



The structure of the data interpretations and logical reasoning (DI-LR) section varies from exam to exam. The variation comes in many forms like the position of DI-LR questions, coverage of the concepts, level of difficulty, etc. For example, in exams like NMAT, SNAP, and CMAT, there is just a logical reasoning section, and the data interpretation questions are placed under the quantitative ability (QA) section, while in CAT, DI-LR is one separate section. In state-level MBA entrance exams like MH CET (which is a gateway to JBIMS, Mumbai), there are two separate sections for logical reasoning and abstract-reasoning questions.

So, from the DI-LR section's perspective, the MBA entrance exams can broadly be divided into two groups, as mentioned below, mainly based on the homogeneity among the topics and the level of difficulty of the questions.

1. CAT, XAT, IIFT
2. NMAT, SNAP, CMAT, TISSNET, MH CET, MAT, others

The questions in the DI-LR section of CAT, XAT, and IIFT are slightly more challenging compared to the other management entrance tests (OMETs). In this Part 1 of the

DI-LR booklet, we will cover all the important topics from the CAT, XAT, and IIFT perspectives. In Part 2 of the DI-LR booklet, the topics are covered mainly from the OMETs perspective.

### Trivia



To get 90+ percentile in DI-LR, solve eight questions correctly.

### Introduction to the DI-LR Section of CAT

The CAT paper pattern has changed a lot in the past 20 years, i.e., paper-based to online, all MCQs to MCQs + TITA, 150 questions to 66 questions, calculator not allowed to calculator allowed, etc. However, DI-LR-based questions have always been part of the paper, and so has been quantitative aptitude, verbal ability, and reading comprehension-based questions.

The following table provides some insights into the *DI-LR section of the past 3 years of the CAT exam*:

CAT Exam Year	No. of Questions	Time Limit	MCQs	TITA Questions
2019	32	60 minutes	24	8
2020	24	40 minutes	18	6
2021	20	40 minutes	15	5

**Note:** The marking scheme for MCQs is +3, -1, and for TITA (type in the answer) questions it is +3, 0.



In 2020, the DI-LR section of CAT surprised the students with a lesser number of sets and more questions per set. Till 2019, DI-LR sets used to have a maximum of four questions. However, in 2020, there were two sets with six questions each, and the same continued even in CAT 2021.

### How to Ace the DI-LR Section of CAT

Though the CAT paper pattern has changed a lot over the years, the DI-LR section has almost remained the same in terms of the surprises it throws and the pain it creates for the (underprepared) learners. It has also been observed that the CAT DI-LR sets are created keeping in mind the real-life scenarios or the recent events.

There is no defined syllabus for this section and every year, students see a new variety of sets in this section. However, the following are some of the important topics from which the questions have been asked more frequently:

- Charts and tables (calculation-based data interpretations)
- Reasoning-based data interpretations (mostly based on real-life scenarios or the recent events)
- Games and tournaments
- Routes and networks
- Quantitative reasoning and puzzles
- Arrangements, distributions, team formations
- Set theory and maximisation/minimisation problems (chocolate distribution concept)

Also, the skills required to ace this section have remained the same over the years and if you can develop these skills, you can easily score well in this section. The desired skills are:

- Sharp observation
- Data analysis/critical reasoning
- Out-of-box thinking
- Quantitative reasoning
- Calculations

Let's look at some puzzles. They will help you understand why the above-mentioned skills are important.

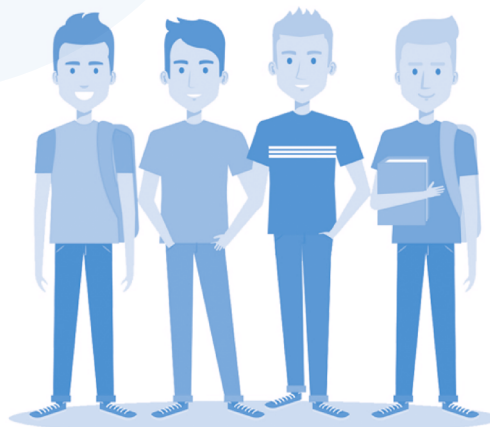
### Puzzle 1 – The Fruit Puzzle



Five prisoners, two men, and three women, were made to sit around a pentagonal table. The warden comes and places a fruit on each one's head such that the prisoners do not know the type of fruit on their heads but they can see the fruits on the heads of the others. They were told that the fruits are either apple or orange and there are at least two fruits of each type.

**How many of them can deduce the exact fruit on their heads if they are not allowed to communicate with each other?**

### Puzzle 2 – Dissimilarity Index





## CAT Mantra



A DI-LR set that may look challenging at first glance may turn out to be an easy one.

Four students were asked to rank five cities (P, Q, R, S, T) based on their preferences for living there. Rank 1 indicates the most preferred city and Rank 5 is the least preferred one. The following table was created based on their rankings. Two students are called moderately dissimilar to each other if the difference in their ranking for a particular city is exactly three.

**How many pairs of students are moderately dissimilar to each other?**

Student → Rank ↓	Ani	Bani	Chavi	Dari
1	P	S	S	T
2	Q	P	T	S
3	T	R	Q	R
4	R	T	P	Q
5	S	Q	R	P

## Puzzle 3 – River Crossing



There are four friends—Paresh, Quresh, Ronit, and Sunil. They are returning to their hostel and it's late evening. It is completely dark around and they have just one lamp among themselves. On the way, they have

come across a cracked bridge. The bridge can hold a maximum of two people at a time. Also, no one can walk a step without the lamp alongside. It is known that individually, each of them can cross the bridge in 2, 3, 6, and 9 minutes, respectively.

**What is the minimum time in which all four will cross the bridge?**

## Puzzle 4 – Sum 100

**Insert any of the +, −, ÷, × signs between the following digits such that the total becomes 100.**

1	2	3	4	5	6	7	8	9	= 100
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

## Puzzle 5 – Picking the Coins



Marco, a numismatist, collected 60 coins of different denominations and put them in a box. There were 14 coins of 10 cents, 10 coins of 20 cents, 18 coins of 25 cents, and the rest of 50 cents. Assume that all the coins were of the same size and texture, and so it is not possible for him to identify the coin without looking at it.

**If he picks the coins from the bag without looking at them, what is the minimum number of coins that he must pick to be sure of having picked at least one coin of each denomination?**

## Solutions to the Puzzles

### Puzzle 1

This puzzle requires you to do *critical thinking*. Here, the gender of the prisoner is not important.



Each of the two prisoners (having the type of fruit lesser in number, say apple) will see three fruits of the same variety (orange in this case) on the heads of the other three prisoners, and one fruit of a different variety (the apple). Since they know that there cannot be four fruits of the same variety, they can deduce that they must have apples on their heads.

*So, two prisoners will know the exact type of fruit on their heads.*

### **Puzzle 2**

This is an *observation-based* puzzle. By close observation, we can make out that:

- Ani and Bani are moderately dissimilar for city Q.
- Ani and Chavi are moderately dissimilar for city P.
- Bani and Dari are moderately dissimilar for cities P and T.
- Ani and Dari are moderately dissimilar for city S.

*So, there are four pairs of students who are moderately dissimilar to each other.*

### **Puzzle 3**

This puzzle requires you to think *out of the box*. Chances are very high that your answer would be 22 minutes as you might have thought that Paresh will assist everyone else to cross the bridge as he takes the least amount of time to cross the bridge. So, he will first go with Quresh, then comes back with the lamp. Then he goes with Ronit and comes back with the lamp, and at last, goes with Sunil. In this way, it would take 22 minutes.

However, they can cross the bridge in 20 minutes. Let's see how is that possible!

First, Paresh will go with Quresh and comes back with the lamp. This will take 3 minutes. As Quresh is slower between the two and he takes 3 minutes to cross the bridge, Paresh will have to reduce his speed to keep the lamp alongside. Then Paresh will hand over the lamp to Ronit and Sunil who, together, will take 9 minutes to cross the bridge. At this point, Quresh will come back with the lamp and it will take another 3 minutes. Finally, Paresh and Quresh will go together which will take another 3 minutes.

So, the total time taken will be  $3 + 2 + 9 + 3 + 3 = 20$  minutes.

### **Puzzle 4**

This puzzle tests your *quantitative reasoning* capability. There are more than 10 ways to get the summation of 100. A couple of them are mentioned below:

$$12 - 3 - 4 + 5 - 6 + 7 + 89 = 100$$

$$12 + 3 + 4 + 5 - 6 - 7 + 89 = 100$$

*We are sure that you would have thought of some other ways of doing it!*

### **Puzzle 5**

Once again, this puzzle requires *critical reasoning skills*. You must understand the question correctly which uses the phrase 'In order to be sure of'. So, let's think about what the worst-case scenario can be. Let's consider a possibility where he picked 50 coins which includes all the coins except the 20 cents coins. Isn't this possible? Yes, it is very much possible. So, the moment he picks the 51st coin, he will be sure that now at least one coin of each denomination has been included.

Hence, he must pick 51 coins.



## Solved Examples

By now, you would have got a fair idea about the skills required to crack the DI-LR section of CAT. Now let's try to get the actual feel of the CAT DI-LR section with the help of some *previous years' questions* (PYQs).

Following are some solved examples from previous years' CAT papers to give you an idea about the topics based on which the questions have been asked more frequently, as mentioned earlier.

### Important

Please note that you are taking up these questions without any preparation and hence, you should not make any judgment about your ability to solve the DI-LR sets. The objective here is just to get an idea about the composition of the DI-LR section of the CAT exam. So, just read the data and see if you can figure out some solution!

#### Set 1 (CAT 2017: SLOT 2)

##### Directions for Questions 1 and 2

A high-security research lab requires the researchers to set a pass key sequence based on the scan of the five fingers of their left hands. When an employee first joins the lab, her fingers are scanned in order of her choice, and then when she wants to re-enter the facility, she has to scan the five fingers in the same sequence.

The lab authorities are considering some relaxation of the scan-order requirements since it is observed that some employees often get locked out because they forget the sequence.

1. The lab has decided to allow a variation in the sequence of scans of the five fingers so that at most two scans (out of five) are out of place. For example, if the original sequence is thumb (T), index finger (I), middle finger (M), ring finger (R),

and little finger (L), then TLMRI is also allowed, but TMRLI is not.

How many different sequences of scans are allowed for any given person's original scan?

#### Solution: 11

This set can easily be solved with a little knowledge of the concept of combinations from quantitative aptitude. However, even if you do not know that you can figure out the solution with manual calculations.

Original sequence = TIMRL

At most two scans out of five are out of place, which here means exactly two scans out of five are out of place because if we take just one scan out of place then the second scan will automatically be out of place.

So, the total number of ways of selecting two fingers (which will be out of place) out

$$\text{of the five fingers} = \frac{\times \times}{\times} =$$

So, the total number of different sequences of scans allowed for any given person's original scan = 10 + 1 (the original scan), i.e., 11 ways.

#### Alternate method

If 'T' is out of place with anyone, then, we will have ITMRL, MITRL, RIMTL, and LIMRT out of place, i.e., *four cases possible*.

If 'I' is out of place with anyone, then, we will have TMIRL, TRMIL, and TLMRI out of place, i.e., *three cases possible*.

If 'M' is out of place with anyone, then we will have TIRML, and TILRM out of place, i.e., *two cases possible*.

If 'R' is out of place with anyone, then, we will have TIMLR out of place, i.e., *one case possible*.

So, the total number of different sequences of scans allowed for any given person's original scan = (4 + 3 + 2 + 1) + 1 (the original scan), i.e., 11 ways.





## CAT Mantra



Revise the basics of quant concepts quickly to perform well in DI-LR.

2. The lab has decided to allow variations of the original sequence so that input of the scanned sequence of five fingers is allowed to vary from the original sequence by one place for any of the fingers. Thus, for example, if TIMRL is the original sequence, then ITRML is also allowed, but LIMRT is not.

How many different sequences are allowed for any given person's original scan?

- (A) 7
- (B) 5
- (C) 8
- (D) 13

**Solution: (C)**

This is a slightly tricky question. You can't directly calculate the number of ways as there are multiple cases to be considered here.

Original sequence = TIMRL

**Case 1:**

Exactly one pair of adjacent fingers are out of place. So, it can be TI, IM, MR, RL, i.e., four ways.

**Case 2:**

Exactly two pairs of adjacent fingers are out of place. So, it can be TI and MR, TI and RL, IM and RL, i.e., three ways.

So, the total number of different sequences of scans allowed for any given person's original scan =  $(4 + 3) + 1$  (the original scan), i.e., eight ways.

Hence, option (C) is correct.

### Set 2 (CAT 2017: SLOT 2)

#### Directions for Questions 3 and 4

A tea taster was assigned to rate teas from six different locations—Munnar, Wayanad,

Ooty, Darjeeling, Assam, and Himachal. These teas were placed in six cups, numbered 1 to 6, not necessarily in the same order. The tea taster was asked to rate these teas on the strength of their flavour on a scale of 1 to 10. He gave a unique integer rating to each tea.

Some other information is given below:

1. Cup 6 contained tea from Himachal.
  2. Tea from Ooty got the highest rating, but it was not in cup 3.
  3. The rating of tea in cup 3 was double the rating of the tea in cup 5.
  4. Only two cups got ratings in even numbers.
  5. Cup 2 got the minimum rating and this rating was an even number.
  6. Tea in cup 3 got a higher rating than that in cup 1.
  7. The rating of tea from Wayanad was more than the rating of tea from Munnar, but less than that from Assam.
3. What was the second-highest rating given?

**Solution: 7**

This is a matrix (or grid) arrangement-based question where you need to arrange the data in tabular format based on the given conditions.

Let's try to identify the starting point.

#### Step 1

##### From point (4)

Only two cups have been given even-number ratings, and one of them is given to the tea in cup 2 (from statement 5).

##### From point (3)

It can be inferred that the rating of the tea in cup 3 is an even number as it is double the rating of the tea in cup 5. So, we can infer that the rating of the tea in cup 5 is an odd number (as the two even-number ratings are given to the tea in cups 2 and 3).



So, tea in cups 5 and 3 could have ratings 1 and 2, 3 and 6, or 5 and 10. Also, tea in cup 2 has the least rating, so tea in cup 5 cannot have 1. So, cups 5 and 3 could have ratings 3 and 6, or 5 and 10.

## Step 2

### From point (2)

The highest rating is given to the cup from Ooty and it is not cup 3. Hence, (10, 5) will also be eliminated.

Hence, cup 3<sub>rating</sub> = 6, cup 5<sub>rating</sub> = 3, cup 2<sub>rating</sub> = 2 (minimum and even).

### From point (6)

The rating given to cup 1 is less than that given to cup 3 and it should also be an odd number. (Since only two cups have even ratings.)

Hence, the possible ratings for cup 1 = 1 or 5. But the lowest possible rating is 2, so the rating given to tea in cup 1 should be 5.

### From points (1) and (2)

Cup 6 is from Himachal and the highest rating is given to the cup from Ooty.

Now, the other 2 ratings will be 7/9 (since only odd ratings greater than 6 and less than or equal to 10 are remaining).

Hence, cup 6<sub>rating</sub> = 7 (Himachal)

and cup 4<sub>rating</sub> = 9 (Ooty, the highest rating)

So, the second highest rating is 7.

4. What was the number of the cup that contained tea from Ooty?

### Solution: 4

As explained in the previous question, the tea from Ooty has to be in cup 4.

So, the answer is 4.

## Set 3 (CAT 2018: SLOT 1)

### Directions for Questions 5 and 6:

There are only four brands of entry-level smartphones called Azra, Bysi, Cxqi, and Dipq in a country. Details about their market share, unit selling price, and profitability (defined as the profit as a percentage of the revenue) for the year 2016 are given in the table below:

Brand	Market Share	Unit Selling Price (Rs.)	Profitability (%)
Azra	40	15,000	10
Bysi	25	20,000	30
Cxqi	15	30,000	40
Dipq	20	25,000	30

In 2017, the sales volume of entry-level smartphones grew by 40% compared to that in 2016. Cxqi offered a 40% discount on its unit selling price in 2017, which resulted in a 15% increase in its market share. Each of the other three brands lost 5% market share. However, the profitability of Cxqi came down to half of its value in 2016. The unit selling prices of the other three brands and their profitability values remained the same in 2017 as they were in 2016.

5. The brand that had the highest revenue in 2016 is:
- (A) Cxqi  
(B) Bysi  
(C) Azra  
(D) Dipq

### Solution: (C)

This is purely a calculation-based data interpretation set.



Let us assume that the overall number of units sold in 2016 was 'X'.

So, the revenue (in terms of X) for each brand for the year 2016 is calculated in the following table:

Brand	Market Share (%)	No. of Units (in 'X')	Unit Selling Price	Revenue (in 'X')
Azra	40	0.4X	15,000	6,000X
Bysi	25	0.25X	20,000	5,000X
Cxqi	15	0.15X	30,000	4,500X
Dipq	20	0.2X	25,000	5,000X

So, Azra had the maximum revenue. Hence, option (C).

Brand	Market Share (%)	No. of Units (in 'X')	Unit Selling Price	Revenue (in 'X')	Profitability	Profit
Azra	40	0.4X	15,000	6,000X	10%	600X
Bysi	25	0.25X	20,000	5,000X	30%	1,500X
Cxqi	15	0.15X	30,000	4,500X	40%	1,800X
Dipq	20	0.2X	25,000	5,000X	30%	1,500X

So, Cxqi had the highest profit. Hence, option (C).

#### Set 4 (CAT 2017: SLOT 2)

##### Directions for Questions 7 and 8

Funky Pizzeria was required to supply pizzas to three different parties. The total number of pizzas it had to deliver was 800, 70% of which were to be delivered to party 3, and the rest were equally divided between party 1 and party 2.

#### CAT Mantra



Accuracy is more important than speed to succeed in CAT.

6. The brand that had the highest profit in 2016 is:
- (A) Azra
  - (B) Bysi
  - (C) Cxqi
  - (D) Dipq

#### Solution: (C)

In the previous question, we calculated the revenue (in terms of X) for each of the brands for the year 2016. We also know the profitability of each of the brands. So, the profit for each of the brands (in terms of X) was as shown below:

Pizzas could be of thin crust (T) or deep dish (D) variety and come in either normal cheese (NC) or extra cheese (EC) versions.

Hence, there are four types of pizzas: T-NC, T-EC, D-NC, and D-EC. Partial information about the proportions of T and NC pizzas ordered by the three parties is given below:





	Thin Crust (T)	Normal Cheese (NC)
Party 1	0.6	
Party 2	0.55	0.3
Party 3		0.65
Total	0.375	0.52

7. How many thin crust pizzas were to be delivered to party 3?
- (A) 398  
(B) 162  
(C) 196  
(D) 364

### Solution: (B)

This is another calculation-based data interpretation set.

The total number of pizzas delivered = 800.

So, pizzas delivered to party 3 = 70% of 800 = 560.

Also, pizzas delivered to party 1 = 50% of (800 – 560) = 120.

And pizzas delivered to party 2 = 50% (800 – 560) = 120.

Now, we can create the following table:

	Thin Crust (T)	Deep Dish (D)	Normal Cheese (NC)	Extra Cheese (EC)
Party 1 (120)	0.6 of 120 = 72	(120 – 72) = 48	(416 – 36 – 364) = 16	(120 – 16) = 104
Party 2 (120)	0.55 of 120 = 66	(120 – 66) = 54	0.3 of 120 = 36	(120 – 36) = 84
Party 3 (560)	(300 – 66 – 72) = 162	(500 – 48 – 54) = 398	0.65 of 560 = 364	(384 – 84 – 104) = 196
Total (800)	— × =	(800 – 300) = 500	0.52 of 800 = 416	(800 – 416) = 384

**Note:** Here, we were given values of thin crust in proportion, so we could calculate deep dish as their total is 800.

Also, we were given values of normal cheese in proportion, so we could calculate extra cheese as their total is also 800.

Along with the above information, we have already found out that pizzas delivered to party 1 are 120 pizzas, pizzas delivered to party 2 are 120 pizzas, and pizzas delivered to party 3 are 560 pizzas.

Based on the table above, the thin-crust pizzas delivered to party 3

$$= \left( - \times \right) - \left[ \left( . \right) + \left( . \right) \right]$$

$$= 300 - (72 + 66) = 162$$

Hence, the correct answer is option (B).

8. How many normal cheese pizzas were required to be delivered to party 1?
- (A) 104  
(B) 84  
(C) 16  
(D) 196

**Solution: (C)**

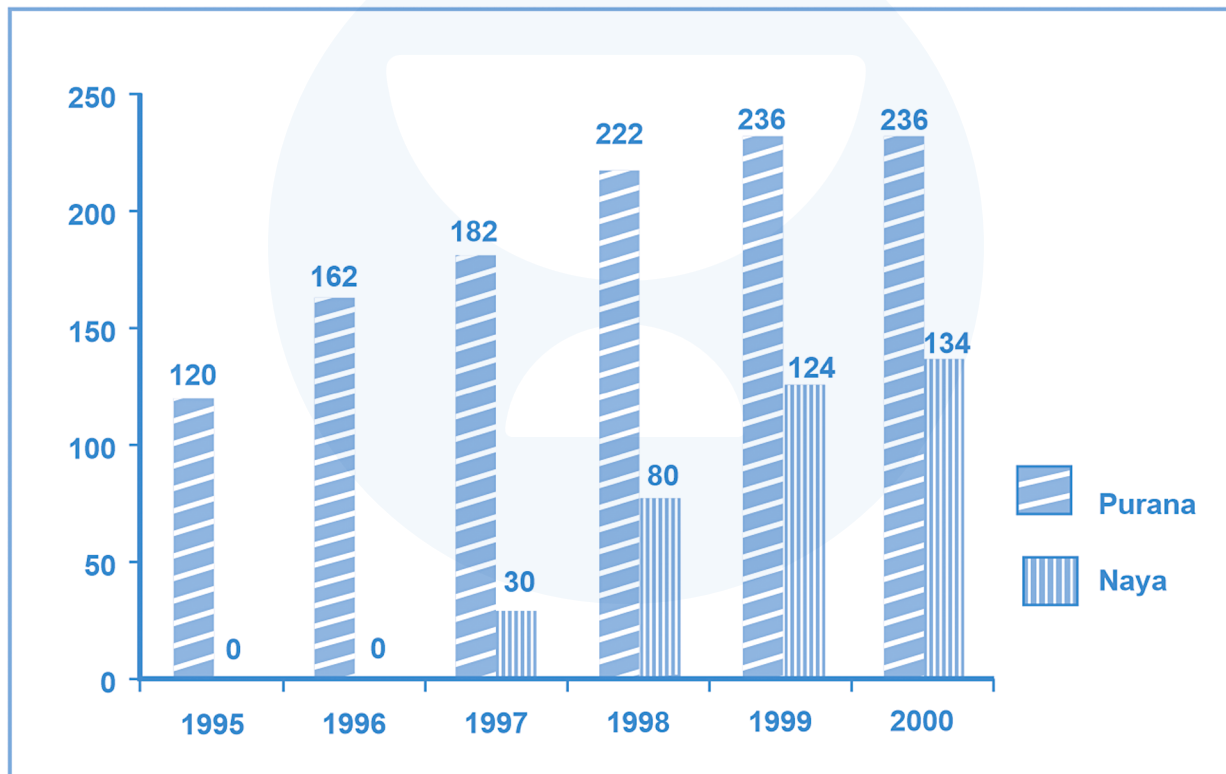
Once we have analysed the data and presented it in the tabular form, as explained in the previous question, the rest of the questions can be answered almost in a fraction of a second.

As can be seen in the table, 16 normal cheese pizzas were required to be delivered to party 1.

Hence, option (C).

**Set 5 (CAT 2004)****Directions for Questions 9 and 10**

Purana and Naya are two brands of kitchen mixer grinders available in the local market. Purana is an old brand that was introduced in 1990, while Naya was introduced in 1997. For both these brands, 20% of the mixer grinders bought in a particular year are disposed of as junk exactly 2 years later. It is known that 10 Purana mixer grinders were disposed of in 1997. The following figures (in the bar chart) show the number of Purana and Naya mixer grinders in operation from 1995 to 2000, at the end of the year.





## Rack Your Brain



A fruit seller bought 20 and 30 apples on Monday and Tuesday, respectively. He continues with the same pattern of buying for the rest of the week. If 20% of the apples bought get rotten exactly after 2 days, what will be the sellable stock of apples on Friday? (Assume that he sold none.)

### Solution:

He bought  $20 + 30 + 20 + 30 + 20 = 120$  fruits by Friday. Out of which, 20% of  $(20 + 30 + 20) = 14$  will be rotten by Friday. So, he will have  $120 - 14 = 106$  fruits.

9. How many Naya mixer grinders were disposed of by the end of 2000?

### Solution: 16

This type of DI-LR set tests the observation skills along with the analytical reasoning skills of the test taker.

The table below shows the Naya and Purana mixer grinders in operations during the given period.

	1995	1996	1997	1998	1999	2000
Purana	120	162	182	222	236	236
Naya	0	0	30	80	124	134

From the table, it is evident that 30 Naya mixer grinders were bought in 1997.

Also, a total of 80 Naya mixer grinders were in operation in 1998 out of which 30 were bought in the previous year, and so 50 Naya mixer grinders must have been bought in 1998.

Since 20% of the mixer grinders bought in a particular year were disposed of as junk exactly 2 years later, the total Naya mixer grinders that were disposed of by the end of the year 2000 (i.e., up to the year 2000) can be calculated as:

$$20\% \text{ of } (30) + 20\% \text{ of } (50) = 16$$

Hence, the answer is 16.

10. How many Naya mixer grinders were purchased in 1999?

### Solution: 50

	1995	1996	1997	1998	1999	2000
Purana	120	162	182	222	236	236
Naya	0	0	30	80	124	134

As discussed in the previous question, the number of Naya mixer grinders purchased in 1997 and 1998 were 30 and 50, respectively.

Also, the number of Naya mixer grinders disposed of in 1999 was 6 (20% of 30). So, the number of Naya mixer grinders carried over from 1998 to 1999 =  $80 - 6 = 74$ .

Since the number of Naya mixer grinders in operation in the year 1999 is 124, the number of Naya mixer grinders purchased in 1999 =  $124 - 74 = 50$ .

Hence, the answer is 50.



## Practice Exercise

### Level of Difficulty – 1

#### Set 1 (XAT 2020)

##### Directions for Questions 1 to 3

During 2015–2019, the revenues of four companies (P, Q, R, and S) were as follows:

Revenue (in Lakh Rupees)				
Year	P	Q	R	S
2015	150	125	150	100
2016	175	140	160	120
2017	200	180	180	140
2018	250	210	200	170
2019	250	220	240	180

1. Which of the given companies has seen the highest year-on-year growth (in percentage) in any single year during this 5-year period?
- (A) R  
(B) Q  
(C) S  
(D) P  
(E) There was a tie among multiple companies.

##### **Solution: (B)**

This question can quickly be solved by observation.

By noticing the table, we can conclude that either company P in 2018 (i.e., 200–250) or company Q in 2017 (i.e., 140–180) must have the highest year-on-year (YoY) growth. So, let's calculate for each of them.

YOY of company P in 2018 =  $50/200 \times 100\%$  = 25%.

YOY of company Q in 2017 =  $40/140 \times 100\%$  = 28.57%.

Hence, option (B).

#### Trivia



CAT MCQs have four options, but XAT MCQs have five options.

2. It was discovered later that one of the companies misreported its revenue of one of the years. If the misreported revenue is replaced by the correct revenue, the revenues of that company over the 5-year period will be in an arithmetic progression. The company that misreported its revenue was:
- (A) S only  
(B) P or S  
(C) P only  
(D) R or S  
(E) P or R

##### **Solution: (B)**

An arithmetic progression (AP) is a sequence of numbers where the common difference between the successive terms is the same (e.g., 105, 110, 115, etc.).

Once again, you need to use your observation skills to quickly solve this question. If we consider company P's revenue in 2018 as 225, then the revenues of company P over the given period will form an AP (150, 175, 200, 225, 250).

Similarly, if we consider company S's revenue in 2016 as 160, then their revenues will also be in AP (100, 120, 140, 160, 180). So, either of the companies P or S might have misreported its revenue. Hence, option (B).

3. During the period from 2014 to 2015, the revenue increased by 25% for three of the companies and by 50% for the remaining company. The total increase in revenue, for all four companies put together, was ₹125 lakhs. Which of the following *cannot* be true?



- (A) The 2014 revenues of P and R cannot be determined uniquely.
- (B) From 2014 to 2015, the increase in revenues of at least two companies were the same.
- (C) From 2014 to 2015, the revenues of P and R increased by different amounts.
- (D) The company that experienced the 50% increase in revenue also experienced the maximum increase in revenue in absolute terms.
- (E) The revenue of Q in 2014 was the same as the revenue of R in 2014.

**Solution: (B)**

Here, we do not know which company has grown by 50%. So, let's calculate the revenue for each of the companies for 25% growth as well as 50% growth over the period 2014–2015.

**For 25% increase**

Company	2014	2015	Increase
P	120	150	30
Q	100	125	25
R	120	150	30
S	80	100	20

**For 50% increase**

Company	2014	2015	Increase
P	100	150	50
Q	83.33	125	41.66
R	100	150	50
S	66.67	100	33.33

Now, if we consider 50% growth for company P and 25% for the rest, then the total increase in the revenue will be:  $50 (P) + 25 (Q) + 30 (R) + 20 (S) = ₹125$  lakhs.

If we consider 50% growth for company R and 25% for the rest, then the total increase in the revenue will be:  $30 (P) + 25 (Q) + 50 (R) + 20 (S) = ₹125$  lakhs.

If we consider 50% growth for company Q or S, the values of the total increase will be in decimal, and hence cannot be ₹125 lakhs. So, Q and S can't have 50% growth.

So, we can say that all the statements given in the options can be true except option (B).

**Shortcut**

We do not know which company has grown by 50%. So, let's calculate the revenue for each of the companies for 25% growth as well as 50% growth over the period 2014–2015.

With a little observation, we can say that Q and S can't be the companies with 50% growth as the total increase in revenue for all the four companies put together, was an integer number. With a little trial and error, we can conclude that company P had 50% growth and company Q had 25% growth. Hence, option (B).

**Set 2 (CAT 2020: SLOT 1)**

**Directions for Questions 4 to 7**

The local office of the APP-CAB company evaluates the performance of five cab drivers, i.e., 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		₹1,000	₹250 × Final Rating
Barun	3					₹1,200	₹200 × Final Rating
Chandan			2			₹1,400	₹100 × Final Rating
Damodaran		3				₹1,300	₹150 × Final Rating
Eman					2	₹1,100	₹200 × Final Rating

The following additional facts are known:

- 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.
- None of the drivers has got the same rating in three parameters.

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

- (A) 3.8  
(B) 3.4  
(C) 3.6  
(D) 3.2

**Solution: (C)**

For a driver to be eligible for the bonus, he should not get a rating of 1 in any of the parameters, and he should also get a rating of 5 in at least one parameter. Also, the same rating can't be given in three parameters.

Now, let's try to maximise the rating of Damodaran by violating at least one of the above-mentioned points.

So, in the following scenario, Damodaran will not get the bonus, and we have assigned the maximum possible ratings.

	P1	P2	P3	P4	P5
Damodaran	5	3	5	4	1

So, the maximum possible final rating =

— = . . Hence, option (C).

**CAT Mantra**



Do not miss to consider the rating values given in the table.

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

- (A) 3.0  
(B) 3.2  
(C) 2.8  
(D) 3.4

**Solution: (A)**

As explained earlier, for a driver to be eligible for the bonus, he should not get a rating of 1 in any parameter and he should also get a rating of 5 in at least one parameter. Also, the same rating can't be given in three parameters.





So, the minimum possible rating (considering the above-mentioned criteria) can be as shown in the table below:

	P1	P2	P3	P4	P5
Eman	5	2	3	3	2

So, the minimum possible final rating =

— = .

Hence, option (A).

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

- (A) 1,740  
(B) 1,600  
(C) 1,700  
(D) 1,750

**Solution: (C)**

As explained in the previous question, we need to satisfy all the criteria, along with considering the partial rating values given in the table. Keeping all the conditions in mind, the following rating values and the bonus amount can be obtained which will minimise the overall monthly payment (in rupees) of each of the drivers:

	P1	P2	P3	P4	P5	Bonus
Arun	5	2	2	4	3	$250 \times 3.2 = 800$
Barun	3	5	2	2	3	$200 \times 3.4 = 600$
Chandan	5	2	2	5	3	$100 \times 3 = 340$
Damodaran	5	3	2	2	3	$150 \times 3 = 450$
Eman	5	3	3	2	2	$200 \times 3 = 600$

So, the total monthly payment (in ₹) for each of the drivers will be:

A:  $1,000 + 800 = 1,800$

B:  $1,200 + 600 = 1,800$

C:  $1,400 + 340 = 1,740$

D:  $1,300 + 450 = 1,750$

E:  $1,100 + 600 = 1,700$

So, ₹1,700 will be the minimum monthly payment for a driver.

Hence, option (C).

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

- (A) 1,960  
(B) 1,950  
(C) 1,900  
(D) 2,050

**Solution: (A)**

This question requires us to take exactly the opposite approach of what we did in the previous question.

Considering all the conditions, we can obtain the following maximum values for the total monthly salary (in ₹) for each driver:

A:  $5 + 4 + 4 + 3 + 3 = 3.8 \times 250 = 950 + 1,000 = 1,950$

B:  $5 + 4 + 4 + 3 + 3 = 3.8 \times 200 = 760 + 1,200 = 1,960$

C:  $5 + 5 + 4 + 4 + 2 = 4 \times 100 = 400 + 1,400 = 1,800$

D:  $5 + 5 + 3 + 4 + 4 = 4.2 \times 150 = 630 + 1,300 = 1,930$

E:  $5 + 5 + 4 + 4 + 2 = 4 \times 200 = 800 + 1,100 = 1,900$

So, the maximum monthly payment for a driver can be ₹1,960.

Hence, option (A).

**Set 3 (CAT 2019: SLOT 1)**

**Directions for Questions 8 to 11**

The following table represents the addition of two six-digit numbers given in the first and the second rows, while the sum is given in the third row. In the representation, each of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 has been coded with one letter among A, B, C, D, E, F, G, H, J, K with distinct letters representing distinct digits.



		B	H	A	A	G	F
+		A	H	J	F	K	F
	A	A	F	G	C	A	F

8. Which digit does the letter A represent?

**Solution: 1**

This is a *cryptarithmic* puzzle where the digits of some numbers are represented by letters (or symbols), as given in the question.

$$\begin{array}{r}
 B \ H \ A \ A \ G \ F \\
 + \ A \ H \ J \ F \ K \ F \\
 \hline
 A \ A \ F \ G \ C \ A \ F
 \end{array}$$

Consider the first column (from the left side).

$$B + A = A \ A$$

So, A can only be 1. (We can also conclude that B = 9 and there is a carryover from the addition in the previous column.)

$$\text{So, } 9 + 1 + 1 = 11$$

Hence, the answer is 1.

9. Which digit does the letter B represent?

**Solution: 9**

As explained in the previous question, A = 1 and the only possible value for B is 9. Hence, the answer is 9.

**Tips by Toppers**

Do not miss to answer such TITA questions where there is a limited possibility of answers. Remember, there is no negative marking for TITA.

10. Which among the digits 3, 4, 6, and 7 cannot be represented by the letter D?

**Solution: 7**

Let's solve this question in a step-by-step manner.

**Step 1:**

From the solutions of the previous questions, we know that A = 1 and B = 9.

**Step 2:**

Now, let's look at the last column (from left side).

The value of F can only be 0 as  $F + F = F$  can only hold true if  $F = 0$ .

**Step 3:**

Consider the second column (from left side)

$H + H = F$ . Also, a carry of '1' has to go from this addition to the next column (as mentioned in the previous question); H has to be '5'.

So, by now, we know that: A = 1, B = 9, F = 0, H = 5.

**Step 4:**

Now, look at the addition of the digits in 4th column (from left side):

$$A + F = C$$

Since F = 0, there should be a carry from the previous column result (otherwise  $A + 0 = A$ ). So,  $G + K = 11$  (as A = 1).

Also, C has to be 2 ( $A + F + \text{carry of '1'}$ )

**Step 5:**

As we know that  $G + K = 11$ , so (G, K) can take values (3, 8), (4, 7), and (5, 6) in any order. But we know that H = 5, so the only possibilities are: (3, 8) and (4, 7).

Also,  $A + J = G$  (third column from the left side). So,  $J = G - 1$ .

Now, let's consider different possibilities:

**Case 1:** G = 3 and K = 8, J = 2 not possible as C = 2

**Case 2:** G = 8 and K = 3, J = 7 possible

**Case 3:** G = 4 and K = 7, J = 3 possible

**Case 4:** G = 7 and K = 4, J = 6 possible

Hence, the values of the letters can be as shown below:

$$\begin{array}{r}
 B \ H \ A \ A \ G \ F \\
 + \ A \ H \ J \ F \ K \ F \\
 \hline
 A \ A \ F \ G \ C \ A \ F
 \end{array}$$



This can be represented as:

$$\begin{array}{r} 9 \ 5 \ 1 \ 1 \ 8 \ 0 \\ + \ 1 \ 5 \ 7 \ 0 \ 3 \ 0 \\ \hline 1 \ 1 \ 0 \ 8 \ 2 \ 1 \ 0 \end{array}$$

or

$$\begin{array}{r} 9 \ 5 \ 1 \ 1 \ 7 \ 0 \\ + \ 1 \ 5 \ 6 \ 0 \ 4 \ 0 \\ \hline 1 \ 1 \ 0 \ 7 \ 2 \ 1 \ 0 \end{array}$$

or

$$\begin{array}{r} 9 \ 5 \ 1 \ 1 \ 4 \ 0 \\ + \ 1 \ 5 \ 3 \ 0 \ 7 \ 0 \\ \hline 1 \ 1 \ 0 \ 4 \ 2 \ 1 \ 0 \end{array}$$

So, D can never be 7 because one of J, G, or K will surely be 7.

**Note:** Letter D is not used in the addition but there is a mention of this letter in the data set.

Hence, the answer is 7.

11. Which among the digits 4, 6, 7, and 8 cannot be represented by the letter G?

**Solution: 6**

As discussed in the previous question, G can only take values from 4, 7, or 8.

Hence, the answer is 6.

#### Set 4 (CAT 2019: SLOT 1)

##### Directions for Questions 12 to 15

Princess, Queen, Rani, and Samragini were the four finalists in a dance competition. Ashman, Badal, Gagan, and Dyu were the four music composers who individually assigned items to the dancers. Each dancer had to individually perform in two dance items assigned by the

different composers. The first items performed by the four dancers were all assigned by different music composers. No dancer performed her second item before the performance of the first item by any other dancers. The dancers performed their second items in the same sequence of their performance of their first items.

The following additional facts are known:

- i) No composer who assigned an item to Princess, assigned any item to Queen.
- ii) No composer who assigned an item to Rani, assigned any item to Samragini.
- iii) The first performance was by Princess; this item was assigned by Badal.
- iv) The last performance was by Rani; this item was assigned by Gagan.
- v) The items assigned by Ashman were performed consecutively. The number of performances between items assigned by each of the remaining composers was the same.

12. Which of the following is true?

- (A) The second performance was composed by Dyu.
- (B) The third performance was composed by Ashman.
- (C) The second performance was composed by Gagan.
- (D) The third performance was composed by Dyu.

**Solution: (A)**

Let's create a table and put the information which is directly given.

Since the dancers performed their second items in the same sequence as their performance of their first items, from points (iii) and (iv), we can get the following arrangement for the dancers and composers for positions 1 to 8.



	1	2	3	4	5	6	7	8
Dancer	Princess			Rani	Princess			Rani
Composer	Badal							Gagan

Also, the items assigned by Ashman were performed consecutively, so he can be placed in fourth and fifth positions. It is also given that the number of performances between items assigned by

each of the remaining composers was the same. Hence, the final table looks like this:

	1	2	3	4	5	6	7	8
Dancer	Princess	Samragini	Queen	Rani	Princess	Samragini	Queen	Rani
Composer	Badal	Dyu	Gagan	Ashman	Ashman	Badal	Dyu	Gagan

So, we can easily conclude that the second performance was composed by Dyu.

Hence, option (A).

**13.** Which of the following is *false*?

- (A) Queen did not perform in any item composed by Gagan.

(B) Rani did not perform in any item composed by Badal.

(C) Samragini did not perform in any item composed by Ashman.

(D) Princess did not perform in any item composed by Dyu.

**Solution: (A)**

	1	2	3	4	5	6	7	8
Dancer	Princess	Samragini	Queen	Rani	Princess	Samragini	Queen	Rani
Composer	Badal	Dyu	Gagan	Ashman	Ashman	Badal	Dyu	Gagan

It is evident from the table that Queen has performed on the item composed by Gagan at position 3.

Hence, option (A).

**14.** The sixth performance was composed by:

- (A) Gagan  
(B) Ashman

(C) Badal

(D) Dyu

**Solution: (C)**

It becomes very easy to answer all the questions once you have created the table, as shown below:

	1	2	3	4	5	6	7	8
Dancer	Princess	Samragini	Queen	Rani	Princess	Samragini	Queen	Rani
Composer	Badal	Dyu	Gagan	Ashman	Ashman	Badal	Dyu	Gagan



It is evident from the table that the sixth performance was composed by Badal. Hence, option (C).

15. Which pair of performances were composed by the same composer?
- (A) The first and the sixth
  - (B) The second and the sixth

- (C) The first and the seventh
- (D) The third and the seventh

**Solution: (A)**

It is evident from the table that the first and sixth performances were composed by Badal.

Hence, option (A).

	1	2	3	4	5	6	7	8
Dancer	Princess	Samragini	Queen	Rani	Princess	Samragini	Queen	Rani
Composer	Badal	Dyu	Gagan	Ashman	Ashman	Badal	Dyu	Gagan





## Level of Difficulty – 2

### Set 1 (CAT 2020: SLOT 2)

#### Directions for Questions 1 to 3

Twenty-five coloured beads are to be arranged in a grid comprising five rows and five columns. Each cell in the grid must contain exactly one bead. Each bead is coloured either red, blue, or green.

While arranging the beads along any of the five rows or along any of the five columns, the rules given below are to be followed:

- Two adjacent beads along the same row or column are always of different colours.
- There is at least one green bead between any two blue beads along the same row or column.
- There is at least one blue and at least one green bead between any two red beads along the same row or column.

Every unique, complete arrangement of twenty-five beads is called a configuration.

- The total number of possible configurations using beads of only two colours is:

#### Solution: b

Let B, G, and R denote blue, green, and red, respectively.

Since only two beads can be used, red is automatically out as it requires at least one green and at least one blue between two reds.

Given the condition that there can be no beads of the same colour adjacent to each other, we can have only two possible arrangements.

- Blue beads in the corners**

B	G	B	G	B
G	B	G	B	G
B	G	B	G	B

G	B	G	B	G
B	G	B	G	B

- Green beads in the corners**

G	B	G	B	G
B	G	B	G	B
G	B	G	B	G
B	G	B	G	B
G	B	G	B	G

Hence, the answer is (b).

- What is the maximum possible number of red beads that can appear in any configuration?

#### Solution: 9

The idea here is to maximise the number of red beads in each row. Let's understand it better with the arrangement of beads in the grid.

Try to put as many R's in a row as possible (keeping the given conditions in mind). Since we know that 1R needs to have at least 1B and 1G between them, we need to leave two spaces between 2Rs, as shown below:

R			R	
	R			R
		R		
R			R	
	R			R

In the remaining positions, we can put the Bs and Gs, as per the condition.

So, we can have a maximum of 9 red beads.

Hence, the answer is 9.





3. What is the minimum number of blue beads in any configuration?

**Solution: 6**

To minimise blue beads, we need to maximise the red beads.

As seen in the previous question, the grid will look as shown below after putting all the colours beads as per the conditions:

R	G	B	R	G
G	R	G	B	R
B	G	R	G	B

R	B	G	R	G
G	R	B	G	R

So, there will be a minimum of 6 blue beads in the grid.

Hence, the answer is 6

**Set 2 (CAT 2019: SLOT 2)**

**Directions for Questions 4 to 7:**

In the table below, the check marks indicate all languages spoken by five people: Paula, Quentin, Robert, Sally, and Terence. For example, Paula speaks only Chinese and English.

	Arabic	Basque	Chinese	Dutch	English	French
Paula			✓		✓	
Quentin				✓	✓	
Robert	✓					✓
Sally		✓			✓	
Terence			✓			✓

These five people form three teams—Team 1, Team 2, and Team 3. Each team has either two or three members. A team is said to speak a particular language if at least one of its members speaks that language.

The following facts are known:

- i) Each team speaks exactly four languages and has the same number of members.
- ii) English and Chinese are spoken by all three teams, Basque and French by exactly two teams, and the other languages by exactly one team.
- iii) None of the teams include both Quentin and Robert.
- iv) Paula and Sally are together in exactly two teams.

- v) Robert is in Team 1 and Quentin is in Team 3.

4. Who among the following four is not a member of Team 2?

- (A) Quentin
- (B) Paula
- (C) Sally
- (D) Terence

**Solution: (A)**

Let's analyse the given data and try to allot teams to the members based on the conditions given in a step-by-step manner. It is also evident from the given data that a person can be part of multiple teams (else each team won't have the same number of members).



### Step 1

From points (i), (ii), and (v), the person in Team 1 speaks English, Chinese, Arabic, and French (as English and Chinese are spoken by all three teams, and Robert, who is in Team 1, speaks Arabic and French). Also, the persons in Team 3 surely speak English, Chinese, Dutch (as Quentin speaks both English and Dutch).

### Step 2

From point (iv), Paula and Sally are together in exactly two teams. But as seen in step 1, all four languages (English, Chinese, Arabic, and French) are covered for Team 1. So, we can conclude that Paula and Sally are together in teams 2 and 3. Also, Paula and Sally together speak only three languages in total, so there has to be one more person in Team 2. Since all the teams have equal members, we can surely say that each team has three members.

*The information collected up till now can be summarised as below:*

Team 1: English, Chinese, Arabic, and French (Robert, \_\_, \_\_)

Team 2: English, Chinese, Basque, and \_\_ (Paula, Sally, \_\_)

Team 3: English, Chinese, Basque, and Dutch (Paula, Sally, Quentin)

### Step 3

In point (ii), it is mentioned that Basque and French are spoken by exactly two teams.

Team 1 already has Robert who speaks French, so the other team that speaks French is Team 2, and Terrence will be the 3rd member of Team 2 since he speaks French.

Terrence will also be a member of Team 1 as there is no one in that team who speaks Chinese and French.

### Step 4

Now let's see who can be the remaining member of Team 1.

Only Paula can be placed in Team 1 as she speaks the two languages from those mentioned in team 1.

*So, the final composition of members will be as shown below:*

Team 1: English, Chinese, Arabic, and French (Robert, Terrence, Paula)

Team 2: English, Chinese, Basque, and French (Paula, Sally, Terrence)

Team 3: English, Chinese, Basque, and Dutch (Paula, Sally, Quentin)

So, we can conclude that everyone mentioned in the options except Quentin can be part of the team.

Hence, option (A).

5. Who among the following four people is a part of exactly two teams?

- (A) Sally
- (B) Robert
- (C) Paula
- (D) Quentin

#### **Solution: (A)**

The final compositions of the teams are:  
Team 1: English, Chinese, Arabic, and French (Robert, Terrence, Paula)

Team 2: English, Chinese, Basque, and French (Paula, Sally, Terrence)

Team 3: English, Chinese, Basque, and Dutch (Paula, Sally, Quentin)

So, among the following four people, only Sally is a part of exactly two teams.

Hence, option (A).

6. Who among the following is a member of all the teams?

- (A) Sally
- (B) No one
- (C) Terence
- (D) Paula

#### **Solution: (D)**

Based on the final compositions of the teams, Paula is a part of all teams.

Hence, option (D).



7. Apart from Chinese and English, which languages are spoken by Team 1?

- (A) Arabic and Basque
- (B) Arabic and French
- (C) Basque and Dutch
- (D) Basque and French

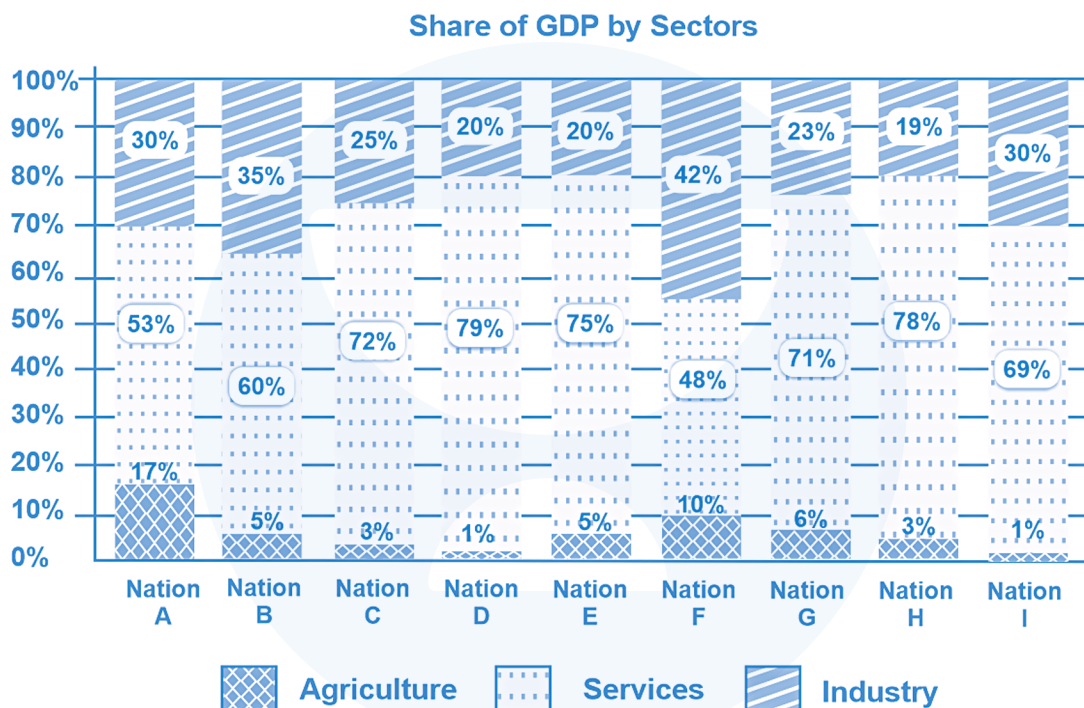
**Solution: (B)**

Based on the languages mentioned in the final compositions of the teams, apart from Chinese and English, Arabic and French are spoken by Team 1. Hence, option (B).

**Set 3 (XAT 2020)**

**Directions for Questions 8 to 11**

The following graph depicts sector-wise percentage contributions to the gross domestic product (GDP) of nine nations, labelled 'Nation A', 'Nation B', and so on. It is known that these nations are Brazil, China, France, Germany, India, Japan, Russia, the UK, and the USA, but not necessarily in the same order.



The following, however, are known:

- i) The GDPs of the nine nations (in US\$ trillion) are:

Nation	Brazil	China	France	Germany	Japan	India	Russia	UK	USA
GDP	2	10	3	4	5	2	2	3	17



- ii) China has the highest agriculture sector GDP, valued at US \$1 trillion, followed respectively by the USA and India.
  - iii) In terms of percentage contribution to the respective nations' GDPs by their service sectors, the UK and France are respectively the first and the second.
  - iv) Nation A, Nation B, and Nation G have the same GDP.
  - v) The GDP of India's industry sector is lower than the GDP of Russia's industry sector. However, it is larger than that of Brazil's industry sector.
8. Based on the given information, how many nations can be uniquely identified?
- (A) 3
  - (B) 7
  - (C) 9
  - (D) 6
  - (E) 2

**Solution: (D)**

Let's analyse the given information in a step-by-step manner.

**Step 1**

From point (ii), China is represented by 'Nation F' as China has total GDP of \$10 trillion and Nation F has a 10% revenue share of the agriculture sector. So, 10% of \$10 trillion = \$1 trillion which is exactly as mentioned in point 2.

Also, from point (iii), the UK must be Nation D and France must be Nation H.

**Step 2**

From point (iv), Nation A, Nation B, and Nation G must be one among India, Brazil, and Russia.

From point (v), with simple calculations of industry sector GDP for each of the nations (with total GDP of \$2 trillion), we can conclude that India must be A, Brazil must be G, and Russia must be B.

**Step 3:**

From point (ii), USA GDP from the agriculture sector is less than China but greater than India.

So, USA GDP from the agriculture sector should be more than \$0.34 trillion and less than \$1 trillion, i.e., percentage-wise, it must be more than 2% and less than 5.8%.

So, the USA can be represented by one of Nation C or Nation E or Nation H.

But Nation H represents France, so, the possible nations for the USA are only C and E.

Now, Germany and Japan can be C or I or E.

So, only six nations (Nations A, B, D, F, G, H) can be uniquely identified.

Hence, option (D).

9. Based on the given information, which of the following *cannot* be ruled out?
- (A) Russia is Nation G.
  - (B) Japan is Nation E.
  - (C) US is Nation I.
  - (D) India is Nation B.
  - (E) China is Nation C.

**Solution: (B)**

As seen in the previous question, the possible nations for the USA are only C and E, and that for Germany and Japan are C or I or E.

So, Japan can be Nation E.

Hence, option (B).

10. If the industry revenue of US is \$4.25 trillion and that for Japan is \$1 trillion, then which nation represents Germany?
- (A) C
  - (B) E
  - (C) I
  - (D) C or I
  - (E) C or E

**Solution: (C)**

As seen in the previous question, the possible nations for the USA are only C or E, and that for Germany and Japan are C or I or E.



Now, industry revenue for US and Japan will be \$4.25 trillion and \$1 trillion, respectively, so Nation C should be the USA and Nation E as Japan.

So, Germany will be represented by Nation I.

Hence, option (C).

- 11.** Which of the following information, when considered in addition to the given information, does not allow us to completely identify the nine nations in the graph?
- (A) Germany's industry GDP is US \$1.2 trillion.
  - (B) Both Japan's and Germany's industry GDPs are more than US \$1 trillion.
  - (C) Japan's industry GDP is US \$1.25 trillion.
  - (D) In terms of percentage contribution to the respective nations' GDP, France and Japan's agriculture sectors contribute the same.
  - (E) The nation ranked fourth in terms of agriculture GDP has its agriculture GDP valued at US \$150 billion.

**Solution: (D)**

As seen in the previous questions, we know the exact country represented by six nations (i.e., Nations A, B, D, F, G, H). Also, the possible nations for the USA are only C and E, and those for Germany and Japan are C or I or E. Now, we will have to evaluate each option one by one to understand which additional statement allows us to identify the remaining nations.

**Note:** In the actual exam, you may leave one of the time-consuming questions of a set. It is not compulsory to attempt all the questions from the set on hand.

Option (A) tells us that Germany's industry GDP is US \$1.2 trillion. This will be possible only when Germany is represented by Nation I. So, USA and Japan can be one of C or E.

So, we are not able to uniquely determine the nations.

**Note:** In the actual exam, we really do not need to evaluate the other options once we get the desired answer.

As per option (B), Germany has to be Nation I, and Japan has to be Nation C. So, USA will be Nation E. So, we can identify the nine nations completely.

As per option (C), Japan has to be Nation C, So, USA will be Nation E, and Germany will be Nation I. So, we can identify the nine nations completely.

As per option (D), Japan has to be Nation C (as the agriculture sector's percentage contributions are the same for France and Japan, i.e., 3%), So, the USA will be Nation E, and Germany will be Nation I. So, we can identify the nine nations, completely.

Option (E) states that China has the highest agriculture sector GDP, valued at US \$1 trillion, followed respectively by the USA and India.

As per the statement, the nation ranked fourth in terms of agriculture GDP has its agriculture GDP valued at US \$150 billion. This will only be possible if we consider Japan as Nation C (as 3% of 5 trillion = 150 billion).

So, Japan has to be Nation C. So, USA will be Nation E, and Germany will be Nation I. So, we can identify the nine nations completely.

Hence, option (A).



## Set 4 (CAT 2004)

### Directions for Questions 12 to 15

The year was 2006. All six teams in Pool A of World Cup hockey, play each other exactly once.

Each win earns a team three points, a draw earns one point, and a loss earns zero points.

The two teams with the highest points qualify for the semi-finals. In case of a tie, the team with the highest goal difference (Goal For – Goals Against) qualifies.

In the opening match, Spain lost to Germany. After the second round (after each team played two matches), the pool table looked as shown below:

Teams	Games played	Won	Drawn	Lost	Goals For	Goals Against	Points
Germany	2	2	0	0	3	1	6
Argentina	2	2	0	0	2	0	6
Spain	2	1	0	1	5	2	3
Pakistan	2	1	0	1	2	1	3
New Zealand	2	0	0	2	1	6	0
South Africa	2	0	0	2	1	4	0

In the third round, Spain played Pakistan, Argentina played Germany, and New Zealand played South Africa. All the third-round matches were drawn. Following are some of the results from the fourth and fifth-round matches:

- i) Spain won both the fourth and fifth-round matches.
  - ii) Both Argentina and Germany won their fifth-round matches by 3 goals to 0.
  - iii) Pakistan won both the fourth and fifth-round matches by 1 goal to 0.
12. Which one of the following statements is true about matches played in the first two rounds?
- (A) Germany beat New Zealand by 1 goal to 0.
  - (B) Spain beat New Zealand by 4 goals to 0.

- (C) Spain beat South Africa by 2 goals to 0.
- (D) Germany beat South Africa by 2 goals to 1.

### Solutions: (D)

This is a 'Games and Tournament' based set with a high level of difficulty. To answer the question, we will have to do a bit more detailed analysis.

The following points can be summarised based on the information given:

- i) Germany won both the games (with 3 goals FOR and 1 AGAINST), its goal compositions could only be 2-1 and 1-0.
- ii) Argentina won both the games (with 2 goals FOR and 0 AGAINST), so its goal compositions could only be 1-0 and 1-0.
- iii) Pakistan has won one game and lost another (with 2 goals FOR and 1 AGAINST), so its goal compositions have to be 2-0 and 0-1.





	Germany	Argentina	Spain	Pakistan	New Zealand	South Africa
Match 1/2	2-1	1-0		2-0		
Match 2/1	1-0	1-0		0-1		

**iv)** It is given that Spain lost its opening match against Germany, so the score of this Germany-Spain match must have been either 2-1 or 1-0. If we consider it as 2-1 then Spain's goal compositions will be 1-2 (Germany) and 4-0 (which could only be against New Zealand). So, New Zealand's goal compositions will be 0-4 and 1-2. But there is no other winning team with composition 2-1 so the Germany-Spain match result should be 1-0.

**v)** So, Spain's goal compositions must be 0-1 (Germany) and 5-1 (New Zealand), as

its goals FOR and AGAINST figures are 5 and 2, respectively.

**vi)** Now, New Zealand's goal compositions must be 1-5 (Spain) and 0-1 (Argentina), as its goals FOR and AGAINST figures are 1 and 6, respectively.

**vii)** Also, Pakistan's 2-0 can only be against South Africa and 0-1 against Argentina.

**viii)** Lastly, South Africa's goal compositions should be 0-2 against Pakistan and 1-2 against Germany.

So, the final outcome of matches after two rounds must be:

Germany	Argentina	Spain	Pakistan	New Zealand	South Africa
2-1 (South Africa)	1-0 (Pakistan)	0-1 (Germany)	2-0 (South Africa)	1-5 (Spain)	0-2 (Pakistan)
1-0 (Spain)	1-0 (New Zealand)	5-1 (New Zealand)	0-1 (Argentina)	0-1 (Argentina)	1-2 (Germany)

As we can see in the table, Germany beat South Africa by 2 goals to 1.

Hence, option (D).

**13.** Which one of the following statements is true about matches played in the first two rounds?

- (A) Pakistan beat South Africa by 2 goals to 1.
- (B) Argentina beat Pakistan by 1 goal to 0.
- (C) Germany beat Pakistan by 2 goals to 1.
- (D) Germany beat Spain by 2 goals to 1.

**Solution: (B)**

As we can see in the table, Argentina beat Pakistan by 1 goal to 0.

Hence, option (B).

**14.** If Pakistan qualified as one of the two teams from Pool A, which was the other team that qualified?

- (A) Argentina
- (B) Germany
- (C) Spain
- (D) Cannot be determined

**Solution: (D)**

As mentioned in point (b), both Argentina and Germany won their fifth-round matches. So, the total wins for each of these teams were at least three at the end of five rounds. Now, if Pakistan qualifies from Pool A, Pakistan must have won at least three matches as only two teams can qualify from Pool A.



Even if Pakistan wins against Spain, any team out of Spain, Germany, and Argentina could have been qualified from Pool A as we do not have concrete data about the victory margins.

So, we cannot find out the other team to qualify from Pool A.

Hence, option (D).

**15.** Which team finished at the top of the pool after five rounds of matches?

- (A) Argentina
- (B) Germany
- (C) Spain
- (D) Cannot be determined

**Solution: (D)**

As explained in the previous question, we cannot determine the top two teams from Pool A.

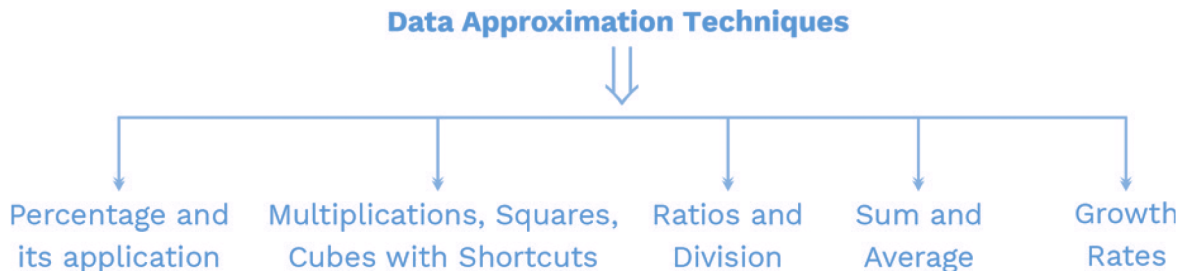
Hence, option (D).





Speed is a great asset in the DILR section of the CAT. If we get entangled in complex calculations, time will surely run out, and we will miss the boat. Therefore, before taking up the DI questions, we must learn a few important calculations and approximation

techniques. An approximation may turn a complex calculation into a less complicated one, and save you a lot of time. The CAT exam does provide an online calculator, but using it for every small calculation can be tedious.



From the above diagram, one can see that data approximation techniques are divided into five parts.

### Percentage and Its Applications

There are several methods to calculate the percentage of any number, but for the data interpretation part, one has to choose the method which not only gives an accurate value but also saves a lot of time. This can be understood with the given illustration.

#### Example

Find 25.1% of 496

**Method 1:** With the normal method, i.e., 25.1% of 496

One can see that multiplying the numerator part is a little tedious and also time-consuming.

$$= \frac{25.1}{100} \times 496 = \frac{251}{1000} \times 496 = \dots$$

**Method 2:** Percentage break

25.1% of 496

This can be written as

(25 + 0.1)% of 496

= 25% (496) + 0.1% (496)

$$= \frac{25}{100} \times 496 + \frac{0.1}{100} \times 496 = \dots$$

#### Rack Your Brain



Find a 4-digit number of the form 'aabb', which is a perfect square.

**Method 3:** Using fractional equivalent of percentage

For quicker calculations, one should remember certain fractions and their equivalent percentages, as given in the following table:

1	100%
1/2	50%
1/3	33.33%
1/4	25%
1/5	20%
1/6	16.66%
1/7	14.28%
1/8	12.5%
1/9	11.11%
1/10	10%
1/11	9.09%
1/12	8.33%

#### Example

Using the 'fractional equivalent of percentage' method, the calculations can be done as shown below.



$$\begin{aligned}
& 25.1\% \\
& = 25\% + 0.1\% \\
& = 1/4 + 1/1000 \\
& \text{So, } 25.1\% \text{ of } 496 \\
& = 1/4 \times 496 + 1/1000 \times 496 \\
& = 124 + 0.496 \\
& = 124.496
\end{aligned}$$

**Note:** One can use any of the above mentioned three methods, depending upon the values in percentage calculation

### Concept of Multiplying Factor Used in Data Interpretation

Suppose one wants to increase a value '50' by 20%. With the normal approach, the increased value can be found as:

$$+ \quad \times \text{ — } = \quad + \quad =$$

Now, using multiplying factor it can be seen as

$$= \quad + \quad \times \text{ — } = \left( + \text{ — } \right) = \quad \times . \quad =$$

So, 1.2 is called the multiplying factor (MF) corresponding to 20% and this method can simplify a lot of calculations.

#### CAT Mantra

The MF corresponding to x% increase is nothing but  $+ \text{ — }$  and for an x% decrease, it is  $- \text{ — }$ .

### Percentage Changes

In data interpretation questions, many a time you are required to calculate percentage change. The following formula can be used to calculate the same:

$$\% \text{ Change} = \frac{\text{ — } - \text{ — }}{\text{ — }} \times 100\%$$

**Note:** While calculating the percentage change, if the result comes out to be negative, it indicates a % reduction.

### Successive percentage changes

Suppose in the first year, the sales of a product of company X increase by 20%, and in the second year, the sales increase by 10% again, then what will be the net increase over the two years?

Here, most of the students do mistakes by answering as  $20\% + 10\% = 30\%$ .

The above case is a true example of successive percentage changes.

#### CAT Mantra

Two successive percentage changes of a% and b% is an effective change of  $\left( a + b + \frac{ab}{100} \right) \%$ .

Here, in the first year, the sales increased by 20% and in the second year by 10%.

$$\begin{aligned}
& \text{Therefore, the net effective increase} = \left( + \quad + \frac{\times}{100} \right) \% \\
& = \quad + \quad + \text{ — } = \quad \%
\end{aligned}$$

### Other Important Concepts

In data interpretation questions, a student is not required to have in-depth knowledge of statistics and applied mathematics. However, it's a sure advantage to know some commonly used terms beforehand. Questions that involve advanced concepts would most likely carry a brief explanation of those terms and concepts; but if you already know them, it can help you connect easily and save a lot of time.



Following are the terms that one may come across while solving calculations based on data sets.

### Inflation

- Inflation is an increase in the price of a commodity.
- The rate of inflation is a percentage that measures the percentage increase in the price.

### Deflation

- Deflation is a decrease in the price of a commodity.
- It is the opposite of inflation.

### Appreciation

- Appreciation is an increase in the purchasing power of money.
- When there is deflation, the value of money appreciates.

### Depreciation

- Depreciation is a decrease in the purchasing power of money.
- It is the opposite of appreciation. When there is Inflation, the value of money depreciates.

### CAGR and AAGR

- CAGR is an acronym for 'compounded annual growth rate'. Similarly, AAGR is an acronym for 'average annual growth rate'. Following are the formulas to calculate CAGR and AAGR:

$$A = \left[ \left( \frac{\text{Final Value}}{\text{Initial Value}} \right)^{\frac{1}{n}} - 1 \right] \times 100$$

$$AA = \frac{\text{Total Growth}}{\text{Number of Years}}$$

### Example 1:

Suppose a person has bought 200 shares of company X at ₹100 in the year 2019, and he has sold all the 200 shares in the year 2021 at ₹150.

What is the CAGR of stocks?

### Solution:

$$\text{CAGR of Stocks} = \left[ \left( \frac{\text{Final Value}}{\text{Initial Value}} \right)^{\frac{1}{n}} - 1 \right] \times 100$$

$$\left( \frac{\text{Final Value}}{\text{Initial Value}} \right)^{\frac{1}{n}} - 1 = \left( \frac{\text{Final Value}}{\text{Initial Value}} \right)^{\frac{1}{n}} - 1$$

### Different Multiplication Methods

#### Multiplication of Numbers Close to 100

Let's first take an example, where the numbers are near base 100.

**Example:**  $98 \times 96$

Conventional method

$$\begin{array}{r} 98 \\ \times 96 \\ \hline \end{array}$$

### Shortcut

#### Step 1

Both numbers should be written one below the other and we find their differences with the base or their complements, write it opposite to them with a negative (-) sign as:

$98 - 2$  (difference of 98 from its base is 2)

$96 - 4$  (difference of 96 from its base is 4)

#### Step 2

The answer will come in two parts – RHS and LHS

For LHS answer, subtract the complement of the first number from the second number, and vice-versa, which is either be  $98 - 4$  or  $96 - 2$ , both ways as shown below:

$$\begin{array}{r} 98 - 2 \quad \text{Cross} \\ 96 - 4 \quad \text{Subtract} \\ \hline 94 \end{array}$$

#### Step 3

For RHS answer, multiply the differences from the base or complements ( $-2 \times -4$ ) to get 08 as the answer:

$$\begin{array}{r} 98 - 2 \\ 96 - 4 \\ \hline 94 / 08 \end{array} \quad \begin{array}{l} \downarrow \\ \text{Multiply} \end{array}$$

It should be noted that the digits on the R.H.S. of the answer should be equal to the number of 0's in the base. Since, in this case, the base is 100. So, put a 0 to the left of 8 to make two digits on the right side. That is why it is 08 and not 8. So, the final answer is  $98 \times 96 = 9,408$ .

### Base not equal to hundred

$$207 \times 212$$

Here, base = 200 (actual base = 100)

$$\begin{array}{r|l} 207 & + 7 \\ 212 & + 12 \\ \hline (219) & 7 \times 12 \end{array}$$

$$\Rightarrow 2 \times (219)/84 = 43,884$$

## Interesting Techniques to Calculate Squares

**Type 1:** Squares of numbers ending in 5.

The answer comes in two parts—LHS and RHS

LHS is computed by multiplying the digit before 5 by the digit one more than that, i.e. by its next consecutive digit.

RHS is always 25 as the number ends in 5, and it is known that  $5^2 = 25$

### Example

Find the square of 45

$$\begin{array}{r|l} 45^2 & \\ 4 \times 5 & 5^2 \\ \hline 20 & 25 \end{array}$$

So, the final answer of  $45^2 = 2,025$ .

**Type 2:** Squares of numbers near the base

The answer will come in 2 parts – LHS and RHS.

When the number is below the base, subtract its deficiency (or complement) from the number for the LHS answer, and for RHS, write the square of the deficiency, i.e. (number – deficiency) / (square of the deficiency).

### Example

Find  $96^2$

$$\begin{array}{r|l} 96 - 4 & 16 \text{ (RHS)} \\ 96 - 4 & 92 \text{ (LHS)} \end{array}$$

So, the final answer is  $96^2 = 9216$

### Keynote

The number of digits on RHS is equal to the number of 0s in the base.

### Duplex Method

Summary of duplex computation:

$$D(a) = a^2$$

$$D(ab) = 2 \times a \times b$$

$$D(abc) = 2 \times a \times c + b^2$$

$$D(abcd) = (2 \times a \times d) + (2 \times b \times c)$$

### Example

Squaring of a two-digit number with duplex method.

Find the value of  $38^2$ .

#### Step 1

RHS = Duplex of right most digit (is 8)

$$D(8) = 8^2 = 64$$

#### Step 2

Middle part = Duplex of both the digits of 38

$$D(38) = 2(3 \times 8) = 48$$

#### Step 3

LHS = Duplex of left most digit (i.e., 3)

$$D(3) = 3^2 = 9$$

So, the value of  $38^2$





$$\begin{aligned}
 &= 9 / 48 / 64 \\
 &= 9, (48 + \text{carry}). 64 \\
 &= 9, (48 + 6), 4 \\
 &= 9 + \text{carry}. (54), 4 \\
 &= 9 + 5, 4, 4 = 1444
 \end{aligned}$$

## How to Find a Cube of a Number?

### Example

Find the cube of 12

#### Step 1

Here,  $a = 1$ ,  $b = 2$  ratio  $\frac{b}{a} = - =$

The first four terms of the first row are:

First term =  $a^3 = 1^3 = 1$

Second term =  $a^2b = \text{first term} \times \frac{b}{a} = 1 \times 2 = 2$

Third term =  $ab^2 = \text{second term} \times \frac{b}{a}$   
 $= 2 \times 2 = 4$

Fourth term =  $b^3 = \text{third term} \times \frac{b}{a} = \times =$

It can be written as

1 2 4 8

#### Step 2

Double the second term and third term.

1   2   4   8  
      4   8

#### Step 3

Add the terms to each column and write one digit at a time and carry over the digit.

So,  $123 = 1728$

1	2	4	8
	4	8	
1	7	2	8
		1	

### Rack Your Brain



Find the square of 11111111.

### Rack Your Brain



Find the value of  $9,42,678 \times 9,99,999$

## Sum and Average

Actual average = Assumed Average + \_\_\_\_\_

Actual sum = Assumed average  $\times$  number of elements + sum of deviations

### Example 2:

Find the average of

79   84   105   113   97

#### Solution:

Suppose assumed average = 90

Then deviation =

$79 - 90 = -11$

$84 - 90 = -6$

$105 - 90 = 15$

$113 - 90 = 23$

$97 - 90 = 7$

Sum =  $45 - 17 = 28$

Average = \_\_\_\_\_ + \_\_\_\_\_

$= 90 + 5.6 = 95.6$

### Rack Your Brain



Find the cube root of 9,12,673.



## Division and Ratios

### Example 3:

Find the approximate value of —

#### Solution:

919 can be written as

900 (by reducing 19)

So, it is roughly reducing the denominator by 2%, so as to maintain the same value, the numerator should also be reduced by 2%. Now, the fraction can be written as:

$$= \frac{\quad}{\quad} \approx \frac{\quad}{\quad} \approx \frac{\quad}{\quad}$$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

## Comparison of Ratios

### Case 1

If  $\frac{A}{x} >$

a)  $\frac{A+}{+} < \frac{A}{x} (x > )$

b)  $\frac{A-}{-} > \frac{A}{x} x >$

### Case 2

If  $\frac{A}{x} <$

a)  $\frac{A+}{+} > \frac{A}{x} x >$

b)  $\frac{A-}{-} < \frac{A}{x} x >$

## Rack Your Brain



Arrange the following fractions in ascending order.

4/13, 6/17, 3/11

### Example 4:

Which is smaller of  $\frac{A}{x}, \frac{A}{y}$ ?

#### Solution:

Both the fractions are proper fractions, i.e.,

$$\frac{A}{x} < 1, \frac{A}{y} < 1$$

$$\therefore \frac{A+}{+} > \frac{A}{x} x >$$

$$\frac{A+}{+} > \frac{A}{x} x >$$

$$\Rightarrow \frac{A+}{+} > \frac{A}{x} x >$$

So, it can be concluded that  $\frac{A+}{+} > \frac{A}{x} x >$



## Practice Exercise

### Level of Difficulty – 1

1. Find 66.66% of 300.  
(A) 100  
(B) 150  
(C) 200  
(D) 250
2. Find the effective net increase in the price of a product if it is increased by 10% and then again increased by 20%.  
(A) 28%  
(B) 23%  
(C) 30%  
(D) 32%
3. If A is 30% more than B, by what percent is B less than A?  
(A) 33.3%  
(B) 23.07%  
(C) 18.28%  
(D) 21%
4. Find 90% of 90% of 200.  
(A) 152  
(B) 162  
(C) 170  
(D) 180
5. Which one of the following is the largest?  
(A) 66%  
(B) —  
(C) —  
(D) —
7. Find the value of  $497 \times 493$ .  
(A) 23,021  
(B) 245,021  
(C) 2,69,211  
(D) 21,681
8. Find the value of  $(9.92)^2$ .  
(A) 9,63,024  
(B) 9,84,064  
(C) 9,13,224  
(D) 9,15,324
9. Find the value of  $(314)^2$ .  
(A) 90,516  
(B) 90,726  
(C) 98,596  
(D) 93,326
10. The sale of a product increased from 1 lakh to 6 lakh in 6 years. Find the average annual growth rate.  
(A) 85%  
(B) 84%  
(C) 81.2%  
(D) 83.3%

### Level of Difficulty – 3

**Directions for Questions 11 to 14: Read the instructions carefully before answering the questions.**

For making an alloy, different elements are used. The price inflation Index of these elements is given in the table below, considering the year 2009 as the base year. For example, the unit price of element C was ₹100 in 2009 and it rose to ₹105 in 2013. Based on this information, answer the following questions:

### Level of Difficulty – 2

6. Find the value of  $111 \times 88$ .  
(A) 9,888  
(B) 9,188  
(C) 9,768  
(D) 9,538



Elements	2009	2010	2011	2012	2013
C	100	102	101.8	103.4	105
Li	100	99.8	97.8	95.6	96
S	100	101.3	100.4	100.7	101
W	100	103	107	106	110
G	100	101.4	103	104.7	107
P	100	98.5	98	95.5	97
La	100	103	106.6	110	114

11. Which element's price rose by the maximum percentage in the last year over the previous year?
- (A) La  
(B) W  
(C) G  
(D) P
12. If the total cost of each element used while making an alloy was equal in 2009 and the cost incurred while making alloy was 1 crore in 2009, how much would it cost in 2013?
- (A) ₹1,04,28,571  
(B) ₹1,06,23,086  
(C) ₹1,09,23,973  
(D) ₹1,03,34,267
13. If the total cost of each element used during making an alloy was equal in 2009, what is the annualised rate of inflation for making an alloy from 2009 to 2013?
- (A) 1.05%  
(B) 2.3%  
(C) 3.2%  
(D) Cannot be determined
14. If the average rate of inflation was 1.2% for the four years, for how many elements prices rose at a higher rate than the average rate?
- (A) 2  
(B) 3  
(C) 4  
(D) 5
15. Which is highest among —, —, —?
- (1) —  
(B) —  
(C) —  
(D) Cannot be determined



## Solutions

1 (C)

$$- = . \%$$

$$- = . \%$$

$$\text{So, } - \times =$$

Hence, option (C).

2 (D)

By successive percentage increase formula

$$\text{Net effective change} = a + b + \frac{ab}{100}$$

$$= + + = \%$$

Hence, option (D).

3 (B)

If B = 100, then A = 130

$$\therefore \frac{B}{A} \times 100 = . \%$$

So, B is 23.07% less than A.

Hence, option (B).

4 (B)

$$90\% = \frac{90}{100}$$

$$\text{So, } \frac{90}{100} \times \frac{90}{100} =$$

Hence, option (B).

5 (B)

$$- = . \% \quad - = \% \quad - = - \times$$

$$= . \times = .$$

Hence, option (B).

6 (C)

$$\begin{array}{r} 111 \times 88 \\ \text{LHS} \quad \text{RHS} \\ 111 + 11 \\ 88 - 12 \\ \hline 99 (-32) \end{array}$$

Since the base is 100 and only 2 digits are allowed at RHS, before taking out complement to make RHS positive, move off to the left so that it becomes 98 (i.e., 99 - 1) on LHS.

Now for RHS, write the complement of (-32) and for LHS subtract 1 from LHS.

So, the answer is 9,768.

Hence, option (C).

7 (B)

Working base =  $100 \times 5 = 500$

$$\begin{array}{r} 497 - 3 \\ 493 - 7 \\ \hline 490 / 21 \\ 490 / 21 \\ \times 5 \\ \hline 2450 / 21 \end{array}$$

Since working base 500 is 5 times the actual base 100, multiply the LHS proportionately by 5.

So, the answer is 2,45,021.

Hence, option (B).

8 (B)

$$(9.92)^2$$

(Comparing with base 1,000)

$$992 - 8 / 984064$$

So, the answer is 98.4064.

Hence, option (B).



9 (C)

Using Duplex Method

$$\begin{aligned}
 314^2 &= D(3) / D(31) / D(314) / D(14) / D(4) \\
 &= 3^2 / 2(3 \times 1) / 2(3 \times 4) + 1^2 / 2(1 \times 4) / 4^2 \\
 &= 9 / 6 / 5 / 8 / 6 \\
 &\quad \quad \quad 2 \quad \quad 1 \\
 &= 98596
 \end{aligned}$$

Hence, option (C).

10 (D)

The sale of a product increased from 1 lakh to 6 lakhs in 6 years.

$$\frac{\text{—}}{\text{—}} \times \frac{\text{—}}{\text{—}} = \frac{\text{—}}{\text{—}} = \text{—} \%$$

Hence, option (D).

**Note:** In this question, we are not provided sales value for different years. So, we can assume that it has grown at the same rate every year, and hence the average rate of growth will be the same as the growth rates in each of the years.

11 (B)

Compare the ratio of 2013 to 2012.

$$\begin{aligned}
 La &= \frac{\text{—}}{\text{—}} & G &= \frac{\text{—}}{\text{—}} \\
 W &= \frac{\text{—}}{\text{—}} & P &= \frac{\text{—}}{\text{—}}
 \end{aligned}$$

Here,  $\frac{\text{—}}{\text{—}} > \frac{\text{—}}{\text{—}}$  (Denominator of the former is smaller)

$$\frac{\text{—}}{\text{—}} < \frac{\text{—} + \text{—}}{\text{—} + \text{—}} = \frac{\text{—}}{\text{—}}$$

$$\therefore \frac{\text{—}}{\text{—}} < \frac{\text{—}}{\text{—}}$$

Hence, W had the highest percentage rise over the last year.

Hence, option (B).

12 (A)

As all elements had equal weight initially, take an average of prices in 2013.

Average of prices =

$$\begin{aligned}
 &\quad + \quad + \quad + \\
 &+ \quad + \quad + \\
 &\hline
 &= \text{—}
 \end{aligned}$$

Hence, new cost = ₹1 crore ×

$$\frac{\text{—}}{\text{—}} = \text{—}, \text{—}, \text{—}$$

Hence, option (A).

13 (A)

The new average is 104.286 up from 100 in 2009. Let  $r$  be the rate of inflation.

$$\therefore (1 + r)^4 = \frac{\text{—}}{\text{—}} = \text{—}$$

From the final value,  $r$  seems to be fairly small and hence we can approximate the expansion to  $1 + 4r = 1.04286$ .

Hence, approx.  $r = 1.0715\%$

Hence, option (A).

14 (C)

If rate of inflation grew at 1.2% which cost 100 in 2009, would cost  $100 \times (1 + 1.2\%)^4$  in 2013  
 $\approx 104.8$

Hence, 4 elements rose by more than that over the 4 years.

Hence, option (C).

15 (C)

All three ratios are less than 1.

It is known that:

$$\frac{a+x}{b+x} > \frac{a}{b} \text{ (if } x > 0 \text{) and } \frac{a}{b} < \text{—}$$

$$\therefore \frac{\text{—}}{\text{—}} < \frac{\text{—} + \text{—}}{\text{—} + \text{—}} = \text{—}$$

$$\therefore \frac{\text{—}}{\text{—}} < \frac{\text{—}}{\text{—}}$$

$$\text{Similarly, } \frac{\text{—}}{\text{—}} < \frac{\text{—} + \text{—}}{\text{—} + \text{—}} = \text{—}$$



∴ — is less than —.

Hence, option (C).

### Rack Your Brain

#### 1. 7,744

We need to find a 4-digit number of the form 'aabb' which is a perfect square. We know that a perfect square number always ends with one of the digits 0, 1, 4, 5, 6, and 9. Also, if the last digit of a perfect square number is odd, the second-last digit should be even, i.e. they can't be the same. So, we can conclude that our last two digits have to be '44' or '66'.

Using the 'base method for square', we can easily figure out that only  $12^2$  ends with '44'. So, our number will be a square of  $(100 - 12)$  or  $(100 + 12)$ . Since the number required is a 4-digit number, it has to be  $88^2 = 7,744$ .

**Note:** The above approach is a 'hit and try' approach. The same question can be solved even by using the concept of 'factorisation and divisibility'.

### Rack Your Brain

#### 2. 12345678987654321

The given number consists of nine 1s. The square of such number produces an interesting pattern, as shown below:

$$11^2 \rightarrow 121$$

$$111^2 \rightarrow 12321$$

$$1111^2 \rightarrow 1234321$$

.

.

.

$$111111111^2 \rightarrow 12345678987654321$$

### Rack Your Brain

#### 3. 9,42,67,70,57,322

To solve this question easily, we can multiply 9,42,678 by 10,00,000 and then subtract 9,42,678 from the result.

So, we will get: 9,42,67,70,57,322.

### Rack Your Brain

#### 4. 97

This is a perfect cube number. Also, the last digit is 3. So, it is cube of a number ending with 7. Also, 912 is just greater than cube of 9.

So, the cube root of the given number is 97.

### Rack Your Brain

#### 5. 3/11, 4/13, 6/17

It is easy to figure out that 6/17 is greater than 1/3, while the other two fractions are less than 1/3.

Also, to compare 4/13 and 3/11, we can use the cross-multiplication approach.

Since  $4 \times 11 > 3 \times 13$ , 4/13 is greater than 3/11.

So, the correct order is 3/11, 4/13, 6/17.



## MIND MAP

