

KEY AND SOLUTIONS FOR DI

Key for Practice Exercise – 1

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|------|------|------|-------|----------|
| 1. C | 4. B | 7. D | 10. B | 13. 3006 |
| 2. C | 5. C | 8. A | 11. D | 14. 31 |
| 3. C | 6. D | 9. A | 12. S | 15. 1036 |

Key for Practice Exercise – 2

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|------|-------------------------|-------|
| 1. B | 7. $33\frac{1}{3}$ | 12. C |
| 2. D | 8. 16 | 13. A |
| 3. B | 9. Cannot be determined | 14. D |
| 4. A | 10. Pentex | 15. B |
| 5. B | 11. B | |
| 6. B | | |

ADDITIONAL QUESTIONS FOR PRACTICE

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|------|------|------|------|------|
| 1. B | 2. A | 3. D | 4. B | 5. C |
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Key for Practice Exercise – 3

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|------|-------|---------|
| 1. C | 6. C | 11. B |
| 2. D | 7. D | 12. 18 |
| 3. B | 8. C | 13. 50 |
| 4. C | 9. A | 14. 17 |
| 5. C | 10. C | 15. 6.7 |

ADDITIONAL QUESTIONS FOR PRACTICE

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|------|------|------|------|------|
| 1. A | 2. B | 3. D | 4. D | 5. A |
|------|------|------|------|------|

Key for Practice Exercise – 4

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|------|------|------|-------|-------|
| 1. C | 4. B | 7. B | 10. C | 13. D |
| 2. A | 5. B | 8. D | 11. C | 14. D |
| 3. C | 6. C | 9. D | 12. C | 15. B |

ADDITIONAL QUESTIONS FOR PRACTICE

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|-------|-------|------|------|------|
| 1. 25 | 2. 60 | 3. 1 | 4. 2 | 5. 3 |
|-------|-------|------|------|------|

ADDITIONAL QUESTIONS FOR PRACTICE

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|-------|-------|-------|-------|-------|
| 16. C | 17. A | 18. D | 19. A | 20. B |
|-------|-------|-------|-------|-------|

Key for Practice Exercise – 5

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|------|------|------------|-------|
| 1. D | 5. D | 9. Emanuel | 13. A |
| 2. C | 6. B | 10. 25 | 14. C |
| 3. B | 7. A | 11. 106 | 15. A |
| 4. C | 8. A | 12. 3 | 16. D |

ADDITIONAL QUESTIONS FOR PRACTICE

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|------|------|------|------|
| 1. A | 2. D | 3. D | 4. A |
|------|------|------|------|

Key for Practice Exercise – 6

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|------|------|-------|----------|
| 1. B | 4. B | 7. B | 10. 22 |
| 2. A | 5. B | 8. C | 11. VII |
| 3. B | 6. A | 9. 48 | 12. Four |

ADDITIONAL QUESTIONS FOR PRACTICE

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|------|------|------|------|
| 1. C | 3. C | 5. D | 7. A |
| 2. A | 4. D | 6. B | 8. D |

Key for Practice Exercise – 7

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|------|------|-------|-------|
| 1. D | 5. D | 9. C | 13. B |
| 2. C | 6. A | 10. A | 14. C |
| 3. A | 7. C | 11. A | 15. D |
| 4. C | 8. C | 12. D | 16. D |

ADDITIONAL QUESTIONS FOR PRACTICE

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|------|------|------|------|
| 1. B | 2. C | 3. B | 4. D |
|------|------|------|------|

Key for Practice Exercise – 8

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|---------|------|-------|-------|
| 1. 1150 | 5. C | 9. C | 13. D |
| 2. 0 | 6. A | 10. A | 14. C |
| 3. 350 | 7. B | 11. B | 15. A |
| 4. 50 | 8. B | 12. A | 16. D |

ADDITIONAL QUESTIONS FOR PRACTICE

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|------|------|------|------|
| 1. C | 2. B | 3. C | 4. B |
|------|------|------|------|

Key for Practice Exercise – 9

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|------|------|------|-------|-------|
| 1. D | 4. D | 7. C | 10. B | 13. D |
| 2. B | 5. C | 8. B | 11. B | 14. C |
| 3. B | 6. A | 9. C | 12. D | 15. C |

ADDITIONAL QUESTIONS FOR PRACTICE

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|-------|-------|-------|--------|-------|
| 1. 98 | 2. 78 | 3. 49 | 4. 150 | 5. 52 |
|-------|-------|-------|--------|-------|

Key for Practice Exercise – 10

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|------|------|-------|-------------|-------|
| 1. C | 5. C | 9. C | 13. C | 17. B |
| 2. C | 6. B | 10. C | 14. 3 | 18. C |
| 3. D | 7. C | 11. D | 15. 6 | 19. D |
| 4. C | 8. C | 12. C | 16. 1998-99 | 20. B |

Key for Practice Exercise – 11

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|------|------|---------|-------|-------|
| 1. C | 5. A | 9. 37.5 | 13. A | 17. C |
| 2. D | 6. B | 10. 270 | 14. C | 18. C |
| 3. B | 7. C | 11. 272 | 15. B | 19. A |
| 4. A | 8. C | 12. 56 | 16. C | 20. A |

Key for Practice Exercise – 12

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|------|------|-------|-------|--------|
| 1. C | 5. B | 9. B | 13. A | 17. 9 |
| 2. B | 6. A | 10. C | 14. D | 18. 4 |
| 3. A | 7. C | 11. A | 15. C | 19. 42 |
| 4. D | 8. D | 12. A | 16. D | 20. 2 |

Key for Practice Exercise – 13

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|------|------|-------|-------|--------|
| 1. C | 5. D | 9. D | 13. D | 17. 26 |
| 2. B | 6. A | 10. D | 14. C | 18. 15 |
| 3. A | 7. B | 11. C | 15. B | 19. 69 |
| 4. D | 8. C | 12. B | 16. C | 20. 34 |

Key for Practice Exercise – 14

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|------|------|--------|-----------|-------|
| 1. C | 5. D | 9. B | 13. 51.67 | 17. D |
| 2. B | 6. D | 10. D | 14. 18000 | 18. B |
| 3. A | 7. B | 11. 10 | 15. 9600 | 19. C |
| 4. B | 8. A | 12. 44 | 16. D | 20. A |

SOLUTIONS

PRACTICE EXERCISE – 1

Solutions for questions 1 to 6:

- Largest increase: by observation
 Tanbaxy: largest increase = $9257 - 8093 = 1164$
 Rockhardt: largest increase = $5648 - 3819 = 1829$
 Mupin: largest increase = $9036 - 6273 = 2763$
 Pipla: largest increase = $6577 - 4239 = 2238$
 Choice (C)
- Total sales in 2011-12 = 26879
 Share of Dr. Meddy's = $6164/26879 \times 100 = 22.93\%$
 Method: 20% of 26879 = $2 \times 2687.9 = 5375.8$
 2% of 26879 = $1/5 (2687.9) = 537.58$
 1% of 26879 = 268.79
 23% of 26879 $\cong 6182 > 6164 \rightarrow (1)$
 \therefore Answer must be $(23\% - 1\%)$ i.e., 22.9%
 Choice (C)
- Percentage increase = $\left(\frac{\text{Final} - \text{Initial}}{\text{Initial}} \right) \times 100$
 For Tanbaxy, the highest percentage increase is less than 20% .
 For Pipla, from 2011-12 to 2012-13 the percentage increase is more than 50%
 For all other companies the percentage increase for any year is less than 50%
 Choice (C)
- Average Annual growth rate is

$$\frac{\text{Percentage increase}}{n-1} = \left(\frac{7645 - 3819}{3819} \right) \times \left(\frac{1}{6-1} \right) \times 100 = \frac{1}{5} \times \left(\frac{3826}{3819} \right) \times 100$$

 $\cong \frac{1}{5} \times 1.00 \times 100 \cong 20\%$
 Choice (B)
- Sales of Mupin in 2015-16 = 9036
 25% increase in 2016-17
 \Rightarrow New sales = $9036 \times 1.25 = 9036 \times 5/4$
 $= [9036 + 9036/4] = 11295$
 Sales of Rockhardt in 2015-16 = 7645
 \therefore Required increase = $11295 - 7645 = 3650$
 Percentage increase = $3650/7645 \times 100$
 50% of 7645 = $7645/2 = 3822.5$
 1% of 7645 = 76.45
 2% of 7645 = 152.9
 $\therefore 48\%$ of 7645 = $3822.5 - 153 = 3669.5$
 47.5% of 7645 = $3822.5 - 19 = 3631.5$
 $\therefore 3650$ lies between 47.5% and 48% of 7645
 From options, answer is 47.75
 Choice (C)
- The star rating was awarded to Tanbaxy in 2011-12, 2012-13 and 2014-15 to Pipla in 2012-13, to Dr. Meddy's in 2011-12, 2013-14 and 2015-16, to Mupin in 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 and to Rockhardt in 2011-12 and 2014-15, i.e. total of 14 instances.
 Choice (D)

Solutions for questions 7 to 11:

- As the question asks for the state ranked 4th from the last after arranging the given states in ascending order, instead of arranging them in ascending order first and then finding the answer, the question can be easily answered by arranging the given states in descending order and finding the fourth state ranked from the top.
 By observation, Uttar Pradesh has the highest number of primary schools as well as middle schools. Similarly Madhya Pradesh is in second position with a total of 87,620. Andhra Pradesh is in third position at 72,721, whereas the state ranked fourth is Maharashtra with 70,545.
 Choice (D)

- By observation, in all the given states, the number of primary schools is more than the number of high schools. Also observing the given data, in none of the states is the number of professional colleges more than half that of the colleges of general education.
 Choice (A)
- As the number of high schools is to be more than the number of colleges of general education by more than 300% , they should be at least four times the number of colleges of general education. By observation, in all the states, the number of high schools is more than the number of colleges of general education by at least four times.
 Choice (A)
- By observation Uttar Pradesh, Madhya Pradesh and Andhra Pradesh account for more than 2,00,000 schools. As the respective state governments own 50% of these schools these three states must be clubbed together for the state governments to have more than 1,00,000 schools.
 Choice (B)
- Observing the given data Uttar Pradesh has the highest number of primary and middle schools, whereas in all cases the number of deemed universities is negligible (or very small) when compared to the number of schools. Hence the difference will be maximum for Uttar Pradesh.
 Choice (D)

Solutions for questions 12 to 15:

The numbers of male and female employees in the different companies are

Company	Male employees	Female employees
P	11910	5955
Q	7656	10527
R	12474	8910
S	16311	10874
T	6213	10355

- The number of female employees is to the highest in company S
 Ans (S)
- Male employees in companies R and S together = 28,785
 The number of male employees in companies P, Q and T together = 25779
 The difference = 3,006
 Ans (3006)
- Total age of employees in company R = $21384 \times 29 = 620136$
 Total age of female employees in company R = $8910 \times 26 = 231660$
 \therefore Average age of male employees = $\frac{388476}{12474} = 31$
 Ans (31)
- The required difference = $11910 - 10874 = 1036$
 Ans (1036)

PRACTICE EXERCISE – 2

Solutions for questions 1 to 6:

- We have to check whether the production of D as a percentage of B is more than 80% but less than 120% or not i.e., the difference between the production of D and that of B is less than 20% of B or not.

Year	Difference	20% of B
2011	700	1220
2012	500	1080
2013	1000	820
2014	900	840
2015	800	1000

\therefore It happened for 2011, 2012, and 2015.
 Choice (B)

2. The total production in
2011 is 23300
2012 is 20400
2013 is 20500
2014 is 20800
2015 is 24900
By observing the above values, the change over the previous year is the highest in the year 2015.
Choice (D)
3. In 2014
Exports of D is $\frac{3}{8} \times 5100 = 1912$
Exports of A is $\frac{1912 \times 6}{5} = 2295$
 \therefore Percentage of exports = $\frac{2295}{5200} \approx 45\%$. Choice (B)
4. In 2015, B forms 20% of total production. (5000/24900)
Let total production be 100; production of B is 20
Production of B in 2016 is $60\% \times 20 = 12$
Total production in 2016 is $60\% \times 20 + 1.35 \times 80 = 120$.
Production of B as a percentage of total production is 10%. (12/120)
Choice (A)
5. From the choices we can observe that II is present in all the four choices.
 \therefore By checking II (which is false), (A), (C) and (D) can be eliminated. Now as the only option left is choice (B) and though it appears that D in 2013 and 2014 is the same, there could be a marginal decrease (For example 5100 and 5090). So the answer is (B) as it is the only option left. Had the question had 'None of these' as an option, then it would have been the answer.
Choice (B)
6. The production cost of $D > B > A > C$. To get the minimum possible number of years in which production cost of D and A together is more than that of B and C together, the production of $D > B$ and $A > C$.
Both the above two conditions must be satisfied in any year for the production cost of D and A together to be more than B and C together. This happened only in the year 2015.
Choice (B)

Solutions for questions 7 to 10:

7. The market share of Penolds in different years is 2010
 $= \frac{200}{900} \times 100 = 22\frac{2}{9}\%$
 $2011 = \frac{200}{1000} \times 100 = 20\%$
 $2012 = \frac{300}{1200} \times 100 = 25\%$
 $2014 = \frac{300}{900} \times 100 = 33\frac{1}{3}\%$
 \therefore It is the highest in the year 2014 i.e., $33\frac{1}{3}\%$.
Ans: $(33\frac{1}{3})$
8. Given, $20 = \frac{2000000 - \text{Exp}}{2000000} \times 100$
 $400000 = 2000000 - \text{Exp}$
 \therefore Expenditure = $1600000 = ₹16$ lakh. Ans: (16)
9. As the cost price of each pen is not known, sales value cannot be determined, for any company.
Hence, through the ratio of expenditures is known, profitability cannot be determined for any company.
Ans: (Cannot be determined)
10. The average annual percentage change is the highest for Pentex i.e., $\frac{1}{5} \times \frac{200 - 100}{100} \times 100 = 20\%$. Ans: (Pentex)

Solutions for questions 11 to 15:

11. Bala's expenses on clothing = 20% his total expenses
 \therefore Bala's total expenses ₹18,500
Food and tuition fees together constitute 35% of Bala's total expenses which is $\frac{35}{100} \times 18500 = ₹6475$ Choice (B)
12. 15% of Anand's Expenses = ₹1620
 \therefore the remaining 85% = $\frac{85}{15} \times 1620 = ₹9180$ Choice (C)
13. Let the total expenses of Bala and Chetan be ₹300 and ₹500 respectively.
The 'other' expenses are $\frac{30}{100} \times 300$ and $\frac{35}{100} \times 500$ respectively.
i.e. ₹900 and ₹1750
The required ratio = 18 : 35
Choice (A)
14. Let Damodar's total expenses be D and that of Edward be E
Given $\frac{20}{100} \times D = 115\% \text{ of } \frac{15}{100} \times E$
 $\therefore 0.2D = 0.1725 E$
 $\frac{D}{E} = \frac{0.1725}{0.2} = \frac{86.25}{100}$
 $\therefore D$ is 13.75% less than E. Choice (D)
15. 10% of Anand's expenses (on clothing) is at least equal to 15% of Chetan's expenses.
 $\therefore 10\% \text{ of } A \geq 15\% \text{ of } C$
 $\therefore \frac{A}{C} \geq 1.5$
 \therefore Total expenses of Anand is at least 1.5 times that of Chetan.
Choice (B)

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions for questions 1 to 5:

1. Number of respondents who said 'don't know' = 5%
Half of them = 2.5%
Number of AOL users = 12%
Number of Eudora users = 13.5%
Total number of users of either AOL or Eudora
 $= 12\% + 13.5\% + 2.5\% = 28\%$ [total respondents] = 7140
Choice (B)
2. Respondents claiming 'features' = 16%
Respondents claiming 'prior usage' = 17%
But all of these are users of pine/elm = 21%
 \therefore There must be some respondents claiming both reasons.
Let the percentage of such people = x
 $\therefore 21\% = 16\% + 17\% - x$
 $\therefore x = 12\%$ (25500) = 3060
Choice (A)
3. We do not know if users of C.C mail already claimed the reason of 'easy to use' for C.C mail itself.
They can shift to Eudora claiming the same reason.
Thus we cannot determine the change in number of respondents claiming 'Easy to use'. Choice (D)
4. Let the total number of users of e-mail packages = 100x out of which user group saying 'don't know' is excluded.
 $= 100x - 5x = 95x$
Now, among these 95x users, except for C.C-mail users, others claim only one reason each.
Number of package users excluding C.C mail
 $= 95x - 9x = 86x$

∴ These 86x users account for 86x reasons.
 The total number of reasons by respondents
 $= 14x + 34x + 16x + 28x + 11x + 17x = 120x$
 ∴ Number of reasons claimed by C.C-mails users
 $= 120x - 86x = 34x$
 The average number of reasons per C.C mail user
 $= 34x/9x \approx 3.8$ approx. Choice (B)

5. $\text{UNIX} + \text{AOL} = 12 + 8.20 = 20.20\%$
 As maximum percentage of respondents who claimed
 at most one reason is greater than 20.2%, the required
 answer = 20.2% of 25,500 = 5151. Choice (C)

PRACTICE EXERCISE – 3

Solutions for questions 1 to 4:

1. By observation, the sales of Scenthol in 2015 is more than
 four times the sales of 2011, whereas for other brands it is
 maximum of three times.
 ∴ Sales of Scenthol increased by maximum percentage
 from 2011 to 2015. Choice (C)
2. Required percentage = $\frac{2250-1250}{2250} \times 100$
 $= \frac{1000}{2250} \times 100 = \frac{4}{9} \times 100 = 44 \frac{4}{9}\%$ Choice (D)
3. Sales of Scenthol in 2016 = $1500 \times 1.4 = 2100$
 ∴ Required percentage = $\frac{2100-1250}{1250} \times 100$
 $= \frac{850}{1250} \times 100 = 68\%$ Choice (B)
4. The sales of all the given brands of toilet soaps during 2015
 is 9000 thousands
 Given, 9000 – 36%
 2250 – ?
 $? = \frac{2250 \times 36}{9000} = 9\%$ Choice (C)

Solution for questions 5 to 8:

5. Profit = Income – Expenses
 As profit percentage is 15,
 1.15 Expenses = ₹368 cr
 ∴ Expenses = $\frac{368}{1.15} = ₹320$ cr Choice (C)
6. Let the income of company Y in 2011 be ₹100. The
 incomes in each of the year from 2012 are ₹110, ₹121,
 ₹133.1 and ₹146.41 respectively.
 Expenditure in 2015 = $\frac{146.41}{1.11} = 131.9$
 Expenditure in 2012 = $\frac{110}{1.15} = 95.65$
 Profit in 2015 = $\frac{11}{100} \times 131.9 = 14.51$
 Profit in 2012 = $\frac{15}{100} \times 95.65 = 14.35$
 ∴ required ratio = $\frac{14.51}{14.35} \times 100 = 101.1$ Choice (C)
7. Let the incomes of X and Y in 2014 be ₹200 and ₹300
 respectively and the expenses be E_x and E_y respectively
 $1.13 E_x = 200$
 $\therefore E_x = \frac{200}{1.13} = 177$
 $E_y = \frac{300}{1.14} = 263$
 The required ratio = $177 : 263 = 17 : 25$. Choice (D)

8. Let the expenses of X and Y be ₹100 each. Their incomes
 would be ₹118 and ₹111 respectively. Choice (C)

Solutions for questions 9 to 11:

9. Let the sales of company P in 2011 be 100.
 Sales in 2012 = 120
 Sales in 2013 = 114 and
 Sales in 2014 = 119.7
 The increase in sales in 19.7%. Choice (A)
10. Let the sales of companies P and Q in 2011 be 200 and
 100 respectively.
 Sales of P in each of the succeeding years would be 240,
 228, 239.4 and 263.34 respectively.
 Sales of Q in the succeeding years would be 90, 103.5 and
 119 respectively.
 The required ratio = $\frac{263.34}{119.0} \approx 11 : 5$. Choice (C)
11. Let the sales of P and Q in 2012 be 100 each. Sales of P in
 2015 would be 109.72 and sales of Q would be 133.25
 ∴ Sales of Q is more than that of P by
 $\frac{23.53}{109.72} \times 100 = 21.5\%$ Choice (B)

Solution for questions 12 to 15:

12. The speed of the car at $t = 4$ sec is 5 m/s, or 18 km/hr.
 Ans (18)
13. Speed at $t = 0 = 0$ m/s
 Speed at $t = 2 = 4$ m/s
 Avg speed = 2 m/s
 Distance covered = $2 \times 2 = 4$ m/s
 Avg speed from $t = 2$ to $t = 6$ secs = 5 m/s
 Distance covered = $4 \times 5 = 20$ ms
 Distance covered from $t = 6$ to $t = 8$ secs = $2 \times 6 = 12$ ms
 Avg speed from $t = 8$ to $t = 10$ secs = 7 ms
 Distance covered = $7 \times 2 = 14$ ms
 Total distance covered = $4 + 20 + 12 + 14 = 50$ meters.
 Ans (50)
14. From the previous question, distance covered in the first 10
 secs = 50 meters.
 Avg speed from $t = 10$ to $t = 12$ secs = 6 m/s
 Distance covered = $6 \times 2 = 12$ meters
 From $t = 12$ to $t = 16$, distance covered = $7 \times 4 = 28$ meters.
 Now 90 meters has been covered.
 The remaining 10 meters would be covered in slightly less
 than a second
 Total time = 17 seconds. Ans (17)
15. From previous question, distance covered in 16 seconds =
 90 meters
 From $t = 16$ to $t = 20$ secs, distance covered = $11 \times 4 = 44$
 meters.
 Total distance covered = $90 + 44 = 134$ meters
 Avg speed = $\frac{134}{20} = 6.7$ m/s. Ans (6.7)

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions for questions 1 to 5:

1. Net Profit by sales was
 $2011 = \frac{12}{125}, 2012 = \frac{14}{150},$
 $2014 = \frac{14}{250}, 2015 = \frac{15}{330}$
 The highest value is for 2011. Choice (A)
2. The highest percentage increase in sales was in 2013.
 Choice (B)

3. Total percentage increase from 2011 to 2015 is $\frac{3}{12} \times 100$
 $= 25\%$
 \therefore Annual average percentage increase
 $= \frac{\text{Total percentage increase}}{n-1} = \frac{25}{4} = 6.25\%$
 (n is number of years) Choice (D)
4. Expenses as a percentage of sales for various years are as follows:
 2011 = 113/125; 2012 = 136/150
 2013 = 254/270; 2014 = 236/250
 2015 = 315/330
 It is the highest in 2015. Choice (D)
5. Expenses in 2015 = 325 - 15 = 310 crores.
 Expenses increase by 20%
 \therefore Expenses in 2016 = 310 + 62 = 372 crores.
 Net profit decrease by 20%
 \therefore Net profit in 2016 = 15 - 3 = 12 crores.
 \therefore Sales in 2016 = 372 + 12 = 384 crores.
 Percentage change in sales in 2016 = $\frac{384 - 325}{325} \times 100$
 $= \frac{59}{325} \times 100 = 18.1\%$ Choice (A)

PRACTICE EXERCISE - 4

Solutions for questions 1 to 4:

1. We can calculate the required percentage directly in terms of angles.
 i.e., required percentage = $\left(\frac{72^\circ - 30^\circ}{30^\circ} \right) \times 100$
 $= \frac{42}{30} \times 100 = 140\%$ Choice (C)
2. Industrial lighting in 2015-16: $\frac{15^\circ}{360^\circ} \times 5,00,00,000$
 $= \frac{1}{24} \times 5,00,00,000 = 21,00,000$
 In 2016-17, 16.66% increase (= $\frac{1}{6}$ th increase) on 21,00,000
 \therefore New value = $(21,00,000) \left(1 + \frac{1}{6} \right) = \left(\frac{7}{6} \times 21,00,000 \right)$
 $= ₹24,50,050$ Choice (A)
3. The value of the new profit is not required for the solution.
 Assume the total profit to be 360
- | | 2015-16 | % increase | 2016-17 |
|----------------------------------|---------|------------|---------|
| Switches | 72 | 25% | 90 |
| Fans | 75 | 20% | 90 |
| Pumps | 30 | 10% | 33 |
| Remaining (360 - (72 + 75 + 30)) | | | 183 |
| | 360 | | 396 |
- New angle for fans division = $\frac{90}{396} \times 360 = \frac{5}{22} \times 360$
 $= \frac{900}{11} \cong 82^\circ$ [since $\frac{1}{11} \cong 0.9$] Choice (C)
4. Actual share of power regulators is $\frac{108}{0.9} = 120$. i.e., power regulators had been under-reported by $120 - 108 = 12$
 \therefore The total profit is $360 + 12 = 372$.
 The share of switches is $\frac{72}{372} = \frac{6}{31} \cong \frac{1}{5} \cong 20\%$
 The answer should be slightly less than 20% as the denominator is slightly more than 30. Choice (B)

Solutions for questions 5 to 10:

5. In questions where only percentage changes have to be calculated it is helpful to note that it may not be necessary to calculate the absolute values involved. For example to calculate the percentage change in the monthly expenditure on (say) provision from 2014 to 2015, we can calculate it by using the expression
 $\left(\frac{\text{monthly expenditure in 2015}}{\text{monthly expenditure in 2014}} - 1 \right) \times 100$
 $= \left(\frac{\text{percentage share of provisions in 2015}}{\text{percentage share of provision in 2014}} - 1 \right) \times 100$
 Hence we can work only with the above two ratios
 i.e. $\frac{17,500}{12,500}$ and $\frac{18}{15}$, which can easily be calculated
 as $\frac{7}{5}$ and $\frac{6}{5}$.
 \therefore The percentage change in provisions is
 $\left(\frac{7}{5} \times \frac{6}{5} - 1 \right) \times 100 = 68\%$. Choice (B)
6. Using the expression given above, we can observe that the ratio of the total monthly expenditures is the same for calculating the percentage change of any head of expenditure $\left(\text{which is } \left(\frac{17,500}{12,500} \right) \right)$.
 Hence we only need to observe the ratios of the percentage figures themselves.
 1. Entertainment: $\frac{10}{30} = \frac{1}{3} \Rightarrow 66.66\%$ decrease
 2. Rent: $\frac{25}{20} = \frac{5}{4} \Rightarrow 25\%$ increase
 3. Clothes: $\frac{20}{5} = \frac{4}{1} \Rightarrow 300\%$ increase
 4. Travelling: $\frac{5}{6} \Rightarrow 16.66\%$ decrease
 Hence the highest increase/decrease was for clothes. Choice (C)
7. If the percentage growth in a head of expenditure is at least 25% $\Rightarrow \left(\frac{17,500}{12,500} \times \frac{\text{percentage share of head of expenditure in 2015}}{\text{percentage share of expenditure in 2014}} \right) > 1.25$
 $\Rightarrow \left(\frac{7}{5} \times \frac{\text{percentage share of head of expenditure in 2015}}{\text{percentage share of expenditure in 2014}} \right) > \frac{5}{4}$
 $\Rightarrow \frac{\text{the percentage share for 2015}}{\text{the percentage share for 2014}} > \frac{25}{28} \cong 0.9$.
 This means that if the percentage figure for a head of expenditure for 2015 is at least about nine-tenths of that for 2014, then the percentage increase in the expenditure under that head is more than 25% which means that we need to check only for those cases where the percentage figure has dropped from 2014 to 2015.
 This happened only for
 (i) Entertainment: $\frac{10}{30} = \text{only } 0.3 \text{ times, hence, Entertainment did not experience more than } 25\% \text{ increase}$
 (ii) Medical expenses: $\frac{12}{14} \cong 0.85$. Hence, Medical expenses also did not experience more than 25% increase.
 (iii) Travelling: $\frac{5}{6} \cong 0.83$. Hence, Travelling also did not experience more than 25% increase

Hence except for these three, all other heads of expenditure experienced a growth of more than 25%. Hence out of the total heads, $7 - 3 = 4$ heads experience a growth of more than 25%. Choice (B)

8. Though the total expenditure for the year 2016 is known, we do not know the exact changes in the expenditure on food and clothes. Hence we cannot answer the question. Choice (D)

9. Given that the percentage increase in medical expenses from 2014 to 2016 = 20%. And the distribution in 2016 is same as in 2015.

$$\Rightarrow \frac{\text{Total monthly expenditure in 2016}}{\text{Total monthly expenditure in 2014}}$$

$$= 1.2 \times \frac{\text{percentage share in 2014}}{\text{percentage share in 2016}}$$

Now using this value we can find the percentage increase in Shymals expenditure on travelling from 2015 to 2016.

It can be observed now that the ratio 1.4 is the same for

$$\frac{\text{Total monthly expenditure in 2015}}{\text{Total monthly expenditure in 2014}} \text{ also.}$$

Hence, total monthly expenditure in 2015 = Total monthly expenditure in 2016

Also the distribution of expenses in 2016 is same as in 2015. Hence there will be absolutely no change in the expenditure under any of the heads. Therefore, there will be 0% change. Choice (D)

10. Using the approach used in the above solution, we get
- $$\frac{\text{Total monthly expenditure in 2016}}{\text{Total monthly expenditure in 2014}} = 1.2 \times \frac{10}{10} = 1.2$$

(i.e. the percentage share can be observed to be same for 2014, 2015 and also 2016)

\Rightarrow percentage increase in expenditure on provisions

$$= \left(1.2 \times \frac{18}{15} - 1\right) \times 100 = (1.2 \times 1.2 - 1) \times 100\% = 44\%$$

Choice (C)

Solutions for questions 11 to 15:

11. The total exports in 2015 = 5900 crores
Since fresh fruits account for 25% of Miscellaneous items,
percentage of fresh fruits in total exports = $\frac{16}{4} = 4\%$

Total imports = 5400 crores

$$\text{Bulk drugs imports} = \frac{15}{100} \times 5400$$

Fresh fruits exported as percentage of Bulk drugs

$$= \frac{5900 \times \frac{4}{100}}{5400 \times \frac{15}{100}} = 29.13\% \quad \text{Choice (C)}$$

12. Country X has a Trade Surplus with the Gulf Countries, the USA, Germany, Others and a Trade Deficit with Japan and France. Hence the ratio is 4 : 2 which is 2 : 1.

Note: South America neither has a surplus nor a deficit trade budget hence it cannot be included in either of the groupings. Choice (C)

13. The sectoral breakup of the exports to the USA specifically is not given. Hence the quantum of software exports to the USA cannot be computed. Choice (D)

14. The average imports per country for country X can be computed if we know the number of Gulf countries, the number of South American countries and others which import goods from country X. Statements I, II and III provide this data and hence they are definitely required. Choice (D)

15. Exports of Agricultural products in 2015

$$= 5900 \times \frac{15}{100} = 885 \text{ Cr.}$$

New imports value (after adding Agricultural products)

$$= 5400 + 885 = 6285 \text{ Cr.}$$

$$\text{Auto imports as a \% of new imports} = \frac{540}{6285} = 8.6 \text{ approx.}$$

$$\text{Percentage point change} = 10 - 8.6 = 1.4\% \quad \text{Choice (B)}$$

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions for questions 1 to 5:

1. As no student from the North and the Central regions is specializing in Marketing, all the students in Marketing should come from the South, East and the West regions. Even if all the students from the West and the East regions opt for Marketing as their specialization, it will account for only 35% of the total students and so at least 5% of the total students who specialize in marketing must be from the South.

$$\therefore \text{Required percentage} = \frac{5}{20} \times 100 = 25\%$$

Answer : 25

2. Given that at least 10% of the students from any region had HR as their specialization. Of the total 15% of the students specializing in HR, 10% of the students are required to fulfill this condition. As we are looking for the required value to be maximum, assuming that remaining 5% of the students

$$\text{are from the East, the required value becomes } \frac{6}{10} = 60\%$$

Answer : 60

3. All the students Operations can be from the East.
All the students specializing in Systems can be from the Central Region.
All the students specializing in Insurance can be from Southern Region.
All the students specializing in HR can be from the Western Region.
All the students specializing in Finance can be from the North.
 \therefore Except the students who are specializing in Marketing all others can be from a single region. Answer : 1

4. Only two of the three specializations - Operations, Insurance and HR or Operations and Finance can have all its students from the North, if no student from the North chooses Systems as specialisation. Answer : 2

5. As the number of regions required is the least we must choose the regions from which the highest number of students come from. The required regions must be North, West and any one of the other three. Answer : 3

PRACTICE EXERCISE – 5

Solutions for questions 1 to 4:

The given information is

Specialization	Year		Indian	Foreign	Total
	I st	II nd			
Marketing	250	150	266	134	400
Finance	270	330			600
Operations	440	360			800
Systems	360	240			600
Total	1320	1080	1620	780	2400

1. $\frac{150}{400} \times 100 = 37.5\%$ of the students who opted for marketing as specialization are in the second year. Choice (D)

2. The maximum percentage would be when all the foreign students other than in marketing are in operations. i.e., $780 - 134 = 646$.

$$\text{The required percentage} = \frac{646}{800} \times 100 = 80.75\%$$

Choice (C)

3. The total number of Indian students = 1620.
The total number of IInd year students = 1080.

$$\text{The difference} = 1620 - 1080 = 540 \quad \text{Choice (B)}$$

4. The number of foreign students in operations

$$= \frac{5}{17} \times 646 = 190$$

$$\text{The number of Indian students in operations} = 800 - 190 = 610 \quad \text{Choice (C)}$$

Solutions for questions 5 to 8:

The given information can be tabulated as below.

	P		Q		R		Total
	Males	Females	Males	Females	Males	Females	
Production	2000	-	8000	-	5000	-	15000
Marketing	1500	1500	1500	1500	1500	1500	9000
Finance	500	500	500	500	500	500	3000
HR	-	1000	-	1000	-	1000	3000
Accounts	1000	1000	1000	1000	1000	1000	6000
Total	5000	4000	11000	4000	8000	4000	36000

5. The required number of employees = $5000 + 8000 = 13000$.
Choice (D)

6. The required percentage = $\frac{2500 + 2500 + 2500}{15000} \times 100 = 50\%$.
Choice (B)

7. The percentage of females for P, Q and R are $\frac{4000}{9000}$ (100)%, $\frac{4000}{15000}$ (100)% and $\frac{4000}{12000}$ (100)% respectively.
Highest of these is the first percentage i.e. for P.
Choice (A)

8. 80% of the total number of employees of P is 7200. Only in the production and marketing departments is the number of employees more than 7200.
Choice (A)

Solutions for questions 9 to 12:

Let the points scored by Anand, Bala, Chandu, David and Emanuel be denoted by A, B, C, D and E respectively. From the replies of the players, we have the following equation,

$$\begin{aligned} B + D + E &= 77 \rightarrow (1) \\ C + E + A &= 60 \rightarrow (2) \\ A + B + D &= 58 \rightarrow (3) \\ E + B + C &= 69 \rightarrow (4) \\ A + C + D &= 54 \rightarrow (5) \\ 3(A + B + C + D + E) &= 318 \\ A + B + C + D + E &= 106 \rightarrow (6) \\ (6) - (1) &= A + C = 29 \\ (2) - (6) &= E = 31 \end{aligned}$$

Similarly we can find the other values as $A = 12$, $B = 21$, $C = 17$ and $D = 25$

9. Emanuel scored the highest points in the match.
Ans: (Emanuel)

10. David scored 25 points. Ans: (25)

11. The total points of the team is 106. Ans: (106)

12. Three players scored more points than what Chandu scored. Ans: (3)

Solutions for questions 13 to 16:

13. For the minimum possible returns, Anand has to get three times the expected returns from the company expected to give 10% returns and two times the expected return from the company expected to give 20% returns.

$$\text{The returns would be } \frac{25 + 30 + 40 + 45}{4} = 35\%$$

Choice (A)

14. For the maximum possible returns, Anand has to get three times the expected returns from the company expected to give 45% returns and two times the expected returns from the company expected to give 25% returns.

$$\text{The returns would be } \frac{50 + 10 + 20 + 135}{4} = \frac{215}{4} = 53.75\%$$

Choice (C)

15. For 42.5% returns on average, Anand has to get three times the returns from the company expected to give 25% return (A) and double the returns from the company expected to give 20% return (C). \therefore Company A belonged to the IT or infrastructure sector.
Choice (A)

16. If company C belonged to the IT or infrastructure sector, the returns from it would be 60%.

$$\text{The maximum returns would be } \frac{25 + 10 + 60 + 90}{4} = \frac{185}{4} = 46.25\%$$

and the minimum returns would be

$$\frac{25 + 20 + 60 + 45}{4} = \frac{150}{4} = 37.5\%$$

If Anand earned 41.25% returns, he would have got double the returns from the company that was expected to give 25% (company A). \therefore Company A belonged to the metals or automobile sector and gave more than the expected returns.
Choice (D)

ADDITIONAL QUESTIONS FOR PRACTICE

1. Total length of the Road = 160 km
Cost for first 50 km = 50×12 (20% more for cement) = 600 lakh
Cost for the next 50 km = 50×9.6 = 480 lakh
Cost for the remaining 60 km = 60×6 = 360 lakh
Apart from the above cost there is an additional cost incurred on account of the contractor finishing the project ahead of time.
Normal rate of work = 2 km/day
Normal finish time of the project = 80 days
Contractor rate of work = $2 \times 1.25 = 2.5$ km/day
Contractor finishes the job in = $160/2.5 = 64$ days
 \therefore No. of days earlier the project finishes = 16
 \therefore Additional cost on account of bonus paid = $16 \times 20 = 320$
 \therefore Total cost of project = $600 + 480 + 360 + 320 = 1760$ lakh
Choice (A)
2. Here we are asked to find the penalty levied on a contractor on account of the delay.
Estimated time of completion = $510/2 = 255$ days
Contractor's rate of work = $2 \times 0.75 = 1.5$ km/day
 \therefore Time taken to finish the job = $510/1.5 = 340$
 \therefore Additional number of days needed to complete the work = $340 - 255 = 85$
 \therefore Penalty incurred by the contractor = $85 \times 10 = 850$ lakh
Choice (D)

3. Bonus received by the contractor = 540 lakh
 \therefore No. of days by which the work is finished earlier
 $= 540/20 = 27$ days
 Actual time required to lay the road $= 360/2 = 180$ days
 Time taken by this contractor = 153 days
 \therefore The contractor's average rate of laying the road
 $= 360/153 = 2.35$ Choice (D)

4. Cost incurred to lay 84 km ISF (cement)
 Cost of 1st 50 km $= 50 \times 12 = 600$ lakh
 Cost of remaining 34 km $= 34 \times 9.6 = 326.4$ lakh
 Additional cost incurred on account of the road being a free way $= 84 \times 1.5 = 126$ lakh
 No. of days the work is completed $= 84/3 = 28$
 Actual time required at the normal rate of work $= 84/2 = 42$
 \therefore Bonus for early completion $= 14 \times 20 = 280$ lakh
 \therefore Total cost $= 600 + 326.4 + 126 + 280$
 The cost = 1332.4 lakh

Cost of laying 140 km Tar NH

Cost incurred for the 1st 50 km $= 50 \times 11 = 550$
 Cost incurred for the next 50 km $= 50 \times 8.8 = 440$
 Cost incurred for the remaining 40 km $= 40 \times 5.5 = 220$
 Additional cost on account of NH $= 140 \times 1 = 140$
 Penalty on account of delay $= 2 \times 10 = 20$
 \therefore Total cost $= 550 + 440 + 220 + 140 - 20 = 1330$ lakh
 \therefore Difference in costs $= 1332.4 - 1330 = 2.4$ lakh
 Choice (A)

PRACTICE EXERCISE – 6

Solutions for questions 1 to 4:

1. In both the months mentioned, Adidas is the most preferred. \therefore It has to be the most preferred when both months are considered together. Choice (B)
2. It is possible that the respondents who responded favourably to Nike (40%) in March were also the respondents who responded favourably to all other brands. Hence, $(100 - 40)\% = 60\%$ is the maximum possible number of respondents who did not respond favourably to any of the brands.
 $\therefore 60\%$ of 1200 = 720 Choice (A)
3. Let the total number of respondents in the months given be a, b, c, d, e respectively.
 Given $b > a$ ----- (1),
 $d > b$ ----- (2) and
 $e >$ each of a, b, c, d ----- (3)
 Considering statement I:
 Since from (1) and (2) above $d > a$
 The N for two brands, i.e., Reebok and Lotto, definitely increased. Hence I is true.
 Considering statement II:
 Since $e > d$, it is possible that the N for no brand or all the brands other than Adidas decreased. Hence II is not definitely false.
 Considering statement III:
 Since $e > b$, and we need to compare the following four pairs of qualities.
 15% of b vs 35% of e
 50% of b vs 50% of e
 25% of b vs 20% of e
 20% of b vs 10% of e
 We can observe that the first two pairs can never be equal while the second two pairs will always be either equal or unequal together. i.e. if 40% of b = 20% of e, then 20% of b = 10% of e and vice versa. Hence, the N for either zero brands or exactly two brands was the same in March and September.
 Hence statement III is definitely false. Choice (B)

4. Considering the sum of the percentage values of the given brands:
 $40\% + 50\% + 20\% + 35\% = 145\%$.
 Now, imagine that there are 145 "favourable responses" (henceforth referred to as "votes"). These have to be distributed among a total of 100 respondents or say voters. It is allowed for any voter to have more than one vote and upto a maximum of four votes. But these 145 votes must be distributed in such a way that the least possible number of respondents get more than one vote each. Hence the extra 45 votes (left after first giving one vote to each voter) should be distributed among the least possible number of voters. This can be done by distributing away as many votes as possible to each voter. But, since the maximum possible votes allowed is only four, three more votes can be given to any voter. Hence, 45 votes can be distributed among at the least 15 voters. Hence, we can have only 15 voters who have more than one vote.
 Thus our required percentage is 15%.
 i.e., 15% of 125% of 800 = 15% of 1000 = 150
 Hence at least 150 respondents must have responded favourably to more than one of the given brands.
 Choice (B)

Solutions for questions 5 to 8:

It is said that the company made a profit in each of the given years. That is in each year, Sales > Expenses. Let the value of the sales in the given years be 100x, 130x, 160x, 140x, 200x and 230x respectively, and the values of expenses be 100y, 120y, 160y, 210y, 90y and 230y respectively. Since sales is greater than expenses in each year, $140x > 210y$ or $x > 1.5y$.

The minimum values of sales and the value of expenses and the minimum value of profit in terms of y are

Year	Sales	Expenses	Profit
2010	150y	100y	50y
2011	195y	120y	75y
2012	240y	160y	80y
2013	210y	210y	0y
2014	300y	190y	110y
2015	345y	230y	115y

5. In the years 2011, 2012 and 2015, the sales, expenses and profits of the company increased or decreased in unison. Choice (B)
6. At least in the years, 2011, 2012, 2014 and 2015, the profits of ABC Corporation increased when compared to the previous year. Choice (A)
7. If profitability in the year 2012 was 50%, $160x = 320y$ or $x = 2y$.
 In 2014, Sales = $200 \times 2y = 400y$
 Expenses = 190y
 \therefore Profitability $= \frac{210}{400} \times 100 = 52.5\%$ Choice (B)
8. Even for the minimum possible value i.e. when $x = 1.5y$, we can see that the profit is the highest in the year 2015. For any higher value of sales also the profit is going to be the highest in 2015. Choice (C)

Solutions for questions 9 to 12:

It is known that the pass percentage in class V in the year 2015 was at least 90%.

\therefore At least 41 of the 45 students in class V would have passed in 2015. From the given graph, there are a total 52 students in class VI in 2015 and 47 students in class VII in 2016. Hence, at least 5 students of class VI of 2015 must have failed and they must continue in class VI in 2016 also. By this we can say that 41 students of class V of 2015 are promoted to class VI.

This can be represented as follows.

Standard	Passed	Failed	Promoted / Joined
V	41	4	$52 - 4 = 48$
VI	$52 - 5 = 47$	$46 - 41 = 5$	41
VII	$50 - 0 = 50$	$47 - 47 = 0$	47
VIII	$43 - 7 = 36$	$57 - 50 = 7$	50
IX	$46 - 2 = 44$	$38 - 36 = 2$	36
X	$42 - 2 = 38$	$48 - 44 = 4$	44

9. 48 students joined class V in the year 2016. Ans (48)
10. The total number of students who failed was
 $= 4 + 5 + 7 + 2 + 4 = 22$ Ans (22)
11. The pass percentage was the highest in class VII
 i.e. 100%. Ans (VII)
12. The overall pass percentage

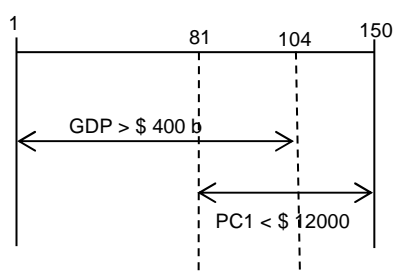
$$= \frac{41 + 47 + 50 + 36 + 44 + 38}{45 + 52 + 50 + 43 + 46 + 42} \times 100$$

$$= \frac{256}{278} = 92\%$$
 In classes – V, VI, VIII and X, the pass percentage was less than the overall pass percentage. Ans (Four)

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions for questions 1 to 4:

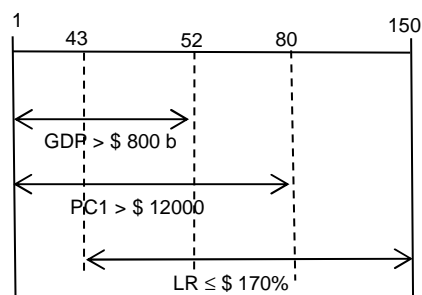
1. Suppose all the countries are arranged along the line given below, in descending order of their GDP.



The number of countries from 81 to 104 is 24.

Choice (C)

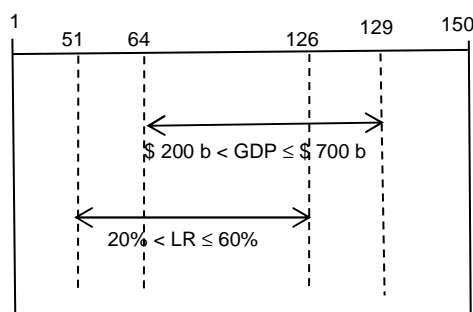
2.



The number of countries from 43 to 52 is 10

Choice (A)

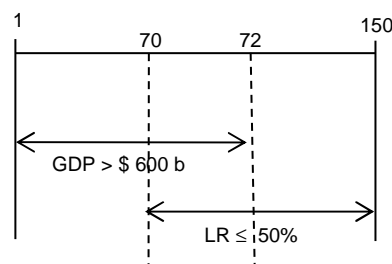
3.



The number of countries from 64 to 126 is 63.

Choice (C)

4.



Statement I is true [\therefore possible ranks are 70, 71 and 72].

Statement II is false because some of these countries can be ranked better than 135 also.

Statement III is false as a country with P.C.I. more than \$10,000 and not more than \$12,000 cannot be ranked better than 81.

Choice (D)

Solutions for questions 5 to 8:

5. The selling price per unit would be the highest for the product for which the ratio of $\frac{\text{sales (by value)}}{\text{sales (by volume)}}$ is the highest, i.e., for product D. Choice (D)
6. For the products for which the share of sales (by value) is more than the share of sales (by volume), the selling price per unit is more than the average selling price of all the units, i.e., for products A and D. Choice (B)
7. If the company made an overall profit, the sales (by value) would be more than the cost and the company could have made a loss on products B, C and F. Choice (A)
8. If the company did not make a loss on any of the six products, then the overall profit has to be at least

$$\frac{15 - 11}{11} \times 100 = \frac{4}{11} \times 100 = 36.36\%. \quad \text{Choice (D)}$$

PRACTICE EXERCISE – 7

Solutions for questions 1 to 3:

1. The total number of matches in the tournament
 $= 5 + 4 + 3 + 2 + 1 + 1$ (finals) = 16 Choice (D)
2. The minimum number of points would be required when one of the teams score the maximum points and the remaining teams equally share all the remaining points.
 Total points available = $15 \times 2 = 30$
 Maximum points for a team = $5 \times 2 = 10$
 The remaining 20 points can be shared by all the five teams, and one of those teams with four points would advance to the finals on the basis of the goal difference. Choice (C)

3. The worst case for a team happens when three teams score the highest points and one of those teams is eliminated.
Points scored by the last three teams (points only among themselves) = 6
Remaining points = 24
These points can be shared by the teams and one of the teams with 8 points could be eliminated on the basis of goal difference.
Choice (A)

Solutions for questions 4 to 8:

4. A player seeded 10, assuming no upsets is expected to reach the last 16 stage, i.e., the fourth round. In this round he would face the player seeded 7 and would be eliminated.
Choice (C)
5. The players who won exactly one match are those who won the first round but lost in the second round, i.e., $64 - 32 = 32$ players.
Choice (D)
6. The player seeded 25 would have lost to the player seeded 8.
Choice (A)
7. The minimum number of upsets happen when the player seeded 13 caused all the upsets, i.e., in the fourth and fifth rounds, the semifinals and the finals, a total of four upsets.
Choice (C)
8. The player Seeded 1 would have faced the player Seeded 128 in round 1, players Seeded 64 or 65 in round 2, player Seeded 32, 33, 97 or 96 in round 3 and in round 4 he would have faced any of seeds 16, 17, 48, 49, 80, 81, 112 or 113.
Choice (C)

Solutions for questions 9 to 12:

In the pool stage, as each team plays every other team once, the total matches in each pool is 10. In the super six stage, the total matches are 9.

\therefore The total matches = $20 + 9 + 2 + 1 = 32$.

In the pool stage, the total number of points available in each pool is $10 \times 2 = 20$.

As there are five teams, each team can end with four points and two of the teams can be eliminated (or)

One team can win all matches and get 8 points, another team 6 points and the three other teams 2 points each and one of them can advance to the super six.

9. The total number of matches in the tournament is 32.
Choice (C)
10. The number of points scored by a team which advanced to the super six stage is at least 2.
Choice (A)
11. Among the top three teams advancing to the super six stage from each group either all of them would carry forward 2 points each (or) one team would carry forward 4 points, second team 2 points and the third team zero points. Even if all the three teams lose all their super six matches, two teams would advance from this group and so a team with a total of 2 points can advance to the semi finals.
Choice (A)
12. Three teams can end up with 6 points each at the end of the pool stage, i.e., three wins each. Now these teams can win all their matches in the super six stage, but one of these teams, would be eliminated.
 \therefore a team with 3 (in the pool stage) + 3 (in the super six stage) wins can be eliminated.
Choice (D)

Solutions for questions 13 to 16:

13. To ensure her win Geeta has to make sure that there is one or two coins left when it is Neeta's turn to play. In each round Geeta can make sure that seven coins ($2 + 5$) leave the table.

\therefore The number of coins left on the table before Neeta's turn has to be of the form $7n + 1$ or $7n + 2$ where n is an integer. As there are 32 coins left on the table, she has to remove two or three coins, so that the coins left over is of the form $7n + 1$ or $7n + 2$.
Choice (B)

14. The number of coins left after Neeta's turn must be of the form $7n + 1$ or $7n + 2$. As she removed four coins, the number of coins would here been of the form $7n + 5$ or $7n + 6$. Only choice (C) satisfies this condition.

Choice (C)

15. When the person who picks up the last coin wins the game, one has to make sure that when it is the other person's turn to play there are six or seven coins left on the table so that whatever the other person plays, one can pick the last coin in his/her turn.

\therefore The number of coins left on the table before Geeta's turn has to be of the form $7n$ or $7n - 1$. As there are 28 coins left on the table, which is of the form $7n$, whatever Neeta plays, the number of coins left will not be of the form ' $7n$ or $7n - 1$ ' before Geeta's turn i.e. Neeta cannot win no matter what she does.
Choice (D)

16. As Neeta removed 2 coins, the number of coins was of the form $7n + 2$ or $7n + 1$. Choices (B) and (C) satisfy this.
Choice (D)

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions for questions 1 to 4:

It is given that India's score was the sum of the scores of the batsmen and the extras. Looking at the number of 6's it can be seen that if Rohit had scored one six, all players together would have scored five sixers, if Rohit had scored two sixers, all players together would have scored ten sixers and so on. Similarly, Kohli or Dhawan would have scored at least two 4's each (as the 4's scored, as a percentage of the total 4's scored by all the players, is a multiple of four for each player). The next possible case is they scored four 4's each. Now if Dhawan has scored the minimum possible number of 4's and 6's, i.e. two and one respectively, he would have scored at least $8 + 6 = 14$ runs, in which case Yuvraj, who scored 32.8% of the runs scored by all the five, would have scored 82 runs.

Now for Dhawan's score of 15, 16 17 etc, we would not get integer values for scores made by others, so Dhawan's score can only be 14, 21 or 28. For the next possible value of Dhawan's score (i.e. 35) the runs scored by Yuvraj would exceed 200.

\therefore Total 4's scored by Indian batsmen is at least 25 and the total 6's scored by Indian batsmen is at least five.

With Dhawan's score as 14, the score of other players would be as follows.

Rohit – 70
Kohli – 56
Yuvraj – 82 and
Dhoni – 28

and India's total score = $70 + 56 + 14 + 82 + 28 + 30 = 280$ (the extras are 30 as India had scored five 6's and the runs through extra's and those through 6's are numerically equal).

For Dhawan's score of 21 ($2 \times 4 + 1 \times 6 + 7$ or $2 \times 4 + 2 \times 6 + 1$) the score of others would be 105, 84, 123 and 42 and India's score would be 405 or 435 depending on the number on sixers.

For Dhawan's score of 28 ($2 \times 4 + 1 \times 6 + 14$ or $2 \times 4 + 2 \times 6 + 8$ or $4 \times 4 + 2 \times 6$ or $4 \times 4 + 1 \times 6 + 6$) India's total score would be 530 or 560 depending on the number of sixers scored by the Indian batsmen.

1. Indian batsmen scored at least 25 fours. Choice (B)
2. India's score cannot be 250. Choice (C)

3. Dhawan scored the maximum percentage of his runs through 4's and 6's. Choice (B)
4. For Yuvraj to face the minimum number of balls, he should have scored 82 runs. Yuvraj scored 82 runs with eleven 4's and two 6's i.e. $44 + 12 = 56$ runs in 13 balls. Now all of the remaining 26 runs could be scored in 2's, i.e. he would have faced at least 13 more balls.
 \therefore he would have played at least $13 + 13 = 26$ balls.
 Choice (D)

PRACTICE EXERCISE – 8

Solutions for questions 1 to 4:

The capacities of the pipeline connecting A with B, C and D are 1500 each while the capacities of all other pipelines are 750 each.

1. To find the minimum flow in the pipeline connecting D and G, we have to maximize the flow in other pipelines. The maximum flow in the pipeline connecting A and B is 1450 (as 700 is stored at depot B and the remaining 750 is the maximum that can flow through pipeline connecting B and E). Similarly the maximum flow in the pipeline connecting A and C is 1400.
 \therefore The minimum flow in the pipeline connecting A and D is $4000 - (1450 + 1400) = 1150$.
 Ans: 1150
2. The maximum flow in the pipeline connecting A and B is 1200, of which 500 litres will flow to E. The flow through the pipeline connecting A and C can be at most 1400, of which 750 will flow to E. Now E would receive $500 + 750 = 1250$ of which 450 would be stored at E, 500 would be transferred to F and 300 to G, with G receiving the remaining 600 from D
 \therefore the flow in the pipeline connecting D and F can be zero.
 Ans : 0
3. The slack in the pipeline supplying oil to depot E would be maximum, when pipeline connecting A and D carries the maximum oil, i.e. 1500 litres. Without any flow in the pipeline supplying oil to depot E, a maximum of $700 (A - B) + 650 (A - C) + 1500 (A - D - F \text{ or } G) = 2850$ can be transported. \therefore a further $4000 - 2850 = 1150$ is required which is to be supplied through depot E.
 \therefore maximum slack = $(750 + 750) - 1150 = 350$
 Ans: 350
4. If the stack in the pipeline connecting D and G is 50, it means that oil flowing through the pipeline connecting D and G is $750 - 50 = 700$. Of the 900 required at G, 700 is flowing through the pipeline connecting D and G. The stack in the pipeline connecting E and F is minimum, when the flow through it is the maximum. The maximum flow through the pipeline connecting E and F is 500 (required at F) + 200 (further requirement at G) i.e. 700.
 \therefore the minimum slack is $750 - 700 = 50$.
 Ans: 50

Solutions for questions 5 to 8:

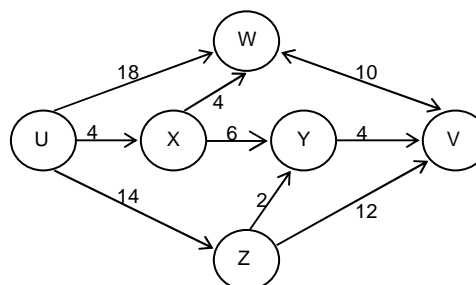
5. The total number of students who like Cricket is
 $= \frac{25}{100} \times 2500 + \frac{25}{100} \times 4000 + \frac{75}{100} \times 3000$
 $= 625 + 1000 + 2250 = 3875$
 Choice (C)
6. The total number of students who like football is
 $= \frac{25}{100} \times 2500 + \frac{50}{100} \times 4000 + \frac{12.5}{100} \times 3000$
 $= 625 + 2000 + 375 = 3000$
 The total number of students who like basketball is
 $[(2,500 + 4,000 + 3,000) - (3000 + 3875)]$
 $= [9500 - 6875] = 2625$.
 \therefore Cricket is liked by the maximum number of students.
 Choice (A)

7. The required percentage = $\frac{2625}{9500} \times 100 = 27.6\%$
 Choice (B)
8. The minimum difference is for football or basketball which is $625 - 375 = 250$ or $1250 - 1000 = 250$ Choice (B)

Solutions for questions 9 to 12:

9. From table II, the cost of preparing a finished product from a semi-finished product is the highest for FP_4 from SF_4 and from table I, the cost of preparing a semi-finished product from a raw material is highest for SF_4 from RM_4 . So, the highest cost of preparing a finished product from a raw material is the highest for FP_4 from RM_4
 It is $1139.6 + 1248.8 = 2388.4$ Choice (C)
10. The cost of preparing FP_8 from RM_2 through
 $SF_5 = 919.9 + 288 = 1207.9$
 $SF_6 = 814.2 + 615.6 = 1429.8$
 $SF_3 = 768.4 + 62.5 = 830.9$
 $SF_4 = 718.4 + 911.7 = 1630.1$
 $SF_1 = 698.6 + 756.3 = 1454.9$
 \therefore It is highest for SF_4 (i.e., 1630.1) Choice (A)
11. The cost of preparing FP_5 from RM_5 is the least, it is $548.8 + 108.5 = 657.3$ Choice (B)
12. The number of ways in which a given finished product can be developed is (number of raw materials) \times (number of semi-finished products) = $6 \times 6 = 36$ Choice (A)

Solutions for questions 13 to 16:



The possible routes are

Route	Total time	Junction
U – W – V	28	W
U – X – W – V	18	X, W
U – X – Y – V	14	X, Y
U – Z – Y – V	20	Z, Y
U – Z – V	26	Z

It is given that, for each of the routes, the only way to increase the total time is to impose checking delays at junctions. Let the time delay due to checking at junctions W, X, Y and Z be w, x, y and z respectively. Now the total time for each of the five routes will be as follows:

Route	Total time
U – W – V	28 + w
U – X – W – V	18 + (x + w)
U – X – Y – V	14 + (x + y)
U – Z – Y – V	20 + (z + y)
U – Z – V	26 + z

13. No traffic flows, from Z – V. Now applying each of the options, the total time would be as follows:

Route	Option A	Option B	Option C	Option D
U – W – V	30	30	30	28
U – X – W – V	30	28	30	28
U – X – Y – V	30	30	32	28
U – Z – Y – V	32	34	32	28
U – Z – V	32	32	30	30

As it is given that the traffic flow at junction W is the same as that at junction Y.

∴ Number of routes involving W that can be used must be the same as that involving Y.

Further only the routes with minimum time duration can be used.

This happens in only (D) as in the routes that can be used, the number of routes involving W is two (U – W – V) and (U – X – W – V) and that involving Y is also two (U – X – Y – V) and (U – Z – Y – V). Choice (D)

14. As X – Y is unusable, U – X – Y – V is not possible. From the remaining, if we apply all the options:

Route	Option A	Option B	Option C	Option D
U – W – V	32	28	30	32
U – X – W – V	32	28	30	28
U – Z – Y – V	30	30	30	32
U – Z – V	30	30	30	28

Only in option (C), the total time taken is the same for each of the four routes. Choice (C)

15. From the given options

Route	Option A	Option B	Option C	Option D
U – W – V	28	28	30	30
U – X – W – V	28	28	30	30
U – X – Y – V	32	28	30	30
U – Z – Y – V	30	28	32	30
U – Z – V	28	30	32	30

It is very likely that option (D) is selected. But if all the four routes take the same time, there will be an equal traffic in all the five routes, i.e. 20% in each route. But then the percentage of traffic in V – W = 20%, U – X = 40% (as these are two routes involving U – X, U – Z = 40% (for the same reason as above).

But here the given condition is that time taken in U – W is equal to U – X, which in turn is equal to U – Z.

As V – W = U – Z

Of the routes, that can be used the number of routes involving U – W must be same as U – X, which in turn is same as U – Z. It happened in only option (A) Choice (A)

16. From the given options

Route	Option A	Option B	Option C	Option D
U – W – V	28	28	30	30
U – X – W – V	28	28	30	30
U – X – Y – V	28	32	30	30
U – Z – Y – V	28	30	32	30
U – Z – V	30	28	32	30

As the time must be the same for all the routes, it must be option (D). Choice (D)

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions from questions 1 to 4:

The percentage share in the market for the companies, (the range in case of companies C and D) in the different years are as follows:

Year	2010	2011	2012	2013	2014	2015
A	40	35	25	25	20	20
B	25	35	35	40	45	50
C	11-24	9-21	16-24	11-24	16-19	11-19
D	11-24	9-21	16-24	11-24	16-19	11-19

1. Sales of company B in 2010 = $\frac{25}{100} \times 1200 = 300$ cr.

Sales of company B in 2015 = $\frac{50}{100} \times 3000 = 1500$ cr.

Percentage increase = $\frac{1200}{300} \times 100 = 400\%$

Choice (C)

2. The percentage increase in market share is maximum if company C or D had the minimum possible market share in 2011 (i.e. 9%) and the same company had the maximum possible market share in 2012 (i.e. 24%)

∴ The percentage increase = $\frac{15}{9} \times 100 = 166.67$

Choice (B)

3. If company C had the maximum percentage increase in sales from 2013 to 2014,

Its sales in 2013 = $\frac{11}{100} \times 2000 = 220$ (minimum possible)

Its sales in 2014 = $\frac{19}{100} \times 2600 = 494$ (maximum possible)

∴ Increase in sales = ₹274 crores. Choice (C)

4. Maximum value of company D's sales in 2010

= $\frac{24}{100} \times 1200 = 288$ crores

Minimum value of company D's sales in 2011

= $\frac{9}{100} \times 1400 = 126$ cores

Percentage decrease = $\frac{162}{288} \times 100 = 56.25\%$

Choice (B)

PRACTICE EXERCISE – 9

Solutions for questions 1 to 5:

1. The number of marketing employees working in the morning shift has to be the maximum possible.

In B₁, 20 persons are working in the Marketing department and 18 persons are working in the morning shift.

Given, there must be at least one person from each department in each of the shifts.

From the Marketing department, at least one person has to work in each of Dawn, General, Evening and Night shifts.

∴ At most 20 – 4 = 16 persons of the Marketing department can be working in the morning shift.

Among the 18 persons working in the morning shift, at least one must be from each of Production, Finance and Research departments and hence at most (18 – 3) = 15 persons can be working in the Marketing department. Similarly if we calculate for other branches.

∴ Only 15 employees of the Marketing department can be working in the morning shift.

B₁ : Minimum of ((20 – 4), (18 – 3)) = 15

B₂ : Minimum of ((25 – 4), (8 – 3)) = 5
 B₃ : Minimum of ((30 – 4) (15 – 3)) = 12
 B₄ : Minimum of ((20 – 4) (25 – 3)) = 16

∴ The required answer is 15 + 5 + 12 + 16 i.e., 48.

Choice (D)

2. In the branch B₃, the maximum possible number of Production employees working in the morning shift is 15 – 3 i.e., 12. The minimum number of Finance employees working in the general shift is only one.

∴ The required difference is 12 – 1 = 11. Choice (B)

3. Minimum of ((20 – 3), (26 – 6)) = 17
 Minimum of ((25 – 3), (31 – 6)) = 22
 Minimum of ((30 – 3), (27 – 6)) = 21
 Minimum of ((20 – 3), (43 – 6)) = 17
 i.e., 17 + 22 + 21 + 17 = 77

Choice (B)

4. From the evening shift to the night shift, minimum change can be done in the following way:

Shift 5 employees in B₁.

Shift 1 employee in B₂.

For B₃ and B₄, there is no need of a change.

∴ The required answer is 5 + 1 = 6. Choice (D)

5. In B₁, of the 12 employees working in the dawn shift at least one must be from Finance and at least one must be from Research. Hence at most 10 can be from Production or Marketing.

Similarly, in the morning shift at most 16 can be from Production or Marketing and in the general shift at most 6 can be from Production or Marketing.

Now, of the 45 employees of Production and Marketing, the remaining (45 – 32) = 13 must be working in the evening and the night shifts.

In B₂, at least 5 employees of Production and Marketing must be working in the evening and night shifts.

In B₃, at least 9 (50 – (20 – 2) – (15 – 2) – (12 – 2)) employees of Production and Marketing must be working in the evening and the night shifts.

In B₄, at least 4 employees of Production and Marketing must be working in the evening and the night shifts.

∴ The required total = 13 + 5 + 9 + 4 = 31 Choice (C)

Solutions for questions 6 to 10:

6. From the first table, 10% of Finance students are with a Science background and from the second table 10% students with Science background are in the Finance stream. Therefore we have

$$\frac{10}{100} \times \text{Science} = \frac{10}{100} \times \text{Finance}$$

∴ Science = Finance.

Choice (A)

7. From first table, 40% of the Finance students are with a Commerce background and from second table 32% of students with a Commerce background are in Finance. Therefore 40% Finance = 32% Commerce

$$\therefore \text{Commerce} = \frac{40}{32} \text{Finance}$$

Given that Number of Finance students is 400

$$\therefore \text{Commerce} = \frac{40}{32} \times 400 = 500$$

Similarly, for other backgrounds

Arts → 200; Science → 400, Engg → 800

Medicine → 100. Hence total students = 2000

⇒ Non-Finance students = 2000 – 400 = 1600

Choice (C)

8. From first table, 10% of Marketing students are with Arts background and from second table, 30% of Arts background students are in Finance Stream.

$$\text{So, we have, } \frac{10}{100} \times \text{Marketing} = \frac{30}{100} \times \text{Arts} \quad \text{--- (1)}$$

Similarly, from first table 10% of Systems stream students are with Arts background and from second table 10% of Arts background students are in Systems stream.

$$\text{Therefore } \frac{10}{100} \times \text{Systems} = \frac{10}{100} \times \text{Arts}$$

∴ Systems = Arts

From (1), we get

$$\frac{10}{100} (\text{Marketing}) = \frac{30}{100} (\text{Systems})$$

i.e. Marketing = 3 (Systems)

Given Marketing = 600, So, 600 = 3 Systems

∴ Systems = 200.

Choice (B)

9. From first table 10% of Marketing students are with Arts background, and from second table 30% of Arts students are in marketing stream. Therefore

$$\frac{30}{100} \times \text{Arts} = \frac{10}{100} \text{Marketing}$$

$$\therefore 3 (\text{Arts}) = \text{Marketing} \quad \text{--- (1)}$$

From first table 20% of Finance stream students are with Arts background and from second table 40% of Arts background students are in Finance stream, so we get

$$\frac{20}{100} \times \text{Finance} = \frac{40}{100} \times \text{Arts}$$

$$\therefore \text{Finance} = 2 \text{ Arts} \quad \text{--- (2)}$$

Similarly, the relation between number of students in other streams and number of students with Arts background can be found, by comparing the figures given in the two tables. For other streams we get, 5% HR = 12.5% Arts

$$\text{Hr} = 2.5 (\text{Arts}) \quad \text{--- (3)}$$

$$10\% \text{ systems} = 10\% \text{ Arts}$$

$$\text{Systems} = \text{Arts} \quad \text{--- (4)}$$

$$5\% \text{ ABM} = 7.5\% \text{ Arts}$$

$$\text{ABM} = 1.5 (\text{Arts}) \quad \text{--- (5)}$$

From equations (1), (2), (3), (4) and (5) we get

$$\begin{aligned} &\text{Marketing} + \text{Finance} + \text{HR} + \text{Systems} + \text{ABM} \\ &= 3 (\text{Arts}) + 2 (\text{Arts}) + 2.5 (\text{Arts}) + (\text{Arts}) + 1.5 (\text{Arts}) \\ &= 10 \text{ Arts.} \quad \text{--- (6)} \end{aligned}$$

Given that number of Arts students is 200. The total number of students in MBA School, is equal to the sum of the number of students in all the streams,

∴ From equation (6), we have

$$\text{Total number of streams} = 10 \text{ Arts}$$

$$= 10 \times 400 = 4000.$$

Choice (C)

10. The number of students with a medicine background is the minimum. As 15% of the students with a medicine background have opted for HR, the minimum number of students with a medicine background has to be 20. We can see that for this value, the values in all the boxes in both the table will be integers. So the minimum number of students would be 40 (Arts) + 80 (Science) + 160 (Engineering) + 20 (medicine) + 100 (Commerce) = 400.

Choice (B)

Solutions for questions 11 to 15:

11. The number of students who scored more than 90% in at least two subjects = students who scored more than 90% in (exactly two + exactly three + exactly four + exactly five) subjects. The number of students will be the least when maximum students score more than 90% in exactly one subject and the other students score more than 90% in all the five subjects. Total instances = 95. If p is the number of students who scored more than 90% in exactly one subject and q is the number of students who scored more than 90% in all the five subjects, p + q = 35 and p + 5q = 95

$$\therefore p = 20 \text{ and } q = 15$$

Choice (B)

12. To find the maximum number of students who satisfy a certain criteria in exactly 'n' subjects, where $x < n$, add up all the values and divide by 'n'. If the answer obtained is less than 'x' values which were added where $x < n$, ignore the 'x' values, add up the rest and divide by $n - x$. The maximum number of students who scored more than 90% in exactly four subjects in each of the classes are

$$\text{Class 6} = \frac{12 + 16 + 15 + 22 + 18}{4} = 20, \text{ as } 22 > 20$$

$$\frac{12 + 16 + 15 + 18}{3} = 20$$

$$\text{Class 7} = \frac{15 + 22 + 22 + 21 + 15}{4} = 23$$

$$\text{Class 8} = \frac{7 + 18 + 16 + 23 + 17}{4} = 20$$

$$\text{as } 23 \text{ is greater than } 20, \frac{7 + 18 + 16 + 17}{3} = 19$$

$$\text{class 9} = \frac{10 + 19 + 15 + 22 + 18}{4} = 21,$$

$$\frac{10 + 19 + 15 + 18}{3} = 20$$

$$\text{Class 10} = \frac{15 + 25 + 21 + 29 + 16}{4} = 26,$$

$$\frac{15 + 25 + 21 + 16}{3} = 25$$

\therefore Total students who scored more than 90% in exactly four subjects = $20 + 23 + 19 + 20 + 25 = 107$. Choice (D)

13. The maximum number of students in the different classes who scored more than 90% in all the five subjects is
 Class 6 – 12 (the lowest value among all the five)
 Class 7 – 15
 Class 8 – 7
 Class 9 – 10
 Class 10 – 15
 Total = 59
 \therefore at most 59 students would have won the scholarship. Choice (D)

14. We have to find the maximum possible number of students who scored more than 90% in class 10.
 Total instances = $15 + 25 + 21 + 29 + 16 = 106$.

$$\therefore \text{required value} = \frac{106}{3} = 35$$

i.e., 35 students scored more than 90% in exactly three subjects and one student scored more than 90% in a single subject. Choice (C)

15. The number of students who scored 90% in a maximum of two subjects will be maximum when we assume that all the students in the class secured more than 90% in at least one subject. Number of instances in class 6 = 83.
 As we need to maximize the number of students who scored more than 90% is at most 2 subjects, (0 subjects, 1 subject and 2 subjects), we should minimize the number of students with the other possibilities i.e. who scored more than 90% in 3, 4 or 5 subjects. We have to assume 8 students got more than 90% in 5 subjects.

$$\therefore 83 \text{ can be written as } 8 \times 5 + 21 \times 2 + 1 \times 1$$

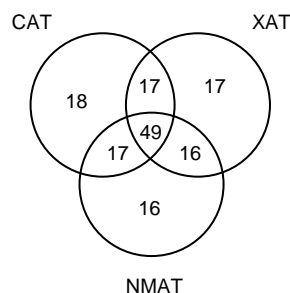
$$\therefore \text{At most two} = 22 (21 + 1) \quad \text{Choice (C)}$$

ADDITIONAL QUESTIONS FOR PRACTICE

Solutions for questions 1 to 5:

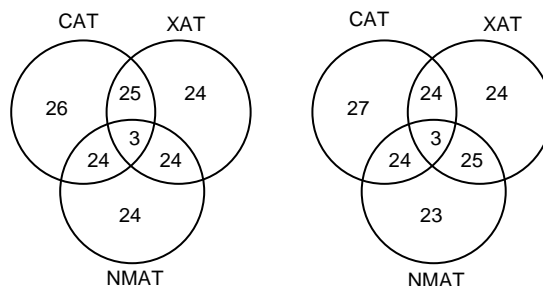
1. For maximum number of students writing NMAT, we need to have maximum number of instances of students taking tests. So 49 students write all the three 50 of them would write exactly two and 51 would write exactly one test. The total number of instances would be $49 \times 3 + 50 \times 2 + 51 \times 1 = 298$. Since $\text{CAT} > \text{XAT} > \text{NMAT}$, for highest possible value of NMAT, they should be as close as possible i.e. 101 for CAT, 99 for XAT and 98 for NMAT.

This can also be represented as in the Venn diagram below.



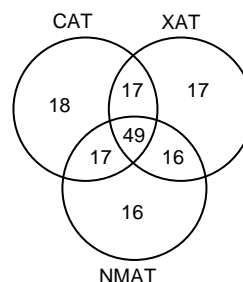
The maximum number of students writing NMAT would be $17 + 49 + 16 + 16 = 98$.
 Ans: (98)

2. To minimize the number of people writing CAT, we need to minimize the number of instances of students taking test at the same time making sure that number of students writing NMAT is more than the number of students writing exactly one test. As the total number of students is 150, and $\text{NMAT} > \text{exactly one}$ take them to be close to half of 150. If we take exactly one to be 76, the total number of instances are $76 \times 1 + 74 \times 2 = 224$. But 224 when divided between CAT, XAT and NMAT, will leave as with 76, 75 and 73 for CAT, XAT and NMAT and $\text{NMAT} < \text{exactly one}$. The next possibility would be for 75 students taking exactly one test. The number of instances are $75 \times 1 + 74 \times 2 + 1 \times 3 = 226$ 226 when divided between CAT, XAT and NMAT would give as 77, 75 and 74. This is also not possible as students writing NMAT is 74 and those writing exactly one is 75. The next case would be 74 writing exactly one, 73 exactly two and three writing exactly three ($74 + 73 + 3 = 150$) The total instances would be $74 \times 1 + 73 \times 2 + 3 \times 3 = 229$. Now dividing 229 nearly equally between CAT, XAT and NMAT we get 78, 76 and 75 for CAT, XAT and NMAT respectively. This can be verified as in the Venn diagrams given below.



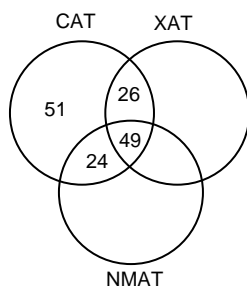
The minimum number of students writing CAT would be 78
 Ans: (78)

3. For maximum number of students writing all the three take the number of people writing exactly one test, exactly two tests and exactly these tests to be nearly equal i.e., 51, 50 and 49. One arrangement would be as follow



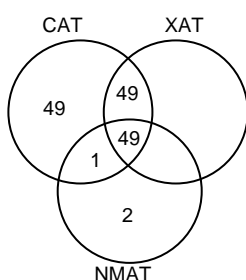
Ans:(49)

4. All 150 students could have written CAT. Take exactly 1, exactly 2 and exactly 3 to be 51, 50 and 49 as in the previous question. Now make sure that all these values come under CAT. This can be done as follows.



Ans: (150)

5. As the minimum number of students who wrote exactly one test is 51 and number of students who wrote NMAT has to be more than that, 52 students could have written NMAT. This can be shown as follow.



Ans: (52)

PRACTICE EXERCISE – 10

Solutions for questions 1 to 4:

- If Mercedes Ltd. had its lowest sales in Japan, Mercedes Ltd. is company B and Toyo Ltd. is company C while BMW Ltd. is company A.
∴ If statement 1 is true, then statement 2 is necessarily true. Choice (C)
- If Form Ltd. had its lowest sales in U.S.A., then it is either company A or company D.
Case 1: Form Ltd. is company A, then BMW Ltd. is company C and the second condition cannot be satisfied.
Case 2: Form Ltd. is company D. Then BMW Ltd. is company A, and Mercedes Ltd. and Toyo Ltd. are companies B and C in any order.
∴ BMW Ltd. has its lowest sales in U.S.A. Choice (C)
- Using either statement (b) or statement (d) we can uniquely determine each of the four companies. Choice (D)
- If Toyo Ltd had the highest sales in U.S.A., then it is company B and Mercedes Ltd. is company C and BMW Ltd. is company A.
If Mercedes Ltd. had the highest sales in U.K., then it is company B and Toyo Ltd. is company C in which case BMW Ltd. is company A.
∴ If one of the statement is true, the other must be false.
If company B is Form Ltd. then company C is BMW Ltd and Toyo Ltd and Mercedes Ltd are one of companies A and D in any order.
∴ At most one of the two statements is true. Choice (C)

Solutions for questions 5 to 8:

- If the income of Mr and Mrs. Sharma are x and y respectively,
 $30x : 25y = 3 : 1$
or $30x = 75y$
or $\frac{x}{y} = \frac{5}{2}$ ∴ Required ratio is 5 : 2 Choice (C)

- As investment in Shares, which form 25% of the savings, is one third of the rent paid, the rent paid would be equivalent to 75% of total savings.
If the income of Mr and Mrs. Sharma are $10x$ and $10y$ respectively, then
 $3x = 75\%$ of $(2x + 1y)$
 $3x = 1.5x + 0.75$
or $x : y = 1 : 2$ Choice (B)

- The total savings = ₹1,20,000
Now there are two possibilities.
Case (1):
Mr.Sharma earns twice as much as Mrs. Sharma.
∴ $0.2(2y) + 0.1y = 1,20,000$
∴ $y = 2,40,000$ and $x = 4,80,000$
∴ Entertainment = $\frac{20}{100} \times 2,40,000 = ₹48,000$

- Case (2):
If Mr. Sharma earns half as much as Mrs. Sharma.
∴ $0.2(0.5y) + 0.1y = 1,20,000$
⇒ $0.2y = 1,20,000$
 $y = 6,00,000$
∴ Expenses on entertainment = ₹1,20,000
∴ Monthly expenses in the first case is ₹4000 and in the second case is ₹10,000. Choice (C)

- 20% of savings = 30% of Mrs. Sharma earnings.
∴ 20% of $(0.2x + 0.1y) = 30\%$ of y
 $.04x + .02y = .3y$
 $.04x = .28y$
 $\frac{x}{y} = \frac{7}{1}$

Medical expenses = 10% of $\frac{7}{8}$ of total earnings.

= 8.75% of total earnings. Choice (C)

Solutions for questions 9 to 12:

- In 2015, the difference between the number of boys and the number of girls in LSP, in Jaipur, is 120.
∴ Number of students in the school is 280.
The difference between the number of boys and girls in LSP, in Pune, is 90.
∴ The total number of students in LSP, in Pune, is 270.
∴ The number of students in LSP, in Mumbai, must be between 270 and 280 and must be a multiple of 9.
∴ It must be 279.
∴ The difference between the number of boys and the number of girls is 31. Choice (C)
- The value of boyage increased for – DPS – Hyderabad, FPS – Hyderabad, LSP – Pune, LSP – Hyderabad, LPS – Pune, LPS – Hyderabad, LFS – Jaipur and LFS – Pune. i.e., a total of 8 schools. Choice (C)
- As the number of girls (i.e. $\frac{2}{3}$) in LSP, in Pune, in 2015 is same as that boys in DPS, in Mumbai, in 2016 i.e.
 $\frac{2}{5}$ (the number of students in DPS, in Mumbai, in 2016)
⇒ Number of students in LSP, in Pune, in 2015 < Number of students in DPS, in Mumbai, in 2016.
Number of students in DPS, in Mumbai, in 2016 will be definitely more than LPS in Pune in 2015. Choice (D)
- The number of students in Hyderabad in DPS = 540
Maximum possible number of students in FPS, in Hyd = 533 (multiple of $7 + 6 = 13$)
in LSP, in Hyd = 528 (multiple of $6 + 5 = 11$)
in LPS, in Hyd = 517 (multiple of $8 + 3 = 11$)
in PDS, in Hyd = 512 (multiple of $9 + 7 = 16$)
in LFS, in Hyd = 510 (multiple of $3 + 2 = 5$)
∴ Number of girls = 204. Choice (C)

Solutions for questions 13 to 16:

13. The least growth from 1990-91 to 1998-99 is in the price of Euro i.e., 8% and the highest is for Pound Sterling i.e., 16%. The value must be greater than 8% and less than 16%.
Choice (C)
14. Since total currency holdings, in 1995-96 were more than that of 1990-91, it can be concluded from the data that it can be possible only when the percentage share (by volume) of Euro in currency holding is more than that of US Dollar. Comparing the values of currency holding for different currencies in different years, we get only three possible years (1994-95, 1997-98 and 1999-2000). Ans: (3)
15. Comparing the currency reserves with the currency reserves in 1992-93, we can observe that total currency holdings were less than those in the year 1992-93 in the years (90-91, 93-94, 94-95, 95-96, 97-98, 99-00). Therefore there are 6 such years. Ans: (6)

18. Here, we can tabulate all the information as follows:

	Indore	Pune	Bhopal	Shillong	Agra	Cochin	Patna	Mysore
Indore	X	M	L	L	M	L	L	L
Pune		X	L	L	M	L	L	L
Bhopal			X	L	M	L	L	L
Shillong				X	M			M
Agra					X	L	L	L
Cochin						X	L	M
Patna							X	M
Mysore								X

We know that Agra has the lowest population. Accordingly we can fill Agra's spaces.

After doing this we can see that except for Pune and Agra, all the cities have a population more than at least 2 cities. So, Pune was ranked second. Accordingly we can fill the remaining.

It is given that Indore was ranked third.

∴ Bhopal was ranked fourth and Mysore was ranked fifth, i.e. four cities have a lesser population than Mysore.

Choice (C)

19. Choice (D)

20. The city ranked fourth in terms of population, i.e. Mysore would have its rank according to population and the number of cities having a population less than it as equal.
Choice (B)

PRACTICE EXERCISE – 11

Solutions for questions 1 to 4:

1. If we need to have minimum quantity of drink A, the other drink should have a maximum percentage of mineral R i.e., C or D with 30% of mineral R. To have at least 35% of mineral R, drinks A and C should be mixed in the ratio 1 : 1, i.e., the minimum required quantity of drink A is 2.5 litres.
Choice (C)
2. For the least cost per litre, we need to mix drinks A and B in the ratio 2 : 1 in which case the cost per litre would be $\frac{50 + 50 + 100}{3} = ₹66.67$
Choice (D)
3. If a solution which contains at least 20% each of mineral P, Q and S is to be made, drinks A, C and E have to be mixed in the ratio 2 : 1 : 1, which gives a cost per litre of $\frac{500}{4} = ₹125$
Choice (B)
4. If the solution must contain at least 30% of mineral R and not more than 35% of mineral Q, the following drinks can be mixed A – B, A – C, A – D and C – D. To have the least cost per litre, drinks A and B must be mixed
Choice (A)

16. By observation it can be seen that in the year 1998-99, the value of each of the currency and the price gold was the highest, therefore, irrespective of shares of individual currencies in total reserves, year 1998-99 had highest reserves.
Ans: (1998-99)

Solutions for questions 17 to 20:

17. Here, it is given that for any city X, the number of cities with a population less than it was exactly one less than its rank. i.e. the city with the lowest population is ranked as 1. So also the city with the highest population is ranked as 8, it means that its population is greater than all the other 7 cities.
From the given table, we can say that all cities except Agra have more population than at least one other city.
∴ Agra was ranked first. Choice (B)

Solutions for questions 5 to 8:

As the rate of boys to girls is given as 2 : 5, assume that the number of boys is 200 and the number of girls is 500
The values can be tabulated as follows

	Boys	Girls	Total
Arts	334	50	84
Science	34	71	105
Medicine	10	39	49
Engineering	48	78	126
Commerce	22	69	91
Others	52	193	245

5. Gender ratio of girls doing medicine = $\frac{39}{10} = 3.9$.
Choice (A)
6. Only in Arts and Engineering is the number of boys at least half of the number of girls.
Choice (B)
7. As the number of girls doing medicine is $\frac{4056}{39} = 104$ times the value calculated in the table, the number of boys would be $104 \times 200 = 20,800$.
Choice (C)
8. The number of boys is the second highest in engineering. The number of girls in engineering = 78
The number of girls in the highest in 'other' = 52
The number of boys in 'other' = 52
The required ratio = 78 : 52 = 3 : 2.
Choice (C)

Solutions for questions 9 to 12:

9. The total number of males = $0.55 \times 1200 = 660$
 The number of males in the accounts department
 $= 660 - (.45 \times 300 + .55 \times 400 + .60 \times 300)$
 $= 660 - (135 + 220 + 180) = 125$
 $\therefore 200 - 125 = 75$ employees in the accounts department are females
 Required percentage = $\frac{75}{200} \times 100 = 37.5\%$ Ans: (37.5)
10. Number of female employees = $0.45 \times 1200 = 540$
 Number of non vegetarian employees = $0.675 \times 1200 = 810$
 \therefore difference = $810 - 540 = 270$ Ans: (270)

11. Total number of vegetarian employees = $0.325 \times 1200 = 390$
 Vegetarians in accounts and production = $67 + 99 = 166$
 \therefore Vegetarians in administration and marketing together = 224
 Since the percentage is the same, the number of vegetarian in administration and marketing are in the ratio 3 : 4 ie 96 and 128 or 32% each
 \therefore Number of non vegetarians = $400 - 128 = 272$
 Ans: (272)
12. At most $390 - (67 + 99) = 224$ employees in the marketing section are vegetarians and it is 56% Ans: (56)

Solutions for questions 13 to 16:

The value of exports of each product to Europe, Germany and the rest of Europe is given in the table below.

Europe	
Product	Export value
A	16.5
B	22
C	18.7
D	19.8
E	13.2
F	14.3
G	5.5

Germany	
Product	Export value
A	10.0
B	8.0
C	6.0
D	8.0
E	6.0
F	4.0

Rest of Europe	
Product	Export value
A	6.5
B	14.0
C	12.7
D	11.8
E	7.2
F	10.3
G	5.5

13. The percentage share is highest for product A
 Choice (A)
14. Exports of product A to rest of Europe (in million dollars)
 $= \frac{35}{100} \times 6.5 = 2.275$ Choice (C)
15. For products A, D and E, the value of exports to Germany was more than two thirds of that to the 'rest of Europe'.
 Choice (B)
16. Exports of product B to the rest of Europe = 14.0
 It is more than the exports of products E and G to the whole of Europe.
 Choice (C)

Solutions for questions 17 to 20:

17. Revenue in 2012
 $= 52,000 \times 41 + 75,500 \times 34 - 6,500 \times 3$
 $= 21,32,000 + 25,67,000 - 19,500$
 $= 46,79,500$
 Revenue in 2013
 $= 73,000 \times 45 + 80,800 \times 35 - 7,200 \times 3$
 $= 32,85,000 + 28,28,000 - 21,600$
 $= 60,91,400$
 The percentage increase = $\frac{14,11,900}{46,79,500} \times 100 = 30.2\%$
 Choice (C)
18. As the export as well as the domestic price is the highest in the year 2016, the average revenue realized per kg of the product will be highest in 2016.
 The revenue in 2016
 $= 82,000 \times 49 + 107,200 \times 43 - 7,800 \times 3$
 $= 40,18,000 + 46,09,600 - 23,400$
 $= 86,27,600 - 23,400$
 $= 86,04,200$
 The revenue per kg of production = $\frac{86,04,200}{1,97,000} = 43.6$
 Choice (C)

19. It can be seen that there is a significant increase in the domestic price in 2014 and the quantity in the domestic market also shows a significant increase.
 \therefore the percentage increase in domestic revenue would be the highest in 2014.
 Domestic revenue in 2013 = $80,800 \times 35 = 28,28,000$
 Domestic revenue in 2014 = $1,14,300 \times 41 = 46,86,300$
 The required percentage = $\frac{18,58,300}{28,28,000} \times 100 = 65.7\%$
 Choice (A)
20. The approximate values for the different years would be
 $2011 = \frac{90 \times 32}{90 \times 32 + 42 \times 38}$
 $2012 = \frac{75.5 \times 34}{75.5 \times 34 + 52 \times 41}$
 $2013 = \frac{80.8 \times 35}{80.8 \times 35 + 73 \times 45}$
 $2014 = \frac{114.3 \times 41}{114.3 \times 41 + 67 \times 47}$
 $2015 = \frac{89 \times 42}{89 \times 42 + 75 \times 45}$
 $2016 = \frac{107 \times 43}{107 \times 43 + 82 \times 49}$

It can be easily seen that the ratio is the highest in 2011.
 The required value would be

$$= \frac{90 \times 32}{90 \times 32 + 42 \times 38 - 5 \times 3} \times 100$$

$$= \frac{2880}{2880 + 1596 - 15} = \frac{2880}{4461} \times 100$$

$$= 64\%$$

Choice (A)

PRACTICE EXERCISE – 12

Solutions for questions 1 to 4:

When the average age of any department increases by exactly one, that means no employee of 25 years joined the department and no employee of age 60 or 64 years left the department and the average age went up by one just because the same number of employees aged exactly by 1 year.

When any employee of age 25 years joins a department (where average age is more than 25-which is the case in all the departments in all the years) the average age will fall the next year and similarly when an employee of age 60 or 64 years retires from a department where the average age is much lower than 60 or 64 years the average age will fall the next year. Besides, when a new employee of age 25 years joins and an employee of age 60 or 64 years retires both in same department in the same year, then the average age the next year will fall the maximum.

The number of employees in different departments in the beginning are 5, 3, 4 and 6 respectively.
The total ages of the employees in the marketing department = $5 \times 48 = 240$
The next year it becomes $240 + 5 = 245$

Had a 25 years old person joined next year, the total age would become $245 + 5 + 25 = 275$.

$$\therefore \text{Average age} = \frac{275}{6} = 45.8$$

Had only a single person retired next year, the total age of people would become $245 + 5 - (60 \text{ or } 64) = 190 \text{ or } 186$ and average age would become $\frac{190}{4}$ or $\frac{186}{4} = 47.5 \text{ or } 46.5$.

As it is said that it became 43, the only possibility is that a 25-year-old person joined and a 60-year-old person retired. Using the same logic, we can find when employees retired or joined other departments.

1. Choice (C)
2. Choice (B)
3. Choice (A)
4. Choice (D)

Solutions for questions 5 to 8:

5. Number of students in school B who prefer vegetarian food = 117
Number of students who prefer to watch cricket = 201
The maximum value common to both = 117
Choice (B)
6. Number of students in school D who prefer vegetarian food = 64
All them 64 people could prefer to watch cricket and so the minimum number is zero.
Choice (A)
7. The least number would be when all the students in school D who prefer non vegetarian food (136) prefer to watch cricket and all the students who prefer watching football prefer vegetarian food.

	Non vegetarian (136)	Vegetarian (64)
Football (48)	0	48
Cricket (152)	136	16

\therefore the value is $0 + 16 = 16$ Choice (C)

8. We need to find the minimum and maximum possible values of students in school C who prefer non-vegetarian food and prefer watching Football.
Total students = 400
Students who prefer non vegetarian food = 140
Students who prefer watching Football = 208
The minimum and maximum possible values are 0 and 140. So both 156 and 194 are not possible.
Choice (D)

Solutions for questions 9 to 11:

9. The expected return in scheme
$$X = \frac{20}{100} \times 60 + \frac{50}{100} \times 20 + \frac{30}{100} \times (-25)$$
$$= 12 + 10 - 7.5 = 14.5\%$$
Choice (B)
10. Let the probability of very good and bad market conditions be p and q respectively
$$\frac{p}{100} \times 40 + \frac{40}{100} \times 10 + \frac{q}{100} \times (-10) + 15.5$$
$$0.4p - 0.1q = 11.5 \Rightarrow 4p - q = 115$$
$$p + q = 60$$
$$\therefore p = 35 \text{ and } q = 25$$
Choice (C)
11. The least possible return happens when the probability of bad market conditions in scheme X is 0.6, such that the expected return is -2%
The total return would be $\frac{60}{100} \times 14.5 + \frac{40}{100} \times (-2)$
$$= 8.7 - 0.8$$
$$= 7.9\%$$
Choice (A)

Solutions for questions 12 to 16:

12. The ratio between the value of the sales of C and that of E does not depend on the actual value of the sales of D in the western region.
 \therefore Required ratio = $25 : 30 = 5 : 6$ Choice (A)
13. Let the exaggerated total sales of product D = D
 \Rightarrow Sales of product D in the North = 10% of D
 \Rightarrow Total sales of all products = $\frac{100}{15}$ of D
 \Rightarrow Total sales in the Northern region = 30% of $\frac{100}{15}$ of D
D = 2D
 \therefore required percentage = $\frac{10\% \text{ of } D}{2D} = 5\%$. Choice (A)
14. Sales of E is 25% of the total sales in the western region.
 \therefore Total sales in the western region is four times the sales of E in that region
 \therefore New, total sales in western region is 80% of what is represented by Sunil.
 \therefore West forms only $\frac{80}{100} \times 25 = 20\%$ of the total of 95%.
(The remaining 5% is the exaggerated value)
 \therefore Percentage share of the Northern region in the total sales = $\frac{30}{95} \times 100 = 31.58\% \approx 31.6\%$. Choice (D)
15. Sales of B = ₹1800 crore
 \therefore Total sales after the exaggeration of sales
$$= \frac{1800}{12} \times 100 = ₹15000 \text{ crore}$$
$$\therefore$$
 Sales of D are exaggerated by ₹1000 crore
Exaggerated sales of D = $\frac{15}{100} \times 15000 = ₹2250 \text{ crore}$
Actual sales of D = ₹1250 crore

Exaggerated sales value in the Western region
 = 50% of 2250 = ₹1125 crore
 ∴ Actual sales value in the Western region
 = 1125 – 1000 = ₹.125 crore
 ∴ It is exaggerated by 1000 crores.

Hence, $\frac{1000}{125} = 8$ times. Choice (C)

16. To find the actual total sales of D we need any relation involving the actual sales of D in the Western region. Hence either III or IV is sufficient. Choice (D)

Solutions for questions 17 to 20:

17. The worst case scenario for a team can happen when the top three teams end up with the same number of points and the bottom three with points only from matches won amongst themselves. In this case one of the top three teams would fail to advance to the semi finals. Total points scored by the bottom three teams = 6 (points only from matches among themselves).

∴ The remaining three teams can have $\frac{24}{3} = 8$ points each

and one of them would fail to advance.

∴ A team must have at least 9 points to be sure of a place in the semi-finals. Ans : (9)

18. Each team in a pool plays five matches. The total number of points for matches between the teams in a pool is 30. A team secures the minimum number of points, when one of the teams secures the maximum points, and the remaining teams evenly share the remaining points such that one of the five teams, i.e., the one with best goal difference, would advance to the semi finals. Maximum points scored by a team = 10.

∴ The points scored by all the other teams = $\frac{20}{5} = 4$.

Ans : (4)

19. The number of matches in each pool is 15. The number of matches for classification of positions from five to eight and nine to twelve is four each. The semi finals, finals and the third place matches together add up to four matches. ∴ The total number of matches played in the tournament = 15 + 15 + 4 + 4 + 4 = 42. Ans : (42)

20. We have seen earlier that a team with four points can advance to the semi-finals. As there are five matches a team can get up to five points without winning a single match. ∴ If a team wins just the semi-finals and the finals, it can win the tournament. Ans : (2)

PRACTICE EXERCISE – 13

Solutions for questions 1 to 4:

1. According to the question, all the LOCAL and STD calls have to be made such that the amount paid should be minimum. If customers have the choice from all the four companies, then they will go for the service which is cheapest. For LOCAL calls, DATACOM is the cheapest but from DATACOM only 2.75 lakh calls can be made. Similarly cheapest STD charges are when using AIRSIM and 2.0 lakh calls can be made from AIRSIM and the rest 1.5 lakh calls should be made using the second cheapest service (APPLE).
 So, total amount spent on STD calls is
 $2 \times 3.25 + 1.5 \times 3.5 = ₹11.75$ lakh.
 Total amount spent on local calls is
 $\frac{2.0 \times 2.75}{\text{DATACOM}} + \frac{2.25 \times 2.5}{\text{APPLE}} + \frac{2.5 \times 1.25}{\text{AIRCOMM}} = 5.5 + 2.5(3.5)$
 $= 5.5 + 8.75 = 14.25$
 Therefore total amount spent = 11.75 + 14.25 = ₹26 lakh.
 Choice (C)

2. When the charges of the companies are compared the difference between the ISD charges is more compared to the difference in the LOCAL charges. Therefore, ISD calls should be made first from the cheapest service.

1 lakh ISD calls should be from APPLE

Amount for ISD charges = $1 \times 6 = 6$ lakh

For Local calls: 2.75 lakhs calls can be made from DATACOM at the rate of 2 rupees. 3 lakh calls can be made from APPLE at the rate of 2.25 rupees. The remaining 0.75 lakhs calls can be made from either of AIRSIM or AIRCOMM at the rate of 2.5 rupees.

Total charges for LOCAL calls

$= 2 \times 2.75 + 3 \times 2.25 + 0.75 \times 2.5 = 14.13$ lakh.

Total (LOCAL+ ISD) charges = (14.13 + 6) lakh

= 20.13 lakh. Choice (B)

3. Revenue loss due to reduction in STD changes
 for AIRCOMM = $0.7 \times (4.5 - 3.5) = 0.7$ lakh
 for AIRSIM = $0.4 \times (3.25 - 2.25) = 0.4$ lakh
 for DATACOM = $0.8 \times (3.5 - 2.5) = 0.8$ lakh
 for APPLE = $1.6 \times (3.5 - 2.5) = 1.6$ lakh
 To compensate the revenue loss, increment in ISD charges per minute

$= \frac{\text{Revenue loss for a company}}{\text{Number of ISD calls made from company}}$

Increment in ISD charges

for AIRTEL = $\frac{0.7}{0.3} = 2.33$

for AIRSIM = $\frac{0.4}{0.1} = 4$

for DATACOM = $\frac{0.8}{0.2} = 4$

for APPLE = $\frac{1.6}{0.4} = 4$

New ISD charges per unit call for various companies

AIRCOMM = 10.33, AIRSIM = 13.5, DATACOM = 10.5, APPLE = 10

The second cheapest ISD charges are for AIRCOMM

Choice (A)

4. Revenue of AIRCOMM = $2.5 \times 1.25 + 4.5 \times 0.7 + 8.0 \times 0.3 = 8.68$ lakhs
 Revenue of AIRSIM = $2.5 \times 1.5 + 3.25 \times 0.4 + 9.5 \times 0.1 = 6$ lakhs
 Revenue of DATACOM = $2.0 \times 1.75 + 3.5 \times 0.8 + 6.5 \times 0.2 = 7.6$ lakhs
 Revenue of APPLE = $2.25 \times 2.0 + 3.5 \times 1.6 + 6.0 \times 0.4 = 12.5$ lakhs
 The company with the highest sales revenue is APPLE.
 Choice (D)

Solutions for questions 5 to 8:

5.

Year	Total sales	Frost-Free %
2010	75	12%
2011	100	24%
2012	125	24%

 ∴ Total sales of Samsung Frost-Free Refrigerators
 = $(₹75 \times 0.12 + 100 \times 0.24 + ₹125 \times 0.24)$ lakh
 = $(₹9 + ₹24 + ₹30) = ₹63$ lakh. Choice (D)
6. Year 2011:
 Ratio of the total sales of the companies Godrej, Electrolux L G, and Samsung
 = 150 : 100 : 75 : 100 = 6 : 4 : 3 : 4
 Given that it is same as the ratio of air conditioner sales
 A E L S
 6 : 4 : 3 : 4
 Now we know that for Samsung in 2011,
 Value of the Air Conditioner sales
 = 24% of (Total sales) = $(0.20)(100) = ₹20$ lakh
 From the above ratio, 4k = ₹20 lakh
 ∴ 3k = ₹15 lakh. Choice (A)

7. By observing the bar chart, the sales of Samsung Washing Machines as a percentage of the total sales of Samsung brand, experienced the steepest increase (from 12 percentage points to 28 percentage points) in 2014. Also, the total sales of Samsung experienced the steepest climb in the same year. 2014 must be the answer.

Alternative method:

	Year	Value of sales of Washing M/Cs
Samsung	2010	$75 \times 32\% = ₹24 \text{ lakh}$
	2011	$100 \times 20\% = ₹20 \text{ lakh}$
	2012	$125 \times 20\% = ₹25 \text{ lakh}$
	2013	$150 \times 12\% = ₹18 \text{ lakh}$
	2014	$200 \times 28\% = ₹56 \text{ lakh}$
	2015	$175 \times 32\% = ₹56 \text{ lakh}$

By observation, the percentage increase is the highest in the year 2014. Choice (B)

8. By observation, Electrolux and LG must have the highest and the least percentage changes respectively. By this we can eliminate choices (B) and (D). Among the other two brands we can observe that increase from 2010 to 2015 is the same but the base (in 2010) is lesser for Samsung. Hence Samsung will experience higher growth rate. Thus Choice (C) is correct. Choice (C)

Solutions for questions 9 to 12:

9. In none of the groups of ten matches, given in choices (1), (2), (3) and (4), did both Amol and Brag score the same number of runs. Number of runs scored by Amol from the 31st to the 40th match = $40 \times 60 - 30 \times 70 = 300$. Similarly values for others can be determined. Choice (D)
10. By similar calculations as above, Amol has the highest average from the 61st to the 70th match. Choice (D)
11. His least possible highest score from the 31st to the 40th match, will be when he scored (the maximum) 1800 runs in 10 matches. The least possible highest score will be 185 and the other 9 scores will be 184, 183, ... 175. Choice (C)
12. It happened for the 31st to the 40th match, when the number runs scored by Chris is more than that of Amol but less than that of Brag. Choice (B)

Solutions for questions 13 to 16:

13. The percentage of females in the total is
- $$12 \times \frac{20}{100} + 18 \times \frac{20}{100} + 32 \times \frac{45}{100} + 8 \times \frac{60}{100} + 14 \times \frac{40}{100} + 16 \times \frac{15}{100}$$
- $$= 2.4 + 3.6 + 14.4 + 4.8 + 5.6 + 2.4 = 33.2$$
- Average number of female engineers per sector
- $$= \frac{33.2}{100} \times \frac{80,500}{6} = 4454$$
- Choice (D)

14. Male engineers in the banking sector = $\frac{60}{100} \times 14 = 8.4\%$

Female engineers in the IT sector = $12 \times \frac{20}{100} = 2.4\%$

The required percentage = $\frac{8 - 2.4}{2.4} \times 100 = 250\%$.

Choice (C)

15. The number of female engineers in the gaming sector currently = $18 \times \frac{20}{100} = 3.6\%$

$$\frac{3.6}{100} \times 80,500 = 2898$$

As the number of females go up by $4628 - 2898 = 1730$

The required percentage = $\frac{4454 \times 6 + 1730}{80,500 + 1730} \times 100$

= 34.6%.

Choice (B)

16. Let the total number of employees be 100.
The difference between the number of male and female engineers would be more in gaming than in IT.
The difference in gaming = $18 \times 6 = 10.8$
The difference in Others = $32 \times 1 = 3.2$
The difference in education < that in banking.
The difference in banking = $14 \times 2 = 2.8$
The difference in medical = $16 \times 7 = 11.2$
The required value = $\frac{11.2}{100} \times 80,500 = 9016$

Choice (C)

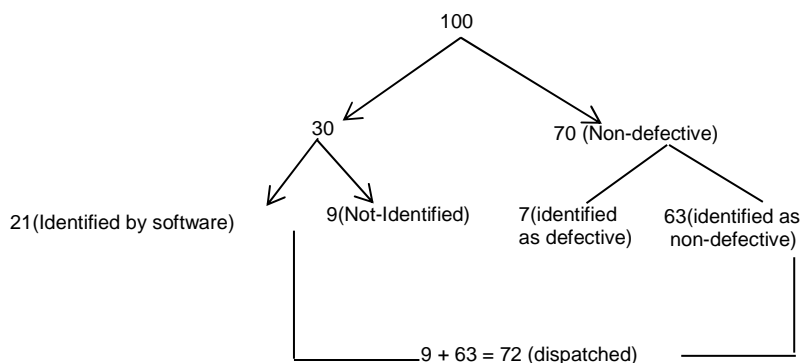
Solutions for questions 17 to 20:

17. As an employee can leave only after completing one year, the number of employees who left without completing two years would be at least 17 (those who left in 2011) + 3 (minimum number of people who joined in 2012 and left in 2013) + 6 (minimum number of people who joined in 2013 and left in 2014) = 26
Ans : (26)
18. The maximum number of people who were with the company in 2010 and were still with the company in 2015 is $(35 - 17 \text{ those who left in 2011}) - 3 \text{ (minimum number of people who joined in 2011 and left in 2012)} = 15$
Ans : (15)
19. The number of employees who worked with the company for at least two years is, at the most 18 (those who joined in 2011 and left in 2012 and 2013) + 12 (those who joined in 2011 and left in 2013) + 19 (those who joined in 2012 and left in 2014) + 20 (those who joined in 2013 and did not leave in 2014) = 69.
Ans : (69)
20. The maximum number of employees who got a promotion is 15 (those who joined in 2010) + 19 (those who joined in 2012) = 34.
Ans : (34)

PRACTICE EXERCISE – 14

Solutions for questions 1 to 5:

1. Assume the company manufactures 100 units, 30 of which would be defective and 70 of which would be non-defective. The following figure would give the breakup of defective and non-defective products.



Of the 72 units dispatched, 9 of them would be defective. $\therefore \frac{9}{72}$ or 12.5% of the products dispatched are defective.

As the company plans to dispatch 1,00,000 units, 12,500 of them would be defective.

Choice (C)

2. The profit if the company does not use the software
 $= 70,000 \times 2500 - (30,000 \times 5,000) = 17.5\text{cr} - 15\text{cr} = 2.5\text{cr}$
 The number of units to be manufactured (if the company uses the software) to dispatch 1,00,000 units.

$$= \frac{1,00,000}{0.72} \times 100 = 1,38,889$$

The cost of 38,889 units (manufactured and not dispatched)

$$= 38,889 \times 1,000 = 3,88,89,000.$$

The profit on dispatched units

$$= 87,500 \times 2,500 - (12,500 \times 5,000)$$

$$= 21.875\text{cr} - 6.25\text{cr} = 15.625\text{cr}.$$

$$\text{The profit} \approx 15.63 - 3.39 = 11.74\text{cr}$$

The gain for the company if it uses the software

$$= 11.74 - 2.50 = 9.24\text{cr}$$

Choice (B)

3. Profit when taking up contract manufacturing

$$= 1,00,000 \times 1000$$

$$= 10\text{cr}$$

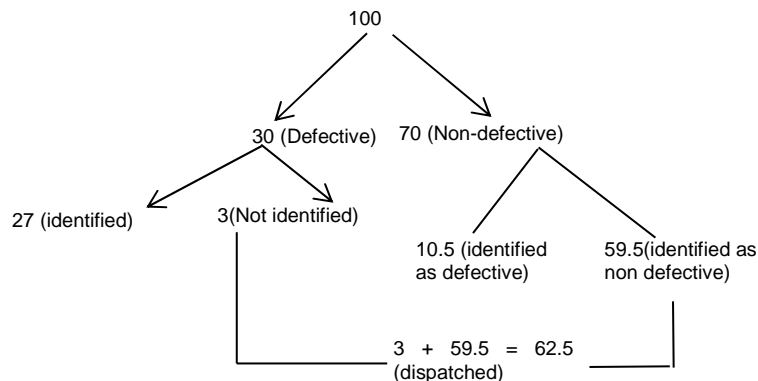
The profit when products are dispatched after testing

$$= 11.74\text{cr}.$$

$$\text{The gain} = 1.74\text{cr}$$

Choice (A)

4. The following is the scenario when the company uses the commercially available software.



So, out of every 100 units manufactured, 62.5 units are dispatched and three of the dispatched units are defective. For dispatching 1,00,000 units, the company has to manufacture 1,60,000 units.

$$\text{The profit would be} = 95,200 \times 2,000 - (4,800 \times 4,000 + 60,000 \times 1,000)$$

$$= 19.04\text{cr} - (1.92 + 6) = 11.12\text{cr}$$

$$\text{The profit after deducting the cost} = 11.12 - 2 = 9.12\text{cr}.$$

The profit when using the software developed by the QC department

$$= 87,500 \times 2,000 - (12,500 \times 4,000 + 38,889 \times 1,000)$$

$$= 17.5 - (5 + 3.89) = 17.5 - 8.89 = 8.61$$

The company should use the commercially available software.

Choice (B)

5. Without considering the cost incurred for products not dispatched, the profit in either case would be
 QC department software = $17.5 - 5 = 12.5\text{cr}$
 Commercially available software = $19.04 - 1.92 - 2 = 15.12$.
 As the commercially available software leads to 21,111 units extra to be not dispatched the cost for these units should compensate for the difference in cost now

$$\frac{2.62 \times 10^7}{21,111} = 1,241$$

\therefore For cost above ₹1,241 the QC department developed software would be profitable.

Choice (D)

Solutions for questions 6 to 10:

Let the total gross income of all the five persons be $100x$ and the total tax paid by all the five persons be $100y$.

∴ A's income is $12x$ and he pays a tax of $9.33y$.

B's income is $15x$ and he pays a tax of $13.33y$.

C's income is $18x$ and he pays a tax of $17.33y$.

∴ For an income of $3x$ ($15 - 12$, $18 - 15$), one has to pay a tax of $4y$ ($13.33 - 9.33$, $17.33 - 13.33$).

That is, for an income of $1x$, one has to pay a tax of $1.33y$.

But for an income of $12x$, A is paying a tax of only $9.33y$.

∴ A's income consists of some part which is taxed at 20% and some part which is taxed at 10%, i.e. up to some point, for an income of $1x$, one has to pay a tax of $.667y$ and beyond that for an income of $1x$, one has to pay a tax of $1.33y$. Since for an income of $12x$, one has to pay only $9.33y$ as tax, the only possibility is that for the first $10x$, one pays a tax at 10% ($.667y$) and for the remaining $2x$, one pays a tax at 20% ($1.33y$). As for an income up to ₹10,000, the tax rate is 10%.

$10x = 10000$ or $x = 1000$.

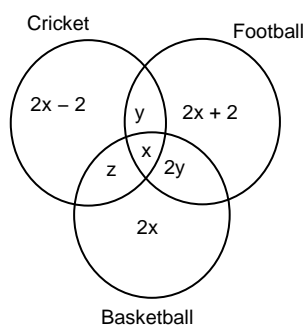
∴ The income and the taxes paid by different persons are as follows:

Person	Gross Income (in Rs.)	Tax Paid (in Rs.)	Net Income (in Rs.)
A	12,000	1,400	10,600
B	15,000	2,000	13,000
C	18,000	2,600	15,400
D	25,000	4,000	21,000
E	30,000	5,000	25,000

- A paid a tax of ₹1,400. Choice (D)
- The net income as a percentage of the gross income is the lowest for E. Choice (B)
- To find the least savings of C, we have to find the maximum possible expense for person C. It is given that for each person, the expenses were less than his net income. Comparing the net income and the pie chart for breakup of expenses, we can find that the maximum expense of person A can be ₹10,600, in which case the expenses of C would be ₹13,250. As the maximum expense of C is ₹13,250, his savings would be at least $15,400 - 13,250 = ₹2,150$. Choice (A)
- The minimum savings of C is ₹2,150 (from the previous question) and the savings of persons B, D and E would definitely be more than this. Choice (B)
- As the tax rate is 10% till any amount up to ₹10,000 and 20% for an amount more than ₹10,000, then for all persons with income less than ₹20,000, the net income would be more than 85% of the gross income. Choice (D)

Solutions for questions 11 to 15:

The given data can be represented as follows:



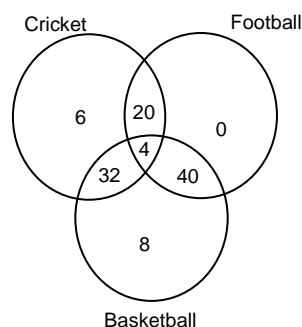
$$7x = 120 - 92 = 28$$

$$x = 4.$$

As basketball is 22 more than cricket and only basketball is more than only cricket by 2, $2y - y = 20$.

$$\therefore z = 32.$$

The Venn diagram would be as follows



- 10 students opted for coaching in only football. Ans: (10)
- 44 students opted for coaching in both football and basketball. Ans: (44)
- $\frac{62}{120} \times 100 = 51.67\%$ of the students who came to the camp attended coaching in cricket. Ans: (51.67)
- The total fee paid = $14,100 \times 120 = 16.92$ lakhs. As children who played one sport and two sports paid a total of $24 \times 10,000 + 92 \times 15,000 = 16.2$ lakhs, the remaining 72,000 was paid by children who opted for coaching in all the three sports.
∴ Fee paid = $\frac{72,000}{4} = 18,000$ Ans: (18,000)
- Let the fee paid by children specializing in only cricket, football and basketball be x , $2x$ and $3x$ respectively.
 $6x + 10(2x) + 8(3x) = 2,40,000$
 $50x = 2,40,000$
 $x = 4,800$
∴ Average fee paid by children specializing in only football is 9,600. Ans: (9,600)

Solutions for questions 16 to 20:

- Let us first calculate the time taken to produce a unit of each product.
Product – A – Machine 1 takes 10 minutes.
From the 11th to the end of 25th minute, machine 2 is working on product A.
From the beginning of the 26th minute to the end of 45th minute machine 3 works on product A and for the next 12 minutes machine 4 works on A. One unit of product A is completed in 57 minutes. When machine 2 is working on a unit of product A, machine 1 can operate on the next unit of product A and so on.
After the first unit of product A is completed every succeeding unit is produced in 20 minutes and this time is determined by the slowest unit in operation. (machine 3 in this case).
So one unit of product A is manufactured after 57, (57 + 20), (57 + 20 + 20) minutes and so on.
That is 57, 77, 97,
∴ In 480 minutes, 22 units can be produced.
Similarly for B, each unit is produced in 72, (72 + 30) minutes and so on.
∴ In 8 hours, 14 units can be completed.
For machine C the first unit is produced after 62 mins and each succeeding one after a 20minute interval.
∴ In 8 hours, 21 units can be produced.
For machine D each unit is produced in 67, (67 + 20) minutes and so on.
∴ In 8 hours, 21 units can be produced. Choice (D)

17. Revenues per day:
 For A – $22 \times 275 = 6,050$
 For B – $14 \times 504 = 7,056$
 For C – $21 \times 234 = 4,914$ and
 For D – $21 \times 345 = 7,245$
 'D' realises maximum revenue. Choice (D)
18. The profit for each unit is
 A – ₹25
 B – ₹54
 C – ₹54 and
 D – ₹45
 Profit for A – $25 \times 22 =$
 Profit for B – $54 \times 14 =$
 For C – 54×21 and
 For D – 45×21
 By observation we can say that the profit is maximum for C.
 Choice (B)
19. Cost price of B = $\frac{504}{1.12} = ₹450$
 Cost price of D = $\frac{345}{1.15} = ₹300$
 \therefore Cost price of B exceeds that of A by 50%.
 Choice (C)
20. For a maximum profit, product C has to be manufactured.
 For 21 units of C, machine I needs to operate for $21 \times 20 = 420$ minute.
 Idle time = $480 - 420 = 60$ minutes
 For 2, idle time = 60 minutes.
 For 3, idle time = 270 minutes.
 For 4, idle time = 228 minutes.
 Total = $60 + 60 + 270 + 228 = 618$ minutes.
 Choice (A)