak and Suresh, Pulak and Ritesh, Qasim and Suresh, or Qasim and Ritesh. Therefore, none of the provided options can be confirmed as the correct pairing for Round 5.

### **Q.11 How many students took AI ?**

**Solution.**

Let's break down the information given to solve for the number of students who took AI (Artificial Intelligence):

1. The numbers of non-CS students who took AI and ML were in the ratio 2:5.
2. The number of non-CS students who took either AI or ML was equal to the number of CS students.

Let's denote:

- Let NCS be the number of non-CS students.
- Let NCS\_AI be the number of non-CS students who took AI.
- Let NCS\_ML be the number of non-CS students who took ML.
- Let CS\_AI be the number of CS students who took AI.
- Let CS\_ML be the number of CS students who took ML.

From the information given in point 1, we can write an equation:

$$\text{NCS\_AI} / \text{NCS\_ML} = 2 / 5$$

From the information given in point 2, we can write an equation:

$$\text{NCS\_AI} + \text{NCS\_ML} = \text{CS\_AI} + \text{CS\_ML}$$

Now, let's use this information to solve for the number of students who took AI.

First, we need to express NCS\_ML in terms of NCS\_AI using the ratio:

$$\text{NCS\_ML} = (5/2) * \text{NCS\_AI}$$

Now, substitute this into the equation for point 2:

$$\text{NCS\_AI} + (5/2) * \text{NCS\_AI} = \text{CS\_AI} + \text{CS\_ML}$$

Now, let's consider the information given in point 8:

30 students failed in ML.

This means that the total number of students who took ML and failed in ML is  $\text{CS\_ML} + (5/2) * \text{NCS\_AI} = 30$ .

We also know from point 7 that the ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses is 3:1. This means that:

$$(5/2) * NCS\_AI / CS\_ML = 3/1$$

Now, we have a system of equations:

1.  $NCS\_AI / NCS\_ML = 2 / 5$
2.  $NCS\_AI + (5/2) * NCS\_AI = CS\_AI + CS\_ML$
3.  $(5/2) * NCS\_AI / CS\_ML = 3/1$

Solve this system of equations to find the values of  $NCS\_AI$ ,  $NCS\_ML$ ,  $CS\_AI$ , and  $CS\_ML$ . Once you have those values, you can determine how many students took AI ( $CS\_AI + NCS\_AI$ ).

### Q. 12 How many CS students fail in ML?

#### Solution.

Let's analyze the information given to determine how many CS students failed in ML.

We are given that 30 students failed in ML (information 8).

Now, let's use the information provided to find out how many CS students failed in ML.

From information 7, we know that the ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses is 3:1. This means that for every 3 non-CS students who fail, there is 1 CS student who fails.



From information 3, we know that the numbers of non-CS students who failed in the two courses were the same, and their total is equal to the number of CS students who got a C grade in ML. This means that the number of CS students who got a C grade in ML is equal to the number of non-CS students who failed in ML.

So, if there were 30 students who failed in ML, then the number of CS students who got a C grade in ML is also 30.

Therefore, 30 CS students failed in ML.

### **Q.13 How many non CS students got A grade in ML?**

#### **Solution.**

Let's break down the information provided and solve for the number of non-CS students who got an A grade in ML.

Let:

CS = Number of CS students

Non-CS = Number of non-CS students

A\_AI = Number of students who got an A grade in AI

B\_AI = Number of students who got a B grade in AI

C\_AI = Number of students who got a C grade in AI

A\_ML = Number of students who got an A grade in ML

B\_ML = Number of students who got a B grade in ML

C\_ML = Number of students who got a C grade in ML

We are given the following information:

1. The numbers of non-CS students who took AI and ML were in the ratio 2:5.

So, the number of non-CS students who took AI =  $2x$  and the number who took ML =  $5x$ , where  $x$  is a positive integer.

2. The number of non-CS students who took either AI or ML was equal to the number of CS students.

$$\text{Non-CS students who took AI or ML} = \text{CS}$$

$$2x + 5x = \text{CS}$$

$$7x = \text{CS}$$

3. The numbers of non-CS students who failed in the two courses were the same, and their total is equal to the number of CS students who got a C grade in ML.

$$(2x/5 + 5x/5) = C\_ML$$

$$(7x/5) = C\_ML$$

4. In both the courses, 50% of the students who passed got a B grade. But, while the numbers of students who got A and C grades were the same for AI, they were in the ratio 3:2 for ML.

So, for AI:

$$B\_AI = 0.5 * (A\_AI + B\_AI + C\_AI)$$

For ML:

$$B\_ML = 0.5 * (A\_ML + B\_ML + C\_ML)$$

$$A\_ML / C\_ML = 3 / 2$$

5. No CS student failed in AI, while no non-CS student got an A grade in AI. So, CS students failing in AI = 0 and A\_AI for non-CS students = 0.

6. The numbers of CS students who got A, B, and C grades respectively in AI were in the ratio 3:5:2, while in ML the ratio was 4:5:2.

$$A\_AI / B\_AI / C\_AI = 3 / 5 / 2$$

$$A\_ML / B\_ML / C\_ML = 4 / 5 / 2$$

7. The ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses was 3:1.

8. 30 students failed in ML.

So,  $C_{ML}$  (CS students who got a C grade in ML) = 30.

Now, we can solve the system of equations to find the values of  $A_{ML}$  and  $x$ :

From point 3, we have:

$$(7x/5) = 30 \text{ (since } C_{ML} = 30)$$

$$7x = 150$$

$$x = 150/7$$

Now that we know  $x$ , we can find the number of non-CS students who took ML:

$$5x = 5 * (150/7) = 750/7$$

Now, we can use point 4 to find  $A_{ML}$ :

$$A_{ML} / C_{ML} = 3 / 2$$

$$A_{ML} / 30 = 3 / 2$$

$$A_{ML} = (3/2) * 30$$

$$A_{ML} = 45$$

So, 45 non-CS students got an A grade in ML.

#### **Q.14 How many students got A grade in AI?**

##### **Solution.**

Let's analyze the information provided to determine how many students got an A grade in the AI (Artificial Intelligence) course.

We are given that:

1. The numbers of non-CS students who took AI and ML were in the ratio 2 : 5.
2. The number of non-CS students who took either AI or ML was equal to the number of CS students.

Let's denote:

- NCS\_AI: The number of non-CS students who took AI.
- NCS\_ML: The number of non-CS students who took ML.
- CS\_AI: The number of CS students who took AI.
- CS\_ML: The number of CS students who took ML.

From the given ratios, we can write the following equations:

1.  $NCS\_AI : NCS\_ML = 2 : 5$
2.  $NCS\_AI + NCS\_ML = CS\_AI + CS\_ML$  (because the number of non-CS students who took either AI or ML was equal to the number of CS students)

Now, let's consider the information related to grades:

3. The numbers of non-CS students who failed in the two courses were the same, and their total is equal to the number of CS students who got a C grade in ML.
4. In both courses, 50% of the students who passed got a B grade. While the numbers of students who got A and C grades were the same for AI, they were in the ratio 3 : 2 for ML.
5. No CS student failed in AI, while no non-CS student got an A grade in AI.
6. The numbers of CS students who got A, B, and C grades respectively in AI were in the ratio 3 : 5 : 2, while in ML, the ratio was 4 : 5 : 2.

Let's use this information to create equations for the grades in AI:

- Number of CS students who got an A grade in AI =  $3x$
- Number of CS students who got a B grade in AI =  $5x$
- Number of CS students who got a C grade in AI =  $2x$

Now, let's consider the information related to failing grades:

- The ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses was 3 : 1.

- 30 students failed in ML.

Let  $F_{CS}$  be the number of CS students who failed in either AI or ML, and  $F_{NCS}$  be the number of non-CS students who failed in either AI or ML.

We can write the following equation based on the information provided:

$$(F_{NCS} + F_{CS}) / F_{CS} = 3 / 1$$

Now, let's solve the equations step by step:

From equation 1 ( $NCS_{AI} : NCS_{ML} = 2 : 5$ ), we can say that  $NCS_{AI} = 2x$  and  $NCS_{ML} = 5x$ .

From equation 2 ( $NCS_{AI} + NCS_{ML} = CS_{AI} + CS_{ML}$ ), we know that  $NCS_{AI} + 2x + 5x = CS_{AI} + CS_{ML}$ .

Now, let's consider the information related to failing grades in ML:

- 30 students failed in ML.

So, we can write:

$$F_{CS} = 30$$

Now, we can use equation 7 (the ratio of failing students) to solve for  $F_{NCS}$ :

$$(F_{NCS} + 30) / 30 = 3 / 1$$

$$F_{NCS} + 30 = 90$$

$$F_{NCS} = 60$$

Now, let's use equation 3 (the numbers of non-CS students who failed in the two courses were the same, and their total is equal to the number of CS students who got a C grade in ML) to find the number of CS students who got a C grade in ML:

$$F_{NCS} + F_{CS} = 60 + 30 = 90$$

So, the number of CS students who got a C grade in ML = 90

Now, let's use equation 6 (the numbers of CS students who got A, B, and C grades respectively) to find the number of CS students who got an A grade in AI:

$$\text{Number of CS students who got an A grade in AI} = 3x = 3 * 3 = 9$$

So, 9 students got an A grade in AI.

### **Q.15 How many non CS students got A grade in ML?**

#### **Solution.**

Let's analyze the given information step by step to find out how many non-CS students got an A grade in ML.

1. The numbers of non-CS students who took AI and ML were in the ratio 2:5.
2. The number of non-CS students who took either AI or ML was equal to the number of CS students.
3. The numbers of non-CS students who failed in the two courses were the same and their total is equal to the number of CS students who got a C grade in ML.

4. In both the courses, 50% of the students who passed got a B grade. But, while the numbers of students who got A and C grades were the same for AI, they were in the ratio 3:2 for ML.
5. No CS student failed in AI, while no non-CS student got an A grade in AI.
6. The numbers of CS students who got A, B, and C grades respectively in AI were in the ratio 3:5:2, while in ML the ratio was 4:5:2.
7. The ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses was 3:1.
8. 30 students failed in ML.

Now, let's use this information to solve for the number of non-CS students who got an A grade in ML:

First, let's represent the number of CS students and non-CS students who took ML as  $CS\_ML$  and  $non\_CS\_ML$ , respectively.

From the information given in point 8, we know that 30 students failed in ML. Therefore, the number of CS students who failed in ML is  $30 / 4 = 7.5$ , but since the number of students must be a whole number, we can consider it as 8.

Now, according to point 3, the numbers of non-CS students who failed in the two courses were the same, and their total is equal to the number of CS students who got a C grade in ML. So, the number of non-CS students who failed in ML is also 8.

According to point 7, the ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses is 3:1. Since we know the number of non-CS students failing in ML (8), we can find the number of non-CS students failing in AI:

$$(8 + x) / 8 = 3/1$$

Now, let's solve for x:

$$8 + x = 24$$

$$x = 24 - 8$$

$$x = 16$$

So, 16 non-CS students failed in AI.

Now, let's consider the grades for ML:

- The total number of CS students in ML is CS\_ML.
- The total number of non-CS students in ML is non\_CS\_ML.
- The total number of students who passed ML is CS\_ML + non\_CS\_ML - 8 (8 CS students who failed).

According to point 4, 50% of the students who passed got a B grade, and the ratio of A to C grades for non-CS students in ML is 3:2. So, let's represent the number of non-CS students who got A, B, and C grades in ML as 3x, 2x, and 2x, respectively.

Now, we have:

$$3x (A) + 2x (B) + 2x (C) = (CS\_ML + non\_CS\_ML - 8) / 2$$

From point 2, we know that the number of non-CS students who took either AI or ML was equal to the number of CS students, so:

$$non\_CS\_ML + non\_CS\_AI = CS\_ML$$



Now, let's use this information to find the values of non\_CS\_AI and non\_CS\_ML:

From point 1, we know that the numbers of non-CS students who took AI and ML were in the ratio 2:5, so:

$$\text{non\_CS\_AI} / \text{non\_CS\_ML} = 2/5$$

$$\text{non\_CS\_AI} = (2/5) * \text{non\_CS\_ML}$$

Now, let's substitute this into the equation for non\_CS\_AI in terms of non\_CS\_ML:

$$\text{non\_CS\_ML} + (2/5) * \text{non\_CS\_ML} = \text{CS\_ML}$$

Simplify:

$$(7/5) * \text{non\_CS\_ML} = \text{CS\_ML}$$

Now, let's find the value of non\_CS\_ML in terms of CS\_ML:

$$\text{non\_CS\_ML} = (5/7) * \text{CS\_ML}$$

Now, we can substitute this back into the equation for grades in ML:

$$3x + 2x + 2x = (\text{CS\_ML} + (5/7) * \text{CS\_ML} - 8) / 2$$

Simplify:

$$7x = (12/7) * \text{CS\_ML} - 4$$

Now, we need to find the value of CS\_ML. Since CS students take both AI and ML, we can represent the number of CS students as CS\_AI = CS\_ML.

Now, let's rewrite the equation:

$$7x = (12/7) * CS\_AI - 4$$

Now, we need to find a solution where  $x$  is an integer. We can try different values for  $x$ :

$$\text{- If } x = 1, \text{ then } CS\_AI = (7/12) * 1 + 4 = 7/12 + 4 = 7/12 + 48/12 = 55/12$$

$$\text{- If } x = 2, \text{ then } CS\_AI = (7/12) * 2 + 4 = 14/12 + 48/12 = 62/12$$

$$\text{- If } x = 3, \text{ then } CS\_AI = (7/12) * 3 + 4 = 21/12 + 48/12 = 69/12$$

We can see that for  $x = 3$ ,  $CS\_AI$  is an integer, and the corresponding value of  $non\_CS\_ML$  is:

$$non\_CS\_ML = (5/7) * CS\_AI = (5/7) * (69/12) = 115/4$$

Now, let's calculate the total number of students in ML:

$$\text{Total students in ML} = CS\_ML + non\_CS\_ML = CS\_AI + non\_CS\_ML = (69/12) + (115/4)$$

Now, we know that 50% of the students who passed ML got a B grade, so:

$$\text{B grade in ML} = (1/2) * (\text{Total students in ML} - 8 - 3x - 2x - 2x)$$

$$\text{B grade in ML} = (1/2) * ((69/12) + (115/4) - 8 - 3x - 2x - 2x)$$

Now, let's calculate the A grades in ML:

$$\text{A grade in ML} = 3x = 3 * 3 = 9 \text{ (since } x = 3)$$

Now, we can calculate the total number of students who got A grade in ML:

$$\text{Total A grades in ML} = \text{A grade in ML (non-CS students)} + \text{A grade in ML (CS students)}$$

Total A grades in ML =  $9 + 3 * 9$  (because CS students are also taking ML)

Total