2 CHAPTER

Arithmetic

PERCENTAGES AND FRACTION

1990

1. In a stockpile of products produced by three machines M1, M2 and M3, 40% and 30% were manufactured by M1 and M2 respectively. 3% of the products of M1 are defective, 1% of products of M2 defective, while 95% of the products of M3 are not defective. What is the percentage of defective in the stockpile?

(a) 3% (b) 5%

(c) 2.5% (d) 4%

2. Gopal went to a fruit market with certain amount of money. With this money he can buy either 50 oranges or 40 mangoes. He retains 10% of the money for taxi fare. If he buys 20 mangoes, then the number of oranges he can buy is

(a) 25 (b) 18

(c) 20 (d) None of these

Directions for Questions 3 to 5 : A dealer deals only in colour TVs and VCRs. He wants to spend up to Rs.12 lakhs to buy 100 pieces. He can purchase a colour TV at Rs.10,000 and a VCR at Rs.15,000. He can sell a colour TV at Rs.12,000 and a VCR at Rs.17,500. His objective is to maximize profits. Assume that he can sell all the items that he stocks.

3. For the maximum profit, the number of colour TVs and VCRs that he should respectively stock are

(a) 80, 20 (b) 20, 80

(c) 60, 40 (d) None of these

4. If the dealer would have managed to get an additional space to stock 20 more items, then for maximizing profit, the ratio of number of VCRs and number of TVs that he should stock is

(a) 7 : 3 (b) 0

(c) 1 : 2 (d) None of these

5. The maximum profit, in rupees lakh, the dealer can earn from his original stock if he can sell a colour TV at Rs. 12200 and VCR at Rs.18300 is

(a) 2.64 (b) 2.49

(c) 2.72 (d) 2.87

6. If equal numbers of people are born on each day, find the approximate percentage of the people whose birthday will fall on 29th February. (If we are to consider people born in 20th century and assuming no deaths).

(a) 0.374 (b) 0.5732

(c) 0.0664 (d) None of these

1991

7. Gopal went to a fruit market with certain amount of money. With this money he can buy either 50 oranges or 40 mangoes. He retains 10% of the money for taxi fare. If he buys 20 mangoes, then the number of oranges he can buy is

(a) 25 (b) 20

(c) 18 (d) 6

1993

8. The rate of increase of the price of sugar is observed to be two percent more than the inflation rate expressed in percentage. The price of sugar, on January 1, 1994, is Rs. 20 per kg. The inflation rate for the years 1994 and 1995 are expected to be 8% each. The expected price of sugar on January 1, 1996 would be

(a) Rs.23.60 (b) Rs.24.00

(c) Rs.24.20 (d) Rs.24.60

9. A report consists of 20 sheets each of 55 lines and each such line consist of 65 characters. This report is retyped into sheets each of 65 lines such that each line consists of 70 characters. The percentage reduction in number of sheets is closest to

(a) 20 (b) 5

(c) 30 (d) 35

1994

10. The number of votes not cast for the Praja Party increased by 25% in the National General Election over those not cast for it in the previous Assembly Polls, and the Praja Party lost by a majority twice as large as that by which it had won the Assembly Polls. If a total 2,60,000 people voted each time. How many voted for the Praja Party in the Assembly Elections.

(a) 1,10,000 (b) 1,50,000

(c) 1,40,000 (d) 1,20,000

1995

11. A person who has a certain amount with him goes to market. He can buy 50 oranges or 40 mangoes. He retains 10% of the amount for taxi fares and buys 20 mangoes and of the balance he purchases oranges. Number of oranges he can purchase is

(a) 36 (b) 40

(c) 15 (d) 20

12. $\frac{2}{5}$ of the voters promise to vote for P and the rest promised to vote for Q. Of these, on the last day 15% of the voters went back of their promise to vote for P and 25% of voters went back of their promise to vote for Q, and P lost by 2 votes. Then the total number of voters is

(a) 100 (b) 110

(c) 90 (d) 95

13. The rate of inflation was 1000%. Then what will be the cost of an article, which costs 6 units of currency now, 2 years from now?

(a) 666 (b) 660

(c) 720 (d) 726

Direction for Question 14: The question is followed by two statements, I and II. Mark the answer as:

(a) if the question can be answered with the help of statement I alone.

(b) if the question can be answered with the help of statement II alone.

(c) if both statement I and statement II are needed to answer the question.

(d) if the question cannot be answered even with the help of both the statements.

14. What is the price of bananas?

I. With Rs.84, I can buy 14 bananas and 35 oranges.

II. If price of bananas is reduced by 50%, then we can buy 48 bananas in Rs.12.

1996

15. I bought 5 pens, 7 pencils and 4 erasers. Rajan bought 6 pens, 8 erasers and 14 pencils for an amount which was half more what I had paid. What per cent of the total amount paid by me was paid for the pens?

(a) 37.5% (b) 62.5%

(c) 50% (d) None of these

16. The price of a Maruti car rises by 30% while the sales of the car come down by 20%. What is the percentage change in the total revenue?

(a) –4% (b) –2%

(c) +4% (d) +2%

1997

17. Fresh grapes contain 90% water while dry grapes contain 20% water. What is the weight of dry grapes obtained from 20 kg fresh grapes?

(a) 2 kg (b) 2.5 kg

(c) 2.4 kg (d) None of these

18. A man earns x% on the first Rs. 2,000 and y% on the rest of his income. If he earns Rs. 700 from income of Rs. 4,000 and Rs. 900 from if his income is Rs. 5,000, find x%.

(a) 20% (b) 15%

(c) 25% (d) None of these

Direction for Question 19: The question is followed by two statements, I and II. Answer the question based on the statements and mark the answer as:

(a) if the question can be answered with the help of any one statement alone but not by the other statement.

(b) if the question can be answered with the help of either of the statements taken individually.

(c) if the question can be answered with the help of both statements together.

(d) if the question cannot be answered even with the help of both statements together.

1998

19. Radha and Rani appeared in an examination. What was the total number of questions?

I. Radha and Rani together solved 20% of the paper.

II. Radha alone solved $\frac{3}{5}$ of the paper solved by Rani.

1999

20. Forty per cent of the employees of a certain company are men, and 75% of the men earn more than Rs. 25,000 per year. If 45% of the company's employees earn more than Rs. 25,000 per year, what fraction of the women employed by the company earn less than or equal to Rs. 25,000 per year?

(a) $\frac{2}{11}$ (b) $\frac{1}{4}$

(c) $\frac{1}{3}$ (d) $\frac{3}{4}$

2000

21. The table below shows the agewise distribution of the population of Reposia. The number of people aged below 35 years is 400 million.

Age group	Percentage
Below 15 years	30.00
15-24	17.75
25-34	17.00
35-44	14.50
45-54	12.50
55-64	7.10
65 and above	1.15

If the ratio of females to males in the 'below 15 years' age group is 0.96, then what is the number of females in that age group?

(a) 82.8 million (b) 90.8 million

(c) 80 million (d) 90 million

2001

22. The owner of an art shop conducts his business in the following manner: every once in a while he raises his prices by X%, then a while later he reduces all the new prices by X%. After one such up-down cycle, the price of a painting decreased by Rs. 441. After a second up-down cycle the painting was sold for Rs. 1,944.81. What was the original price of the painting?

(a) Rs. 2,756.25 (b) Rs. 2,256.25

(c) Rs. 2,500 (d) Rs. 2,000

Direction for Question 23: The question is followed by two statements, I and II.

Mark

(a) if the question can be answered by one of the statements alone and not by the other.

(b) if the question can be answered by using either statement alone.

(c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

(d) if the question cannot be answered even by using both statements together.

23. Two friends, Ram and Gopal, bought apples from a wholesale dealer. How many apples did they buy?

I. Ram bought one-half the number of apples that Gopal bought.

II. The wholesale dealer had a stock of 500 apples.

2002

24. Mayank, Mirza, Little and Jaspal bought a motorbike for $60. Mayank paid one-half of the sum of the amounts paid by the other boys. Mirza pad one-third of the sum of the amounts paid by the other boys. Little paid one-fourth of the sum of the amounts paid by the other boys. How much did Jaspal have to pay?

(a) $15 (b) $13

(c) $17 (d) None of these

2003(L)

25. At the end of year 1998, Shepard bought nine dozen goats. Henceforth, every year he added p% of the goats at the beginning of the year and sold q% of the goats at the end of the year where $p > 0$ and $q > 0$. If Shepard had nine dozen goats at the end of year 2002, after making the sales for that year, which of the following is true?

(a) $p = q$ (b) $p < q$

(c) $p > q$ (d) $p = q/2$

Direction for Question 26: The question is followed by two statements, A and B. Answer the question using the following instructions.

Choose (a) if the question can be answered by using one of the statements alone but not by using the other statement alone.

Choose (b) if the question can be answered by using either of the statements alone.

Choose (c) if the question can be answered by using both statements together but not by either statement alone.

Choose (d) if the question cannot be answered on the basis of the two statements.

2004

26. Zakib spends 30% of his income on his children's education, 20% on recreation and 10% on healthcare. The corresponding percentage for Supriyo are 40%, 25%, and 13%. Who spends more on children's education?

A. Zakib spends more on recreation than Supriyo.

B. Supriyo spends more on healthcare than Zakib.

2006

27. The length, breadth and height of a room are in the ratio 3 : 2 : 1. If the breadth and height are halved while the length is doubled, then the total area of the four walls of the room will

(a) remain the same

(b) decrease by 13.64%

(c) decrease by 15%

(d) decrease by 18.75%

(e) decrease by 30%

Directions for Questions 28 and 29: Each question is followed by two statements, A and B.

Answer each question using the following instructions:

Mark (a) if the question can be answered by using the statement A alone but not by using the statement B alone.

Mark (b) if the question can be answered by using the statement B alone but not by using the statement A alone.

Mark (c) if the question can be answered by using either of the statements alone.

Mark (d) if the question can be answered by using both the statements together but not by either of the statements alone.

Mark (e) if the question cannot be answered on the basis of the two statements.

2007

28. In a particular school, sixty students were athletes. Ten among them were also among the top academic performers. How many top academic performers were in the school?

A. Sixty per cent of the top academic performers were not athletes.

B. All the top academic performers were not necessarily athletes.

29. Thirty per cent of the employees of a call centre are males. Ten per cent of the female employees have an engineering background. What is the percentage of male employees with engineering background?

A. Twenty five per cent of the employees have engineering background.

B. Number of male employees having an engineering background is 20% more than the number of female employees having an engineering background.

MEMORY BASED QUESTIONS

2009

30. Mogambo has got some money which he can spend completely in buying either 50 mangoes or 40 oranges. If he wants to save 10% of the amount and buy at least 20 oranges, then what is the maximum possible number of mangoes that he can buy?

(a) 15 (b) 16

(c) 20 (d) 24

2010

31. One hundred ml of alcohol is mixed with y ml of water. Forty ml of this alcohol-water mixture is added to 2y ml of another alcohol-water mixture whose alcohol concentration is 26%. If the percentage of water in the resultant mixture is 2y%, then what is the value of y?

(a) 30 (b) 40

(c) 20 (d) 25

2011

32. If $12P + 3R + 4Q = 16$, where P, Q and R are positive real numbers, then what is the maximum possible value of $P^3R^3Q^2$?

(a) 1 (b) 2

(c) 4 (d) 8

2012

33. A contractor did not have space in his garage for 8 of his trucks. He, therefore, increased the size of his garage by 50% which gave him space for 8 more trucks than he owned altogether. How many trucks did he own?

(a) 32 (b) 48

(c) 40 (d) 45

34. The list price of an article was increased by 10%. It was then decreased by 10%. If the final price became Rs. 20, then find the initial list price (in Rs.)

(a) $\frac{10 \times 100^2}{100^2 - 20^2}$

(b) $\frac{20^2 \times 10^2}{100^2 - 10^2}$

(c) $\frac{20 \times 100^2}{100^2 - 10^2}$

(d) $20 \times \left(\frac{100^2 - 10^2}{100^2}\right)$

2014

35. There are two factories – A and B – in Kaarobaarnagar. In factory A, the number of male employees is 50% more than that of female employees. In factory B, the number of female employees is 40% less than that of male employees. The number of female employees in factory B is 60 more than that of male employees in factory A. Which of the following cannot be the total number of male employees in the two factories put together?

(a) 204 (b) 180

(c) 320 (d) 300

2017

36. Out of the shirts produced in a factory, 15% are defective, while 20% of the rest are sold in the domestic market. If the remaining 8840 shirts are left for export, then the number of shirts produced in the factory is

(a) 13600 (b) 13000

(c) 13400 (d) 14000

37. In a village, the production of food grains increased by 40% and the per capita production of food grains increased by 27% during a certain period. The percentage by which the population of the village increased during the same period is nearest to

(a) 16 (b) 13

(c) 10 (d) 7

2018 Slot 1

38. In an examination, the maximum possible score is N while the pass mark is 45% of N. A candidate obtains 36 marks, but falls short of the pass mark by 68%. Which one of the following is then correct?

(a) $201 \leq N \leq 242$. (b) $N \geq 253$.

(c) $N \leq 200$. (d) $243 \leq N \leq 252$.

PROFIT, LOSS AND DISCOUNT

1991

Direction for Question 1: The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II alone,

Mark (c) if both the statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

1. Is it more profitable for Company M to produce Q?

I. Product R is sold at a price four times that of Q.

II. One unit of Q requires 2 units of labour, while one unit of R requires 5 units of labour. There is no other constraint on production.

1994

2. A dealer offers a cash discount of 20% and still makes a profit of 20%, when he further allows 16 articles to a dozen to a particularly sticky bargainer. How much percent above the cost price were his wares listed?

(a) 100% (b) 80%

(c) 75% (d) 66 2/3%

Directions for Questions 3 and 4: The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II, alone,

Mark (c) if both, statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

3. If the selling price were to be increased by 10%, the sales would reduce by 10%. In what ratio would profits change?

I. The cost price remains constant.

II. The cost price increased 10%.

1995

4. A stockist wants to make some profit by selling sugar. He contemplates about various methods. Which of the following would maximise his profit?

I. Sell sugar at 10% profit.

II. Use 900 g of weight instead of 1 kg.

III. Mix 10% impurities in sugar and selling sugar at cost price.

IV. Increase the price by 5% and reduce weights by 5%.

(a) I or III (b) II

(c) II, III and IV (d) Profits are same

Direction for Question 5: The question is followed by two statements, I and II. Mark the answer as:

(a) if the question can be answered with the help of statement I alone.

(b) if the question can be answered with the help of statement II alone.

(c) if both statement I and statement II are needed to answer the question.

(d) if the question cannot be answered even with the help of both the statements.

5. What is the profit percentage?

I. The cost price is 80% of the selling price.

II. The profit is Rs.50.

1996

6. Instead of a metre scale, a cloth merchant uses a 120 cm scale while buying, but uses an 80 cm scale while selling the same cloth. If he offers a discount of 20% on cash payment, what is his overall profit percentage?

(a) 20% (b) 25%

(c) 40% (d) 15%

Directions for Questions 7 and 8: Answer the questions based on the following information.

A watch dealer incurs an expense of Rs. 150 for producing every watch. He also incurs an additional expenditure of Rs. 30,000, which is independent of the number of watches produced. If he is able to sell a watch during the season, he sells it for Rs. 250. If he fails to do so, he has to sell each watch for Rs. 100.

7. If he is able to sell only 1,200 out of 1,500 watches he has made in the season, then he has made a profit of

(a) Rs. 90,000 (b) Rs. 75,000

(c) Rs. 45,000 (d) Rs. 60,000

8. If he produces 1,500 watches, what is the number of watches that he must sell during the season in order to break-even, given that he is able to sell all the watches produced?

(a) 500 (b) 700

(c) 800 (d) 1,000

9. I sold two watches for Rs. 300 each, one at the loss of 10% and the other at the profit of 10%. What is the percentage of loss(–)or profit(+) that resulted from the transaction?

(a) (+)10 (b) (–)1

(c) (+)1 (d) (–)10

Directions for Questions 10 and 11: Each question is followed by two statements, I and II. Mark the answer as:

(a) if the question cannot be answered even with the help of both the statements taken together.

(b) if the question can be answered by any one of the two statements.

(c) if each statement alone is sufficient to answer the question, but not the other one (E.g. statement I alone is required to answer the question, but not statement II and vice versa).

(d) if both statements I and II together are needed to answer the question.

10. What is the cost price of the article?

I. After selling the article, a loss of 25% on cost price is incurred.

II. The selling price is three-fourths of the cost price.

11. What is the selling price of the article?

I. The profit on sales is 20%.

II. The profit on each unit is 25% and the cost price is Rs. 250.

1997

12. A dealer buys dry fruits at Rs. 100, Rs. 80 and Rs. 60 per kilogram. He mixes them in the ratio 3 : 4 : 5 by weight, and sells at a profit of 50%. At what price per kilogram does he sell the dry fruit?

(a) Rs. 80 (b) Rs. 100

(c) Rs. 95 (d) None of these

13. After allowing a discount of 11.11%, a trader still makes a gain of 14.28%. At how many percentage above the cost price does he mark on his goods?

(a) 28.56%

(b) 35%

(c) 22.22%

(d) None of these

Directions for Questions 14 and 15: Answer the questions based on the following information.

A company purchases components A and B from Germany and USA respectively. A and B form 30% and 50% of the total production cost. Current gain is 20%. Due to change in the international scenario, cost of the German mark increased by 30% and that of USA dollar increased by 22%. Due to market conditions, the selling price cannot be increased beyond 10%.

1998

14. What is the maximum current gain possible?

(a) 10% (b) 12.5%

(c) 0% (d) 7.5%

15. If the USA dollar becomes cheap by 12% over its original cost and the cost of German mark increased by 20%, what will be the gain? (The selling price is not altered.)

(a) 10% (b) 20%

(c) 15% (d) 7.5%

Directions for Questions 16 and 17: The questions is followed by two statements, I and II. Answer the question using the following instructions.

Mark the answer as:

(a) if the question can be answered by one of the statements alone, but cannot be answered by using the other statement alone.

(b) if the question can be answered by using either statement alone.

(c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

(d) if the question cannot be answered even by using both statements together.

2000

16. Harshad bought shares of a company on a certain day, and sold them the next day. While buying and selling he had to pay to the broker 1% of the transaction value of the shares as brokerage. What was the profit earned by him per rupee spent on buying the shares?

I. The sales price per share was 1.05 times that of its purchase price.

II. The number of shares purchased was 100.

2002

17. A dress was initially listed at a price that would have given the store a profit of 20% of the wholesale cost. What was the wholesale cost of the dress?

A. After reducing the listed price by 10%, the dress sold for a net profit of $10.

B. The dress is sold for $50.

Directions for Questions 18 and 19: Answer the questions on the basis of the information given below.

A certain perfume is available at a duty-free shop at the Bangkok international airport. It is priced in the Thai currency Baht but other currencies are also acceptable. In particular, the shop accepts Euro and US Dollar at the following rates of exchange:

US Dollar 1 = 41 Bahts

Euro 1 = 46 Bahts

The perfume is priced at 520 Bahts per bottle. After one bottle is purchased, subsequent bottles are available at a discount of 30%. Three friends S, R and M together purchase three bottles of the perfume, agreeing to share the cost equally. R pays 2 Euros. M pays 4 Euros and 27 Thai Bahts and S pays the remaining amount in US Dollars.

2003(L)

18. How much does R owe to S in Thai Baht?

(a) 428 (b) 416

(c) 334 (d) 324

19. How much does M owe to S in US Dollars?

(a) 3 (b) 4

(c) 5 (d) 6

Directions for Questions 20 and 21: Answer the following questions based on the information given below:

Shabnam is considering three alternatives to invest her surplus cash for a week. She wishes to guarantee maximum returns on her investment. She has three options, each of which can be utilized fully or partially in conjunction with others.

Option A : Invest in a public sector bank. It promises a return of +0.10%.

Option B : Invest in mutual funds of ABC Ltd. A rise in the stock market will result in a return of + 5% while a fall will entail a return of –3%.

Option C: Invest in mutual funds of CBA Ltd. A rise in the stock market will result in a return of –2.5%, while a fall will entail a return of +2%.

20. The maximum guaranteed return to Shabnam is

(a) 0.25% (b) 0.10%

(c) 0.20% (d) 0.15%

(e) 0.30%

21. What strategy will maximize the guaranteed return to Shabnam?

(a) 100% in option A

(b) 36% in option B and 64% in option C

(c) 64% in option B and 36% in option C

(d) 1/3 in each of the three options

(e) 30% in option A, 32% in option B and 38% in option C

MEMORY BASED QUESTIONS

2014

22. A trader used to make 5% profit on an item by selling it at the usual marked price. One day, he tripled the marked price of the item and finally offered a discount of 30%. Find the percentage profit he made on the item that day.

(a) 120.5% (b) 100%

(c) 94.5% (d) None of these

2015

23. A shopkeeper sold 10 items, all of which are of the same cost price, such that profit percentage on no two item is the same. The profits made on the given items were in an arithmetic progression. If the profit percentage of the item the selling price of which is 4th highest and the item the selling price of which is 7th highest were 13 % and 10 % respectively, find the profit percentage on the whole.

(a) 11.5%

(b) 12%

(c) 12.5%

(d) Data insufficient

2016

24. The percentage profit earned by selling an article at Rs.1,920 is equal to the percentage loss incurred by selling the same article at Rs.1,280. At what price (in Rs.) should the article be sold to make a profit of 25%?

2017

25. The manufacturer of a table sells it to a wholesale dealer at a profit of 10%. The wholesale dealer sells the table to a retailer at a profit of 30%. Finally, the retailer sells it to a customer at a profit of 50%. If the customer pays Rs.4290 for the table, then its manufacturing cost (in Rs) is

(a) 1500 (b) 2000

(c) 2500 (d) 3000

26. Mayank buys some candies for Rs.15 a dozen and an equal number of different candies for Rs.12 a dozen. He sells all for Rs.16.50 a dozen and makes a profit of Rs.150. How many dozens of candies did he buy altogether?

(a) 50 (b) 30

(c) 25 (d) 45

2018 Slot 1

27. A wholesaler bought walnuts and peanuts, the price of walnut per kg being thrice that of peanut per kg. He then sold 8 kg of peanuts at a profit of 10% and 16 kg of walnuts at a profit of 20% to a shopkeeper. However, the shopkeeper lost 5 kg of walnuts and 3 kg of peanuts in transit. He then mixed the remaining nuts and sold the mixture at Rs. 166 per kg, thus making an overall profit of 25%. At what price, in Rs. per kg, did the wholesaler buy the walnuts?

(a) 98 (b) 86

(c) 84 (d) 96

RATIO AND PROPORTION

1991

1. An outgoing batch of students wants to gift PA system worth Rs.4200 to their school. If the teachers offer to pay 50% more than the students, and an external benefactor gives three times teachers' contribution, how much should the teachers donate?

(a) 600 (b) 840

(c) 900 (d) 1200

1993

2. From each of the two given numbers, half the smaller number is subtracted. Of the resulting numbers the larger one is three times as large as the smaller. What is the ratio of the two numbers?

(a) 2 : 1

(b) 3 : 1

(c) 3 : 2

(d) None

1996

3. The cost of diamond varies directly as the square of its weight. Once, this diamond broke into four pieces with weights in the ratio 1 : 2 : 3 : 4. When the pieces were sold, the merchant got Rs. 70,000 less. Find the original price of the diamond.

(a) Rs. 1.4 lakh (b) Rs. 2 lakh

(c) Rs. 1 lakh (d) Rs. 2.1 lakh

Direction for Question 4: The question is followed by two statements, I and II. Mark the answer as:

(a) if the question cannot be answered even with the help of both the statements taken together.

(b) if the question can be answered by any one of the two statements.

(c) if each statement alone is sufficient to answer the question, but not the other one (E.g. statement I alone is required to answer the question, but not statement II and vice versa).

(d) if both statements I and II together are needed to answer the question.

4. What is the number of type-2 widgets produced, if the total number of widgets produced is 20,000?

I. If the production of type-1 widgets increases by 10% and that of type-2 decreases by 6%, the total production remains the same.

II. The ratio in which type-1 and type-2 widgets are produced is 2 : 1.

1997

5. A student gets an aggregate of 60% marks in five subjects in the ratio 10 : 9 : 8 : 7 : 6. If the passing marks are 50% of the maximum marks and each subject has the same maximum marks, in how many subjects did he pass the examination?

(a) 2 (b) 3

(c) 4 (d) 5

6. The value of each of a set of coins varies as the square of its diameter, if its thickness remains constant, and it varies as the thickness, if the diameter remains constant. If the diameter of two coins are in the ratio 4 : 3, what should be the ratio of their thickness if the value of the first is four times that of the second?

(a) 16 : 9 (b) 9 : 4

(c) 9 : 16 (d) 4 : 9

1998

7. A yearly payment to the servant is Rs. 90 plus one turban. The servant leaves the job after 9 months and receives Rs. 65 and a turban. Then find the price of the turban.

(a) Rs. 10 (b) Rs. 15

(c) Rs. 7.50 (d) Cannot be determined

8. I have one-rupee coins, 50-paisa coins and 25-paisa coins. The number of coins are in the ratio 2.5 : 3 : 4. If the total amount with me is Rs. 210, find the number of one-rupee coins.

(a) 90 (b) 85

(c) 100 (d) 105

Direction for Question 9: The question is followed by two statements, I and II. Answer the question based on the statements and mark the answer as:

(a) if the question can be answered with the help of any one statement alone but not by the other statement.

(b) if the question can be answered with the help of either of the statements taken individually.

(c) if the question can be answered with the help of both statements together.

(d) if the question cannot be answered even with the help of both statements together.

9. What is the value of 'a'?

I. Ratio of a and b is 3 : 5, where b is positive.

II. Ratio of 2a and b is $\frac{12}{10}$, where a is positive.

1999

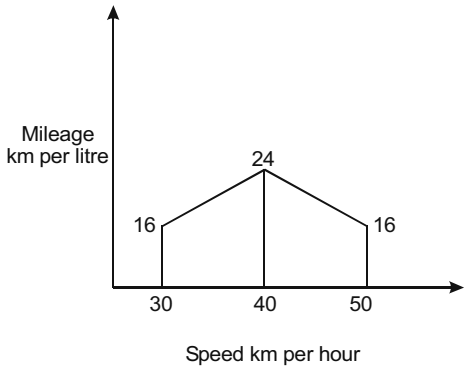
10. The speed of a railway engine is 42 kmph when no compartment is attached, and the reduction in speed is directly proportional to the square root of the number of compartments attached. If the speed of the train carried by this engine is 24 kmph when 9 compartments are attached, the maximum number of compartments that can be carried by the engine is

(a) 49 (b) 48

(c) 46 (d) 47

Directions for Questions 11 and 12: Answer the questions based on the following information.

Rajiv reaches city B from city A in 4 hours, driving at speed of 35 kmph for the first two hour and at 45 kmph for the next two hours. Aditi follows the same route, but drives at three different speeds: 30, 40 and 50 kmph, covering an equal distance in each speed segment. The two cars are similar with petrol consumption characteristics (km per litre)shown in the figure below.



11. The quantity of petrol consumed by Aditi for the journey is

(a) 8.3 l (b) 8.6 l

(c) 8.9 l (d) 9.2 l

12. Zoheb would like to drive Aditi's car over the same route from A to B and minimize the petrol consumption for the trip. What is the quantity of petrol required by him?

(a) 6.67 l (b) 7 l

(c) 6.33 l (d) 6.0 l

2001

13. Fresh grapes contain 90% water by weight while dried grapes contain 20% water by weight. What is the weight of dry grapes available from 20 kg of fresh grapes?

(a) 2 kg (b) 2.4 kg

(c) 2.5 kg (d) None of these

2002

14. Three travellers are sitting around a fire, and are about to eat a meal. One of them has 5 small loaves of bread, the second has 3 small loaves of bread. The third has no food, but has 8 coins. He offers to pay for some bread. They agree to share the 8 loaves equally among the three travellers, and the third traveller will pay 8 coins for his share of the 8 loaves. All loaves were the same size. The second traveller (who had 3 loaves) suggests that he will be paid 3 coins, and that the first traveller be paid 5 coins. The first traveller says that he should get more than 5 coins. How much should the first traveller get?

(a) 5 (b) 7

(c) 1 (d) None of these

15. If pqr = 1, the value of the expression

$$\frac{1}{1+p+q^{-1}}+\frac{1}{1+q+r^{-1}}+\frac{1}{1+r+p^{-1}}$$ is equal to

(a) p + q + r (b) $\frac{1}{p+q+r}$

(c) 1 (d) $p^{-1}+q^{-1}+r^{-1}$

16. Flights A and B are scheduled from an airport within the next one hour. All the booked passengers of the two flights are waiting in the boarding hall after check-in. The hall has a seating capacity of 200, out of which 10% remained vacant. 40% of the waiting passengers are ladies. When boarding announcement came, passengers of flight A left the hall and boarded the flight. Seating capacity of each flight is two-third of the passengers who waited in

the waiting hall for both the flights put together. Half the passengers who boarded flight A are women. After boarding for flight A, 60% of the waiting hall seats became empty. For every twenty of those who are still waiting in the hall for flight B, there is one air hostess in flight A. What is the ratio of empty seats in flight B to the number of air hostesses in flight A?

(a) 10 : 1 (b) 5 : 1

(c) 20 : 1 (d) 1 : 1

Direction for Question 17: The question is followed by two statements, A and B. Answer each question using the following instructions.

Choose (a) if the question can be answered by one of the statements alone but not by the other.

Choose (b) if the question can be answered by using either statement alone.

Choose (c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

Choose (d) if the question cannot be answered even by using both statements together.

17. A sum of Rs. 38,500 was divided among Jagdish, Punit and Girish. Who received the minimum amount?

A. Jagdish received $\frac{2}{9}$ of what Punit and Girish received together.

B. Punit received $\frac{3}{11}$ of what Jagdish and Girish received together.

2003(R)

18. Let a, b, c, d and e be integers such that a = 6b = 12c, and 2b = 9d = 12 e. Then which of the following pairs contains a number that is not an integer?

(a) $\left(\frac{a}{27}, \frac{b}{e}\right)$ (b) $\left(\frac{a}{36}, \frac{c}{e}\right)$

(c) $\left(\frac{a}{12}, \frac{bd}{18}\right)$ (d) $\left(\frac{a}{6}, \frac{c}{d}\right)$

19. In a coastal village, every year floods destroy exactly half of the huts. After the flood water recedes, twice the number of huts destroyed are rebuilt. The floods occurred consecutively in the last three years — 2001, 2002 and 2003. If floods are expected again in 2004, the number of huts expected to be destroyed is

(a) less than the number of huts existing at the beginning of 2001

(b) less than the total number of huts destroyed by floods in 2001 and 2003

(c) less than the total number of huts destroyed by floods in 2002 and 2003

(d) more than the total number of huts built in 2001 and 2002

Direction for Question 20: The question is followed by two statements, A and B. Answer the question using the following instructions:

Choose (a) if the question can be answered by using statement A alone but not by using B alone.

Choose (b) if the question can be answered by using statement B alone but not by using A alone.

Choose (c) if the question can be answered by using either statement alone and

Choose (d) if the question can be answered using both the statements together but not by either statement alone.

20. The members of a local club contributed equally to pay Rs. 600 towards a donation. How much did each one pay?

A. If there had been five fewer members, each one would have paid an additional Rs. 10.

B. There were at least 20 members in the club, and each one paid not more than Rs. 30.

2004

21. If $\frac{a}{b+c} = \frac{b}{c+a} = \frac{c}{a+b} = r$ then r cannot take any value except

(a) $\frac{1}{2}$ (b) –1

(c) $\frac{1}{2}$ or -1 (d) $-\frac{1}{2}$ or -1

2006

22. If $\frac{a}{b} = \frac{1}{3}$, $\frac{b}{c} = 2$, $\frac{c}{d} = \frac{1}{2}$, $\frac{d}{e} = 3$ and $\frac{e}{f} = \frac{1}{4}$, then what is the value of $\frac{abc}{def}$?

(a) $\frac{3}{8}$ (b) $\frac{27}{8}$

(c) $\frac{3}{4}$ (d) $\frac{27}{4}$

(e) $\frac{1}{4}$

23. The number of employees in Obelix Menhir Co. is a prime number and is less than 300. The ratio of the number of employees who are graduates and above, to that of employees who are not, can possibly be:

(a) 101 : 88 (b) 87 : 100
(c) 110 : 111 (d) 85 : 98
(e) 97 : 84

MEMORY BASED QUESTIONS

2012

24. Three men are gambling in Casino Royal. They start with sums of money in the ratio 7 : 6 : 5 and finish with sums of money in the ratio 6 : 5 : 4, in the same order as before. One of them won $ 12. How many dollars did he start with ? [The three men gambled amongst each other only]

(a) $1080 (b) $420
(c) $210 (d) None of these

2013

25. The ratio of alcohol to water in an alcohol-water solution is 9 : 1. The rate of evaporation per hour of alcohol and water on boiling is 20% and 5% respectively. The minimum number of hours for which the solution needs to be boiled so as it contains at least 18% of water?

(a) 3 (b) 4
(c) 3.5 (d) 4.5

2016

26. If $4x + 3y : y - 6x :: 14 : 1$, then find the value of $\frac{2x}{y}$.

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) 2 (d) 4

2017

27. If a, b, c are three positive integers such that a and b are in the ratio 3 : 4 while b and c are in the ratio 2:1, then which one of the following is a possible value of (a + b + c)?

(a) 201 (b) 205
(c) 207 (d) 210

2018 Slot 1

28. Raju and Lalitha originally had marbles in the ratio 4:9. Then Lalitha gave some of her marbles to Raju. As a result, the ratio of the number of marbles with Raju to that with Lalitha became 5:6. What fraction of her original number of marbles was given by Lalitha to Raju?

(a) $\frac{1}{4}$ (b) $\frac{1}{5}$
(c) $\frac{6}{19}$ (d) $\frac{7}{33}$

2018 Slot 2

29. The scores of Amal and Bimal in an examination are in the ratio 11 : 14. After an appeal, their scores increase by the same amount and their new scores are in the ratio 47 : 56. The ratio of Bimal's new score to that of his original score is

(a) 4 : 3 (b) 3 : 2
(c) 5 : 4 (d) 8 : 5

AVERAGE

1991

Directions for Questions 1 to 3: Each of these items has a question followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II alone,

Mark (c) if both the statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

1. The average of three unequal quotations for a particular share is Rs.110. If all are quoted in integral values of rupee, does the highest quotation exceed Rs.129?

I. The lowest quotation is Rs.100.
II. One of the quotations is Rs.115.

1993

2. Is the average of the largest and the smallest of four given numbers greater than the average of the four numbers?

I. The difference between the largest and the second largest numbers is greater than the difference between the second smallest and the smallest numbers.
II. The difference between the largest and the second largest numbers is less than the difference between the second largest and the second smallest numbers.

1994

3. What is the average weight of the 3 new team members who are recently included into the team?

I. The average weight of the team increases by 20 kg.
II. The 3 new men substitute earlier members whose weights are 64 kg, 75 kg and 66 kg.

Directions for Questions 4 to 6: Answer the questions based on the following information.

There are 60 students in a class. These students are divided into three groups A, B and C of 15, 20 and 25 students each. The groups A and C are combined to form group D.

1997

4. What is the average weight of the students in group D?

(a) More than the average weight of A

(b) More than the average weight of C

(c) Less than the average weight of C

(d) Cannot be determined

5. If one student from group A is shifted to group B, which of the following will be true?

(a) The average weight of both groups increases

(b) The average weight of both the groups decreases

(c) The average weight of the class remains the same

(d) Cannot be determined

6. If all the students of the class have the same weight, then which of the following is false?

(a) The average weight of all the four groups is the same

(b) The total weight of A and C is twice the total weight of B

(c) The average weight of D is greater than the average weight of A

(d) The average weight of all the groups remains the same even if a number of students are shifted from one group to another

7. The average marks of a student in 10 papers are 80. If the highest and the lowest scores are not considered, the average is 81. If his highest score is 92, find the lowest.

(a) 55 (b) 60

(c) 62 (d) Cannot be determined

1999

8. Total expenses of a boarding house are partly fixed and partly varying linearly with the number of boarders. The average expense per boarder is Rs. 700 when there are 25 boarders and Rs. 600 when there are 50 boarders. What is the average expense (in Rs.)per boarder when there are 100 boarders?

(a) 550 (b) 580

(c) 540 (d) 570

Direction for Question 9: The question is followed by two statements I and II.

Mark:

(a) if the question can be answered by any one of the statements alone, but cannot be answered by using the other statement alone.

(b) if the question can be answered by using either statement alone.

(c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

(d) if the question cannot be answered even by using both the statements together.

9. The average weight of students in a class is 50 kg. What is the number of students in the class?

I. The heaviest and the lightest members of the class weigh 60 kg and 40 kg respectively.

II. Exclusion of the heaviest and the lightest members from the class does not change the average weight of the students.

2000

10. Consider a sequence of seven consecutive integers. The average of the first five integers is n. The average of all the seven integers is

(a) n

(b) n + 1

(c) k × n, where k is a function of n

(d) $n + \left(\frac{2}{7}\right)$

11. A shipping clerk has five boxes of different but unknown weights each weighing less than 100 kg. The clerk weights the boxes in pairs. The weights obtained are 110, 112, 113, 114, 115, 116, 117, 118, 120 and 121 kg. What is the weight of the heaviest box?

(a) 60 kg (b) 62 kg

(c) 64 kg (d) Cannot be determined

2001

12. A student took five papers in an examination, where the full marks were the same for each paper. His marks in these papers were in the proportion of 6 : 7 : 8 : 9 : 10. In all papers together, the candidate obtained 60% of the total marks. Then the number of papers in which he got more than 50% marks is

(a) 2 (b) 3

(c) 4 (d) 5

13. A college has raised 75% of the amount it needs for a new building by receiving an average donation of Rs. 600 from the people already solicited. The people already solicited represent 60% of the people the college will ask for donations. If the college is to raise exactly the amount needed for the new building, what should be the average donation from the remaining people to be solicited?

(a) Rs. 300 (b) Rs. 250

(c) Rs. 400 (d) Rs. 500

14. Three classes X, Y and Z take an algebra test.

The average score in class X is 83.

The average score in class Y is 76.

The average score in class Z is 85.

The average score of all students in classes X and Y together is 79.

The average score of all students in classes Y and Z together is 81.

What is the average for all the three classes?

(a) 81 (b) 81.5

(c) 82 (d) 84.5

15. A set of consecutive positive integers beginning with 1 is written on the blackboard. A student came along and erased one number. The average of the remaining numbers is $35\frac{7}{17}$. What was the number erased?

(a) 7 (b) 8

(c) 9 (d) None of these

2002

16. Amol was asked to calculate the arithmetic mean of 10 positive integers, each of which had 2 digits. By mistake, he interchanged the 2 digits, say a and b, in one of these 10 integers. As a result, his answer for the arithmetic mean was 1.8 more than what it should have been. Then b – a equals

(a) 1 (b) 2

(c) 3 (d) None of these

Direction for Question 17: The question is followed by two statements, A and B. Answer the question using the following instructions.

Choose (a) if the question can be answered by one of the statements alone but not by the other.

Choose (b) if the question can be answered by using either statement alone.

Choose (c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

Choose (d) if the question cannot be answered even by using both statements together.

17. Is 500 the average (arithmetic mean) score in the GMAT?

A. Half of the people who take the GMAT score above 500 and half of the people score below 500.

B. The highest GMAT score is 800 and the lowest score is 200.

2007

18. Ten years ago, the ages of the members of a joint family of eight people added up to 231 years. Three years later, one member died at the age of 60 years and a child was born during the same year. After another three years, one more member died, again at 60, and a child was born during the same year. The current average age of this eight-member joint family is nearest to

(a) 23 years (b) 22 years

(c) 21 years (d) 25 years

(e) 24 years

Direction for Question 19: The question is followed by two statements A and B. Indicate your response based on the following directives.

Mark (a) if the questions can be answered using A alone but not using B alone.

Mark (b) if the question can be answered using B alone but not using A alone.

Mark (c) if the question can be answered using A and B together, but not using either A or B alone.

Mark (d) if the question cannot be answered even using A and B together.

19. The average weight of a class of 100 students is 45 kg. The class consists of two sections, I and II, each with 50 students. The average weight, W_I, of Section I is smaller than the average weight W_{II}, of the Section II. If the heaviest student say Deepak, of section II is moved to Section I, and the lightest student, say Poonam, of Section I is moved to Section II, then the average weights of the two sections are switched, i.e., the average weight of Section I becomes W_{II} and that of Section II becomes W_I. What is the weight of Poonam?

A: $W_{II} - W_I = 1.0$.

B: Moving Deepak from Section II to I (without any move I to II)makes the average weights of the two sections equal.

2016

20. During a fundraiser event for the elderly people, apart from all the members of the organising committee, a huge number of volunteers also donated some amount for the noble cause. The members of the organising committee made an average contribution of Rs.1,100 and this sum comprised 88% of the total amount raised through the event. The number of members in the organising committee was 40% more than the number of volunteers. Find the average contribution (in Rs.) made by the volunteers.

2017

21. The average height of 22 toddlers increases by 2 inches when two of them leave this group. If the average height of these two toddlers is one-third the average height of the original 22, then the average height, in inches, of the remaining 20 toddlers is

(1) 30 (2) 23

(3) 32 (4) 26

2018 Slot 1

22. A CAT aspirant appears for a certain number of tests. His average score increases by 1 if the first 10 tests are not considered, and decreases by 1 if the last 10 tests are not considered. If his average scores for the first 10 and the last 10 tests are 20 and 30, respectively, then the total number of tests taken by him is

23. In an apartment complex, the number of people aged 51 years and above is 30 and there are at most 39 people whose ages are below 51 years. The average age of all the people in the apartment complex is 38 years. What is the largest possible average age, in years, of the people whose ages are below 51 years?

(1) 26 (2) 25

(3) 28 (4) 27

2018 Slot 2

24. The arithmetic mean of x, y and z is 80, and that of x, y, z, u and v is 75, where $u = (x + y)/2$ and $v = (y + z)/2$. If $x \geq z$, then the minimum possible value of x is

SIMPLE INTEREST AND COMPOUND INTEREST

1991

1. A sum of money compounded annually becomes Rs.625 in two years and Rs.675 in three years. The rate of interest per annum is

(a) 7% (b) 8%

(c) 6% (d) 5%

Direction for Question 2 : The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II, alone,

Mark (c) if both, statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

1994

2. Little Beau Peep lost her sheep. She couldn't remember how many were there. She knew she would have 400 more next year, than the number of sheep she had last year. How many sheep were there?

I. The number of sheep last year was 20% more than the year before that and this simple rate of increase continues to be the same for the next 10 years.

II. The increase is compounded annually.

1995

3. Ram purchased a flat at Rs.1 lakh and Prem purchased a plot of land worth Rs.1.1 lakh. The respective annual rates at which the prices of the flat and the plot increased were 10% and 5%. After two years they exchanged their belongings and one paid the other the difference. Then

(a) Ram paid Rs.275 to Prem

(b) Ram paid Rs.475 to Prem

(c) Ram paid Rs.375 to Prem

(d) Prem paid Rs.475 to Ram

4. A man invests Rs.3,000 at the rate of 5% per annum. How much more should he invest at the rate of 8%, so that he can earn a total of 6% per annum?

(a) Rs.1,200 (b) Rs.1,300

(c) Rs.1,500 (d) Rs.2,000

Direction for Question 5 : The question is followed by two statements. As the answer, mark

(a) if the question cannot be answered even with the help of both the statements taken together.

(b) if the question can be answered by any one of the two statements.

(c) if each statement alone is sufficient to answer the question, but not the other one (E.g. statement I alone is required to answer the question, but not statement II and vice versa).

(d) if both statements I and II together are needed to answer the question.

1996

5. What is the total worth of Lakhiram's assets?

I. A compound interest at 10% on his assets, followed by a tax of 4% on the interest, fetches him Rs. 1,500 this year.

II. The interest is compounded once every four months.

Direction for Question 6: The question is followed by two statements, I and II.

Mark

(a) if the question can be answered by one of the statements alone and not by the other.

(b) if the question can be answered by using either statement alone.

(c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

(d) if the question cannot be answered even by using both statements together.

2001

6. Is Country X's GDP higher than country Y's GDP?

I. GDPs of the countries X and Y have grown over the past 5 years at compounded annual rate of 5% and 6% respectively.

II. Five years ago, GDP of country X was higher than that of country Y.

MEMORY BASED QUESTIONS

2015

7. An amount borrowed at simple interest gets tripled in 24 years. How many years does it take to get doubled, if the interest rate is same.

2018 Slot 1

8. John borrowed Rs. 2,10,000 from a bank at an interest rate of 10% per annum, compounded annually. The loan was repaid in two equal instalments, the first after one year and the second after another year. The first instalment was interest of one year plus part of the principal amount, while the second was the rest of the principal amount plus due interest thereon. Then each instalment, in Rs., is

2018 Slot 2

9. Gopal borrows Rs. X from Ankit at 8% annual interest. He then adds Rs. Y of his own money and lends Rs. X + Y to Ishan at 10% annual interest. At the end of the year, after returning Ankit's dues, the net interest retained by Gopal is the same as that accrued to Ankit. On the other hand, had Gopal lent Rs. X + 2Y to Ishan at 10%, then the net interest retained by him would have increased by Rs. 150. If all interests are compounded annually, then find the value of X + Y.

MIXTURE AND SOLUTIONS

1. A man buys spirit at Rs. 60 per litre, adds water to it and then sells it at Rs. 75 per litre. What is the ratio of spirit to water if his profit in the deal is 37.5%?

(a) 9 : 1 (b) 10 : 1

(c) 11 : 1 (d) None of these

2. Two liquids A and B are in the ratio 5 : 1 in container 1 and 1 : 3 in container 2. In what ratio should the contents of the two containers be mixed so as to obtain a mixture of A and B in the ratio 1 : 1?

(a) 2 : 3 (b) 4 : 3

(c) 3 : 2 (d) 3 : 4

Direction for Question 3: The question is followed by two statements, I and II. Mark the answer as:

(a) if the question cannot be answered even with the help of both the statements taken together.

(b) if the question can be answered by any one of the two statements.

(c) if each statement alone is sufficient to answer the question, but not the other one (E.g. statement I alone is required to answer the question, but not statement II and vice versa).

(d) if both statements I and II together are needed to answer the question.

1996

3. What is the ratio of the two liquids A and B in the mixture finally, if these two liquids kept in three vessels are mixed together? (The containers are of equal volume.)

I. The ratio of liquid A to liquid B in the first and second vessel is 3 : 5, 2 : 3 respectively.

II. The ratio of liquid A to liquid B in vessel 3 is 4 : 3.

1998

4. There are two containers: the first contains 500 ml of alcohol, while the second contains 500 ml of water. Three cups of alcohol from the first container is taken out and is mixed well in the second container. Then three cups of this mixture is taken out and is mixed in the first container. Let A denote the proportion of water in the first container and B denote the proportion of alcohol in the second container. Then

(a) A > B (b) A < B

(c) A = B (d) Cannot be determined

2004

5. A milkman mixes 20 litres of water with 80 litres of milk. After selling one-fourth of this mixture, he adds water to replenish the quantity that he had sold. What is the current proportion of water to milk?

(a) 2 : 3 (b) 1 : 2

(c) 1 : 3 (d) 3 : 4

MEMORY BASED QUESTIONS

2011

6. From a vessel containing 160 litres of milk, 'x' litres is drained out and replaced with water. Then 'x' litres of milk-water solution is drained out and replaced with water. If the quantity of milk left in the vessel is 90 litres, then what is the value of 'x'?

(a) 30 (b) 40

(c) 36 (d) 35

2014

7. An empty metal container (without its handle) weighs 15% of what it weighs when completely filled with a particular liquid. After adding the handle, the weight of the fully filled container increases by 5%. If the weight of a partly filled container is $\frac{1}{3}$ of the completely filled container with the handle attached, then what fraction of container is utilized?

(a) $\frac{4}{17}$ (b) $\frac{3}{17}$

(c) $\frac{6}{19}$ (d) $\frac{3}{19}$

8. The percentage volumes of milk in three solutions A, B and C form a geometric progression in that order. If we mix the first, second and third solutions in the ratio 2 : 3 : 4, by volume, we obtain a solution containing 32% milk. If we mix them in the ratio 3 : 2 : 1, by volume, we obtain a solution containing 22% milk. What is the percentage of milk in A?

(a) 6% (b) 12%

(c) 18% (d) 24%

2015

9. From a vessel completely filled up with pure wine, 140 litres of content is removed and replaced with equal quantity of water. The process is repeated one more time. In a 98 litres sample of the resulting solution 80 litres is water. Find the capacity (in litres) of the vessel.

2016

10. A 100 ml flask contains 30% acid solution. What quantity of the solution should be replaced with 12% acid solution so that the resultant solution contains 21% acid?

(a) 50 ml

(b) 44.44 ml

(c) 33.33 ml

(d) 64 ml

2017

11. Bottle 1 contains a mixture of milk and water in 7 : 2 ratio and Bottle 2 contains a mixture of milk and water in 9 : 4 ratio. In what ratio of volumes should the liquids in Bottle 1 and Bottle 2 be combined to obtain a mixture of milk and water in 3 : 1 ratio?

(a) 27 : 14 (b) 27 : 13

(c) 27 : 16 (d) 27 : 18

12. Consider three mixtures - the first having water and liquid A in the ratio 1 : 2, the second having water and liquid B in the ratio 1 : 3, and the third having water and liquid C in the ratio 1 : 4. These three mixtures of A, B, and C, respectively, are further mixed in the proportion 4 : 3 : 2. Then the resulting mixture has

(a) The same amount of water and liquid B

(b) The same amount of liquids B and C

(c) More water than liquid B

(d) More water than liquid A

2018 Slot 1

13. Two types of tea, A and B, are mixed and then sold at Rs. 40 per kg. The profit is 10% if A and B are mixed in the ratio 3 : 2, and 5% if this ratio is 2 : 3. The cost prices, per kg, of A and B are in the ratio

(a) 21 : 25 (b) 19 : 24

(c) 18 : 25 (d) 17 : 25

14. A trader sells 10 litres of a mixture of paints A and B, where the amount of B in the mixture does not exceed that of A. The cost of paint A per litre is Rs. 8 more than that of paint B. If the trader sells the entire mixture for Rs. 264 and makes a profit of 10%, then the highest possible cost of paint B, in Rs. per litre, is

(a) 16

(b) 20

(c) 22

(d) 26

2018 Slot 2

15. A 20% ethanol solution is mixed with another ethanol solution, say, S of unknown concentration in the proportion 1:3 by volume. This mixture is then mixed with an equal volume of 20% ethanol solution. If the resultant mixture is a 31.25% ethanol solution, then the unknown concentration of S is

(a) 50%

(b) 48%

(c) 55%

(d) 52%

16. The strength of a salt solution is p% if 100 ml of the solution contains p grams of salt. If three salt solutions A, B, C are mixed in the proportion 1 : 2 : 3, then the resulting solution has strength 20%. If instead the proportion is 3 : 2 : 1, then the resulting solution has strength 30%. A fourth solution, D, is produced by mixing B and C in the ratio 2 : 7. The ratio of the strength of D to that of A is

(a) 1 : 3 (b) 3 : 10

(c) 2 : 5 (d) 1 : 4

17. A jar contains a mixture of 175 ml water and 700 ml alcohol. Gopal takes out 10% of the mixture and substitutes it by water of the same amount. The process is repeated once again. The percentage of water in the mixture is now

(a) 20.5 (b) 25.4

(c) 35.2 (d) 30.3

18. There are two drums, each containing a mixture of paints A and B. In drum 1, A and B are in the ratio 18 : 7. The mixtures from drums 1 and 2 are mixed in the ratio 3 : 4 and in this final mixture, A and B are in the ratio 13 : 7. In drum 2, then A and B were in the ratio

(a) 220 : 149 (b) 251 : 163

(c) 229 : 141 (d) 239 : 161

TIME SPEED AND DISTANCE

1990

1. A car after traveling 18 km from a point A developed some problem in the engine and speed became 4/5 of its original speed. As a result, the car reached point B 45 minutes late. If the engine had developed the same problem after traveling 30 km from A, then it would have reached B only 36 minutes late. The original speed of the car (in km per hour) and the distance between the points A and B (in km.) is

(a) 25, 130 (b) 30,150

(c) 20, 90 (d) None of these

2. Two trains are traveling in opposite direction at uniform speed 60 and 50 km per hour respectively. They take 5 seconds to cross each other. If the two trains had traveled in the same direction, then a passenger sitting in the faster moving train would have overtaken the other train in 18 seconds. What are the lengths of trains (in metres)?

(a) 112, 78

(b) 97.78, 55

(c) 102.78, 50

(d) 102.78, 55

Directions for Questions 3 to 6 : Each of the following questions is followed by two statements. MARK,

(a) if the question can be answered with the help of statement I alone,

(b) if the question can be answered with the help of statement II alone,

(c) if both, statement I and statement II are needed to answer the question, and

(d) if the statement cannot be answered even with the help of both the statements.

3. Ramu went by car from Calcutta to Trivandrum via Madras, without any stoppages. The average speeds for the entire journey was 40 kmph. What was the average speed from Madras to Trivandrum?

I. The distance from Madras to Trivandrum is 0.30 times the distance from Calcutta to Madras.

II. The average speed from Madras to Trivandrum was twice that of the average speed from Calcutta to Madras.

4. How long did Mr. X take to cover 5000 km journey with 10 stopovers?

I. The i^{th} stopover lasted i^2 minutes.

II. The average speed between any two stopovers was 66 kmph.

1991

5. A train started from Station A, developed engine trouble and reached Station B, 40 minutes late. What is the distance between Stations A and B?

I. The engine trouble developed after travelling 40 km from Station A and the speed reduced to $\frac{1}{4}$th of the original speed.

II. The engine trouble developed after travelling 40 km from station A in two hours and the speed reduced to $\frac{1}{4}$th of the original speed.

6. What is the time difference between New York and London?

I. The departure time at New York is exactly 9.00 a.m. local time and the arrival time at London is at 10.00 a.m. local time.

II. The flight time is 5 hours.

7. Every day Neera's husband meets her at the city railway station at 6.00 p.m. and drives her to their residence. One day she left early from the office and reached the railway station at 5.00 p.m. She started walking towards her home, met her husband coming from their residence on the way and they reached home 10 minutes earlier than the usual time. For how long did she walk?

(a) 1 hour (b) 50 minutes

(c) ½ hour (d) 55 minutes

Directions for Questions 8 to 10 : Use the following information:

Q started to move from point B towards point A exactly an hour after P started from A in the opposite direction. Q's speed was twice that of P. When P had covered one-sixth of the distance between the points A and B, Q had also covered the same distance.

1993

8. The point where P and Q would meet is
(a) Closer to A
(b) Exactly between A and B
(c) Closer to B
(d) P and Q will not meet at all

9. How many hours would P take to reach B?
(a) 2 (b) 5
(c) 6 (d) 12

10. How many more hours would P (compared to Q) take to complete his journey?
(a) 4 (b) 5
(c) 6 (d) 7

11. A ship leave on a long voyage. When it is 18 miles from the shore, a seaplane, whose speed is ten times that of the ship, is sent to deliver mail. How far from the shore does the seaplane catch up with the ship?
(a) 24 miles (b) 25 miles
(c) 22 miles (d) 20 miles

1994

12. Shyam went from Delhi to Shimla via Chandigarh by car. The distance from Delhi to Chandigarh is $\frac{3}{4}$ times the distance from Chandigarh to Shimla. The average speed from Delhi to Chandigarh was half as much again as that from Chandigarh to Shimla. If the average speed for the entire journey was 49 kmph. What was the average speed from Chandigarh to Shimla?
(a) 39.2 kmph (b) 63 kmph
(c) 42 kmph (d) None of these

13. A and B walk from X to Y, a distance of 27 km at 5 kmph and 7 kmph respectively. B reaches Y and immediately turns back meeting A at Z. What is the distance from X to Z?
(a) 25 km (b) 22.5 km
(c) 24 km (d) 20 km

14. The winning relay team in a high school sports competition clocked 48 minutes for a distance of 13.2 km. Its runners A, B, C and D maintained speeds of 15 kmph, 16 kmph, 17 kmph, and 18 kmph respectively. What is the ratio of the time taken by B to than taken by D?
(a) 5 : 16 (b) 5 : 17
(c) 9 : 8 (d) 8 : 9

Direction for Question 15: The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II, alone,

Mark (c) if both, statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

15. Is the distance from the office to home less than the distance from the cinema hall to home?
I. The time taken to travel from home to office is as much as the time taken from home to the cinema hall, both distance being covered without stopping.
II. The road from the cinema hall to home is bad and speed reduces, as compared to that on the road from home to the office.

1995

16. In a race of 200 m run, A beats S by 20 m and N by 40 m. If S and N are running a race of 100 m with exactly same speed as before, then by how many metres will S beat N?
(a) 11.11 m (b) 10 m
(c) 12 m (d) 25 m

17. I live X floors above the ground floor of a high-rise building. It takes me 30 s per floor to walk down the steps and 2 s per floor to ride the lift. What is X, if the time taken to walk down the steps to the ground floor is the same as to wait for the lift for 7 min and then ride down?
(a) 4 (b) 7
(c) 14 (d) 15

18. A man can walk up a moving 'up' escalator in 30 s. The same man can walk down this moving 'up' escalator in 90 s. Assume that his walking speed is same upwards and downwards. How much time will he take to walk up the escalator, when it is not moving?
(a) 30 s (b) 45 s
(c) 60 s (d) 90 s

1996

19. In a mile race, Akshay can be given a start of 128 m by Bhairav. If Bhairav can give Chinmay a start of 4 m in a 100 m dash, then who out of Akshay and Chinmay will win a race of one and half miles, and what will be the final lead given by the winner to the loser? (One mile is 1,600 m.)
(a) Akshay, $\frac{1}{12}$ mile (b) Chinmay, $\frac{1}{32}$ mile
(c) Akshay, $\frac{1}{24}$ mile (d) Chinmay, $\frac{1}{16}$ mile

20. A man travels three-fifths of a distance AB at a speed 3a, and the remaining at a speed 2b. If he goes from B to A and return at a speed 5c in the same time, then

(a) $\frac{1}{a}+\frac{1}{b}=\frac{1}{c}$ (b) a + b = c

(c) $\frac{1}{a}+\frac{1}{b}=\frac{2}{c}$ (d) None of these

21. A man travels from A to B at a speed x km/hr. He then rests at B for x hours. He then travels from B to C at a speed 2x km/hr and rests for 2x hours. He moves further to D at a speed twice as that between B and C. He thus reaches D in 16 hr. If distances A-B, B-C and C-D are all equal to 12 km, the time for which he rested at B could be

(a) 3 hr (b) 6 hr

(c) 2 hr (d) 4 hr

22. In a watch, the minute hand crosses the hour hand for the third time exactly after every 3 hr 18 min and 15 s of watch time. What is the time gained or lost by this watch in one day?

(a) 14 min 10 s lost

(b) 13 min 50 s lost

(c) 13 min 20 s gained

(d) 14 min 40 s gained

Directions for Questions 23 and 24: Answer the questions based on the following information.

A certain race is made up of three stretches: A, B and C, each 2 km long, and to be covered by a certain mode of transport. The following table gives these modes of transport for the stretches, and the minimum and maximum possible speeds (in km/hr) over these stretches. The speed over a particular stretch is assumed to be constant. The previous record for the race is 10 min.

		Min.	Max.
A	Car	40	60
B	Motorcycle	30	50
C	Bicycle	10	20

1997

23. Anshuman travels at minimum speed by car over A and completes stretch B at the fastest speed. At what speed should he cover stretch C in order to break the previous record?

(a) Maximum speed for C

(b) Minimum speed for C

(c) This is not possible

(d) None of these

24. Mr Hare completes the first stretch at the minimum speed and takes the same time for stretch B. He takes 50% more time than the previous record to complete the race. What is Mr Hare's speed for the stretch C?

(a) 10.9 km/hr (b) 13.3 km/hr

(c) 17.1 km/hr (d) None of these

25. Mr Tortoise completes the race at an average speed of 20 km/hr. His average speed for the first two stretches is four times that for the last stretch. Find the speed over stretch C.

(a) 15 km/hr (b) 12 km/hr

(c) 10 km/hr (d) This is not possible

26. An express train travelling at 80 km/hr overtakes a goods train, twice as long and going at 40 km/hr on a parallel track, in 54 s. How long will the express train take to cross a platform of 400 m long?

(a) 36 s (b) 45 s

(c) 27 s (d) None of these

Directions for Questions 27 to 29: Answer the questions based on the following information.

Boston is 4 hr ahead of Frankfurt and 2 hr behind India. X leaves Frankfurt at 6 p.m. on Friday and reaches Boston the next day. After waiting there for 2 hr, he leaves exactly at noon and reaches India at 1 a.m. On his return journey, he takes the same route as before, but halts at Boston for 1hr less than his previous halt there. He then proceeds to Frankfurt.

27. If his journey, including stoppage, is covered at an average speed of 180 mph, what is the distance between Frankfurt and India?

(a) 3,600 miles (b) 4,500 miles

(c) 5,580 miles (d) Data insufficient

28. If X had started the return journey from India at 2.55 a.m. on the same day that he reached there, after how much time would he reach Frankfurt?

(a) 24 hr (b) 25 hr

(c) 26 hr (d) Data insufficient

29. What is X's average speed for the entire journey (to and fro)?

(a) 176 mph (b) 180 mph

(c) 165 mph (d) Data insufficient

Directions for Questions 30 and 31: Answer the questions based on the following information.

A thief, after committing the burglary, started fleeing at 12 noon, at a speed of 60 km/hr. He was then chased by a policeman X. X started the chase, 15 min after the thief had started, at a speed of 65 km/hr.

30. At what time did X catch the thief?

(a) 3.30 p.m. (b) 3 p.m.

(c) 3.15 p.m. (d) None of these

31. If another policeman had started the same chase along with X, but at a speed of 60 km/hr, then how far behind was he when X caught the thief?

(a) 18.75 km (b) 15 km

(c) 21 km (d) 37.5 km

DirectionS for Questions 32 to 34: Each of these items has a question followed by two statements, I and II. Mark the answer

(a) if the question can be answered with the help of one statement alone.

(b) if the question can be answered with the help of any one statement independently.

(c) if the question can be answered with the help of both statements together.

(d) if the question cannot be answered even with the help of both statements together.

32. A person is walking from Mali to Pali, which lies to its north-east. What is the distance between Mali and Pali?

I. When the person has covered $\frac{1}{3}$ the distance, he is 3 km east and 1 km north of Mali.

II. When the person has covered $\frac{2}{3}$ the distance, he is 6 km east and 2 km north of Mali.

33. What is the speed of the car?

I. The speed of a car is 10 (km/hr) more than that of a motorcycle.

II. The motorcycle takes 2 hr more than the car to cover 100 km.

34. After what time will the two persons Tez and Gati meet while moving around the circular track? Both of them start at the same point and at the same time.

I. Tez moves at a constant speed of 5 m/s, while Gati starts at a speed of 2 m/s and increases his speed by 0.5 m/s at the end of every second thereafter.

II. Gati can complete one entire lap in exactly 10 s.

1998

35. Distance between A and B is 72 km. Two men started walking from A and B at the same time towards each other. The person who started from A travelled uniformly with average speed of 4 km/hr. While the other man travelled with varying speed as follows: in the first hour his speed was 2 km/hr, in the second hour it was 2.5 km/hr, in the third hour it was 3 km/hr, and so on. When will they meet each other?

(a) 7 hr

(b) 10 hr

(c) 35 km from A

(d) Mid-way between A and B

36. I started climbing up the hill at 6 a.m. and reached the top of the temple at 6 p.m. Next day I started coming down at 6 a.m. and reached the foothill at 6 p.m. I walked on the same road. The road is so short that only one person can walk on it. Although I varied my pace on my way, I never stopped on my way. Then which of the following must be true?

(a) My average speed downhill was greater than that of uphill

(b) At noon, I was at the same spot on both the days.

(c) There must be a point where I reached at the same time on both the days.

(d) There cannot be a spot where I reached at the same time on both the days.

1999

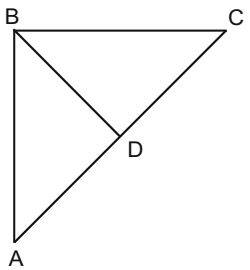
37. Navjivan Express from Ahmedabad to Chennai leaves Ahmedabad at 6.30 a.m. and travels at 50 kmph towards Baroda situated 100 km away. At 7.00 a.m. Howrah-Ahmedabad Express leaves Baroda towards Ahmedabad and travels at 40 kmph. At 7.30 a.m. Mr Shah, the traffic controller at Baroda realizes that both the trains are running on the same track. How much time does he have to avert a head-on collision between the two trains?

(a) 15 min (b) 20 min

(c) 25 min (d) 30 min

Directions for Questions 38 to 40: Answer the questions based on the following information.

A road network (shown in the figure below) connects cities A, B, C and D. All road segments are straight lines. D is the mid-point on the road connecting A and C. Roads AB and BC are at right angles to each other with BC shorter than AB. The segment AB is 100 km long.



Ms X and Mr Y leave A at 8.00 a.m., take different routes to city C and reach at the same time. X takes the highway from A to B to C and travels at an average speed of 61.875 kmph. Y takes the direct route AC and travels at 45 kmph on segment AD. Y's speed on segment DC is 55 kmph.

38. What is the average speed of Y?

(a) 47.5 kmph (b) 49.5 kmph

(c) 50 kmph (d) 52 kmph

39. The total distance travelled by Y during the journey is approximately

(a) 105 km (b) 150 km

(c) 130 km (d) Cannot be determined

40. What is the length of the road segment BD?

(a) 50 km (b) 52.5 km

(c) 55 km (d) Cannot be determined

2000

41. A truck travelling at 70 km/hr uses 30% more diesel to travel a certain distance than it does when it travels at a speed of 50 km/hr. If the truck can travel 19.5 km/L of diesel at 50 km/hr, how far can the truck travel on 10 L of diesel at a speed of 70 km/hr?

(a) 130 km (b) 140 km

(c) 150 km (d) 175 km

Directions for Questions 42 and 43: Answer the questions based on the following information.

There are five machines — A, B, C, D, and E — situated on a straight line at distances of 10 m, 20 m, 30 m, 40 m and 50 m respectively from the origin of the line. A robot is stationed at the origin of the line. The robot serves the machines with raw material whenever a machine becomes idle. All the raw materials are located at the origin. The robot is in an idle state at the origin at the beginning of a day. As soon as one or more machines become idle, they send messages to the robot-station and the robot starts and serves all the machines from which it received messages. If a message is received at the station while the robot is away from it, the robot takes notice of the message only when it returns to the station. While moving, it serves the machines in the sequence in which they are encountered, and then returns to the origin. If any messages are pending at the station when it returns, it repeats the process again. Otherwise, it remains idle at the origin till the next message(s) is(are) received.

42. Suppose on a certain day, machines A and D have sent the first two messages to the origin at the beginning of the first second, and C has sent a message at the beginning of the 5th second and B at the beginning of the 6th second, and E at the beginning of the 10th second. How much distance has the robot travelled since the beginning of the day, when it notices the message of E? Assume that the speed of movement of the robot is 10 m/s.

(a) 140 m (b) 80 m

(c) 340 m (d) 360 m

43. Suppose there is a second station with raw material for the robot at the other extreme of the line which is 60 m from the origin, i.e. 10 m from E. After finishing the services in a trip, the robot returns to the nearest station. If both stations are equidistant, it chooses the origin as the station to return to. Assuming that both stations receive the messages sent by the machines and that all the other data remains the same, what would be the answer to the above question?

(a) 120 (b) 140

(c) 340 (d) 70

Direction for Question 44: The question is followed by two statements, I and II. Answer the question using the following instructions.

Mark the answer as:

(a) if the question can be answered by one of the statements alone, but cannot be answered by using the other statement alone.

(b) if the question can be answered by using either statement alone.

(c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

(d) if the question cannot be answered even by using both statements together.

44. Ghosh Babu has decided to take a non-stop flight from Mumbai to No-man's-land in South America, He is scheduled to leave Mumbai at 5 a.m., IST on December 10, 2000. What is the local time at No-man's-land when he reaches there?

I. The average speed of the plane is 700 km/hr.

II. The flight distance is 10,500 km.

2001

45. At his usual rowing rate, Rahul can travel 12 miles downstream in a certain river in 6 hr less than it takes him to travel the same distance upstream. But if he could double his usual rowing rate for this 24 miles round trip, the downstream 12 miles would then take only 1 hr less than the upstream 12 miles. What is the speed of the current in miles per hour?

(a) $\frac{7}{3}$ (b) $\frac{4}{3}$

(c) $\frac{5}{3}$ (d) $\frac{8}{3}$

46. Shyama and Vyom walk up an escalator (moving stairway). The escalator moves at a constant speed. Shyama takes three steps for every two of Vyom's steps. Shyama gets to the top of the escalator after having taken 25 steps, while Vyom (because his slower pace lets the escalator do a little more of the work)takes only 20 steps to reach the top. If the escalator were turned off, how many steps would they have to take to walk up?

(a) 40 (b) 50

(c) 60 (d) 80

47. Train X departs from station A at 11 a.m. for station B, which is 180 km so far. Train Y departs from station B at 11 a.m. for station A. Train X travels at an average speed of 70 km/hr and does not stop anywhere until it arrives at station B. Train Y travels at an average speed of 50 km/hr, but has to stop for 15 min at station C, which is 60 km away from station B enroute to station A. Ignoring the lengths of the trains, what is the distance, to the nearest kilometre, from station A to the point where the trains cross each other?

(a) 112 km (b) 118 km

(c) 120 km (d) None of these

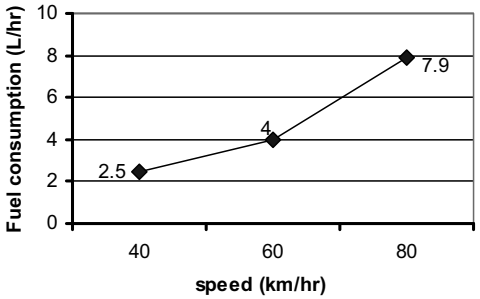
48. Three runners A, B and C run a race, with runner A finishing 12 m ahead of runner B and 18 m ahead of runner C, while runner B finishes 8 m ahead of runner C. Each runner travels the entire distance at a constant speed. What was the length of the race?

(a) 36 m (b) 48 m

(c) 60 m (d) 72 m

Directions for Questions 49 and 50: Answer the questions based on the following information.

The petrol consumption rate of a new model car 'Palto' depends on its speed and may be described by the graph below.



49. Manasa makes a 200 km trip from Mumbai to Pune at a steady speed of 60 km/hr. What is the volume of petrol consumed for the journey?

(a) 12.5 L (b) 13.33 L

(c) 16 L (d) 19.75 L

50. Manasa would like to minimize the fuel consumption for the trip by driving at the appropriate speed. How should she change the speed?

(a) Increase the speed

(b) Decrease the speed

(c) Maintain the speed at 60 km/hr

(d) Cannot be determined

Directions for Questions 51 and 52: Each question is followed by two statements, I and II.

Mark

(a) if the question can be answered by one of the statements alone and not by the other.

(b) if the question can be answered by using either statement alone.

(c) if the question can be answered by using both the statements together, but cannot be answered by using either statement alone.

(d) if the question cannot be answered even by using both statements together.

51. On a given day a boat ferried 1,500 passengers across the river in 12 hr. How many round trips did it make?

I. The boat can carry 200 passengers at any time.

II. It takes 40 min each way and 20 min of waiting time at each terminal.

52. What will be the time for downloading software?

I. Transfer rate is 6 kilobytes per second.

II. The size of the software is 4.5 megabytes.

2002

53. On a straight road XY, 100 m long, five heavy stones are placed 2 m apart beginning at the end X. A worker, starting at X, has to transport all the stones to Y, by carrying only one stone at a time. The minimum distance he has to travel is

(a) 472 m (b) 422 m

(c) 744 m (d) 860 m

54. Only a single rail track exists between stations A and B on a railway line. One hour after the north-bound super fast train N leaves station A for station B, a south-bound passenger train S reaches station A from station B. The speed of the super fast train is twice that of a normal express train E, while the speed of a passenger train S is half that of E. On a particular day, N leaves for B from A, 20 min behind the normal schedule. In order to maintain the schedule, both N and S increased their speeds. If the super fast train doubles its speed, what should be the ratio (approximately)of the speeds of passenger train to that of the super fast train so that the passenger train S reaches exactly at the scheduled time at A on that day?

(a) 1 : 3 (b) 1 : 4

(c) 1 : 5 (d) 1 : 6

55. On a 20 km tunnel, connecting two cities A and B, there are three gutters (1, 2 and 3). The distance between gutters 1 and 2 is half the distance between gutters 2 and 3. The distance from city A to its nearest gutter, gutter 1, is equal to the distance of city B from gutter 3. On a particular day, the hospital in city A receives information that an accident has happened at gutter 3. The victim can be saved only if an operation is started within 40 min. An ambulance started from city A at 30 km/hr and crossed gutter 1 after 5 min. If the driver had doubled the speed after that, what is the maximum amount of time would the doctor get to attend the patient at the hospital. Assume 1 min is elapsed for taking the patient into and out of the ambulance?

(a) 4 min

(b) 2.5 min

(c) 1.5 min

(d) The patient died before reaching the hospital

56. A car rental agency has the following terms. If a car is rented for 5 hr or less, then, the charge is Rs. 60 per hour or Rs. 12 per kilometre whichever is more. On the other hand, if the car is rented for more than 5 hr, the charge is Rs. 50 per hour or Rs. 7.50 per kilometre whichever is more. Akil rented a car from this agency, drove it for 30 km and ended up playing Rs. 300. For how many hours did he rent the car?

(a) 4 hr (b) 5 hr

(c) 6 hr (d) None of these

57. A train approaches a tunnel AB. Inside the tunnel is a cat located at a point that is $\frac{3}{8}$ of the distance AB measured from the entrance A. When the train whistles the cat runs. If the cat moves to the entrance of the tunnel A, the train catches the cat exactly at the entrance. If the cat moves to the exit B, the train catches the cat at exactly the exit. The speed of the train is greater than the speed of the cat by what order?

(a) 3 : 1 (b) 4 :1

(c) 5 : 1 (d) None of these

2003(R)

58. A car is being driven, in a straight line and at a uniform speed, towards the base of a vertical tower. The top of the tower is observed from the car and, in the process, it takes 10 min for the angle of elevation to change from 45° to 60°. After how much more time will this car reach the base of the tower?

(a) $5\left(\sqrt{3}+1\right)$ (b) $6\left(\sqrt{3}+\sqrt{2}\right)$

(c) $7\left(\sqrt{3}-1\right)$ (d) $8\left(\sqrt{3}-2\right)$

59. Two straight roads R1 and R2 diverge from a point A at an angle of 120°. Ram starts walking from point A along R1 at a uniform speed of 3 km/hr. Shyam starts walking at the same time from A along R2 at a uniform speed of 2 km/hr. They continue walking for 4 hr along their respective roads and reach points B and C on R1 and R2 respectively. There is a straight line path connecting B and C. Then Ram returns to point A after walking along the line segments BC and CA. Shyam also returns to A after walking along line segments BC and CA. Their speeds remains unchanged. The time interval (in hours) between Ram's and Shyam's return to the point A is

(a) $\frac{10\sqrt{19}+26}{3}$ (b) $\frac{2\sqrt{19}+10}{3}$

(c) $\frac{\sqrt{19}+26}{3}$ (d) $\frac{\sqrt{19}+10}{3}$

2003(L)

Directions for Questions 60 to 62: Answer the questions on the basis of the information given below.

A city has two perfectly circular and concentric ring roads, the outer ring road (OR)being twice as long as the inner ring road (IR). There are also four (straight line) chord roads from E1, the east end point of OR to N2, the north end point of IR; from N1, the north end point of OR to W2, the west end point of IR; from W1, the west end point of OR, to S2, the south end point of IR; and from S1 the south end point of OR to E2, the east end point of IR. Traffic moves at a constant speed of 30π km/hr on the OR road, 20π km/hr on the IR road, and $15\sqrt{5}$ km/hr on all the chord roads.

60. The ratio of the sum of the lengths of all chord roads to the length of the outer ring road is

(a) $(\sqrt{5}:2)$ (b) $(\sqrt{5}:2\pi)$

(c) $\sqrt{5}:\pi$ (d) None of the above.

61. Amit wants to reach N2 from S1. It would take him 90 minutes if he goes on minor arc S1 – E1 on OR, and then on the chord road E1 – N2. What is the radius of the outer ring road in kms?

(a) 60 (b) 40

(c) 30 (d) 20

62. Amit wants to reach E2 from N1 using first the chord N1 – W2 and then the inner ring road. What will be his travel time in minutes on the basis of information given in the above question?

(a) 60 (b) 45

(c) 90 (d) 105

63. In a 4000 meter race around a circular stadium having a circumference of 1000 meters, the fastest runner and the slowest runner reach the same point at the end of the 5th minute, for the first time after the start of the race. All the runners have the same starting point and each runner maintains a uniform speed throughout the race. If the fastest runner runs at twice the speed of the slowest runner, what is the time taken by the fastest runner to finish the race?

(a) 20 min (b) 15 min

(c) 10 min (d) 5 min

Directions for Question 64: In the question there are two statements: A and B.

Choose (a) if the question can be answered by one of the statements alone but not by the other.

Choose (b) if the question can be answered by using either statement alone.

Choose (c) if the question can be answered by using both the statements together but cannot be answered using either statement alone.

Choose (d) if the question cannot be answered even by using both the statements A and B.

64. If A and B run a race, then A wins by 60 seconds. If B and C run the same race, then B wins by 30 seconds. Assuming that C maintains a uniform speed what is the time taken by C to finish the race?

A. A and C run the same race and A wins by 375 metres.

B. The length of the race is 1 km.

2004

65. Two boats, traveling at 5 and 10 kms per hour, head directly towards each other. They begin at a distance of 20 kms from each other. How far apart are they (in kms)one minute before they collide.

(a) $\frac{1}{12}$ (b) $\frac{1}{6}$

(c) $\frac{1}{4}$ (d) $\frac{1}{3}$

66. If a man cycles at 10 km/hr, then he arrives at a certain place at 1 p.m. If he cycles at 15 km/hr, he will arrive at the same place at 11 a.m. At what speed must he cycle to get there at noon?

(a) 11 km/hr (b) 12 km/hr

(c) 13 km/hr (d) 14 km/hr

67. Karan and Arjun run a 100-meter race, where Karan beats Arjun 10 metres. To do a favour to Arjun, Karan starts 10 metres behind the starting line in a second 100 metre race. They both run at their earlier speeds. Which of the following is true in connection with the second race?

(a) Karan and Arjun reach the finishing line simultaneously.

(b) Arjun beats Karan by 1 metre

(c) Arjun beats Karan by 11 metres.

(d) Karan beats Arjun by 1 metre.

68. A sprinter starts running on a circular path of radius r metres. Her average speed (in metres/minute) is πr during the first 30 seconds, $\frac{\pi r}{2}$ during next one minute, $\frac{\pi r}{4}$ during next 2 minutes, $\frac{\pi r}{8}$ during next 4 minutes, and so on. What is the ratio of the time taken for the nth round to that for the previous round?

(a) 4 (b) 8

(c) 16 (d) 32

2005

69. A jogging park has two identical circular tracks touching each other, and a rectangular track enclosing the two circles. The edges of the rectangles are tangential to the circles. Two friends, A and B, start jogging simultaneously form the point where one of the circular tracks touches the smaller side of the rectangular track. A jogs along the rectangular track, while B jogs along the two circular tracks in a figure of eight. Approximately, how much faster than A does B have to run, so that they take the same time to return to their starting point?

(a) 3.88% (b) 4.22%

(c) 4.44% (d) 4.72%

Directions for Questions 70 and 71: Answer the questions on the basis of the information given below.

Ram and Shyam run a race between points A and B, 5 km apart, Ram starts at 9 a.m from A at a speed of 5 km/hr, reaches B, and returns to A at the same speed, Shyam starts at 9:45 a.m. from A at a speed of 10 km/hr, reaches B and comes back to A at the same speed.

70. At what time do Ram and Shyam first meet each other?

(a) 10 a.m.

(b) 10:10 a.m.

(c) 10:20 a.m.

(d) 10:30 a.m.

71. At what time does Shyam over take Ram?

(a) 10:20 a.m

(b) 10:30 a.m

(c) 10:40 a.m

(d) 10:50 a.m

2006

72. Arun, Barun and Kiranmala start from the same place and travel in the same direction at speeds of 30, 40 and 60 km per hour respectively. Barun starts two hours after Arun. If Barun and Kiranmala overtake Arun at the same instant, how many hours after Arun did Kiranmala start?

(a) 3 (b) 3.5
(c) 4 (d) 4.5
(e) 5

2007

Directions for Questions 73 and 74: Answer the following questions based on the information given below:

Cities A and B are in different time zones. A is located 3000 km east of B. The table below describes the schedule of an airline operating non-stop flights between A and B. All the times indicated are local and on the same day.

Departure		Arrival	
City	Time	City	Time
B	8:00 am	A	3:00 pm
A	4:00 pm	B	8:00 pm

Assume that planes cruise at the same speed in both directions. However, the effective speed is influenced by a steady wind blowing from east to west at 50 km per hour.

73. What is the time difference between A and B?

(a) 1 hour and 30 minutes
(b) 2 hours
(c) 2 hours and 30 minutes
(d) 1 hour
(e) Cannot be determined

74. What is the plane's cruising speed in km per hour?

(a) 700
(b) 550
(c) 600
(d) 500
(e) Cannot be determined.

2008

75. Rahim plans to drive from city A to station C, at the speed of 70 km per hour, to catch a train arriving there from B. He must reach C at least 15 minutes before the arrival of the train. The train leaves B, located 500 km south of A, at 8:00 am and travels at a speed of 50 km per hour. It is known that C is located between west and northwest of B, with BC at 60° to AB. Also, C is located between south and southwest of A with AC at 30° to AB. The latest time by which Rahim must leave A and still catch the train is closest to

(a) 6 : 15 am (b) 6 : 30 am
(c) 6 :45 am (d) 7 : 00 am
(e) 7 : 15 am

MEMORY BASED QUESTIONS

2009

76. Chaupat, Popat and Sarpat participate in a race of 'x' m. Chaupat finishes 18 m ahead of Popat and 24 m ahead of Sarpat. Popat finishes 8 m ahead of Sarpat. If none of the three changes his running speed during the race, then what is the value of x?

(a) 54 (b) 48
(c) 90 (d) 72

77. Himanshu, Saral and Vikas start running from the same point in the same direction along a straight line at 07 : 00 a.m., 08 : 00 a.m. and 10 : 00 a.m. with speeds of 2 kmph, 3 kmph and 4 kmph respectively. When Saral catches Himanshu he sends Himanshu back (along the straight line) immediately to deliver a message to Vikas. At what time would Himanshu meet Vikas?

(a) 10 : 30 a.m. (b) 11 : 00 a.m.
(c) 10 : 40 a.m. (d) 11 : 15 a.m.

2010

78. P and Q are two points 100 km apart. A starts running from P towards Q at 10 km/hr. B starts running from Q at exactly the same time and in the same direction as that of A at 20 km/hr. After an hour, B turns back and changes his speed to 10 km/hr. After another hour, B again turns back and changes his speed to 20 km/hr. He keeps on changing his speed and direction in this manner till the time he meets A. After how much time will A and B meet for the first time?

(a) 30 hours (b) 18 hours
(c) 10 hours (d) 20 hours

2011

79. Pawan and Qureshi working together can do a piece of work in 10 days whereas Qureshi and Rohit working together can do the same work in 12 days. All three work together to do a job for which they are paid Rs. 300. If Qureshi's share is Rs. 140, then what is Pawan's share?

(a) Rs. 100 (b) Rs. 60
(c) Rs. 80 (d) Cannot be determined

80. Yamini and Zora are standing 25 km apart. Zora starts moving towards Yamini. After 40 minutes Yamini also starts moving towards Zora. By the time Yamini covers 5 km, Zora has covered 15 km. They meet at a point 7 km from the starting point of Yamini. What is the speed of Yamini?
(a) 7.5 km/h (b) 10.5 km/h
(c) 17.5 km/h (d) 6 km/h

2013

81. Once upon a time, the king of a jungle planned a 2-kilometre race between a rabbit and a tortoise. Soon after the start of the race, the rabbit took a huge lead. On realizing that even after taking a nap of 't' min, he would beat the tortoise by 13 min, he stooped under a tree and went to sleep. Meanwhile the tortoise kept walking. When the rabbit woke up, he realized that he had slept for (14 + t) min, and immediately started running towards the target at a speed $\frac{3}{2}$ times his original speed. The race eventually ended in a dead heat. If the ratio of the original speed of the rabbit to that of the tortoise was 6 : 1 and the rabbit overstretched his nap by $1\frac{1}{6}$t min, then how long did the tortoise take to complete the race?
(a) 24 min (b) 30 min
(c) 28 min (d) 36 min

2014

82. P, Q and R start walking from the same point. P and Q start at 1 PM and R starts at 3 PM. R takes over P at 5 PM and then doubles his speed and takes over Q after another hour. What is the ratio of speed of A and speed of B?
(a) 8 : 5 (b) 3 : 4
(c) 4 : 3 (d) 5 : 8

2015

83. There is a string of length 100 m running from east to west. 1000 ants are dropped onto the string. Assume that each ant lands on the string facing either the east or the west direction. As soon as they land, each ant starts moving in the direction which is being faced by it at 50 m/ min till it falls off the string. But if an ant collides with another ant coming from the opposite direction, both of them reverse their directions and proceed to move now in the opposite directions. Ants fall only at either of the ends of the string. What is the minimum time by which the string is definitely free of ants?
(a) 1 min (b) 2 min
(c) 200 min (d) Infinite time

84. In a rowing competition, first boat rows over the course at an average speed of 4 yards/second. Second boat rows over the first half of the course at the rate of $3\frac{1}{2}$ yards /second and over the remaining half at $4\frac{1}{2}$ yards/second, thereby reaching the winning post 15 seconds after the first boat. Find the time taken (in minutes) by the second boat to cover the entire course.

2016

85. Two friends – Prakash and Arpit – started running simultaneously from a point P in the same direction along a straight running track. The ratio of the speeds of Prakash and Arpit was 2 : 5 respectively. Two hours later, Arpit turned back and started running backwards at one-fifth of his original speed. He met Prakash at a distance of 10 km from the point P. What was Prakash's speed?
(1) 1.25 km/hr (2) 2.5 km/hr
(3) 3.75 km/hr (4) 6.25 km/hr

86. Anu and Prem started running simultaneously from diametrically opposite points on a circular track. They ran in opposite directions and met after 12 minutes for the first time. After how long (in minutes) would they meet for the seventh time?

2017

87. In a 10 km race. A, B, and C, each running at uniform speed, get the gold, silver, and bronze medals, respectively. If A beats B by 1 km and B beats C by 1 km, then by how many metres does A beat C?

88. Arun drove from home to his hostel at 60 miles per hour. While returning home he drove half way along the same route at a speed of 25 miles per hour and then took a bypass road which increased his driving distance by 5 miles, but allowed him to drive at 50 miles per hour along this bypass road. If his return journey took 30 minutes more than his onward journey, then the total distance traveled by him is
(a) 55 miles (b) 60 miles
(c) 65 miles (d) 70 miles

89. A motorbike leaves point A at 1 pm and moves towards point B at a uniform speed. A car leaves point B at 2 pm and moves towards point A at a uniform speed which is double that of the motorbike. They meet at 3:40 pm at a point which is 168 km away from A. What is the distance, in km, between A and B?
(a) 364 (b) 378
(c) 380 (d) 388

2018 Slot 1

90. Point P lies between points A and B such that the length of BP is thrice that of AP. Car 1 starts from A and moves towards B. Simultaneously, car 2 starts from B and moves towards A. Car 2 reaches P one hour after car 1 reaches P. If the speed of car 2 is half that of car 1, then the time, in minutes, taken by car 1 in reaching P from A is

91. Train T leaves station X for station Y at 3 pm. Train S, traveling at three quarters of the speed of T, leaves Y for X at 4 pm. The two trains pass each other at a station Z, where the distance between X and Z is three-fifths of that between X and Y. How many hours does train T take for its journey from X to Y?

92. The distance from A to B is 60 km. Partha and Narayan start from A at the same time and move towards B. Partha takes four hours more than Narayan to reach B. Moreover, Partha reaches the mid-point of A and B two hours before Narayan reaches B. The speed of Partha, in km per hour, is

(a) 3 (b) 4

(c) 6 (d) 5

2018 Slot 2

93. On a long stretch of east-west road, A and B are two points such that B is 350 km west of A. One car starts from A and another from B at the same time. If they move towards each other, then they meet after 1 hour. If they both move towards east, then they meet in 7 hrs. The difference between their speeds, in km per hour, is

94. Points A, P, Q and B lie on the same line such that P, Q and B are, respectively, 100 km, 200 km and 300 km away from A. Cars 1 and 2 leave A at the same time and move towards B. Simultaneously, car 3 leaves B and moves towards A. Car 3 meets car 1 at Q, and car 2 at P. If each car is moving in uniform speed then the ratio of the speed of car 2 to that of car 1 is

(a) 1 : 4

(b) 2 : 9

(c) 2 : 7

(d) 1 : 2

95. Points A and B are 150 km apart. Cars 1 and 2 travel from A to B, but car 2 starts from A when car 1 is already 20 km away from A. Each car travels at a speed of 100 kmph for the first 50 km, at 50 kmph for the next 50 km, and at 25 kmph for the last 50 km. The distance, in km, between car 2 and B when car 1 reaches B is

TIME AND WORK

1990

1. A, B and C individually can finish a work in 6, 8 and 15 hours respectively. They started the work together and after completing the work got Rs.94.60 in all. When they divide the money among themselves, A, B and C will respectively get (in Rs.)

(a) 44, 33, 17.60 (b) 43, 27.20, 24.40

(c) 45, 30, 19.60 (d) 42, 28, 24.60

1991

2. Alord got an order from a garment manufacturer for 480 Denim Shirts. He brought 12 sewing machines and appointed some expert tailors to do the job. However, many didn't report to duty. As a result, each of those who did, had to stitch 32 more shirts than originally planned by Alord, with equal distribution of work. How many tailors had been appointed earlier and how many had not reported for work?

(a) 12, 4 (b) 10, 3

(c) 10, 4 (d) None of these

3. Three machines, A, B and C can be used to produce a product. Machine A will take 60 hours to produce a million units. Machine B is twice as fast as Machine A. Machine C will take the same amount of time to produce a million units as A and B running together. How much time will be required to produce a million units if all the three machines are used simultaneously?

(a) 12 hours (b) 10 hours

(c) 8 hours (d) 6 hour

Direction for Question 4 : The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II, alone,

Mark (c) if both, statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

1993

4. Two types of widgets, namely type A and type B, are produced on a machine. The number of machine hours available per week is 80. How many widgets of type A must be produced?

I. One unit of type A widget requires 2 machine hours and one unit of type B widget requires 4 machine hours.

II. The widget dealer wants supply of at least 10 units of type A widget per week and he would not accept less than 15 units of type B widget.

5. A group of workers was put on a job. From the second day onwards, one worker was withdrawn each day. The job was finished when the last worker was withdrawn. Had no worker been withdrawn at any stage, the group would have finished the job in two-third the time. How many workers were there in the group?

(a) 2 (b) 3

(c) 5 (d) 11

1994

6. One man can do as much work in one day as a woman can do in 2 days. A child does one third the work in a day as a woman. If an estate-owner hires 39 pairs of hands, men, women and children in the ratio 6 : 5 : 2 and pays them in all Rs. 1,113 at the end of the days work. What must the daily wages of a child be, if the wages are proportional to the amount of work done?

(a) Rs.14 (b) Rs.5

(c) Rs.20 (d) Rs.7

7. A water tank has three taps A, B and C. A fills four buckets in 24 minutes, B fills 8 buckets in 1 hour and C fills 2 buckets in 20 minutes. If all the taps are opened together a full tank is emptied in 2 hours. If a bucket can hold 5 litres of water, what is the capacity of the tank?

(a) 120 litres (b) 240 litres

(c) 180 litres (d) 60 litres

8. There is a leak in the bottom of the tank. This leak can empty a full tank in 8 hours. When the tank is full, a tap is opened into the tank which admits 6 litres per hour and the tank is now emptied in 12 hours. What is the capacity of the tank?

(a) 28.8 litres (b) 36 litres

(c) 144 litres (d) Cannot be determined

Direction for Question 9 : The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II, alone,

Mark (c) if both, statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

9. A and B work at digging a ditch alternately for a day each. If A can dig a ditch in *'a'* days and B can dig that ditch in '*b*' days, will work get done faster if A begins the work?

I. n is a positive integer such that $n\left(\frac{1}{a}+\frac{1}{b}\right)=1$

II. b > a

1995

10. A group of men decided to do a job in 8 days. But since 10 men dropped out every day, the job got completed at the end of the 12th day. How many men were there at the beginning?

(a) 165 (b) 175

(c) 80 (d) 90

11. Two typists undertake to do a job. The second typist begins working one hour after the first. Three hours after the first typist has begun working, there is still $\frac{9}{20}$ of the work to be done. When the assignment is completed, it turns out that each typist has done half the work. How many hours would it take each one to do the whole job individually ?

(a) 12 hr and 8 hr (b) 8 hr and 5.6 hr

(c) 10 hr and 8 hr (d) 5 hr and 4 hr

1997

Directions for Questions 12 and 13: Answer the questions based on the following information.

The Weirdo Holiday Resort follows a particular system of holidays for its employees. People are given holidays on the days where the first letter of the day of the week is the same as the first letter of their names. All employees work at the same rate.

12. Raja starts working on February 25, 1996, and finishes the job on March 2, 1996. How much time would T and J take to finish the same job if both start on the same day as Raja?

(a) 4 days (b) 5 days

(c) Either (a) or (b) (d) Cannot be determined

13. Starting on February 25, 1996, if Raja had finished his job on April 2, 1996, when would T and S together likely to have completed the job, had they started on the same day as Raja?

(a) March 15, 1996 (b) March 14, 1996

(c) March 22, 1996 (d) Data insufficient

1998

14. A company has a job to prepare certain number cans and there are three machines A, B and C for this job. A can complete the job in 3 days, B can complete the job in 4 days, and C can complete the job in 6 days. How many days will the company take to complete the job if all the machines are used simultaneously?

(a) 4 days (b) $\frac{4}{3}$ days

(c) 3 days (d) 12 days

2001

15. A can complete a piece of work in 4 days. B takes double the time taken by A, C takes double that of B, and D takes double that of C to complete the same task. They are paired in groups of two each. One pair takes two-thirds the time needed by the second pair to complete the work. Which is the first pair?

(a) A and B (b) A and C

(c) B and C (d) A and D

16. There's a lot of work in preparing a birthday dinner. Even after the turkey is in the oven, there's still the potatoes and gravy, yams, salad, and cranberries, not to mention setting the table.Three friends — Asit, Arnold and Afzal — work together to get all of these chores done. The time it takes them to do the work together is 6 hr less than Asit would have taken working alone, 1 hr less than Arnold would have taken alone, and half the time Afzal would have taken working alone. How long did it take them to do these chores working together?

(a) 20 min (b) 30 min

(c) 40 min (d) 50 min

2002

17. It takes six technicians a total of 10 hr to build a new server from Direct Computer, with each working at the same rate. If six technicians start to build the server at 11 am, and one technician per hour is added beginning at 5 pm, at what time will the server be completed?

(a) 6.40 pm (b) 7 pm

(c) 7.20 pm (d) 8 pm

18. Three small pumps and a large pump are filling a tank. Each of the three small pump works at $\frac{2}{3}$ the rate of the large pump. If all four pumps work at the same time, they should fill the tank in what fraction of the time that it would have taken the large pump alone?

(a) $\frac{4}{7}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

2004

19. In Nuts And Bolts factory, one machine produces only nuts at the rate of 100 nuts per minute and needs to be cleaned for 5 minutes after production of every 1000 nuts. Another machine produces only bolts at the rate of 75 bolts per minute and needs to cleaned for10 minutes after production of every 1500 bolts. If both the machines start production at the same time, what is the minimum duration required for producing 9000 pairs of nuts and bolts?

(a) 130 minutes (b) 135 minutes

(c) 170 minutes (d) 180 minutes

2005

20. A chemical plant has four tanks (A, B, C and D), each containing 1000 litres of a chemical. The chemical is being pumped from one tank to anther as follows.

From A to B @ 20 litres/minute

From C to A @ 90 litres/minute

From A to D @ 10 litres/minute

From C to D @ 50 litres/minute

From B to C @ 100 litres/minute

From D to B @ 110 litres/minute

Which tank gets emptied first, and how long does it take (in minutes)to get empty after pumping starts?

(a) A, 16.66 (b) C, 20

(c) D, 20 (d) D, 25

MEMORY BASED QUESTIONS

2012

21. The radius of the cross-sections of pipes P_1 and P_2 are 7 m and 14 m respectively. Water flows through P_1 at a constant rate of 10 m/s and it can alone fill a tank in 2 hours. If P_1 is used as the inlet pipe and P_2 as the outlet pipe then together they fill the tank in 4 hours. What is the rate of water flow (in m/s) through P_2?

(a) 1.00 (b) 1.25

(c) 1.50 (d) 2.00

2013

22. Anushka and Anirudh working together can complete a piece of work in 20 days. They started the work together, but Anushka left after x days and Anirudh finished the remaining work in the next x/2 days. Had Anushka left after 3x/4 days, Anirudh would have taken x days to finish the remaining work. Find the ratio of the efficiency of Anushka to that of Anirudh.

(a) 2 : 3 (b) 3 : 2

(c) 2 : 1 (d) 1 : 1

2016

23. A contractor agreed to finish a piece of work in 150 days. He employed 75 men and made them work for 8 hours per day. However, after 90 days, he realized that only $\frac{2}{7}$th of the work was completed. How many more men would he need to employ to complete the work on time if he intended to make everybody work for 10 hours per day henceforth?

2017

24. A tank has an inlet pipe and an outlet pipe. If the outlet pipe is closed then the inlet pipe fills the empty tank in 8 hours. If the outlet pipe is open then the inlet pipe fills the empty tank in 10 hours. If only the outlet pipe is open then in how many hours the full tank becomes half-full?

(a) 20 (b) 30

(c) 40 (d) 45

2017

25. Amal can complete a job in 10 days and Bimal can complete it in 8 days. Amal, Bimal and Kamal together complete the job in 4 days and are paid a total amount of Rs 1000 as remuneration. If this amount is shared by them in proportion to their work, then Kamal's share, in rupees, is

(a) 100 (b) 200

(c) 300 (d) 400

2018 Slot 1

26. A tank is fitted with pipes, some filling it and the rest draining it. All filling pipes fill at the same rate, and all draining pipes drain at the same rate. The empty tank gets completely filled in 6 hours when 6 filling and 5 draining pipes are on, but this time becomes 60 hours when 5 filling and 6 draining pipes are on. In how many hours will the empty tank get completely filled when one draining and two filling pipes are on?

27. When they work alone, B needs 25% more time to finish a job than A does. They two finish the job in 13 days in the following manner: A works alone till half the job is done, then A and B work together for four days, and finally B works alone to complete the remaining 5% of the job. In how many days can B alone finish the entire job?

(a) 16 (b) 18

(c) 20 (d) 22

28. Humans and robots can both perform a job but at different efficiencies. Fifteen humans and five robots working together take thirty days to finish the job, whereas five humans and fifteen robots working together take sixty days to finish it. How many days will fifteen humans working together (without any robot) take to finish it?

(a) 45

(b) 32

(c) 40

(d) 36

2018 Slot 2

29. A water tank has inlets of two types A and B. All inlets of type A when open, bring in water at the same rate. All inlets of type B, when open, bring in water at the same rate. The empty tank is completely filled in 30 minutes if 10 inlets of type A and 45 inlets of type B are open, and in 1 hour if 8 inlets of type A and 18 inlets of type B are open. In how many minutes will the empty tank get completely filled if 7 inlets of type A and 27 inlets of type B are open?

30. Ramesh and Ganesh can together complete a work in 16 days. After seven days of working together, Ramesh got sick and his efficiency fell by 30%. As a result, they completed the work in 17 days instead of 16 days. If Ganesh had worked alone after Ramesh got sick, in how many days would he have completed the remaining work?

(a) 12 (b) 13.5

(c) 14.5 (d) 11

31. A tank is emptied everyday at a fixed time point. Immediately thereafter, either pump A or pump B or both start working until the tank is full. On Monday, A alone completed filling the tank at 8 pm. On Tuesday, B alone completed filling the tank at 6 pm. On Wednesday, A alone worked till 5 pm, and then B worked alone from 5 pm to 7 pm, to fill the tank. At what time was the tank filled on Thursday if both pumps were used simultaneously all along?

(a) 4:48 pm (b) 4:24 pm

(c) 4:36 pm (d) 4:12 pm

MISCELLANEOUS

1990

1. I brought 30 books on Mathematics, Physics, and Chemistry, priced at Rs.17, Rs.19, and Rs.23 per book respectively, for distribution among poor students of Standard X of a school. The physics books were more in number than the Mathematics books but less than the Chemistry books, the difference being more than one. The total cost amounted to Rs.620. How many books on Mathematics, Physics, and Chemistry could have been bought respectively?

(a) 5, 8, 17 (b) 5, 12, 13

(c) 5, 10, 15 (d) 5, 6, 19

2. The last time Rahul bought Diwali cards, he found that the four types of cards that he liked were priced Rs.2.00, Rs.3.50, Rs.4.50 and Rs.5.00 each. As Rahul wanted 30 cards, he took five each of two kinds and ten each of the other two, putting down the exact number of 10 rupees notes on the payment counter. How many notes did Rahul give?

(a) 8 (b) 9

(c) 10 (d) 11

Direction for Question 3: The question is followed by two statements, I and II. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II alone,

Mark (c) if both the statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

1991

3. X says to Y, "I am 3 times as old as you were 3 years ago". How old is X?

I. Y's age 17 years from now will be same as X's present age.

II. X's age nine years from now is 3 times Y's present age.

1994

4. Two towns A and B are 100 km apart. A school is to be built for 100 students of town B and 30 students of Town A. Expenditure on transport is Rs. 1.20 per km per student. If the total expenditure on transport by all 130 students is to be as small as possible, then the school should be built at

(a) 33 km from Town A. (b) 33 km from Town B

(c) Town A (d) Town B

5. It takes the pendulum of a clock 7 seconds to strike 4 o'clock. How much time will it take to strike 11 o'clock?

(a) 18 seconds (b) 20 seconds

(c) 19.25 seconds (d) 23.33 seconds

Direction for Question 6 : Data is provided followed by two statements – I and II – both resulting in a value, say I and II. As your answer,

Mark (a) if I > II.

Mark (b) if I < II.

Mark (c) if I = II.

Mark (d) if nothing can be said.

6. Last week Martin received $ 10 in commission for selling 100 copies of a magazine. Last week Miguel sold 100 copies of this magazine. He received his salary of $ 5 per week plus a commission of 2 cents for each of the first 25 copies sold, 3 cents for each of next 25 copies sold and 4 cents for each copy thereafter. ($1 = 100 cents).

I. Martin's commission in the last week.

II. Miguel's total income for last week.

Direction for Question 7 : The question is followed by two statements. As the answer,

Mark (a) if the question can be answered with the help of statement I alone,

Mark (b) if the question can be answered with the help of statement II, alone,

Mark (c) if both, statement I and statement II are needed to answer the question, and

Mark (d) if the question cannot be answered even with the help of both the statements.

7. Ten boys go to a neighbouring orchard. Each boy steals a few mangoes. What is the total number of mangoes they steal?

I. The first boy steals 4 mangoes and the fourth boy steals 16 mangoes and the eight boy 32 mangoes and the tenth boy steals 40 mangoes.

II. The first boy stole the minimum number of mangoes and the tenth boy stole the maximum number of mangoes.

1996

8. Once I had been to the post office to buy five-rupee, two-rupee and one-rupee stamps. I paid the clerk Rs. 20, and since he had no change, he gave me three more one-rupee stamps. If the number of stamps of each type that I had ordered initially was more than one, what was the total number of stamps that I bought?

(a) 10 (b) 9

(c) 12 (d) 8

Directions for Questions 9 and 10: Answer the questions based on the following information.

A salesman enters the quantity sold and the price into the computer. Both the numbers are two-digit numbers. But, by mistake, both the numbers were entered with their digits interchanged. The total sales value remained the same, i.e. Rs. 1,148, but the inventory reduced by 54.

9. What is the actual price per piece?

(a) Rs. 82 (b) Rs. 41

(c) Rs. 6 (d) Rs. 28

10. What is the actual quantity sold?

(a) 28 (b) 14

(c) 82 (d) 41

11. Out of two-thirds of the total number of basketball matches, a team has won 17 matches and lost 3 of them. What is the maximum number of matches that the team can lose and still win more than three-fourths of the total number of matches, if it is true that no match can end in a tie?

(a) 4 (b) 6

(c) 5 (d) 3

Directions for Questions 12 and 13: Answer the questions based on the following information.

Production pattern for number of units (in cubic feet) per day.

Day	1	2	3	4	5	6	7
Number of units	150	180	120	250	160	120	150

For a truck that can carry 2,000 cubic ft, hiring cost per day is Rs. 1,000. Storing cost per cubic feet is Rs. 5 per day.

1998

12. If all the units should be sent to the market, then on which days should the trucks be hired to minimize the cost?

(a) 2nd, 4th, 6th, 7th

(b) 7th

(c) 2nd, 4th, 5th, 7th

(d) None of these

13. If the storage cost is reduced to Re. 0.80 per cubic feet per day, then on which day(s), should the truck be hired?

(a) 4th (b) 7th

(c) 4th and 7th (d) None of these

14. You can collect as many rubies and emeralds as you can. Each ruby is worth Rs. 4 crore and each emerald is worth Rs. 5 crore. Each ruby weighs 0.3 kg. And each emerald weighs 0.4 kg. Your bag can carry at the most 12 kg. What should you collect to get the maximum wealth?

(a) 20 rubies and 15 emeralds

(b) 40 rubies

(c) 28 rubies and 9 emeralds

(d) None of these

15. My son adores chocolates. He likes biscuits. But he hates apples. I told him that he can buy as many chocolates he wishes. But then he must have biscuits twice the number of chocolates and should have apples more than biscuits and chocolates together. Each chocolate cost Re. 1. The cost of apple is twice the chocolate and four biscuits are worth one apple. Then which of the following can be the amount that I spent on that evening on my son if number of chocolates, biscuits and apples brought were all integers?

(a) Rs. 34

(b) Rs. 33

(c) Rs. 8

(d) None of these

Direction for Question 16: The question is followed by two statements, I and II. Answer the questions based on the statements and mark the answer as:

(a) if the question can be answered with the help of any one statement alone but not by the other statement.

(b) if the question can be answered with the help of either of the statements taken individually.

(c) if the question can be answered with the help of both statements together.

(d) if the question cannot be answered even with the help of both statements together.

16. What is the price of tea?

I. Price of coffee is Rs. 5 more than that of tea.

II. Price of coffee is Rs. 5 less than the price of a cold drink which cost three times the price of tea.

1999

Directions for Questions 17 to 19: Answer the questions based on the following information.

Ten coins are distributed among four people P, Q, R and S such that one of them gets one coin, another gets two coins, the third gets three coins and the fourth gets four coins. It is known that Q gets more coins than P, and S gets fewer coins than R.

17. If the number of coins distributed to Q is twice the number distributed to P, then which one of the following is necessarily true?

(a) R gets an even number of coins.

(b) R gets an odd number of coins.

(c) S gets an even number of coins.

(d) S gets an odd number of coins.

18. If R gets at least two more coins than S, then which one of the following is necessarily true?

(a) Q gets at least two more coins than S.

(b) Q gets more coins than S.

(c) P gets more coins than S.

(d) P and Q together get at least five coins.

19. If Q gets fewer coins than R, then which one of the following is not necessarily true?

(a) P and Q together get at least four coins.

(b) Q and S together get at least four coins.

(c) R and S together get at least five coins.

(d) P and R together get at least five coins.

Directions for Questions 20 and 21: Answer the questions based on the following information.

There are blue vessels with known volumes $v_1, v_2, ..., v_m$, arranged in ascending order of volume, $v_1 > 0.5$ litre, and $v_m < 1$ litre. Each of these is full of water initially. The water from each of these is emptied into a minimum number of empty white vessels, each having volume 1 litre. The water from a blue vessel is not emptied into a white vessel unless the white vessel has enough empty volume to hold all the water of the blue vessel. The number of white vessels required to empty all the blue vessels according to the above rules was n.

20. Among the four values given below, which is the least upper bound on e, where e is the total empty volume in the white vessels at the end of the above process?

(a) mv_m

(b) $m(1 - v_m)$

(c) mv_1

(d) $m(1 - v_1)$

21. Let the number of white vessels needed be n_1 for the emptying process described above, if the volume of each white vessel is 2 litres. Among the following values, which is the least upper bound on n_1?

(a) $\frac{m}{4}$

(b) Smallest integer greater than or equal to $\left(\frac{n}{2}\right)$

(c) n

(d) Greatest integer less than or equal to $\left(\frac{n}{2}\right)$

MEMORY BASED QUESTIONS

2011

22. What are the last two digits of 9483^{67483}?

(a) 21 (b) 87

(c) 27 (d) None of these

2013

23. During his trip to England, Mr. Clockilal, a horologist, decided to visit 'The Cuckooland Museum' dedicated to the exhibition of cuckoo clocks. He entered the museum between 12 noon and 1 p.m. The moment he entered the museum, he observed that the angle between the minute hand and the hour hand of one of the clocks was 20°. While leaving the museum, he observed that the angle between the minute hand and the hour hand of the same clock was 220°. If he spent more than 3 hours and less than 4 hours in the museum, then how much time did he exactly spend in the museum?

(a) 3 hours $52\frac{8}{11}$ minutes

(b) 3 hours $53\frac{4}{11}$ minutes

(c) 3 hours $38\frac{2}{11}$ minutes

(d) Either (a) or (c)

24. Muniram made an investment of 10 lakh in Axim Dynamic Bond. The variation in fund value of the bond with respect to time follows a polynomial with degree 2. Due to precarious market condition, the fund value of the investment becomes 50% of the investment at the end of 2nd year. If the fund value becomes 150% of the investment at the end of 4th year, then what is the absolute difference (in lakh) between the investment and the fund value of the bond at the end of 8th year?

(a) 80 (b) 70

(c) 75 (d) 60

ANSWERS

Percentages and Fraction

1. (a)	**2.** (c)	**3.** (c)	**4.** (b)	**5.** (a)	**6.** (d)	**7.** (b)	**8.** (c)	**9.** (a)	**10.** (c)
11. (d)	**12.** (a)	**13.** (d)	**14.** (b)	**15.** (b)	**16.** (c)	**17.** (b)	**18.** (b)	**19.** (d)	**20.** (d)
21. (b)	**22.** (a)	**23.** (d)	**24.** (b)	**25.** (c)	**26.** (a)	**27.** (e)	**28.** (a)	**29.** (c)	**30.** (c)
31. (d)	**32.** (a)	**33.** (c)	**34.** (c)	**35.** (c)	**36.** (b)	**37.** (c)	**38.** (d)		

Profit, Loss and Discount

1. (c)	**2.** (a)	**3.** (b)	**4.** (b)	**5.** (a)	**6.** (a)	**7.** (b)	**8.** (b)	**9.** (b)	**10.** (a)
11. (c)	**12.** (d)	**13.** (a)	**14.** (a)	**15.** (b)	**16.** (a)	**17.** (a)	**18.** (d)	**19.** (c)	**20.** (c)
21. (b)	**22.** (a)	**23.** (a)	**24.** (2000)	**25.** (b)	**26.** (a)	**27.** (d)			

Ratio and Proportion

1. (c)	**2.** (a)	**3.** (c)	**4.** (b)	**5.** (c)	**6.** (b)	**7.** (a)	**8.** (d)	**9.** (d)	**10.** (b)
11. (c)	**12.** (a)	**13.** (c)	**14.** (b)	**15.** (c)	**16.** (a)	**17.** (c)	**18.** (d)	**19.** (c)	**20.** (a)
21. (c)	**22.** (a)	**23.** (e)	**24.** (b)	**25.** (b)	**26.** (b)	**27.** (c)	**28.** (d)	**29.** (a)	

Average

1. (a) **2.** (a) **3.** (d) **4.** (d) **5.** (c) **6.** (c) **7.** (b) **8.** (a) **9.** (d) **10.** (b)
11. (b) **12.** (c) **13.** (a) **14.** (b) **15.** (a) **16.** (b) **17.** (d) **18.** (e) **19.** (c) **20.** (210)
21. (c) **22.** (60) **23.** (c) **24.** (105)

Simple Interest and Compound Interest

1. (b) **2.** (c) **3.** (a) **4.** (c) **5.** (d) **6.** (d) **7.**12 **8.** (121000) **9.** (4000)

Mixture and Solutions

1. (b) **2.** (d) **3.** (a) **4.** (c) **5.** (a) **6.** (d) **7.** (b) **8.** (c) **9.** (245) **10.** (a)
11. (b) **12.** (c) **13.** (b) **14.** (b) **15.** (a) **16.** (a) **17.** (c) **18.** (d)

Time speed and distance

1. (d) **2.** (c) **3.** (c) **4.** (d) **5.** (b) **6.** (d) **7.** (d) **8.** (a) **9.** (d) **10.** (c)
11. (d) **12.** (c) **13.** (b) **14.** (c) **15.** (c) **16.** (a) **17.** (d) **18.** (b) **19.** (d) **20.** (c)
21. (a) **22.** (b) **23.** (c) **24.** (b) **25.** (c) **26.** (c) **27.** (b) **28.** (a) **29.** (a) **30.** (c)
31. (b) **32.** (b) **33.** (c) **34.** (d) **35.** (d) **36.** (c) **37.** (b) **38.** (b) **39.** (a) **40.** (b)
41. (c) **42.** (a) **43.** (a) **44.** (d) **45.** (d) **46.** (b) **47.** (a) **48.** (b) **49.** (b) **50.** (b)
51. (a) **52.** (c) **53.** (d) **54.** (d) **55.** (c) **56.** (c) **57.** *(b) **58.** (a) **59.** (b) **60.** (c)
61. (c) **62.** (d) **63.** (c) **64.** (c) **65.** (c) **66.** (b) **67.** (d) **68.** (c) **69.** (d) **70.** (b)
71. (b) **72.** (c) **73.** (d) **74.** (b) **75.** (b) **76.** (d) **77.** (b) **78.** (d) **79.** (a) **80.** (a)
81. (b) **82.** (d) **83.** (b) **84.** 16 **85.** (b) **86.** 156 **87.** (1900) **88.** (c) **89.** (b) **90.** (b)
91. (15) **92.** (d) **93.** (50) **94.** (a) **95.** (5)

Time and Work

1. (a) **2.** (c) **3.** (b) **4.** (c) **5.** (b) **6.** (d) **7.** (b) **8.** (c) **9.** (a) **10.** (a)
11. (c) **12.** (c) **13.** (c) **14.** (b) **15.** (d) **16.** (c) **17.** (d) **18.** (b) **19.** (c) **20.** (c)
21. (b) **22.** (d) **23.** 150 **24.** (a) **25.** (a) **26.** (10) **27.** (c) **28.** (b) **29.** (48) **30.** (b)
31. (b)

Miscellaneous

1. (c) **2.** (d) **3.** (a) **4.** (d) **5.** (d) **6.** (a) **7.** (d) **8.** (a) **9.** (b) **10.** (a)
11. (a) **12.** (c) **13.** (b) **14.** (b) **15.** (a) **16.** (c) **17.** (d) **18.** (b) **19.** (a) **20.** (d)
21. (b) **22.** (b) **23.** (d) **24.** (b)

EXPLANATIONS

Percentages and Fraction

1. a Let there be 100 products in the stockpile. Hence, products from M1 = 40, from M2 = 30 and from M3 = 30. Number of defective products from M1 = 0.03 x 40 = 1.2, from M2 = 0.01 x 30 = 0.3 and from M3 = 0.05 x 30 = 1.5.

Therefore, total number of defective products =3, Percentage of defective stockpile = 3.

2. c Let Gopal have Rs. 400. The price of an orange and that of a mango would be Rs.8 and Rs.10 respectively.

If he keeps 10% of the money for taxi fare, he is left with Rs.360.

Now if he buys 20 mangoes i.e. if he spends Rs. 200, he is left with Rs. 160, for which he can buy 20 oranges.

3. c Let the number of TVs and VCRs bought be t and v respectively. Therefore,

$t + v \le 100$ ... (i)

$10000t + 15000v \le 1200000 \Rightarrow 2t + 3v \le 240$ ... (ii)

Profit = 2000t + 2500v, to maximize profit we have to maximize v.

From (i) and (ii),

$2(100 - v) + 3v \le 240$

$v \le 40$ and $t \le 60$

For maximum profit: t = 60 and v = 40.

4. b Let the number of TVs and VCRs bought be t and v respectively. Therefore,

$t + v \le 120$ ... (i)

$10000t + 15000v \le 1200000 \Rightarrow 2t + 3v \le 240$ ... (ii)

Profit = 2000t + 2500v, to maximize profit we have to maximize v.

From (i) and (ii),

$2(120 - v) + 3v \le 240$

$v \le 0$ and $t \le 120$

For maximum profit: t = 120 and v = 0.

Required ratio = 0.

5. a Let the number of TVs and VCRs bought be t and v respectively. Therefore,

$t + v \le 100$ ... (i)

$10000t + 15000v \le 1200000 \Rightarrow 2t + 3v \le 240$ ... (ii)

Profit = 2200t + 3300v,

to maximize profit we have to maximize v.

From (i) and (ii),

$2(100 - v) + 3v \le 240$

$v \le 40$ and $t \le 60$

For maximum profit: t = 60 and v = 40.

Required profit = 2200 × 60 + 3300 × 40

= Rs.2.64 lakhs.

6. d Let 'p' people be born everyday. Since February 29 comes once in 4 years. In 20th century there were 25 leap years, hence number of people born on 29th February = 25p. Total number of people born in the century = (25 x 366 x p) + (75 x 365 x p) = 36525p. Therefore, percentage of people born on 29th February $= \frac{25}{36525} \times 100 = 0.0684$.

HINT: Students please note that this could well be solved by taking 1 set of leap year as well. In other words, in a 4 year period in 20th century number of people born = (3 x 365 x p) + 366p = 1461p and number of people born on 29th February in this 4 year period = p.

Hence, required percentage = $\frac{1}{1461} \times 100 = 0.0684$.

Thus the period has no significance in this problem.

7. b Let the amount with Gopal be Rs. 400. Therefore, price of an orange is then Rs. 8 and that of a mango is Rs.10. If he keeps 10% of the money for taxi fare, he is left with Rs.360. Now if he buys 20 mangoes, then he spends on mangoes Rs. 200. Now he is left with Rs.160, in which he can buy 20 oranges.

8. c Since the inflation rate is 8% in both the years 1994 and 1995, therefore, the rate of increase of the price of sugar is 10%.

$\therefore$ Price of sugar on January 1, 1996 = Price of sugar on January 1, 1994 $\times \left(1 + \frac{10}{100}\right)^2 = 20 \times 1.21$

= Rs.24.20 per kg.

9. a The total number of the characters = (20 x 55 x 65).

Let the number of pages in the new format be n.

Thus, the total number of the characters

= (65 x 70 x n).

Since the total number of the characters remains same, therefore, $n \approx 16$.

Hence, the required percentage

$= \frac{20 - 16}{20} \times 100 = 20\%$.

10. c Let x be the number of votes not cast for Praja Party in the previous polls.

So the number of votes not cast for the party in this assembly polls would be 1.25x.

Margin of victory in the previous polls

= (Votes cast) – (Votes not cast)

= (260000 – x) – x = (260000 – 2x).

Margin of loss in this years polls

= 1.25x – (260000 – 1.25x)

= (2.5x – 260000).

As per the given information,

margin of loss this year = 2 × Margin of victory last year.

Therefore, (2.5x – 260000) = 2(260000 – 2x).

$\Rightarrow$ x = 120000.

So the number of votes cast for the party in assembly election = 260000 – 120000 = 140000.

11. d Let us assume that the person has Rs.100.

With this, he can buy 50 oranges or 40 mangoes.

In other words, the price of an orange is Rs.2 and that of a mango is Rs.2.50.

If he decides to keep 10% of his money for taxi fare, he would be left with Rs.90.

Now if he buys 20 mangoes, he would spend Rs.50 and will be left with Rs.40.

Thus, he can buy 20 oranges.

12. a Let there be 100 voters in all.

Initially, 40 of these promised to vote for P, while 60 of them promised to vote for Q.

On the last day, (15% of 40) = 6 voters went back of their promise and voted for Q.

Also, 25% of 60 = 15 voters shifted their interest from Q to P.

So finally, P end up getting (40 – 6 + 15) = 49 votes and Q end up getting (60 – 15 + 6) = 51 votes.

Hence, margin of victory for Q = (51 – 49) = 2, which is true. Hence, there were 100 voters in all.

13. d Required cost $= 6\left[1+\frac{1000}{100}\right]^2$

$= 6(11)^2 = 121 \times 6 = 726.$

14. b Statement II in itself suggests the price of a banana. Since we can buy 48 bananas in Rs.12, price of a banana = Re.0.25. And since this price is after 50% reduction, the actual price of a banana = Re.0.5.

15. b Let us look at the two equations. Let (5 pens + 7 pencils + 4 erasers)cost Rs. x. Hence, (6 pens + 14 pencils + 8 erasers)will cost Rs. 1.5x. Had, in the second case, Rajan decided to buy 10 pens instead of 6, the quantity of each one of them would have doubled over the first case and hence it would have cost me Rs. 2x. So (10 pens + 14 pencils + 8 erasers)= Rs. 2x. Now subtracting the second equation from the third, we get 4 pens cost Rs. 0.5x. Since 4 pens cost Re 0.5x, 5 of them will cost Re 0.625x. This is the amount that I spent on pens. Hence, fraction of the total amount paid = 0.625 = 62.5%.

16. c This can simply be solved by multiplying the two multiplication factors to get the effective multiplication factor. E.g. multiplication factor for 30% increase = 1.30. Multiplication factor for 20% decrease = 0.8.

Hence, 1.30 × 0.8 = 1.04. This multiplication factor (i.e. 1.04)indicates that there is a 4% increase in total revenue.

So the answer is +4%.

Alternative method:

By using the formula $x + y + \frac{xy}{100}$

$\therefore$ x = +30%; y = – 20%

$\Rightarrow 30 + 60 + \frac{50(-20)}{100} = 30 - 20 - 6 = +4\%.$

17. b 20 kg fresh grapes will contain (0.9 × 20) = 18 kg water and 2 kg mass. If the dry grape has to contain 2 kg mass, it should constitute 80% of that. Hence, if 80% of dry grapes corresponds to 2 kg, its total weight will be $\left(\frac{2}{0.8}\right)$ = 2.5 kg.

18. b The two equations can be written as:

$2000\left(\frac{x}{100}\right) + 2000\left(\frac{y}{100}\right) = 700$

and $2000\left(\frac{x}{100}\right) + 3000\left(\frac{y}{100}\right) = 900$

The equations can be simplified to x + y = 35 and 2x + 3y = 90. Solving these two equations simultaneously, we get x = 15%.

19. d Even by using both the statements, we can only find out the proportion of the paper solved by Radha and Rani. In the light of the fact that the number of questions solved by either or both of them is not given, we cannot answer the question asked.

20. d Men Women

40% 60%

Out of 40% men, 75% earn more than Rs. 25,000.

Hence, 30% of the company (men) earn more than Rs. 25,000.

But, in all 45% of the employees earn more than Rs. 25,000.

Hence, among women 15% earn more than Rs. 25,000 and the remaining (60 – 15)% earn less than or equal to Rs. 25,000.

Therefore, the fraction of women = $\frac{45}{60} = \frac{3}{4}$.

21. b Total 400 million is for 64.75% of the population. Hence, total population is 617.76 million. Let females be F and males be M. Then $\frac{F}{M} = 0.96$ (in the class below 15).

Total population in the range is approximately 185.32 million. Hence, number of females is 90.8 million.

22. a In first updown cycle, the reduction price is Rs. 441. According to this, (b)and (d) are removed. Now we have to analyse (c), if the original price is Rs. 2,500, then after first operation, the price will be 2500 – 441= Rs. 2,059.

In second operation, it will come down to around Rs. $1688\left[\text{here decrease\%} = \frac{441}{2500} \times 100 \approx 18\%\right]$.

So the value is not equivalent to Rs. 1,944.81.

Hence, option (a) is the answer.

23. d Statement I gives a general figure of Ram and Gopal.

Statement II does not give any idea of how many apples Ram and Gopal purchased.

Both statements together also cannot give any result.

24. b Mayank paid $\frac{1}{2}$ of the sum paid by other three.

$\Rightarrow$ Mayank paid $\frac{1}{3}$ rd of the total amount = \$20.

Similarly, Mirza paid \$15 and Little paid \$12.

Remaining amount of \$60 – \$20 – \$15 – \$12 = \$13 is paid by Jaspal.

25. c Given that Shephard had 9 dozens of goat at the end of 1998.

$\therefore$ Number of goats at the beginning of 1999 = (1 + p%) 9 dozens

He sells off q% of this at the end of the year 1999.

$\therefore$ Number of goats at the end of 1999 = (1 – q%) (1 + p%) 9 dozens

Since every year the same process is repeated and at the end of 2002, he has the same number as at the end of 1998,

we can get that (1 + p%)(1 – q%) = 1

$\Rightarrow$ 1 + p – q – pq = 1

$\Rightarrow$ p – q = pq

$\Rightarrow$ p > q (Since p > 0 and q > 0)

26. a Let incomes of Zakib and Supriyo be Z and S respectively.

Statement A: 20% of Z > 25% of S $\Rightarrow$ $Z > \frac{5}{4}S$

Now, Zakia spent 30% of his income on education

= 30% of Z > $\frac{30}{100} \times \frac{5}{4} S = 0.375S$

From this we cannot say if 0.3 Z is greater than or less than 0.4 S.

Hence, statement A alone is not sufficient.

Statement B: 13% of S > 10% of Z

Multiplying both sides by 3, we get,

39% of S > 30% of Z

So 40% of S is definitely more than 30% of Z.

Hence, statement B alone is sufficient.

27. e Let the initial length, breadth and height of the room be 3x, 2x and x respectively.

Initial area of the four walls = 2 (3x + 2x) x = $10x^2$

The new dimensions are: length = 6x, breadth = x and height $= \frac{x}{2}$.

New area of the four walls = $2(6x + x)\frac{x}{2} = 7x^2$

Therefore, percentage decrease

$$= \frac{10x^2 - 7x^2}{10x^2} \times 100 = 30\% .$$

28. a From statement A, it is clear that 40% of top academic performers are athletes and that is equal to 10. So total number of academic performers can be calculated.

Statement B does not provide any relevant information.

So the answer is (a).

29. c Statement A alone is sufficient because 10% of the female employees have engineering background, 70% of the employees are females, so 7% of the employees are female and having engineering background. Hence, 18% of the employees are male and having engineering background. From statement B, we know the number of male employees having engineering background. So, the percentage of male employees having engineering background can be calculated. So, the answer is (c).

30. c As he wants to save 10% of the total money, he can buy either 45 mangoes or 36 oranges. If he buys exactly 20 oranges then he can buy 16 more oranges with the money left.

Let M be the price of a mango and O be the price of an orange.

So $45\,M = 36\,O$

$\Rightarrow O = \frac{5}{4}M$

$\Rightarrow 16\,O = 16 \times \frac{5}{4}M$

$\Rightarrow 16\,O = 20\,M$

So he can buy 20 mangoes with the money left.

31. d Volume of water in the 40 ml taken from the first alcohol-water mixture $= \left(\frac{y}{100+y}\right) \times 40$ ml

Volume of water in the 2y ml taken from the second alcohol-water mixture $= (1 - 0.26) \times 2y = 1.48y$ ml.

Total volume of the two mixtures taken

$= (40 + 2y)$ ml.

Hence, $\frac{\left(\frac{y}{100+y}\right) \times 40 + 1.48y}{40 + 2y} = \frac{2y}{100}$

Solving the above equation for y, we get

$y = 25$ or -108 (which is rejected)

Note: Instead of solving for y, the value can also be obtained by simply substituting the options in the last equation.

32. a **Note:** A.M. $\geq$ G.M.

$$\frac{4P+4P+4P+R+R+R+2Q+2Q}{8} \geq \sqrt[8]{256 \times P^3R^3Q^2}$$

$$\frac{12P+3R+4Q}{8} \geq 2\sqrt[8]{P^3R^3Q^2}$$

$$16 \geq 16\sqrt[8]{P^3R^3Q^2}$$

$1 \geq \sqrt[8]{P^3R^3Q^2}$ or $1 \geq P^3R^3Q^2$.

33. c Suppose the contractor had x trucks.

So, we have $\frac{x+8}{x-8} = \frac{3}{2}$

$\Rightarrow x = 40$

34. c List price first increases by 10% and then decreases by 10%.

$$\Rightarrow \left(\frac{100+10}{100}\right) \times \left(\frac{100-10}{100}\right) \times \text{initial list price} = \text{final list price}$$

$\Rightarrow$ Initial list price $= \frac{20 \times 100^2}{100^2 - 10^2}$

35. c Let the number of female employees in factory A and the number of male employees in factory B be 2a and 5b respectively. Therefore, the number of male employees in factory A and that of female employees in factory B will be 3a and 3b respectively.

$\therefore \quad 3b = 3a + 60$

$\Rightarrow \quad b - a = 20 \quad \ldots(i)$

Total number of male employees in the two factories put together

$= 3a + 5b.$

$= 3a + 5 \times (20 + a)$

$= 8a + 100.$

Among the given options, only $8a + 100 = 320$ will not give a positive integer value of 'a'.

36. b Let total shirts produced = 100x

Defective = 15x

Rest = 85x

Shirts sold in domestic market = 17x

Remaining shirts = 68x

So, $68x = 8840$

$\Rightarrow 100x = 13000.$

37. c The required percentage $= \left(\frac{40}{127} - 1\right) \times 100 = 10\%$

38. d According to the question,

$$36 = \left(1 - \frac{68}{100}\right)\left(\frac{45}{100}N\right)$$

$$36 = \frac{32}{100} \times \frac{45}{100} \times N$$

$\Rightarrow \quad N = 250$

Hence, $243 \leq N \leq 252$

Profit, Loss and Discount

1. c The statement I only gives the comparison of the selling prices. You must realise that this information is not enough to answer the question as the profit also depends on cost. So we also need to analyze the statement II. And since there is no other constraint on production, we can solely compare the profitability of two products on the basis of labour. According to it, if 10 units of labour is available, it can produce 5 units of Q and 2 units of R. So, from 10 units of labour, I can earn (5 x 1)= 5 units of sales revenue from Q and (2 x 4)= 8 units of sales revenue from R. So by taking both statements together we can determine which would be more profitable.

2. a 16 articles sold at priced 12 articles, is equivalent to discount of $\left[\left(\frac{16-12}{16}\right) \times 100\right] = 25\%$

Hence, shop keepers offer two discounts of 20% and 25% respectively and still makes a profit of 20%.

If c is the cost price of an article and m is the marked price, then $1.2 \times c = m \times \frac{3}{4} \times \frac{4}{5}$

$\Rightarrow$ m = 2c.

This means that he had marked his goods 100% above his cost price.

3. b P = (SP – CP)x Sales. From the data given in the question we can figure out that P1 = (1.1SP – CP) x 0.9Sales.

Hence, $\frac{P}{P1} = \frac{1.11(SP - CP)}{(1.1SP - CP)}$.

To find this ratio we need to eliminate the variables CP & SP. This can only be done if in the denominator, CP is replaced by 1.1CP. In other words, if the CP increases by 10%, as in that case our ratio will be $\frac{1.11}{1.1}$ = 1.01.

Hence, only statement II is required to answer the question.

4. b Profit percentage in each case is

(i) 10%

(ii) $\frac{100 \times 100}{900} = \frac{100}{9}\%$

(iii) $\frac{100 \times 1.1 - 100}{100} \times 100 = 10\%$

(iv) $\frac{10 \times 100}{95} = \frac{200}{19}\%$

5. a It is clear that only statement I is required to answer the question, if CP = 0.8 SP, then SP = $\left(\frac{1}{0.8}\right)$ CP.

$\therefore$ SP = 1.25 CP

Thus, profit percentage is 25.

6. a Let the price per metre of cloth be Re 1. The shopkeeper buys 120 cm, but pays for only 100 cm. In other words, he buys 120 cm for Rs. 100.

So his CP = $\left(\frac{100}{120}\right)$ = Re 0.833 per metre. Now he sells 80 cm, but charges for 100 cm. In other words, he sells 80 cm for Rs. 100. On this he offers a 20% discount on cash payment. So he charges Rs. 80 for 80 cm cloth. In other words, his SP = $\left(\frac{80}{80}\right)$ = Re 1 per metre. So his percentage profit in the overall transaction = $\frac{(1 - 0.833)}{0.833}$ = 20%.

7. b Total expense incurred in making 1,500 watches = (1500 x 150)+ 30000 = Rs. 2,55,000.

Total revenue obtained by selling 1,200 of them during the season = (1200 × 250) = Rs. 3,00,000. The remaining 300 of them has to be sold by him during off season.

The total revenue obtained by doing that = (300 × 100) = Rs. 30,000.

Hence, total revenue obtained = (300000 + 30000) = Rs. 3,30,000.

Hence, total profit = (330000 – 255000) = Rs. 75,000.

8. b From the previous solution, we can see that the total expense incurred by him in manufacturing 1,500 watches = Rs.2,55,000. In order to break-even, he has to make a minimum revenue in order to recover his expenditure. He gets Rs. 250 per watch sold and Rs. 100 on every watch not sold. Let him sell x watches to break-even. So our equation will be 250x + 100(1500 – x) = 255000. Solving this, we get x = 700 watches.

9. b In this case, we need not use the data that SP = Rs. 300 each. This has to be used only to figure out that the SP of both the articles is the same. Also since the profit percentage on one is equal to the loss percentage on the other, viz. 10% effectively, it will be a loss given by $\frac{(10)^2}{100}$ = 1%. Hence, the correct answer is (–)1.

10. a Both the statements are telling the same, that selling price is 75% of cost price.

So we cannot determine the actual cost of the article.

11. c By using statement II we can determine the selling price of the article.

Selling price = 1.25 × 250 = Rs. 312.50

But by using statement I we cannot determine the selling price.

12. d Let he mix 3 kg, 4 kg and 5 kg of dry fruits at Rs. 100, Rs. 80 and at Rs. 60 per kilogram respectively. Hence, his effective cost of the dry fruits per kilogram should be the weighted average

$= \frac{3 \times 100 + 4 \times 80 + 5 \times 60}{3 + 4 + 5} = \frac{920}{12}$

In order to make a 50% profit, he will have to sell it at

$\frac{920}{12} \times 1.5 = \frac{920}{12} \times \frac{3}{2} = \frac{920}{8}$ = Rs. 115 per kilogram.

Since none of the answer-choices confirms this, the answer is (d).

13. a **Hint:** Students please note that the percentages that are given are the basic percentages derived from basic fractions. E.g. 11.11% = $\frac{1}{9}$ and 14.28 = $\frac{1}{7}$. Hence, you should make use of the most of this kind of knowledge. So let the CP be Re 1.

Since he makes a profit of $\frac{1}{7}$, his SP = $(1 + \frac{1}{7})$ = Rs. $\frac{8}{7}$.

His marked price should be $\frac{1}{9}$ above this. So if we subtract $\frac{1}{9}$ of MP from the MP, we will get the SP.

So $(MP - \frac{1}{9} MP) = SP = \frac{8}{7}$

Hence, MP = $\frac{9}{7}$

Therefore, percentage of mark-up on CP = (MP – CP)/CP

$= (\frac{9}{7} - 1)/1 = \frac{2}{7} = 2(\frac{1}{7}) = 2 \times 14.28 = 28.56\%$

Alternative method:

We can use the formula $z = x - y - \frac{xy}{100}$, where

z = Gain percentage

x = Percentage above CP

y = Discount percentage

$\therefore\ 14.28\% = x - 11.11\% - \frac{11.11x}{100}$

or $14.28 = \frac{100x - 1111 - 11.11x}{100}$

or 1428 – 1111 = 88.89x

or x = 28.56% (Approximately)

For questions 14 and 15:

Let CP = 100

Current gain = 20

$\Rightarrow$ SP = 120

CP = Cost of A + Cost of B + Other

= 30% + 50% + 20%

14. a Since cost of German mark (A) increase by 30%

New cost of A = 30 + 30% of 30 = 39

Similarly,

New cost of B = 50 + 22% of 50 = 61

New CP = 39 + 61 + 20 = 120

New SP = 120 + 10% of 120 = 132

Maximum profit $= \frac{12}{120} = 10\%$

15. b New cost of A = 30 + 20% of 30 = 36

New cost of B = 50 – 12% of 50 = 44

New CP = 36 = 44 + 20 = 100

Gain = 20%

16. a Statement I implies that profit is 2.95%, but we want the profit per rupee spent on buying the shares. The cost of buying the shares for Harshad is CP + 0.01 CP = 1.01 CP.

The cost of selling is SP – 0.01 SP = 0.99 SP

The difference of the two is profit, i.e.

0.99 SP – 1.01 CP = 0.99 × 1.05 CP – 1.01 CP

= 0.0295 CP. Hence, profit = 2.95%.

Statement II gives us no information regarding sales price and purchase price.

17. a Statement:

A. Let the wholesale price is x.

Thus, listed prices = 1.2x

After a discount of 10%, new price = 0.9 × 1.2x = 1.08x

$\therefore$ 1.08 – x = 10$.

Thus, we know x can be found.

B. We do not know at what percentage profit, or at what amount of profit the dress was actually sold.

For questions 18 and 19:

S, M and R in all spend 1248 Bahts.

Initially M pays 211 Bahts and R pays 92 Bahts.

Remaining is paid by S i.e; 945 Bahts.

If 1248 is divided equally among S, M and R, each has to spend 415 Bahts.

Hence, M has to pay 205 Bahts which is 5 Dollars to S.

and R has to pay 324 Bahts to S.

For questions 20 and 21:

To maximise Shabnam's return we need to evaluate all the given options in the question number 7. Assume Shabnam had one rupee to invest. Let the return be denoted by 'r'.

Consider the option (30% in option A, 32% in option B and 38% in option C): If the stock market rises, then

r = 0.1 × 0.3 + 5 × 0.32 – 2.5 × 0.38 = 0.653

If the stock market falls, then

r = 0.1 × 0.3 – 3 × 0.32 + 2 × 0.38 = – 0.197

Consider option (100% in option A): This will give a return of 0.1%.

Consider option (36% in option B and 64% in option C) : If the stock market rises, then

r = 5 × 0.36 – 2.5 × 0.64 = 0.2

If the stock market falls, then

r = – 3 × 0.36 + 2 × 0.64 = 0.2

Consider option (64% in option B and 36% in option C): If the stock market rises, then

$r = 5 \times 0.64 - 2.5 \times 0.36 = 2.1$

If the stock market falls, then

$r = -3 \times 0.64 + 2 \times 0.36 = -1.2$

Consider option (1/3 in each of the 3 options): If the stock market rises, then

$r = 0.1 \times 0.33 + 5 \times 0.33 - 2.5 \times 0.33 = 0.858$

If the stock market falls, then

$r = 0.1 \times 0.33 - 3 \times 0.33 + 2 \times 0.33 = -0.297$

We can see that only in option **(36% in option B and 64% in option C)**, Shabnam gets an assured return of 0.2% irrespective of the behaviour of the stock market. So right option for questions number 19 is **(0.20%)** and question number 20 is **(36% in option B and 64% in option C)**.

22. a Let the earlier cost price of the item = ₹ 100

$\Rightarrow$ Earlier marked price = ₹ 105.

On that day, 30% discount is offered on

₹ 3 × 105 = ₹ 315

Thus, new selling price = ₹ 220.50

$\Rightarrow$ New Profit percentage = 120.50%.

23. a If the profit amount are in A.P then the profit % ages are also in an A.P.

If P_4 = 13% and P_7 = 10% then P_5 = 12% and P_6 = 11%.

Average of the middle terms will give the profit % on the whole i.e. (11 + 12)/2 = 11.5 %

24. 2000 Let the C.P. of the article be Rs.x.

$$\therefore \quad \frac{1920 - x}{x} \times 100 = \frac{x - 1280}{x} \times 100$$

$$\Rightarrow \quad 1920 - x = x - 1280$$

$$\Rightarrow \quad 2x = 3200$$

$$\Rightarrow \quad x = 1600$$

Hence, to make a profit of 25%, the S.P.

= 125% of 1600 = Rs.2,000.

25. b Let the CP be x

$$\therefore \quad x \times \frac{110}{100} \times \frac{130}{100} \times \frac{150}{100} = 4290$$

x = Rs. 000.

26. a Let he buys one dozen candies of each type IInd type

Total C.P. = Rs. 7

S.P. = Rs. 33

Profit = Rs. 6

For getting profit of Rs. 50

He must sold 50 dozens

27. 4 Let the price of the peanut bought by the wholesaler be Rs. x / kg and that of walnut be Rs.3x/kg.

For the shopkeeper, total price of 8 kg of peanuts and 16 kg of walnuts is

$$\frac{110}{100} \times 8x + \frac{120}{100} \times 16 \times 3x = \frac{332x}{5}$$

The shopkeeper sold the remaining mixture i.e. 16 kg at Rs. 166 /kg.

$\therefore$ Total S.P for him = 16 × 166 = Rs. 2656

He made overall profit of 25%

$$\therefore \text{ Total C.P. } = \frac{100}{125} \times 2656 = \frac{4}{5} \times 2656$$

$$\therefore \frac{332x}{5} = \frac{4}{5} \times 2656$$

$\Rightarrow X = 32$

$\therefore$ The wholesaler bought the walnuts at 3 × 32

= Rs. 96 per kg.

Ratio and Proportion

1. c The ratios of the share of students, teachers and benefactor is 1 : 1.5 : 4.5. So, the proportion of teachers share is $\frac{1.5}{7}$. So teachers would donate:

$\frac{(1.5 \times 4200)}{7}$ = Rs.900.

2. a Let the two given numbers be x and y such that x > y.

According to the question,

$$x - \frac{y}{2} = 3\left(y - \frac{y}{2}\right) \Rightarrow \frac{x}{y} = \frac{2}{1}.$$

3. c Let the original weight of the diamond be 10x. Hence, its original price will be $k(100x^2)$... where k is a constant. The weights of the pieces after breaking are x, 2x, 3x and 4x. Therefore, their prices will be kx^2, $4kx^2$, $9kx^2$ and $16kx^2$.

So the total price of the pieces = $(1 + 4 + 9 + 16)kx^2$ = $30kx^2$. Hence, the difference in the price of the original diamond and its pieces = $100kx^2 - 30kx^2$ = $70kx^2$ = 70000.

Hence, kx^2 = 1000 and the original price = $100kx^2$ = 100 × 1000 = 100000 = Rs. 1 lakh.

4. b Consider the statement I:

Let number of type-1 widgets = x.

Number of type-2 widgets = y.

From the given question, x + y = 20000.

From statement I, 1.1 x + 0.94y = 20000.

So we can get x and y.

From statement II, number of type-2 widgets produced $= \frac{1}{3} \times 20000 = 6667$.

The question can be answered by using either of the statements alone.

5. c Let his marks be 100, 90, 80, 70 and 60 in the five subjects. Hence, totally he has scored 400 marks. This constitutes only 60% of the total marks. Hence, total marks = $\frac{400}{0.6}$ = 667, Since the total marks in each subject is the same, hence maximum marks in each subject will be $\left(\frac{667}{5}\right) \simeq 133$. Out of this 50% is the passing marks. In other words, to pass in a subject he needs to score 66.5 marks. We can see that only in one subject he scored less than this, viz. 60. Hence, he passed in 4 subjects.

6. b Let D_1, T_1 and D_2, T_2 denote the diameters and the thickness of the two coins respectively. If V_1 and V_2 are the values of the two coins.

$$\frac{V_1}{V_2} = \left(\frac{D_1^2 T_1}{D_2^2 T_2}\right) = \left(\frac{D_1}{D_2}\right)^2 \left(\frac{T_1}{T_2}\right)$$

Therefore, $\frac{4}{1} = \left(\frac{4}{3}\right)^2 \left(\frac{T_1}{T_2}\right) \Rightarrow \left(\frac{T_1}{T_2}\right) = \frac{9}{4}$.

7. a Let the cost of the turban be T.

Total payment for one year = Rs. 90 + T. So the payment for 9 months should be Rs. $\frac{3}{4}(90 + T)$. But this is equal to (65 + T). Equating the two, we get T = Rs. 10.

8. d Since the number of coins are in the ratio 2.5 : 3 : 4, the values of the coins will be in the ratio

(1 × 2.5) : (0.5 × 3): (0.25 × 4)

= 2.5 : 1.5 : 1 or 5 : 3 : 2

Since they totally amount to Rs. 210, if the value of each type of coins are assumed to be 5x, 3x and 2x, the average value per coin will be $\frac{210}{10x}$.

So the total value of one-rupee coins will be

$5 \times \left(\frac{210}{10x}\right)$ = Rs. 105

So the total number of one-rupee coins will be 105.

9. d Note that both the statements give the same piece of information that a : b = 3 : 5 and that a and b are both positive. But none of the statements either in itself or together can give the value of a.

10. b $18 \propto \sqrt{9}$

$42 \propto \sqrt{x}$; Here x = number of compartments

$$\frac{18}{42} = \frac{\sqrt{9}}{\sqrt{x}}$$

Simplifying, x = 49, but this is with reference to maximum speed. Hence, number of compartments would be one less in order to run i.e. 48.

11. c Distance between A and B = (35 × 2) + (45 × 2) = 160 km.

Distance covered by Aditi in each speed segment = $\frac{160}{3}$

Hence, total petrol consumed

$$= \left(\frac{160}{3} \times \frac{1}{16}\right) + \left(\frac{160}{3} \times \frac{1}{24}\right) + \left(\frac{160}{3} \times \frac{1}{16}\right) = 8.9 \text{ l}$$

12. a For minimum petrol consumption, Zoheb should drive at 40 kmph, petrol consumption = $\frac{160}{24}$ = 6.67 l.

13. c Fresh grapes contain 10% pulp.

$\therefore$ 20 kg fresh grapes contain 2 kg pulp.

Dry grapes contain 80% pulp.

$\therefore$ 2 kg pulp will contain $\frac{2}{0.8} = \frac{20}{8} = 2.5$ kg dry grapes.

14. b Each traveller had $\frac{8}{3}$ loaves.

$\Rightarrow$ First traveller has given $5 - \frac{8}{3}$ loaves to the third.

Second traveller sacrificed only $3 - \frac{8}{3} = \frac{1}{3}$rd of a loaf.

So, first should get 7 coins.

15. c Given pqr = 1 $\Rightarrow$ $pq = \frac{1}{r}$ and $\frac{1}{p} = qr$

$$\frac{1}{1+p+q^{-1}} + \frac{1}{1+q+r^{-1}} + \frac{1}{1+r+p^{-1}}$$

$$= \frac{q}{1+q+pq} + \frac{r}{1+qr+r} + \frac{1}{1+r+qr}$$

$$= \frac{qr}{1+qr+r} + \frac{r}{1+qr+r} + \frac{1}{1+r+qr} = \frac{1+r+qr}{1+r+qr} = 1$$

Alternate solution: Putting x = y = z = 1, we get

$$\frac{1}{1+p+q^{-1}} + \frac{1}{1+q+r^{-1}} + \frac{1}{1+r+p^{-1}}$$

$$= \frac{1}{1+1+1} + \frac{1}{1+1+1} + \frac{1}{1+1+1} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1.$$

16. a

Total seats in the hall	200
Seats vacant	20
Total waiting	180
Ladies	72

Seating capacity of flight $\frac{2}{3}\times 180 = 120$

Number of people in flight A = 100

For flight B = 180 – 100 = 80

Thus, airhostess for A = $\frac{80}{20} = 4$

Empty seats in flight B = 120 – 80 = 40

40 : 4 = 10 : 1

17. c Jagdish (J), Punit (P), Girish (G)

Statement A: J = $\frac{2}{9}$ [P + G]W

P + G + J = 38500

Thus, only J can be found.

Statement B: Similarly, from this only P can be found.

Combining we know J, P and G can be found.

18. d a = 6b = 12c and 2b = 9d = 12e.

Dividing the first equation by 12 and second by 36, we get $\frac{a}{12}=\frac{b}{2}=\frac{c}{1}$ and $\frac{b}{18}=\frac{d}{4}=\frac{e}{3}$

i.e. $\frac{a}{108}=\frac{b}{18}=\frac{c}{9}$ and $\frac{b}{18}=\frac{d}{4}=\frac{e}{3}$

$\therefore \frac{a}{108}=\frac{b}{18}=\frac{c}{9}=\frac{d}{4}=\frac{e}{3}$

$\therefore$ a : b : c : d : e = 108 : 18 : 9 : 4 : 3.

$\therefore \frac{c}{d}=\frac{9}{4}$ is not an integer.

19. c Let in 2001 the number of huts before floods = 32

$\therefore$ Huts destroyed = $\frac{32}{2} = 16$ and rebuilt = 32.

$\therefore$ Total huts after floods in 2001 = 16 + 32 = 48

Similarly, in 2002, destroyed = 24

Rebuilt = 48

Total = 24 + 48 = 72

Similarly, in 2003, destroyed = 36

Rebuilt = 72

Total = 36 + 72 = 108

$\therefore$ Checking with choices, the answer is (c).

20. a Let there be n members in the club.

From statement A, we have $\frac{600}{n-5}=\frac{600}{n}+10$.

Solving this equation, we get n = 20. Therefore, we can find the payment of each member.

Hence, statement A alone is sufficient.

From statement B, we cannot determine anything.

21. c If $\frac{a}{b+c}=\frac{b}{c+a}=\frac{c}{a+b}=r$

then there are only two possibilities.

(i) If $a+b+c\neq 0$, then

$$\frac{a}{b+c}=\frac{b}{c+a}=\frac{c}{a+b}=\frac{a+b+c}{(b+c)+(c+a)+(a+b)}$$

$$=\frac{a+b+c}{2(a+b+c)}=\frac{1}{2}$$

(ii) If a+ b + c = 0, then

b + c = – a

c + a = – b

a + b = – c

Hence, $\frac{a}{b+c}=\frac{a}{(-a)}=-1$

Similarly, $\frac{b}{c+a}=\frac{c}{a+b}=-1$

Therefore, option (c)is the correct answer.

22. a $\frac{a}{b}=\frac{1}{3}, \frac{b}{c}, \frac{2}{1} \Rightarrow a:b:c = 2:6:3$

Similarly, a : b : c : d : e : f = 6 : 18 : 9 : 18 : 6 : 24

$$\therefore \frac{abc}{def}=\frac{6\times 18\times 9}{18\times 6\times 24}=\frac{3}{8}$$

Hence, option (a)is the correct answer.

Alternate method:

$$\frac{a}{b}\times\frac{b}{c}\times\frac{c}{d}\times\frac{d}{e}\times\frac{e}{f}=\frac{a}{f}=\frac{1}{3}\times 2\times\frac{1}{2}\times 3\times\frac{1}{4}=\frac{1}{4}$$

$$\frac{b}{c}\times\frac{c}{d}=\frac{b}{d}=2\times\frac{1}{2}=1$$

$$\frac{c}{d}\times\frac{d}{e}=\frac{c}{e}=\frac{1}{2}\times 3=\frac{3}{2}$$

So, $\frac{abc}{def}=\frac{a}{f}\times\frac{b}{d}\times\frac{c}{e}=\frac{1}{4}\times 1\times\frac{3}{2}=\frac{3}{8}$.

23. e Using options, the sum of the numerator and denominator of the ratio should be a prime number.

Only option (e)satisfies [97 + 84 = 181].

24. b Suppose that the total amount involved in this game in \$K.

The first person has $\frac{7}{18}$ K in the beginning and $\frac{6}{15}$ K in the end. Thus he won something.

Second person has $\frac{6}{18}$ K in the beginning and $\frac{5}{15}$ K in the end. So he neither gains nor loses. At this point it is very clear that third person loses something.

$$\Rightarrow \quad \frac{6}{15}K - \frac{7}{18}K = 12.$$

So, $K = 1080$.

So, the winner must have started with \$420.

25. b Let the required number of hour be h.

$$\therefore \frac{1\times\left(1-\frac{5}{100}\right)^{h}}{9\left(1-\frac{20}{100}\right)^{h}+1\times\left(1-\frac{5}{100}\right)^{h}} \geq \frac{18}{100}$$

Going through the options, h = 4 comes out to be the correct answer.

26. b Let $4x + 3y = 14k$, then $xy = 2k$ and $y - 6x = k$.

On solving the first and the third equations,

we get $x = \frac{k}{2}$ and $y = 4k$.

$$\Rightarrow \quad xy = 2k^2$$

$$\therefore \quad \frac{2x}{y} = \frac{2\times\frac{k}{2}}{4k} = \frac{1}{4}.$$

27. c a : b = 3 : 4

b : c = 2 : 1

a : b : c = 3 : 4 : 2

Let a = 3x, b = 4x, c = 2x.

So, a + b + c = 9x which is a multiple of 9.

So, among options, only 207 is a multiple of 9.

∴ The possible value of (a + b + c) is 207.

28. d Let Raju and Lalitha originally had 4 and 9 marbles respectively and Lalitha gave x marbles to Raju.

$$\therefore \quad \frac{4+x}{9-x} = \frac{5}{6}$$

$$11x = 21$$

$$x = \frac{21}{11}$$

Hence, the fraction of her original number of marbles given by Lalitha to Raju was

$$\frac{\frac{21}{11}}{9} = \frac{21}{11\times 9} = \frac{7}{33}$$

29. a Let the new marks be 47 and 56 respectively.

Old marks are in the ratio of 11 : 14 and their difference is 3.

Therefore, the old marks has to be 33 and 42 so that the difference becomes 9 and equal to the new one.

Hence, required ratio for Bimal = 56 : 42 = 4 : 3.

Average

1. a Sum of all the three quotations = 110 × 3 = Rs. 330

From statement I, if the lowest quotation is Rs. 110 then the sum of other two quotations = 330 – 100 = Rs. 230.

Now, minimum value of second quotation = Rs. 101

Therefore, maximum value of third quotation = 230 –101 = Rs. 229.

2. a If the numbers are a, b, c and d such that a < b < c < d, then from statement I, we get (d – c) > (b – a).

So we can say, (d + a)> (b + c) or (d + a) + (d + a) > (b + c)+ (d + a). Dividing both the sides by 4, we get $\frac{(d+a)}{2} > \frac{(a+b+c+d)}{4}$.

This shows that the average of the largest and the smallest of four numbers is indeed greater than the average of all the 4 numbers. Hence, we can answer the question using statement I only.

3. d As neither average weight of the original members is not mentioned nor the number of members in original team, question cannot be answered.

4. d Although the number of students in group D is more than in any other group, we still cannot say anything about the average weight of this group as nothing is mentioned about the average weights of any of the groups or of the individual students.

5. c Although one student is shifted from group A to group B, the number of students in the class and the total weight of the students remain the same. Therefore, the average weight of the class remains the same.

6. c The total weight of any group will vary according to the number of students in that group. Hence, the total weight of group A and C which has (15 + 25)= 40 will be twice that of students in group B which has 20 students. However, it is clear that if all the students are of same weight, then the average weight of all groups remains same irrespective of how many students are present in each group. Hence, clearly the statement given in option (c) is false.

7. b Total marks scored by the student in 10 papers = (80 × 10)= 800. If we exclude the papers in which he scored the highest and the lowest marks, then the total marks scored by him in remaining 8 papers = (81 × 8)= 648. Hence, his total in these two papers in which he scored the highest and the lowest marks = (800 – 648) = 152. Since his highest score is 92, his lowest score is (152 – 92) = 60.

8. a Let x be the fixed cost and y the variable cost. Then,

$17500 = x + 25y$ … (i)

$30000 = x + 50y$ … (ii)

Solving the equation (i)and (ii), we get

$x = 5000, y = 500$

Now if the average expense of 100 boarders be 'A'. Then, $100 \times A = 5000 + 500 \times 100$

$\Rightarrow A = Rs.\ 550.$

9. d Statement I gives the weight of the heaviest and lightest members of the class but no indication as to the number of students in the class or the total weight of the students is there. The second statement is also inconclusive, making our answer choice as (d).

10. b Use any 7 consecutive numbers to check the answers.

$n = \frac{(1+2+3+4+5)}{5} = 3$, average of 7 integers is $k = \frac{(1+2+3+4+5+6+7)}{7} = 4$.

So $k = n + 1$.

Alternate Solution:

The average of the first 5 terms is the middle term which is third term, and the average of the first 7 terms is the middle term which is the fourth term. Hence, it is one more than the previous average.

11. b 60 kg is wrong because then to arrive at a total of 121, the other box will have to weigh 61 kg which will be obviously be the highest. 64 is wrong too, because then to add up to 121, the other weight will have to be 57 and to make up to a total of 120, the next box shall have a weight 63 which obviously makes the maximum possible total 64 + 63 = 127. 62 is the correct answer because the other boxes shall be 59, 54, 58, 56. These will give all the totals given in the question.

12. c Let the marks scored in five subjects be 6x, 7x, 8x, 9x and 10x (on a scale of 1).

Average score = 60%

$\Rightarrow \frac{6x + 7x + 8x + 9x + 10x}{5} = \frac{60}{100} \Rightarrow 8x = 0.6$

$\Rightarrow x = 0.075$

So the marks are 0.45, 0.525, 0.6, 0.675 and 0.75.

Number of times the marks exceed 50% is 4.

13. a Let x be the total number of people the college will ask for donations.

$\therefore$ People already solicited = 0.6x

Amount raised from the people solicited = $600 \times 0.6x = 360x$

Now 360x constitutes 75% of the amount.

Hence, remaining 25% = 120x

Hence, average donation from remaining people = $\frac{120x}{0.4x}$ = Rs. 300.

14. b Let the number of students in classes X, Y and Z be a, b and c respectively. Then,

total of X = 83a; total of Y = 76b; total of Z = 85c

Also $\frac{83a + 76b}{a + b} = 79 \Rightarrow 4a = 3b;$

and $\frac{76b + 85c}{b + c} = 81 \Rightarrow 4c = 5b$

Hence, $b = \frac{4}{3}a$, $c = \frac{5}{4}b = \frac{5}{4} \times \frac{4}{3}a = \frac{5}{3}a$

Average of X, Y and Z = $\frac{83a + 76b + 85c}{a + b + c}$

$= \frac{83a + 76 \times \frac{4}{3}a + 85 \times \frac{5}{3}a}{a + \frac{4}{3}a + \frac{5}{3}a}$

$= \frac{978}{12} = 81.5.$

15. a Let the highest number be n and x be the number erased.

Then, $\frac{\frac{n(n+1)}{2} - x}{(n-1)} = 35\frac{7}{17} = \frac{602}{17}.$

Here, the denominator (n – 1) must be a multiple of 17.

For $n - 1 = 68 \Rightarrow n = 69$, we have $\frac{\frac{69(70)}{2} - x}{68} = \frac{602}{17}$

$\Rightarrow x = 602 \times 68 - 69 \times 35 = 2415 - 2408 = 7.$

Hence, n = 69 and x = 7 satisfy the above conditions.

16. b Let the number be 'ab'.

Arithmetic mean is more by 1.8 means sum is more by 18.

$\therefore$ $(10b + a) - (10a + b) = 18 \Rightarrow 9(b - a) = 18$

$\Rightarrow b - a = 2.$

17. d A gives 500 as median and B gives 600 as range.

A and B together do not give average. Therefore, it cannot be answered from the given statements.

18. e The total age of all the eight people in the family = 231

As per the information given in the question, the total age of all the people in the family = $231 + 3 \times 8 - 60 + 0 = 195$

Similarly, the total age of the people in the family four years ago = 195 + 3 × 8 – 60 + 0 = 159.

Therefore, the current average age of all the people in the family = $\frac{159+32}{8} = 24$ years.

19. c **Using A:** $W_{II} = 45.5$ and $W_I = 44.5$

Using B: Weight of Deepak = 70kg (Only after using statement A)

This is sufficient to find weight of Poonam using the data given in the question statement. Hence, option (c) is correct choice.

20. 210 Let the number of volunteers be x.

$\therefore$ the number of members = 1.4x

Total contribution made by the members

= 1100 × 1.4x = Rs.1540x

Now, Rs.1540x is 88% of the total amount raised, therefore, the remaining 12% = Rs.210x.

Hence, the average contribution made by the volunteers

$= \frac{210x}{x}$ = Rs.210.

21. c Let the average height of 22 toddlers be x.

Average height of two toddlers = $\frac{1x}{3}$.

Now, Average increases by 2 inches when two leave the group.

So, sum of the heights of 20 toddlers = 20(x + 2)

So, $22x = (x + 2) \times 20 + \frac{2x}{3}$.

$\Rightarrow$ x = 30.

So, the average height of the remaining 20 toddlers is 30 + 2 = 32 inches.

22. 60 Let the number of tests taken by him be x and the average score be A.

The average score for the first 10 tests = 20

So, the sum of the scores for these first 10 tests = 200

Similarly, the sum of the scores for the last 10 tests = 30 × 10 = 300

$\therefore \frac{200+300+s}{x} = A$, where s is the sum of the scores for remaining tests.

$\frac{500+s}{x} = A$ ....(i)

Now, according to the question,

$\frac{s+300}{x-10} = A+1$ ....(ii)

$\frac{200+s}{x-10} = A-1$ ....(iii)

On solving eq. (i),(ii) and (iii), we get A = 25, x = 60.

$\therefore$ The total number of tests taken by him is 60.

23. c The maximum average of the people under 51 years is found when there are 30 people with 51 years of age.

$\therefore$ Sum of the age of those 30 people aged 51 years = 51 × 30 = 1530

Average of all people in the apartment complex = 38

$\therefore$ Sum of the age of all people = (30 + 39)38 = 2622

$\therefore$ Sum of the age of the people aged below 51 years = 2622 – 1530 = 1092

$\therefore$ Largest possible average of the people aged below 51 years

$= \frac{1092}{39} = 28$

24. 105 Given that: x + y + z = 240,

x + y + z + u + v = 375, 2u = x + y and 2v = y + z

$\Rightarrow$ u + v = 135

Using these equations, we get x + 2y + z = 270 and y = 30

Hence, x + z = 210 and minimum value of x = 105 ($\because x \geq z$)

Simple Interest and Compound Interest

1. b For a difference of 1 year, CI can be computed as SI. Hence, from the 2nd year to the 3rd year interest earned = (675 – 650)= Rs.50 on Rs.625.

Hence, the Rate of interest

$= \frac{50}{625} \times 100 = 8\%$ p.a.

2. c The statement I suggests that the number of sheep had increased by 20% last year over the previous year. But it does not suggest whether the rate of increase is annual or not.

E.g. 20% increase in a year can also be obtained by 9.5% increase over 6 months. i.e. 1.095 x 1.095 = 1.20.

The statement II however suggests that the increase is compounded annually.

Hence, now we can find the answer.

If the number of sheep last year was *x*, then $x + 400 = x(1.2)^2$

Hence, *x* = 909.

Thus, we require both statements to answer the question.

3. a After 2 years, the price of the flat will be $(1)(1.10)^2$ = Rs.1.21 lakh.

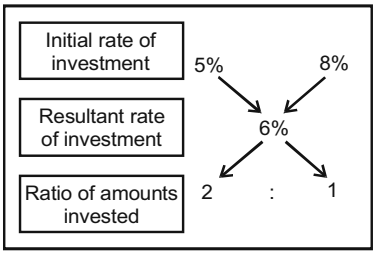
Correspondingly the price of the land will be $(1.1)(1.05)^2$ = Rs.1.21275 lakh.

Hence, the price of the plot = Rs.(1.21275 – 1.21) lakh = Rs.275 more than that of the flat.

Hence, if they exchange, Ram will have to pay this amount to Prem .

4. c Using alligation, the ratio of the amounts invested at both the rates = 2 : 1.

Since he has invested Rs.3,000 at 5%, he should further invest Rs.1,500 at 8% to earn a total interest of 6% per annum.



Alternative method:

Let the amount invested at 8% be Rs.x.

Then, $3000 \times \frac{105}{100} + x \times \frac{108}{100} = (3000 + x)\frac{106}{100}$

$\Rightarrow$ 0.02x = 30 $\Rightarrow$ x = 1,500

$\therefore$ He should further invest Rs.1,500 at 5% to earn a total interest of 6% per annum.

5. d Both the statements are needed to answer the questions. Since in statement I all the dates are given except the time to compound the interest. That date is given in the second statement.

6. d From statement I nothing can be said since exact figures are not given.

From statement II since X > Y (from B) we do not know how much X is greater than Y, because if it is slightly greater than it will be less than Y after 5 years whereas if the difference is very high, then X will be greater than Y even after 5 years.

7. 12 For the amount to get tripled, the increase is 200% of the principal. If it happens in 24 years then it will take 12 years for the increase to be 100% of the principal.

8. 121000 Let the two instalments be 'x'

After one year, 210000 × 1.1 = 231000

After paying the first instalment,

$(231000 - x) \times 1.1 = x$

$\Rightarrow$ $x = 121000$

9. 4000 Let X = Rs. 100a and Y = Rs. 100b

Gopal owes Ankit an interest of Rs. 8a at the end of the year and similarly

Ishan owes Gopal an interest of Rs. (10a + 10b) at the end of the year.

Given that, 2 × 8a = 10a + 10b

$\Rightarrow$a : b = 5 : 3 or a = 5k and b = 3k

Also, additional amount equal to Y or 300k at 10% interest would fetch Gopal Rs. 150 more.

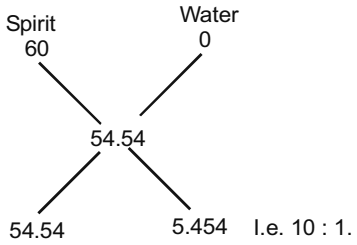
$\Rightarrow$ 30k = Rs. 150

Hence, X + Y = 800k = Rs. 4000.

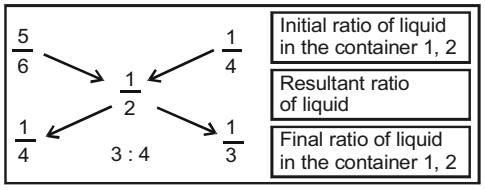
Mixture and Solutions

1. b Since SP of spirit and solution water = Rs.75/l and there is a profit of 37.5%, CP of spirit and water solution = $\frac{75}{1.375}$ = Rs.54.54/l

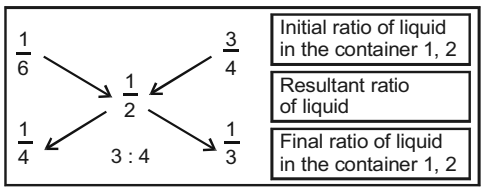
This should indeed be the weighted average of the costs of spirit and water. So if we alligate, we can get the ratio of spirit : water (assuming that cost of water is 0).



2. d We can solve this by alligation. But while we alligate, we have to be careful that it has to be done with respect to any one of the two liquids, viz. either A or B. We can verify that in both cases, we get the same result. E.g. the proportion of A in the first vessel is $\frac{5}{6}$ and that in the second vessel is $\frac{1}{4}$, and we finally require $\frac{1}{2}$ parts of A. Similarly, the proportion of B in the first vessel is $\frac{1}{6}$, that in the second vessel is $\frac{3}{4}$ and finally we want it to be $\frac{1}{2}$. With respect to liquid **A**



With respect to liquid B



3. a Given that containers are in equal volume, that does not mean that quantities in each container are in equal volumes. Since we do not know the quantity of the liquid, we cannot find the ratio of the final mixture.

4. c Let the capacity of each cup be 100 ml. So 300 ml of alcohol is taken out from the first container and poured into the second one. So the first vessel will have 200 ml of alcohol and the second one will have 500 ml of water and 300 ml of alcohol. So the ratio of water to alcohol in the second vessel is 5 : 3.

Hence, proportion of alcohol in B = 3 : 8

Now if 300 ml of mixture is removed from the second container, it will have $\left(300\times\frac{5}{8}\right)$ = 187.5 ml of water and $\left(300\times\frac{3}{8}\right)$ = 112.5 ml of alcohol.

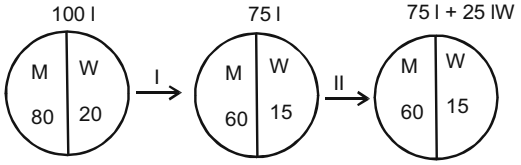
Now if this mixture is poured in the second vessel, that vessel would have (200 + 112.5)= 312.5 ml of alcohol and 187.5 ml of water. Hence, ratio of alcohol to water in this container = 312.5 : 187.5 = 5 : 3

Hence, proportion of water = A = 3 : 8

Hence, we find that A = B

Note: This result will be independent of the capacity of the cup.

5. a



The diagram is self explanatory. Removal of 25 litres at stage I will result in volume of milk being reduced by 80% of 25 lit i.e. 20 lit and volume of water being reduced by the remaining 5 lit. So M = 60 lit and W = 15 lit. Addition of 25 lit water will finally given M = 60 lit and W = 40 M. Hence, the ratio of W and M = 40 : 60 = 2 : 3.

6. d After the first operation:

The amount of milk (in litres) left = 160 – x

After the second operation:
The amount of milk (in litres) left

$$=(160-x)-\frac{160-x}{160}\times x = 90$$

$\Rightarrow$ $x^2 - 320x + 70 \times 160 = 0$

$\Rightarrow$ $(x - 40)(x - 280) = 0$

Therefore, x = 40.

(Since x cannot be equal to 280.)

7. b Let the container (without the handle) weigh 100x when it is completely filled with a liquid.

$\therefore$ The empty metal container (without its handle) weighs 15x.

After handle is added weight of fully filled container

= 105x.

$\therefore$ Weight of handle = 5x.

$\therefore$ Weight of partly filled container

$$= \frac{1}{3}\times 105x = 35x.$$

$\therefore$ Weight of liquid in partly filled container

= 35x – (15x + 5x) = 15x.

Total capacity of container

= 105x – (15x + 5x) = 85x.

$\therefore$ Fraction of container that is utilized

$$= \frac{15x}{85x} = \frac{3}{17}.$$

8. c Suppose percentage of milk in A, B and C vessels is a, ar and ar^2 respectively.

By the problem,

$$\frac{2a + 3ar + 4ar^2}{900} = \frac{32}{100} \quad \ldots (i)$$

$$\frac{3a + 2ar + ar^2}{600} = \frac{22}{100} \quad \ldots (ii)$$

From (i) & (ii), a = 12 and r = 2.

$\therefore$ The percentage of milk in A = 12%.

9. 245

Let x be the initial quantity of wine in the vessel. y litres of content is removed twice. The part of wine left is $x\left(1-\frac{y}{x}\right)^2$.

Now in 98 L of sample 18 L is wine which is same as $\frac{18}{98}$ part of the solution

$$\left(1-\frac{y}{x}\right)^2 = \frac{(x-y)^2}{x^2} = \frac{18}{98} = \frac{9}{49}$$

$$\Rightarrow \frac{(x-140)^2}{x^2} = \frac{9}{49} \Rightarrow x = 245.$$

10. a Let x ml of the solution be replaced with 12% acid solution. Therefore,

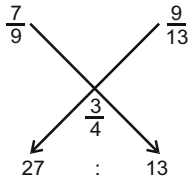
$$\frac{30}{100}\times(100-x)+\frac{12}{100}\times x = \frac{21}{100}\times 100$$

$\Rightarrow$ x = 50

11. b

	Milk	Water
I.	7	2
II.	9	4

For milk, using allegation method,



Hence, the required ratio = 27 : 13

12. c Ratio of liquid $A = \frac{\frac{2}{3}\times 4}{9} \Rightarrow \frac{8}{27}$

Ratio of liquid $B = \frac{\frac{3}{4}\times 3}{9} \Rightarrow \frac{1}{4}$

Ratio of liquid $C = \frac{\frac{4}{5}\times 2}{9} \Rightarrow \frac{8}{45}$

Ratio of water = $\frac{\frac{1}{3}\times 4+\frac{1}{4}\times 3+\frac{1}{5}\times 2}{9}$

$\Rightarrow \frac{\frac{4}{3}+\frac{3}{4}+\frac{2}{5}}{9}$

$\Rightarrow \frac{149}{60\times 9}=\frac{149}{540}$

$\therefore$ Water in more than liquid B.

13. b Let the cost prices per kg of A and B be Rs. y and Rs. z respectively.

A B Profit

3x : 2x 10%

$\therefore$ Total C.P. when mixed in the ratio of 3 : 2

= (3xy + 2xz)

S.P.= 5x × 40 = 200 x

P = 10%

$200x = \frac{110}{100}(3xy+2xz)$

33y + 22z = 2000 … (i)

When A and B are mixed in the ratio of 2 : 3, then total C.P. = 2xy + 3xz

Profit = 5%

$200\,x = \frac{105}{100}(2xy+3xz)$

42y + 63z = 4000 .... (ii)

On solving eq. (i) and (ii), we get,

$y = \frac{7600}{231}$ and $z = \frac{3200}{77}$

$\therefore \quad \frac{y}{z}=\frac{19}{24}$

14. b Let the cost of paint B is Rs. x/litre and that of point A is Rs. (8 + x)/ litre.

Suppose, the quantity of paint A in the mixture be y litres and that of paint B be (10 – y) litres.

$\therefore$ Total cost of the mixture = (8 + x) y + x(10 – y)

SP. of the entire mixture = Rs. 264

Profit = 10%

$\therefore \quad C.P = \frac{100}{110}\times 264 = Rs.240$

$\therefore \quad (8+x)y+x(10-y)=240$

$\Rightarrow$ 8y + 10x = 240

4y + 5x = 120

In order to get highest possible cost of paint B, put minimum value of y.

$\therefore$ y = 5 will give the highest possible value of x

$\therefore$ 5x = 120 – 20

x = 20

15. a Let the concentration of the ethanol solution 's' with which the 20% ethanol solution is mixed be x%.

Thus, concentration of the final mixture after the first step $= \left(\frac{20+3x}{1+3}\right)\%$

Now, this mixture is mixed with another 20% ethanol solution in equal proportion and we get resultant mixture of 31.25% ethanol solution.

$\Rightarrow \quad \frac{\left(\frac{20+3x}{4}+20\right)}{1+1}=31.25$

Hence, x = 50%.

16. a Let the strength of A, B and C be a, b, c respectively.

$\Rightarrow \quad \frac{a+2b+3c}{6}=20$ or a + 2b + 3c = 120 … (1)

Similarly,3a + 2b + c = 180 … (2)

Subtracting, (1) from (2) we get: c = a – 30 and subtracting (1) from 3 × (2) we get: b = 105 – 2a

Given that, $\frac{2b+7c}{9}$

$\Rightarrow \frac{210-4a+7a-210}{9}=\frac{a}{3}$

Hence, D : A = 1 : 3.

17. c Fraction of alcohol in the mixture = $\frac{700}{875}=\frac{4}{5}$

Fraction of alcohol after the secong substitution

$= \frac{4}{5}\times\frac{9}{10}\times\frac{9}{10} = 0.648 = 64.8\ \%$

Hence, percentage of water in the final mixture = 35.2%

18. d It is given that the parts of B in drum 1 and the final mixture are multiples of 7.

Therefore, parts of B in drum 2 has to be multiple of 7.

Hence, the correct answer will be 239 : 161.

Time speed and distance

1. d It can be seen that by travelling 12 km (30 –18) more at original speed, the car reaches 9 minutes earlier. So, in order to reach 45 minutes earlier, it has to travel a distance of 60 km more at original speed.

So the distance between points A & B = (18 + 60) = 78 kms.

Hence, the answer is (d).

2. c To completely cross each other the trains have to effectively travel a distance equal to the sum of their lengths.

They cover this distance at a effective speed of (60 + 50) = 110 kmph in 5 sec.

Hence, the sum of the lengths = $110 \times \left(\frac{5}{3600}\right)$

= 0.152.78 km or 152.78 m.

For the passenger sitting in the faster train to cross the slower train completely, he should have moved through a distance equal to the length of the slower train.

Since the trains are moving in the same direction, effective speed = (60 – 50)= 10 kmph.

Since the distance equal to the length of the slower train is covered in 18 secs., the length of the slower train $= 10 \times \left(\frac{18}{3600}\right)$ = 0.05 km or 50 m.

Thus the length of the faster train is (152.78 – 50) = 102.78 m.

3. c None of the statements alone is sufficient to answer the question.

Using both statements together: Let the distance and average speed between Calcutta and Madras be 'x' km and 'y' kmph respectively.

$$\text{Average speed} = \frac{\text{Total Dstance}}{\text{Total Time}}$$

$$= \frac{1.3x}{\left(\frac{x}{y} + \frac{0.3x}{2y}\right)} = \frac{1.3}{\left(\frac{1}{y} + \frac{0.3}{2y}\right)} = 40 \text{ kmph}$$

Since y is the only unknown, its value can be determined and hence the average speed between Madras and Trivandrum can be found. Thus we require both statements to answer the question.

4. d From statement I we can find that the stopping time was $\left(1^2 + 2^2 + 3^2 + 4^2 + \cdots + 10^2\right)$ minutes

But this statement alone is not sufficient to answer the question.

From statement II, average speed between stopovers can be determined but we cannot find total time from the source stop to the destination stop. Thus, this statement alone is also not sufficient.

We cannot answer the question even by using both the statements together.

5. b In order to solve the question, we need to know two things : (a)the original speed of the train or the new speed of the train and (b)at what distance from A or after how much time after leaving A the train brokedown. The statement II provides both of these data viz. original speed = 20 kmph and distance from A = 40 kms. and hence only this is required to answer the question.

E.g: If the distance between A & B is considered to be x, then time taken had it not broken down is x/20 hours. The new time taken is [2 + (x – 40)/5] hours and we know that this time is 40 min. more than the original time. The equation becomes : x/20 + 40/60 = [2 + (x – 40)/5], which can be easily solved to get value of x.

6. d **From both statements I and II:**

Arrival time of flight by New York local time will be 2 P.M.

Since we don't know whether the flight landed on same date or other we can not find the answer.

7. d Since her husband meets her mid way, the total time saved by him can be equally divided into time saved while going to station and that saved while returning home. In other words, he saved 5 min. while going and 5 min. while coming. So instead of usual time of 6.00 pm he must have met her at 5.55 pm. So she must have walked for 55 min.

8. a It is clear that after a particular amount of time P and Q are equidistant from A and B respectively and speed of Q is twice the speed of P, therefore, in the remaining time distance moved by Q will be twice than P. Hence, they would meet closer to A.

9. d Let the speed of P be x and the distance between A and B be d, so the speed of Q will be 2x.

According to the question,

$(1+t)v = 2vt = \frac{d}{6}$ (Let t be the travel time of Q)

$\Rightarrow t = 1$ and $d = 12v$

Hence, the time taken by P to reach to B $= \frac{d}{v} = 12$ hours.

10. c As P takes 12 hours to complete his journey, so Q moving with twice the speed of P will take $\frac{12}{2} = 6$ hours to complete his journey.

Hence, P will take 6 hours more than Q to complete the journey.

11. d The separation between the ship and the seaplane is 18 miles. Since the two are travelling in the same direction, the relative speed would be 9 times the speed of the ship (If speed of ship is x miles/hour, speed of the seaplane would be 10x and 10x – x = 9x). Hence, to catch up with the ship, the seaplane would take $\frac{18}{9x} = \frac{2}{x}$ hours. Now, the ship covers x miles in an hour, so in $\frac{2}{x}$ hours it would cover 2 miles. So when the seaplane catches up with the ship, it would be 18 + 2 = 20 miles from the shore.

12. c It is clear that the ratio of the distances between (Delhi-Chandigarh): (Chandigarh-Shimla) = 3 : 4.

The ratio of the speeds between (Delhi-Chandigarh) : (Chandigarh-Shimla)= 3 : 2.

Let the distances be 3x and 4x respectively and speeds be 3y and 2y.

So the time taken will be $\left(\frac{x}{y}\right)$ and $\left(\frac{2x}{y}\right)$ respectively. Average speed

$$= \frac{(\text{Total Distance})}{(\text{Total Time})} = \frac{(7x)}{\left(\frac{x}{y} + \frac{2x}{y}\right)} = \frac{7y}{3} = 49.$$

Hence, y = 21. So the average speed from Chandigarh to Shimla = 2y = 42 kmph.

13. b Let they meet at a distance x kms from X.

So the total distance travelled by A = x at the speed of 5 kmph.

Total distance travelled by B = 27 + (27 – x) = (54 – x)at the speed of 7 kmph.

Time taken by A = $\frac{x}{5}$.

Time taken by B = $\frac{(54 - x)}{7}$.

Since they have met at the same time, they would have travelled for the same time.

Hence, $\frac{x}{5} = \frac{(54 - x)}{7}$ or x = 22.5 kms.

14. c Since it is a relay race, all the runners ran the same distance.

Hence, for a same distance, ratio of times $= \frac{1}{\text{ratio of speeds}}$.

Hence, ratio of times taken by B & D = 18 : 16 = 9 : 8.

15. c Statement I tells us that the time taken to cover both distances is the same, but it does not tell us anything about the speeds at which these are covered. This information is given by the second statement, which says the speed from cinema hall to home is less than that between home to the office.

Hence, by using both the statements we can say that the distance between cinema hall to home is less than that between home to the office.

16. a In the same time as A runs 200 m in the race, S runs 180 m and N runs 160 m.

In other words, in the same time as S runs 180 m, N runs 160 m.

So in the same time as S runs 100 m, N will run $\left(100 \times \frac{160}{180}\right)$ = 88.89 m.

Hence, in a 100 m race, S will beat N by (100 – 88.89) = 11.11 m.

17. d Since I live X floors above the ground floor and it takes me 30 s per floor to walk down and 2 s per floor to ride the lift, it takes 30X s to walk down and 2X s to ride the lift after waiting 420 s.

$\Rightarrow$ 30X = 2X + 420 $\Rightarrow$ X = 15.

Alternative method:

X > 14 as time taken to walk has to be greater than 7 min.

18. b Let the length of the escalator be 90 ft.

(There is no loss of generality in making this assumption.)

Let the speed of the escalator be y ft per second and the man's walking speed be x ft per second.

According to the question, we get

$$\frac{90}{30} = x + y$$

$$\frac{90}{90} = x - y$$

Adding the above equations, we get 2x = 4, i.e., x = 2.

$\therefore$ Time taken by the man to walk up the escalator when it is not moving = $\frac{90}{2}$ or 45 s.

19. d In a mile race, Akshay can be given a start of 128 m by Bhairav. This means that Bhairav can afford to start after Akshay has travelled 128 m and still complete one mile with him. In other words, Bhairav can travel one mile, i.e. 1,600 m in the same time as Akshay can travel (1600 – 128) = 1,472 m. Hence, the ratio of the speeds of Bhairav and Akshay = Ratio of the distances travelled by them in the same time = $\frac{1600}{1472}$ = 25 : 23. Bhairav

can give Chinmay a start of 4 miles. This means that in the time Bhairav runs 100 m, Chinmay only runs 96 m. So the ratio of the speeds of Bhairav and Chinmay = $\frac{100}{96}$ = 25 : 24. Hence, we have B : A = 25 : 23 and B : C = 25 : 24. So A : B : C = 23 : 25 : 24. This means that in the time Chinmay covers 24 m, Akshay only covers 23 m. In other words, Chinmay is faster than Akshay. So if they race for $1\frac{1}{2}$ miles = 2,400 m, Chinmay will complete the race first and by this time Akshay would only complete 2,300 m. In other words, Chinmay would beat Akshay by 100 m = $\frac{1}{16}$ mile.

20. c Let the total distance be x. So the man travels a distance $\frac{3x}{5}$ at a speed 3a. Therefore, total time taken to travel this distance = $\frac{3x}{(15a)} = \frac{x}{(5a)}$ $\left[\text{Time} = \frac{\text{distance}}{\text{speed}}\right]$

He then travels a distance $\frac{2x}{5}$ at a speed 2b. Hence, time taken to travel this distance = $\frac{2x}{(10b)}$ = $\frac{x}{(5b)}$. So total time taken in going from A to B = $\frac{x}{(5a)} + \frac{x}{(5b)}$. Now he travels from B to A and comes back. So total distance travelled = 2x at an average speed 5c.

Hence, time taken to return = $\frac{2x}{(5c)}$.

Since the time taken in both the cases remains the same, we can write $\frac{x}{5a} + \frac{x}{5b} = \frac{2x}{5c}$.

Therefore, $\frac{1}{a} + \frac{1}{b} = \frac{2}{c}$.

21. a Total time taken by the man to travel from A to D = 16 hr and total distance travelled = 36 km. The time that he would have taken had he not rested in between will be (16 – x – 2x) = (16 – 3x). But this time should be equal to the addition of the times that he takes to travel individual segments. This is given as : $\frac{12}{x} + \frac{12}{2x} + \frac{12}{4x} = \frac{84}{4x} = \frac{21}{x}$.

Therefore, $\frac{21}{x} = (16 - 3x)$.

So we get the equation $3x^2 - 16x + 21 = 0$. Solving this equation, we get x = 3 or x = $\frac{7}{3}$. This should be the time for which he rested at B.

22. b In a watch that is running correct, the minute hand should cross the hour hand once in every $65 + \frac{5}{11}$ min. So they should ideally cross three times once in $3 \times \left(\frac{720}{11}\right) = \frac{2060}{11}$ min = 196.36 min. But in the watch under consideration they meet after every 3 hr, 18 min and 15 s, i.e. $(3 \times 60 + 18 + \frac{15}{60})$ = $\frac{793}{4}$ min = 198.25 min. In other words, our watch is actually losing time (as it is slower than the normal watch). Hence, when our watch elapsed 198.25 min, it actually should have elapsed 196.36 min. So in a day, when our watch will elapse (60 × 24) = 1440, it should actually elapse $\left(1440 \times \frac{196.36}{198.25}\right)$ = 1426.27. Hence, the amount of time lost by our watch in one day = (1440 – 1426.27)= 13.73, i.e. 13 min and 50s (approximately).

23. c If he travels at minimum speed over stretch A (i.e. 40km/hr), the total time taken to cover this stretch = $\frac{2}{40}$ = $\frac{1}{20}$ hr = 3 min.

If he then travels at the fastest speed over stretch B (i.e. 50 km/hr), the total time taken to cover this stretch = $\frac{2}{50} = \frac{1}{25}$ = 2.4 min.

Thus, total time taken over the first two stretches = 3 + 2.4 = 5.4 min.

In order to break the previous record he will have to cover the third stretch in (10 – 5.4) = 4.6 min.

To do this he will have to cover the third stretch at $\frac{2}{4.6}$ = 0.434 km per minute or 26.08 km/hr. But the maximum speed over the stretch C is 20 km/hr. Hence, it is not possible for C to break the previous record.

24. b The minimum speed in stretch A is 40 km/hr. If Mr Hare travels the first stretch at this speed, then the time taken by him to cover this stretch = $\frac{2}{40}$ = 3 min. Also he takes 3 min to cover stretch B. And he covers the entire race in (1.5 × 10)= 15 min. This means that he should have taken (15 – 3 – 3) = 9 min to cover stretch C. Hence, his speed over this stretch should be $\frac{2}{9}$ = 0.22 km per minute or 13.3 km/hr.

25. c Let his average speed over the last stretch be x. Hence, his average speed for first two stretches = 4x. So the total time taken to cover the three stretches = $\frac{4}{4x} + \frac{2}{x}$

His average speed over the race is 20 km/hr.

Hence, the time taken to complete the race = $\frac{6}{20}$

Hence, we have the equation $\frac{4}{4x} + \frac{2}{x} = \frac{6}{20}$

Solving this equation, we get x = 10 km/hr.

26. c Effective speed of two trains = 80 – 40 = 40 km/hr. (Since they are moving in the same direction as inferred from the word 'overtakes'). At this speed in 54 s, they would travel an effective distance of $\frac{40 \times 54}{3600}$ = 0.6 km or 600 m. This effective distance should be equal to the sum of the lengths of the two trains. So, if length of the express train is L, length of the goods train will be 2L. Hence, our equation will be L + 2L = 600 or L = 200 m.

So, the time taken by this train to cross a platform 400 m long will be = $\frac{(200 + 400)}{80 \times \frac{5}{18}}$ = 27 s.

(Note that we have converted the denominator in metres per second. Hence, the factor of $\frac{5}{18}$).

For questions 27 to 29 : Let us convert all the time to same time zone, viz. Boston. So X left Frankfurt at 6 p.m. on Friday (Frankfurt time) or 10 p.m. on Friday (Boston time). X reached Boston at 10 a.m. on Saturday (Boston time). In other words, X has taken 12 hr in all to go from Frankfurt to Boston. After 2 hr wait, X leaves at 12 noon (Boston time). Now X reaches India at 1 a.m. on Sunday (Indian time) or 11 a.m. on Saturday (Boston time). Thus, X takes 11 hr in all to go from Boston to India.

27. b Overall, X has travelled for 25 hr (including stoppages)at an average speed of 180 miles per hour. Hence, the distance between Frankfurt and India is (25 × 180)= 4500 miles.

28. a On the return journey, X halts at Boston for one hour less than his previous halt there. Therefore, X takes 24 hr for his return journey.

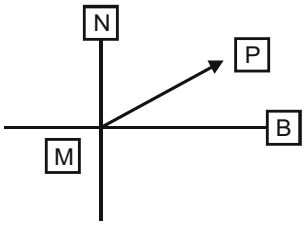
29. a Since distance between Frankfurt and India is 4,500 miles, overall distance travelled by him (to and fro) = 9000 miles. And he has taken $(25 + 24 + 1\frac{11}{12}{}^{*}) = 50\frac{11}{12}$ hr in all to cover this distance.

***Note:** $1\frac{11}{12}$ hr has been accounted for the halt that he had in India (from 1 a.m. to 2.55 a.m.). Hence, his average speed for the entire journey $= \frac{9000}{\left(50\frac{11}{12}\right)}$, i.e. 176.75 mph.

30. c Since the policeman started 15 min late, in this time the thief would have already covered $\frac{60}{4}$ = 15 km. To catch the thief, the policeman will have to make up for this distance of 15 km. Every hour the policeman is travelling (65 – 60) = 5 km more than the thief. Hence, to make up the distance of 15 km, he would take 3 hr. Since policeman started at 12.15 p.m., he would catch the thief at 3.15 p.m.

31. b Every hour the second policeman covers (65 – 60)= 5 km less than the first one. Since the first policeman catches the thief in 3 hr, in this time the second policeman will be (3 × 5) = 15 km behind.

32. b



The diagram will be as shown. M is Mali and P is Pali.

Consider statement I. When the person covers $\frac{1}{3}$ distance, he is 3 km east and 1 km north of Mali. Based on this statement alone, we can easily find out where he will be on line MP by using Pythagoras' theorem. Once we find this distance, we can easily get distance MP by multiplying it by 3. Similarly, based on statement II alone also, we can find distance MP. Hence, both the statements are independently sufficient to answer the question. Hence, the answer is (b).

33. c Let the speed of the motorcycle be x km/hr. Therefore, speed of the car will be (x + 10) km/hr.

From statement II, we can form the following equation.

$$\left(\frac{100}{(x+10)}\right) = \left(\left(\frac{100}{x}\right) + 2\right)$$

After solving this equation, we can get the speed of the car. Hence, this question can be answered by combining both the statements.

34. d None of the statements specifies the direction in which Tez and Gati are moving, which is very significant.

35. d Since A and B are moving in opposite directions, we will add their speeds to calculate the effective speeds. In other words, in the first hour they would effectively cover a distance of (4 + 2) = 6 km towards each other. In the second hours, they would effectively cover a distance of (4 + 2.5) = 6.5 km towards each other.

In the third hour, (4 + 3) = 7 km.

In the fourth hour, (4 + 3.5) = 7.5 km and so on.

We can see that the distances that they cover in each hour are in AP, viz. 6, 6.5, 7, 7.5, ... with a = 6 and d = 0.5. Since they have to effectively cover a distance of 72 km, the time taken to cover this much distance would be the time taken to meet each other. So the sum of the first n terms of our AP has to be 72.

If we are to express this in our equation of sum of first n terms of the AP, we will get $S_n = \frac{n}{2} \times [2a + (n - 1)d]$.

Substituting our values, we will get

$$72 = \frac{n}{2} \times [12 + 0.5(n - 1)]$$

Solving this, we get n = 9 hr. In 9 hr A would have covered (9 × 4) = 36 km.

So B would also have covered (72 – 36) = 36 km.

Hence, they would meet mid-way between A and B.

36. c Since the distance travelled was the same both ways and also it was covered in the same time, the average speed will be the same uphill and downhill. Hence, statement (a) is false. Statement (b)need not be true. It would be true and had the speeds (and not average speed) been the same both ways. But it is clearly indicated that he varied his pace throughout. Now it has to be noted that the journey uphill and the journey downhill started at the same time, i.e. 6 a.m. and also ended at the same time 6 p.m. (though on different days). So if we were to assume a hypothetical case in which one person starts downhill at 6 a.m. and other one starts uphill at 6 a.m., along the same path, then there would be a point on the path where they would meet (i.e. they would reach at the same time), irrespective of their speeds. Our case is similar to that, except for the fact that here, we have only one person moving both ways. So there has to be a point on the path, where he reached at the same time on both days.

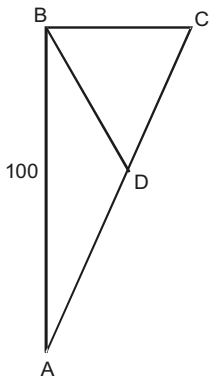
37. b At 7.30 a.m., Navjivan Express is at 50 km from A at the same time, Howrah-Ahmedabad Express is at 20 km from B.

Hence, distance between the trains at 7.30 a.m. is 30 km.

Relative speed = 50 + 40 = 90 kmph

Hence, time left = $\frac{30}{90} = \frac{1}{3}$ hr = 20 min.

38. b



Since AD = DC, the distance travelled is same for the two stretches.

Hence, the average speed is given by

$$\frac{2ab}{(a+b)} = \frac{(2 \times 45 \times 55)}{(45 + 55)} = 49.5 \text{ kmph.}$$

39. a Now, since X and Y reach C at the same time,

$$\frac{100 + BC}{61.875} = \frac{AC}{49.5}$$

Hence, you need to take help from options. i.e.

If AC = 105, $BC^2 = AC^2 - AB^2 = 105^2 - 100^2 = 1025$ or BC = 32

So, $\frac{100 + BC}{AC} = \frac{132}{105} = 1.25$

40. b In this triangle, AD = DC = BD = $\frac{105}{2}$ = 52.5 km

Note: The best way to solve this question is to treat questions 39 and 40 together. You would figure out that the answer to question 40 has to be half of the answer to question 39, and the only pairs of answer choices that fit into this condition are 105 and 52.5.

41. c The vehicle travels 19.5 km/L at the rate of 50 km/hr.

So it should travel $\frac{19.5}{1.3}$ km/L at the rate of 70 km/hr = 15 km/L.

The distance covered at 70 km/hr with 10 L = 10 × 15 = 150 km.

42. a The robot begins to give material to machine A and then to D, it thus covers 40 m in that time span and takes 4 s. Also then it returns to the origin, and takes 4 s, while covering 40 m again. When it arrives at the origin, the messages of B and C are already there, thus it moves to give the material to them, which takes it in total 6 s, and it covers 30 + 30 = 60 m in total. Hence, the distance travelled by the robot will be 40 m + 40 m + 60 m = 140 m.

43. a In this question, once the robot has delivered the material to machines A and D, it shall reach the origin 2 (nearest), taking 6 s, and covering 60 m.

Then it immediately moves to deliver material to machines C and B covering a distance of 40 m and finally back to the origin (nearest). Thus, it cover a distance of 60 m. Hence, it covers a total distance of 120 m.

44. d Here, by combining the two statements, we get the duration of the flight.
For the arrival time we should have information regarding the time zone difference of Mumbai and No-man's-land.

45. d Let x be the speed of Rahul, and y be the speed of current in mph.

$$\frac{12}{x-y}-\frac{12}{x+y}=6 \Rightarrow \frac{y}{x^2-y^2}=\frac{1}{4}$$

$$\Rightarrow y=\frac{x^2-y^2}{4} \quad \text{... (i)}$$

When Rahul doubles his rowing speed, then we have

$$\frac{12}{2x-y}-\frac{12}{2x+y}=1 \quad \Rightarrow \quad \frac{2y}{4x^2-y^2}=\frac{1}{12}$$

$$\Rightarrow y=\frac{4x^2-y^2}{24} \quad \text{... (ii)}$$

$\therefore$ From (i) and (ii), we have $2x^2 = 5y^2$

Putting $x^2=\frac{5}{2}y^2$ in (i), we get $y=\frac{\frac{3}{2}y^2}{4} \Rightarrow y=\frac{8}{3}$.

46. b If Shyam takes 1 min for every 3 steps, then he takes $\frac{1}{3}$ min for every step.

For 25 steps, he takes $\frac{25}{3}$ min, i.e. 8.33 min.

So Vyom takes $\frac{1}{2}$ min for every step.

For 20 steps, he takes $\frac{20}{2}$ min, i.e. 10 min.

Difference between their time = 1.66 min.

Escalator takes 5 steps in 1.66 min and difference in number of steps covered = 5

Speed of escalator is 1 step for 0.33 min, i.e. 3 steps per minute.

If escalator is moving, then Shyam takes 25 steps and escalator also takes 25 steps.

Hence, total number of steps = 50.

47. a Total time taken by B to cover 60 km $= \frac{60}{50}\text{hr} = \frac{6}{5}\text{hr}$

It stops at station C for $\frac{1}{4}$ hr.

Now, in $\left(\frac{6}{5}+\frac{1}{4}\right)$ hr train X travels

$70 \times \frac{29}{20} = 101.5$ km

This implies that they do not cross each other by the time train Y finishes its stoppage at station C.

Let they meet after t hr.

Then $70t + 50(t-\frac{1}{4}) = 180 \Rightarrow t=\frac{192.5}{120}\text{hr}$

Distance from A will be $(70 \times \frac{192.5}{120})$ km = 112 km approximately

48. b Let L be length in metres of the race which A finishes in t seconds.

Speed of A = $\frac{L}{t}$ m/s

Speed of B = $\frac{L-12}{t}$ m/s

Speed of C = $\frac{L-18}{t}$ m/s

Time taken by B to finish the race

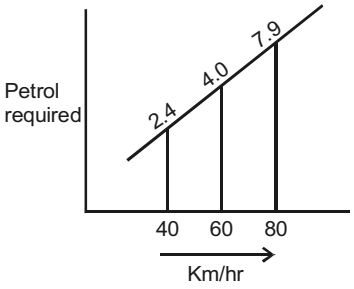
$$= \frac{L}{(L-12)/t} \text{ s} = \left(\frac{L}{L-12}\right)t \text{ s}$$

In this time, C covers (L – 8) m

$$\left(\frac{L-18}{t}\right)\left(\frac{L}{L-12}\right)t = L-8$$

$\Rightarrow L = 48$ m

49. b



60 km/hr is travelled in 4 L petrol (from the graph).

$\therefore$ 1 L is required for 15 km, i.e. for 15 km, 1 L petrol is required.

For 200 km, $\frac{200}{15}$ = 13.33 L is required.

50. b The fuel consumption at various speeds would be

$\frac{200}{40} \times 2.5 = 12.5$ L;

$\frac{200}{80} \times 7.9 = 19.75$ L;

$\frac{200}{60} \times 4 = 13.33$ L

If Manasa travels at 40 km/hr, the total consumption would be 12.5 L. Hence, Manasa has to decrease the speed.

51. a Statement I gives the capacity of boat and is of no help in finding out the number of round trips.

From statement II round trips can be calculated since we know the total time taken is 12 hr.

52. c Statement I gives the rate and statement II gives the size. It is like statement I gives the speed and statement II the distance and we are to find out time. So both statements are needed.

53. d Every trip will need more than 180 m and there are $4\frac{1}{2}$ trips. Hence, the distance covered will be greater than 750 m, for which there is only one option = 860.

Alternative method:

For the first stone, he will cover 100 m.

For second, 200 – 4 = 196 m

For third, 200 – 8 = 192 m

For fourth, 200 – 12 = 188 m

For fifth, 200 – 16 = 184 m

Hence, total distance = 860 m

54. d If speed of N = 4, speed of S = 1,

$$\Rightarrow \text{Average speed} = \frac{2\times 4\times 1}{4+1} = 1.6$$

Because time available is $\frac{2}{3}$, speed = $\frac{3}{2}$

Now average speed = 2.4

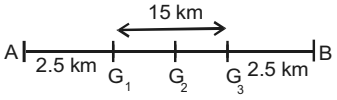
Now speed of N = 8

Now speed of S = y

$$\frac{2\times 8\times y}{8+y} = 2.4 \Rightarrow y = 1.3$$

Required ratio = 1.3 : 8 $\approx$ 1 : 6

55. c



Let G_1, G_2 and G_3 be the three gutters such that $G_2G_3 = 2\ G_1G_2$.

AG_1 = 5 min × 30km/hr = 2.5 km

$\therefore$ $G_1\ G_3$ = 20 – 2 × 2.5 = 15 km

Time taken to cover AG_1 = 5 min

Time taken to cover ($G_1G_3 + G_3A$)

$$= \frac{(15+17.5)\text{km}}{2\times 30\ \text{km/hr}} = \frac{32.5}{60}\times 60 = 32.5\ \text{minutes}$$

The patient reaches the hospital in a total of (32.5 + 5) = 37.5 minutes

Maximum time that the doctor gets to attend the patient = 40 – 37.5 – 1 = 1.5 minutes.

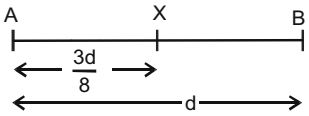
56. c By trial and error:

30 × 12 = 360 > 300

30 × 7.5 = 225 < 300

50 × 6 = 300. Hence, he rented the car for 6 hr.

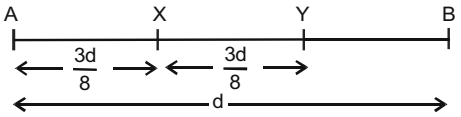
57. ***b** AB is the tunnel and 'd' km be its length.



Let the current position of the cat be X. If it runs towards A, it would reach A at the same time as the train reaches A.

However, if it runs towards the other end B, it would reach point Y at the same time when the train reaches A.

Hence, point Y would be at a distance of $\frac{3d}{8}$ km from X



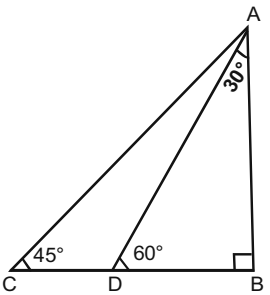
As the cat and the train would reach B simultaneously, the cat would cover the rest $\frac{2d}{8} = \frac{d}{4}$ km distance in the same time that the train takes to cover the whole tunnel i.e. d km.

Therefore, the speed of the train = 4 × the speed of the cat

Hence, ratio of the speeds of the train and cat is 4 : 1.

*** The language in the question is slightly ambiguous**. A possible interpretation is that the ratio of their speeds is to be determined which is correctly 4 : 1.

58. a Let AB be the tower and C and D be the initial and final positions of the car.



Let AB = 1

Therefore, BC =1

$$\therefore \tan 60 = \frac{AB}{BD} \Rightarrow \sqrt{3} = \frac{1}{BD} \Rightarrow BD = \frac{1}{\sqrt{3}}$$

$$\therefore CD = BC - BD = 1 - \frac{1}{\sqrt{3}}$$

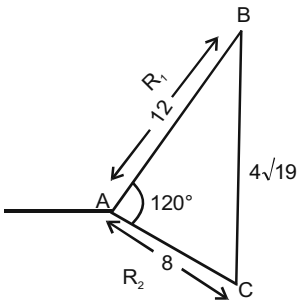
As time for traveling CD, i.e. $1-\frac{1}{\sqrt{3}}$ is 10 min

$\therefore$ Time required for traveling BD $= \frac{\frac{1}{\sqrt{3}}}{1-\frac{1}{\sqrt{3}}} \times 10$

$= \frac{1}{\sqrt{3}-1} \times 10 = \frac{10}{\sqrt{3}-1} = \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{10\left(\sqrt{3}+1\right)}{2} = 5\left(\sqrt{3}+1\right)$ min

59. b



$BC^2 = (12)^2 + 8^2 - 2 \times 12 \times 8 \times \cos 120°$

$\therefore BC = 4\sqrt{19}$

$\therefore t_1 = \frac{4\sqrt{19}+8}{3}$ and $t_2 = \frac{4\sqrt{19}+12}{2}$

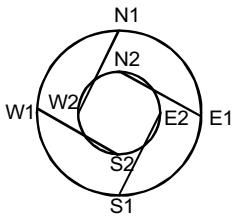
[where t_1 and t_2 are time taken by Ram and Shyam to reach the starting point]

$t_2 - t_1 = \frac{4\sqrt{19}+12}{2} - \frac{4\sqrt{19}+8}{3}$

$= \frac{12\sqrt{19}+36-8\sqrt{19}-16}{6}$

$= \frac{4\sqrt{19}+20}{6} = \frac{2\sqrt{19}+10}{3}$.

For question 60 to 62 :



If the radius of the inner ring road is r, then the radius of the outer ring road will be 2r (since the circumference is double).

The length of IR = 2π r, that of OR = 4π r and that of the chord roads are $r\sqrt{5}$ (Pythagoras theorem)

The corresponding speeds are 20π, 30π and $15\sqrt{5}$ kmph.

Thus time taken to travel one circumference of IR = $\frac{r}{10}$ hr, one circumference of OR = $\frac{r}{7.5}$ hr and one length of the chord road = $\frac{r}{15}$ hr

60. c Sum of the length of the chord roads = $4r\sqrt{5}$ and the length of OR = 4π r.

Thus, the required ratio = $\sqrt{5} : \pi$

61. c The total time taken by the route given = $\frac{r}{30} + \frac{r}{15} = \frac{3}{2}$ (i.e. 90 min.)

Thus, r = 15 km. The radius of OR = 2r = 30 kms

62. d The total time taken = $\frac{r}{20} + \frac{r}{15} = \frac{7r}{60}$

Since r = 15, total time taken = $\frac{7}{4}$ hr = 105 min.

63. c The ratio of the speeds of the fastest and the slowest runners is 2 : 1. Hence, they should meet at only one point on the circumference i.e. the starting point (As the difference in the ratio in reduced form is 1). For the two of them to meet for the first time, the faster should have completed one complete round over the slower one. Since the two of them meet for the first time after 5 min, the faster one should have completed 2 rounds (i.e. 2000 m)and the slower one should have completed 1 round. (i.e. 1000 m) in this time. Thus, the faster one would complete the race (i.e. 4000 m)in 10 minutes.

64. c If A takes X seconds then B takes (x + 60) seconds to run 1000 m.

Ratio of speeds of A and C = 1000 : 625 = 8 : 5

Ratio of time taken by A and C = 5 : 8

If B takes y second then C takes (y + 30) seconds to run 1000 m, then

$5(y + 30) = 8x$ ...(i)

and $\frac{1000}{x+60} = \frac{1000}{y}$ ...(ii)

Solving, we get the values of x and y.

Hence, both statements are required.

65. c The boats will be colliding after a time which is given by

$t = \frac{20}{5+10} = \frac{4}{3}$ hours $= 80$ minutes.

After this time of 80 minutes, boat (1) has covered $80 \times \frac{5}{60}$ kms $= \frac{20}{3}$ kms, whereas boat (2) has covered $80 \times \frac{10}{60}$ kms = $\frac{40}{3}$ kms.

After 79 minutes, distance covered by the first boat = $d_1 = \left(\frac{20}{3} - \frac{5}{60}\right)$ kms

After 79 minutes, distance covered by the second boat = $d_2 = \left(\frac{40}{3} - \frac{10}{60}\right)$ kms

So the separation between the two boats

$= 20 - (d_1 + d_2) = \frac{1}{4}$ kms

Alternative method:

Relative speed of two boats = 5 + 10 = 15 km/hr

i.e. in 60 min they cover (together) = 15 km

$\therefore$ in 1 min they will cover (together) $\frac{15}{60} = \frac{1}{4}$ km

66. b Let d be the distance to be travelled and t be the time taken to reach at 1 p.m.

If the man cycles at 10 km/hr, then $\frac{d}{t} = 10$ ... (i)

If the man cycles at 15 km/hr, then $\frac{d}{t-2} = 15$ ... (ii)

Solving (i)and (ii), we get t = 6 hours and d = 60 km

To reach the place by noon, he needs to cycle at

$= \frac{d}{t-1} = \frac{60}{6-1} = 12$ km/hr

67. d **Race 1:**

In whatever time Karan covers a distance of 100 m, Arjun covers 90 m in the same time.

$\therefore$ Ratio of their speeds = 10 : 9

Race 2:

Now Karan is 10 m behind the starting point. Once again to cover 100 m from this new point Karan will be taking the same time as before. In this time, Arjun will be covering 90 meters only. This means that now both of them will be at the same point, which will be 10 meters away from the finish point. Since both of them are required to cover the same distance of 10 m and Karan has a higher speed, he will beat Arjun. No need for calculations as option (d)is the only such option.

68. c As options are independent of n, let us assume n = 2.

Circumference of the track $= 2\pi r$

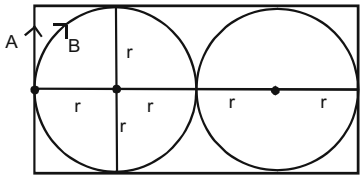
$\therefore$ Time taken for first round

$= \frac{1}{2} + 1 + 2 + 4 = 7.5$ minutes and time taken for second round = 8 + 16 + 32 + 64 = 120 minutes

Hence, ratio $= \frac{120}{7.5} = 16 : 1 = 16$

69. d Let r be the radius of the two circular tracks.

$\therefore$ The rectangle has dimensions 4r × 2r.



A covers a distance of 2r + 2r + 4r + 4r = 12 r

B covers a distance of $2\pi r + 2\pi r = 4\pi r$

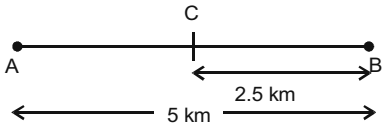
Time taken by both of them is same.

$\therefore \frac{4\pi r}{S_B} = \frac{12r}{S_A} \Rightarrow S_B = \frac{\pi}{3} S_A$

$\therefore$ Required percentage $= \frac{S_B - S_A}{S_A} \times 100$

$= \frac{\pi - 3}{3} \times 100 = 4.72\%.$

For questions 70 and 71:



Ram: A (9:00 AM) C (9:30) B (10:00 AM)

A (11:00 AM) C (10:30) B (10:00 AM)

@ 5km/h

Shyam: A (9:45 AM) C (10:00) AM B (10:15 AM)

A (10:45 AM) C (10:30) B (10:15 AM)

@ 10 km/h

70. b It is clear that Ram and Shyam shall meet each other between C & B, sometime after 10:00 AM. At 10:00 AM they are moving as shown below:

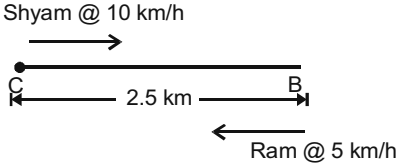


Fig. at 10:00 AM

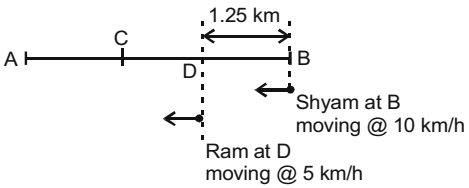
From now, time taken to meet = $\frac{2.5}{(10+5)} \times 60$ min

= 10 minutes

So, they meet each other at 10:10 AM.

71. b It is clear from the diagram that at 10:30; Shyam overtakes Ram.

Alternate: At 10:15 the situation is as show:



Time taken for Shyam to overtake Ram

$= \frac{1.25}{(10-5)} \times 60 = 15$ min.

$\Rightarrow$ Shyam overtakes Ram at 10:30 AM.

72. c Let us assume that Arun started running at 10 a.m. and Barun started at 12 noon. So, in these two hours distance traveled by Arun is 60 km and the relative speed of Barun w.r.t Arun is 10 km/hr.

So Barun will overtake Arun after $= \frac{60}{10} = 6$ hours

So, Barun reaches there at 6 p.m.

So, Kiranmala also overtakes Arun at 6 p.m.

Let us assume Kiranmala takes 't' time to overtake Arun and the relative speed of Kiranmala w.r.t Arun is 30 km/hr and Arun ran for 8 hrs.

So, distance travelled by Arun is = 30 × 8 = 240 km

while distance travelled by Kiranmala = 60t

$\therefore$ 240 = 6t $\Rightarrow$ t = 4

Hence, Kiranmala start running 4 hours after Arun had st off.

For questions 73 and 74:

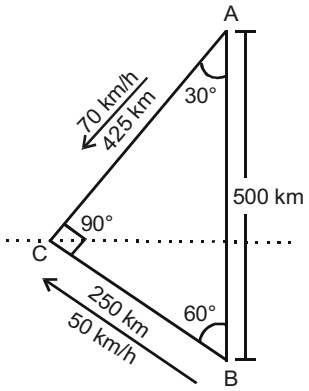
Let the cruising speed of the plane and the time difference between A and B be y km/hr and x hours respectively.

Distance between A and B = 3000 kilometers.

For the plane moving from city A to City B : 3000 = (7 – x)× (y – 50). This is satisfied for x = 1 and y = 550.

These are the only values given in the options that satisfy the above equation.

75. b As per the conditions given in the questions, we get the following figure.



The train leaving at B reaches C at 1:00 p.m. taking a total time of 5 hours, which means that Rahim should reach C by 12:45 p.m.

Now total time taken by Rahim moving with a speed of 70 km/hr is 't'.

$t = \frac{250\sqrt{3}}{70}$ km/hr = 6 hrs 12 mins (approx)

The time by which Rahim must start from A

= 13 : 00 – 0 : 15 – 6 : 12 = 6 : 33

Therefore, the latest time by which Rahim must leave A and still catch the train is closest to 6:30 a.m.

76. d In the time Chaupat covers x m, Popat covers (x – 18) m and Sarpat covers (x – 24) m.

And in the time Popat covers x m, Sarpat covers (x – 8) m.

So $\frac{x-18}{x-24} = \frac{x}{x-8}$

$\Rightarrow x^2 - 26x + 144 = x^2 - 24x$

$\Rightarrow 2x = 144$

$\Rightarrow x = 72$

77. b Himanshu starts at 7 a.m. and Saral at 8 a.m. So Himanshu would have covered 2 km by the time Saral starts. Saral will catch Himanshu after $\frac{2}{3-2} = 2$ hours.

So Himanshu and Saral will be together at 10 a.m. after each has covered 6 km. Vikas also starts at 10 a.m. So the time taken by Himanshu to meet Vikas will be $\frac{6}{2+4} = \frac{6}{6} = 1$ hour.

So Himanshu and Vikas meet at 11 a.m.

78. d A covers 10 km in the first hour while B covers 20 km. As a result the distance between them increases by 10 km.

A covers 10 km in the next hour while B covers – 10 km. As a result the distance between them decreases by 20 km.

In the first two hours the distance between A and B decreases by 10 km.

The time taken by A and B to meet for the first time

$= \frac{100}{10} \times 2 = 20$ hours

79. a Let the work (in units) done in a day by Pawan, Qureshi and Rohit be P, Q and R respectively. Let the total work done be (L.C.M. of 10 and 12) 60 units.

$\therefore$ P + Q = 6 units and Q + R = 5 units.

Let Pawan's share be Rs. x. So Rohit's share will be

Rs. (160 – x).

Ratio of the amount received by Pawan and Qureshi together to the amount received by Qureshi and Rohit together

$$= \frac{x+140}{140+160-x} = \frac{6}{5} \quad \text{or} \quad x = 100$$

80. a If Yamini covers 5 km in 't' hours, Zora will cover 15 km in $t+\frac{2}{3}$ hours.

The distance between the two at this moment is 5 km, and Yamini will cover 2 km more and Zora will cover 3 km more till they meet.

Therefore, the ratio of the speeds of Yamini to Zora is 2 : 3.

$$\frac{5}{t} \div \frac{15}{\left(t+\frac{2}{3}\right)} = \frac{2}{3}$$

Solving the above equation, we get $t = \frac{2}{3}$.

Speed of Yamini = 7.5 km/hr.

81. b The rabbit overstretched his sleeping time by $1\frac{1}{6}t$ min.

$$\therefore \quad t+1\frac{1}{6}t = 14+t \Rightarrow t = 12$$

Let the speed (in km/min) of the rabbit and tortoise be '6x' and 'x' respectively.

Had the rabbit not overstretched his nap, he would have beaten the tortoise by 13 min.

$$\therefore \quad \frac{2}{6x}+12+13 = \frac{2}{x}$$

$$\Rightarrow \quad x = \frac{1}{15}$$

Hence, the time taken by the tortoise to complete the race = $\frac{2}{x} = \frac{2}{1/15}$ = 30 min.

82. d The distance covered by R in 2 hours (3 PM to 5 PM) is same as the distance covered by P in 4 hours (1 PM to 5 PM).

Ratio of speeds of P and R = 1 : 2.

Now, R tales over Q in another hour by doubling his speed, so R has covered a total distance in 3 hours (3 PM to 6 PM) which he would have covered in 4 hours without changing his speed.

To cover the same distance, a takes 5 hours (1 PM to 6 PM) Ratio of speed of Q and R = 4 : 5

$\Rightarrow$ Ratio of speed of P and Q = 5 : 8.

83. b 

Let's take there are two ants.

Considering worst possible case we can see easily the required time is same as the time taken by an ant to reach one extreme point to another extreme point.

Which will be same when there are 1000 ants.

ie, maximum time = $\frac{100}{50}$ min. = 2 min.

84. 16

Let the distance be x

$$\therefore \quad 15 + \frac{x}{4} = \frac{x/2}{7/2} + \frac{x/2}{9/2}$$

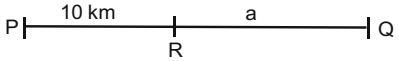
Solving we have x = 15 × 252

Total time taken by the second boat

$$= \frac{15\times 252}{7} + \frac{15\times 252}{9}$$

= 960 sec = 16 min.

85. b Let the speeds of Prakash and Arpit be 2x and 5x respectively. Let's assume that Arpit turned back from point Q as shown in the figure given below, ran at a speed of x after turning back and met Prakash at point R, 't' hours after they started running.



From the given conditions,

$$2x \times t = 10 = 5x \times 2 - x \times (t-2)$$

$$\Rightarrow \quad t = 4$$

So the running speed of Prakash

$$= 2x = \frac{10}{4} = 2.5 \text{ km/hr.}$$

86. 156 Let the length of the track be 4x meters.

As they together cover 2x meters in 12 minutes, they will together cover 4x meters in 24 minutes.

Hence, the required time = 12 + 6 × 24 = 156.

87. 1900 900

Ratio of speed of A and B is 10 : 9 and that of B to C is 10 : 9

$\therefore$ Ratio of speed of A and C is 100 : 81

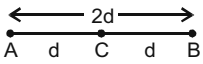
$\Rightarrow$ So, in 100 km race, A beats C by 19 km

$\Rightarrow$ So, in 10 km race A beats C by

$$= \frac{19}{100} \times 10 \text{ km}$$

$$= \frac{19}{10} \times 1000 \text{ m} = 1900 \text{ m}$$

88. c



Total time taken to cover distance AB = $\frac{2d}{60}$.

Time taken to cover BC = $\frac{d}{25}$.

Time taken to reach point A through bypass road

= $\frac{d+5}{50}$.

So, $\frac{d}{25}+\frac{(d+5)}{50}-\frac{2d}{60}=\frac{30}{60}$

$\Rightarrow \frac{12d+6d+30-10d}{5}=\frac{30}{60}$

$\Rightarrow$ 8d + 30 = 150

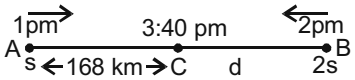
$\Rightarrow$ 8d = 120

$\Rightarrow$ d = 15

$\Rightarrow$ So, total distance travelled by him is 4d + 5

= 65 miles.

89. b



Time taken to cover distance AC = $2+\frac{40}{60}=\frac{8}{3}$ hrs.

So, speed of motorbike = $\frac{168}{8}\times 3$ = 63 km/hr

So, speed of car = 2 × 63 = 126 km/hr

BC (distance) = $126\times\left(1+\frac{40}{60}\right)=126\times\frac{5}{3}=210$ km

So, total distance = 168 + 210 = 378 km.

90. b Let distance AP be x km.

$\therefore$ BP = 3x km.

Let the speed of car 1 be 2s then speed of car 2 will be s.

Now, according to the question,

$\frac{3x}{s}-\frac{x}{2s}=1$

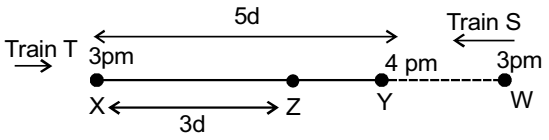
$\frac{6x-x}{2s}=1$

$\Rightarrow \frac{x}{s}=\frac{2}{s}$

$\therefore$ Time taken by car 1 in reaching P from A is

= $\frac{x}{2s}=\frac{2}{5\times 2}=\frac{1}{5}\times 60=12$ minutes.

91. 15



Let Train S is at point W at 3 pm and both the trains pass each other at point Z.

$\therefore$ Speed of train T be 4s and that of train S will be 3s.

Distance covered by train S from 3 pm to 4 pm i.e. (YW) = 3s × 1 = 3s.

$\therefore$ The time taken by the trains when both started simultaneously at 3 pm till they passed each other

$=\frac{5d+3s}{(4s+3s)}=\frac{5d+3s}{7s}$

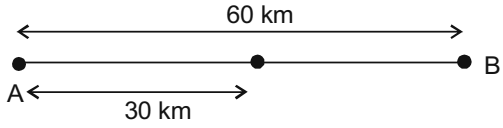
So, the speed of train T to cover distance XZ

$=\frac{3d}{5d+3s}\times 7s$

$\Rightarrow 4s=\frac{3d\times 7s}{5d+3s}$

$\therefore$ Time taken by train T to cover the distance from X to Y = $\frac{5d}{4s}=\frac{5}{4}\times 12=15$ hours

92. d



Partha →

Narayan →

Let Narayan takes t hours to cover the distance AB.

$\therefore$ Partha will take (t + 4) hours to cover the same distance.

Now, Partha reaches midpoint of AB two hours before Narayan reaches B.

$\therefore$ Partha takes (t – 2) hours to cover 30 km.

$\Rightarrow$ Remaining 30 km, is covered by Partha in (t + 4) – (t – 2) = 6 hours.

$\therefore$ Speed of Partha = $\frac{30}{6}=5$ km/hr.

93. 50 Let the speed of the cars starting from A and B be x km/hr and y km/hr respectively.

Applying the concept of relative speed we get:

$\frac{350}{x+y}=1$ and $\frac{350}{y-x}=7$

Solving the two equations, we get x = 150 km/hr and y = 200 km/hr.

Hence, required difference is 50.

94. a Ratio of speeds of car 1 and car 3 = 200 : 100 = 2 : 1

Similarly, ratio of speeds of car 3 and car 2

= 200 : 100 = 2 : 1

Hence, ratio of the speeds of car 2 and car 1 = 1 : 4.

95. 5 Time taken for Car 1 to reach B from the point when Car 2 starts:

First 30 km – 18 min

Second 50 km – 60 min

Third 50 km – 120 min

$\Rightarrow$ Total time = 198 minutes

In 198 minutes the distance covered by Car 2 will be:

First 50 km – 30 min

Second 50 km – 60 min

Therefore, in remaining time of 108 min the distance covered by Car 2 at 25 km/hr will be = 45 km.

Hence, required distance = 5 km.

Time and Work

1. a Ratio of working efficiently of A, B and C

$= \frac{1}{6} : \frac{1}{8} : \frac{1}{15}$ or 20 : 15 : 8

Total earnings would be divided among A, B and C in ratio 20 : 15 : 8.

Earnings of A, B and C (in Rs.) will be 44, 33 and 17.60 respectively.

2. c Let x be the number of tailors initial appointed.

Let n be the number of shirts that had to be stitched by each tailor initially

Let y be the number of tailors who did not come.

$x \times n = 480$.

$(x - y)(n + 32) = 480$

Only option (c)satisfies the equation.

3. b B being twice as fast as A, will take half of time of A to produce a million units i.e. = 30 hrs.

Since Machine C takes the same amount of time as A & B running together,

$\therefore \frac{1}{C} = \frac{1}{A} + \frac{1}{B}$ or $\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{2}{A} + \frac{2}{B}$.

$\Rightarrow \frac{2}{60} + \frac{2}{30} = \frac{1}{10}$.

Hence, it will take 10 hours.

4. c **From statement I:** From this statement, exact number of widgets produced by machine A cannot be determined.

From statement II: From this statement also exact number of widgets produced by machine A cannot be determined.

On combining statements I and II: Dealer produced minimum 10 units of widget A and 15 units of widget B and for that he requires 10 × 2 + 15 × 4 = 80 machine hours and number of machine hours available per week is also 80 hours.

Hence, he produced 10 units of widget A.

5. b Let the work done by a worker be x units, w be the total work and n be the number of workers in the group. Then,

w = Work done on the nth day i.e. last day + Work done on the second last day + … + Work done on the first day

$\Rightarrow w = x + 2x + \ ... + nx = \frac{n(n+1)x}{2}$ … (i)

When none of the workers is removed, then

$w = nx \times \frac{2n}{3} = \frac{2n^2x}{3}$ … (ii)

From equation (i)and (ii), we get

$\frac{n(n+1)x}{2} = \frac{2n^2x}{3} \Rightarrow n = 3.$

6. d There are 18 men, 15 women and 6 children.

Working efficiency of man : woman : child = 6 : 3 : 1.

So the ratio of the work done in a day by 18 men, 15 women and 6 children = (18 × 6) : (15 × 3) : (6 ×1) = 108 : 45 : 6.

Hence, the daily wage of Rs. 1,113 should be divided in this ratio. That makes it, Rs.756 for men, Rs.315 for women and Rs. 42 for children.

Hence, 6 children earn Rs. 42 in a day.

So the daily wage of a child should be Rs. 7.

7. b Since a bucket holds 5 litres of water, water discharged in one minute by tap A, B and C is $\frac{5}{6}$ litres, $\frac{2}{3}$ litres and $\frac{1}{2}$ litres respectively

If A, B and C are all opened simultaneously, total discharge in one minute = $\left(\frac{5}{6} + \frac{2}{3} + \frac{1}{2}\right)$ = 2 litres

So in 2 hours, the discharge would be 240 litres, that is the capacity of the tank.

8. c Since the leak can empty the tank in 8 hours, the rate of leak = $\frac{1}{8}$.

And since the leak along with the tap can empty it in 12 hours, the equation can be rewritten as:

$\frac{1}{x} - \frac{1}{8} = -\frac{1}{12}$ (where x is the time taken by the tap to fill the tank).

Simplifying we get, $\frac{1}{x} = \frac{1}{24}$ or x = 24.

This means that the tap can fill the tank in 24 hours. Since the tap admits 6 litres per hour, it will admit (6 × 24)= 144 litres in 24 hours, which should be the capacity of the tank.

9. a If the total work is one unit, work done by A and B in one day will be $\frac{1}{a}$ unit and $\frac{1}{b}$ unit respectively.

Using statement I: $\frac{n}{a} + \frac{n}{b} = 1$,

Since 'n' is an integer, if both A and B work for n days, work will be completed no matter who starts a work.

Using statement II, nothing can be concluded as total amount of work is not known.

10. a If x men were there on day one, there would be (x – 110)men on the 12th day.

Hence, on an average, there were (x – 55) men.

The job takes $\frac{3}{2}$ times the normal time.

Hence, the average number of people = $\frac{2}{3}$.

$\Rightarrow$ $x - 55 = \frac{2}{3}x$

Hence, x = 165

11. c Let the first typist takes X hours and the second takes Y hours to do the whole job.

When the first was busy typing for 3 hr, the second was busy only for 2 hr.

Both of them did $\frac{11}{20}$ of the whole work.

$\therefore \frac{3}{X} + \frac{2}{Y} = \frac{11}{20}$.

When the assignment was completed, it was revealed that each typist had done half the work.

$\therefore$ The first one spent $\frac{X}{2}$ hr, and the second, $\frac{Y}{2}$ hr.

And since the first had begun one hour before the second, we have $\frac{X}{2} - \frac{Y}{2} = 1 \Rightarrow X = 10$ hr, $Y = 8$ hr.

12. c As there is no day in the week whose first letter is R, it can be concluded that Raja does not have any holidays. Since 1996 is a leap year, we can figure out that Raja has totally worked for 7 days. Let his rate of doing the job be one unit per day. So he would complete 7 units of work in a week. J's situation is similar to Raja and does not have any holiday during the week. T will have two holidays in a week (Tuesday and Thursday). Since the rate of working for all the three of them is the same, the working pattern of J and T would be as follows.

We can see that depending on which day is February 25, 1996, to complete 7 units, they would either take 4 days or 5 days. Hence, the answer is (c).

Sun.	Mon.	Tue.	Wed.	Thurs.	Fri.	Sat.
2 units	2 units	1 unit	2 units	1 unit	2 units	2 units

13. c Now Raja has worked for (5 days in February + 31 days in March + 2 days in April) = 38 days. Let us assume his rate to be the same as in the previous question, viz. one unit a day. Hence, he completes 38 units totally. In a week, T takes holiday on Tuesday and Thursday, while S takes holiday on Saturday and Sunday. We can see that their working pattern would be as follows.

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
1 unit	2 units	1 unit	2 units	1 unit	2 units	1 unit

So in a week they work together 10 units work. Thus, in three weeks, they would complete 30 units work. It can be found out that February 25 is Sunday. So the remaining 8 units of work can be completed only on Friday, i.e. March 22.

14. b In one day, A would do $\frac{1}{3}$ of the job, B would do $\frac{1}{4}$ of the job and C would do $\frac{1}{6}$ of the job.

Hence, if all three of them work simultaneously, in one day they would do $\left(\frac{1}{3} + \frac{1}{4} + \frac{1}{6}\right) = \frac{3}{4}$ of the job.

Hence, to complete the entire job together they would take $\frac{4}{3}$ days.

Shortcut:

A can complete the job in 3 days. So A, B and C combined will take less days than A alone to finish the job. So straightway option (b).

15. d Work done in one day by A, B, C and D are $\frac{1}{4}, \frac{1}{8}, \frac{1}{16}$ and $\frac{1}{32}$ respectively.

Using answer choices, we note that the pair of B and C does $\frac{3}{16}$ of work in one day; the pair of A and D does $\frac{1}{4} + \frac{1}{32} = \frac{9}{32}$ of the work in one day.

Hence, A and D take $\frac{32}{9}$ days.

B and C take $\frac{16}{3} = \frac{32}{6}$ days.

Hence, the first pair must comprise of A and D.

16. c Let 't' be the time taken for all three together, then $\frac{1}{t+6} + \frac{1}{t+1} + \frac{1}{2t} = \frac{1}{t}$

Solving the above equation, we get

$3t^2 + 7t - 6 = 0$ or $t = \frac{2}{3}$ hr = 40 min

17. d Total amount of work = 60 man-hours

From 11 am to 5 pm, 6 technicians = 36 man-hours

From 5 pm to 6 pm, 7 technicians = 7 man-hours

From 6 pm to 7 pm, 8 technicians = 8 man-hours

From 7 am to 8 pm, 9 technicians = 9 man-hours

Total = 60 man-hours

18. b Three small pumps = Two large pumps

Three small + One large pumps = Three large pump

$\therefore$ $\frac{1}{3}$ rd of total time is taken by the large pump alone.

19. c **Machine I :**

Number of nuts produced in one minute = 100

To produce 1000 nuts time required = 10 min

Cleaning time for nuts = 5 min

Effective time to produce 1000 nuts = 15 min

Effective time to produce 9000 nuts = 15 × 9 – 5 = 130 min

Machine II :

To produce 75 bolts time required = 1 min

To produce 1500 bolts time required = 20 min

Cleaning time for bolts = 10 min

Effective time to produce 1500 bolts = 30 min

Effective time to, produce 9000 bolts = 30 × 6 – 10 = 170 min … (ii)

From (i) and (ii),

Minimum time to produce 900 pairs of nuts and bolts = 170 minutes

20. c

A	B	C	D
–20	20		
90		–90	
–10			10
		–50	50
	–100	100	
	110		–110
Total +60	30	–40	–50

D gets emptied first, it gets emptied in 20 minutes.

Hence, option (c) is the correct answer.

21. b Area of cross section for

$$P_1 = A_1 = \left(\frac{22}{7}\right)7^2 = 154 \text{ m}^2$$

Volume of water flowing through P_1 in one second

$= 154 \times 10 = 1540 \text{ m}^3$

Volume of tank = V = $1540 \times 2 \times 3600$

$= 11088 \times 10^3 \text{ m}^3$

Area of cross section for

$$P_2 = A_2 = \left(\frac{22}{7}\right)14^2 = 616 \text{ m}^2$$

Let the rate of water flowing through P_2 = s m/s

Volume of water flowing through P_2 in one second = 616s m^3

Volume of water flow in the tank when P_1 is used as inlet and P_2 is used as outlet pipe: 1540 – 616s.

Time taken to fill = 4 hours = 4 x 3600 seconds

So,(1540 – 616s) × 4 × 3600 = V

$= 11088 \times 10^3$

$= 1540 \times 2 \times 3600$

or $1540 - 616s = 770$

or $s = 1.25$ m/s

22. d Let the efficiencies of Anirudh and Anushka be 'a' and 'b' units/day respectively.

$$\therefore (a+b)x + a \times \frac{x}{2} = (a+b)\frac{3x}{4} + a \times x \Rightarrow \frac{a}{b} = 1$$

Hence, the required ratio is 1 : 1.

23. 150 $\frac{m \times d \times h}{w} = \text{constant}$, where

m = number of men

d = number of days

h = number of hours

w = amount of work

Let the number of additional men required be x.

$$\therefore \quad \frac{75 \times 90 \times 8}{2} = \frac{(75+x) \times 60 \times 10}{5}$$

or $x = 150$

Hence, 150 additional men would be required.

24. a A $\rightarrow$ inlet pipe, B $\rightarrow$ outlet pipe

A takes 8 hours to fill the tank

(A and B) together takes 10 hours

So, total volume of the tank is LCM of 8, 10 i.e. 0 ltrs(say)

Half filled tank means $\frac{40}{2}$ = 20 ltrs.

In 1 hour, A fills $\frac{40}{8}$ = 5 ltrs and

(A + B) fills $\left(\frac{40}{10}\right)$ = 4 ltrs.

So, B empties in 1 hour = 5 – 4 = 1 ltr

So, total time taken by B to make the full tank half filled $= \frac{20}{1} = 20$ hours.

25. a Amal can complete the work in 10 days

Bimla can complete the work in 8 days

(Amal + Bimla + Kamal) can complete the work in 4 days

Total work done = LCM of 10, 8 and 4 = 40 units.

So, Amal's 1 day work is 4 units.

Bimal's 1 day work is 5 units

Amal's + Bimal's + Kamal's together 1 day work is = 10 units

$\Rightarrow$ Kamal's 1 day work is 1 unit.

So, their amount of work done is in the ratio of 4 : 5 : 1

$\Rightarrow$ Share of Kamla = Rs.100

26. 10 Let the filling pipe be denoted by f and the draining pipe by d.

$\therefore \quad 6(6f + 5d) = 60\,(5f + 6d)$

$6f + 5d = 50f + 60d$

$\Rightarrow$ $4f + 5d = 0$

$5d = -4f$

$\frac{d}{f} = -\frac{4}{5}$

$\therefore$ Total quantity of the tank

$= 6\ (6 \times 5 + 5 \times (-4))$

$= 60$ units

One draining and two filling pipes will fill

$= 1 \times -4 + 2 \times 5 = 6$ units in 1 hour

$\therefore$ Number of hours when the empty tank will get completely filled $= \frac{60}{6} = 10$ hours

27. c Let A finishes the job in 4x days.

$\therefore$ B finishes the job in $\frac{125}{100} \times 4x = 5x$ days.

Total work = LCM (4x, 5x) = 20x.

$\therefore$ A does $\frac{20x}{4x} = 5$ units in 1 day.

$\therefore$ B does $\frac{20x}{5x} = 4$ units in 1 day.

$\frac{20x}{2} = 10x$	?	$\frac{5}{100} \times 20x = x$
A	$(A + B)$ in 4 days	B

$\therefore$ In 4 days, A and B together does

$= 4\ (5 + 4) = 36$ units

$\therefore$ $36 = 20x - (10x + x)$

$9x = 36$

$x = 4$

$\therefore$ Total work done $= 20 \times 4 = 80$

Hence, B can alone finish the entire job in

$= \frac{80}{4} = 20$ days.

28. b According to the question,

$30(15H + 5R) = 60\ (5H + 15R)$

$15H + 5R = 10H + 30R$

$5H = 25R$

$\frac{H}{R} = \frac{5}{1}$

$\therefore$ Total work = $30\ (15 \times 5 + 5 \times 1) = 2400$

$\therefore$ Number of days taken by fifteen humans working together without any robot to finish the job

$= \frac{2400}{15 \times 5} = 32$

29. 48 Let the units of water bring in by A and B in 1 minute be 'a' and 'b' respectively.

$\Rightarrow 30 \times (10a + 45b) = 60(8a + 18b)$

$\Rightarrow 2a = 3b$ or $a : b = 3 : 2$

Therefore, total capacity of tank $= 30 \times (30 + 90)$

Hence, required time $= \frac{30(30 + 90)}{7 \times 3 + 27 \times 2} = 48$ minutes.

30. b Let the efficiencies of Ramesh and Ganesh be R and G respectively.

$\Rightarrow$ $16(R + G) = 17G + 7R + 10 \times (0.7R)$

$\Rightarrow$ $G = 2R$

Thus, total Work $= 48R$

Work left after 7 days $= 48R - 7 \times 3R = 27R$

Hence, required time $= \frac{27R}{2R} = 13.5$ days.

31. b Work done by A in 3 hours i.e. from 5 pm to 8 pm is done by B in 2 hours i.e. from 5 pm to 7 pm

Thus, the ratio of rate of flow of water from A and B = 2 : 3

Therefore, we can assume the time taken by A and B to be 3x hours and 2x hours respectively.

Now, it's given that $3x - 2x = 2$ hours (A finishes at 8 pm and B at 6 pm)

Thus, time taken by A and B to fill the tank will be 6 hours and 4 hours respectively such that the starting time is 2 pm and capacity of the tank = 12 units.

Hence, required time $= \frac{12}{5} = 2.4$ hours which means they will fill the tank completely at 4.24 pm by starting at 2 pm.

Miscellaneous

1. c Options (b) and (d)can be eliminated as the difference in the number of books is 1. i.e.12,13 and 5,6 respectively.

Among option (a) and (c)we can quickly verify by multiplying only the last digits.

Eg. For option (a)the last digit of the total cost should be (5 x 7) + (8 x 9)+ (7 x 3) = 5 + 2 + 1 = 8. Which is not we are looking for as our total cost is Rs.620.

Hence, option (c)is correct choice.

2. d As total cost is an integral multiple of 10, number of cards bought by Rahul of Rs.3.50 and that of Rs.4.50 must be equal i.e. 5 or 10.

If Rahul bought 5 cards of Rs.3.50 and 5 cards of Rs.4.50, total cost of all cards = 2 × 10 + 3.50 × 5 + 4.50 × 5 + 5 + 10 = Rs. 110.

If Rahul bought 10 cards of Rs.3.50 and 10 cards of Rs.4.50, total cost of all cards = 2 × 5 + 3.50 × 5 + 450 × 10 + 5 × 5 = Rs. 115. (not possible)

$\therefore$ Required number of notes $= \frac{110}{10} = 11$.

3. a Let present age of X and Y be x and y respectively.

We have, $x = 3(y - 3)$ ... (i)

From statement I, $x = y + 17$ ... (ii)

From statement II, $x + 9 = 3y$ ... (iii)

From (i) and (ii)x = 37.5 years and y = 12.5 years

But, equations (i) and (iii)are same so we cannot find values of x and y.

4. d

Option	Location	Expenditure of Town A students	Expenditure of Town B students	Total Expenditure
(a)	33 km from A	33 x 1.2 x 30 = 1188	67 x 1.2 x 100 = 8040	1188 + 8040 = 9228
(b)	33 km from B	67 x 1.2 x 30 = 2412	33 x 1.2 x 100 = 3960	2412 + 3960 = 6372
(c)	Town A	0	100 x 100 x 1.2 = 12000	12000
(d)	Town B	30 x 100 x 1.2 = 3600	0	3600

Hence, we find that the least expenditure will be incurred if the school is located in town B.

HINT : Students please note that since there are more number of students from Town B, to minimise the total expenditure the school should be located as closer to town B as possible.

5. d If a clock has to strike 4 or 4 times, there are 3 time intervals between the 4 strikes (Since the first strike happens at the zeroth second).

So in 7 seconds the pendulum elapses 3 time intervals. To strike 11, there has to be 10 time intervals, which will take $\frac{10 \times 7}{3}$ = 23.33 seconds.

6. a Miguel's income

= 5 + (0.02 × 25)+ (0.03 × 25) + (0.04 × 50)

= $8.25.

Martin's commission = $10.

Hence, obviously I > II.

7. d From the statement I, we can only find the number of mangoes stolen by 4 of the 10 boys.

The statement II suggests that the number of mangoes stolen by each of the remaining six boys is more than 4 and less than 40. Although from the two statements that are given it is tempting to assume that the number of mangoes stolen by the boys must be in AP, since it is not mentioned explicitly we cannot answer the question.

8. a Since I paid Rs. 20 and because of lack of change, the clerk gave me Rs. 3 worth of stamps, it can be concluded that the total value of the stamp that I wanted to buy is Rs. 17. Since I ordered initially a minimum of 2 stamps of each denominations, if I buy exactly 2 stamps each, my total value is 2(5 + 2 + 1) = Rs. 16. The only way in which I make it Rs. 17 is buying one more stamp of Re 1. Hence, the total number of stamps that I ordered = (2 + 2 + 3) = 7.

In addition, the clerk gave me 3 more. Hence, the total number of stamps that I bought = (7 + 3) = 10 (viz. 2 five-rupee, 2 two-rupee and 6 one-rupee stamps).

For questions 9 and 10:

Hint: Students, please note that this sum could be intelligently solved by looking at both the questions together and also the answer choices. We know that the inventory has reduced by 54 units. This means two things: (i) actual quantity sold was less than the figure that was entered the computer (i.e. after interchanging digits), so the unit's place digit of the actual quantity sold should be less than its ten's place digit; and (ii) the difference between the actual quantity sold and the one that was entered in the computer is 54. From question 10, we can figure out that the only answer choice that supports both these conditions is (a), as (82 – 28 = 54).

So the actual quantity sold = 28. Now since the total sales is Rs.1,148, actual price per piece = $\frac{1148}{28}$ = Rs.41.

Hence, the answer to question is (b).

9. b

10. a

11. a The team has played a total of (17 + 3) = 20 matches. This constitutes $\frac{2}{3}$ of the matches. Hence, total number of matches played = 30. To win $\frac{3}{4}$ of them, a team has to win 22.5, i.e. at least win 23 of them. In other words, the team has to win a minimum of 6 matches (since it has already won 17)out of remaining 10. So it can lose a maximum of 4 of them.

12. c We can see that there are two types of cost: (i) Transportation cost (viz. hiring truck) and (ii) storing cost. It can be seen that the daily production is far less than the capacity of the truck. So a truck can be hired to carry multiple days production at one go. So as long as the storing cost is less than the cost of hiring the truck (i.e. Rs. 1,000), it makes sense to store the production. When the storing cost exceeds Rs. 1,000, it is best that the entire lot be sent to the market.

The cost pattern is as given in the following table:

Units produced	Units to be stored	Cost of storing (Rs.)	Cost of sending to the market (Rs.)	Should you hire truck?	Cost Incurred (Rs.)
150	150	750	1,000	No	750
180	(150 + 180) = 330	1,650	1,000	Yes	1000
120	120	600	1,000	No	600
250	(120 + 250) = 370	1,850	1,000	Yes	1,000
160	160	800	1,000	No	800
120	(160 + 120) = 280	1,400	1,000	Yes	1,000
150	150	750	1,000	Yes*	1,000
			Total Cost		6,150

* In spite of the fact that storing is cheaper than hiring truck on the last day, we have to do with the latter option because everything that is manufactured has to be sent to the market.

So according to this table, if the truck is hired on 2nd, 4th, 6th and 7th days, total cost = Rs. 6,150. But is this the most cost-effective scheme? It can be seen that we are hiring truck on two consecutive days (6th and 7th). Hence, since everything that is manufactured has to be sent to the market, we have yet another option of hiring the truck on the 5th day and sending the 6th and 7th days production together on the last day. In that case, the cost on 5th day would be Rs. 1,000 (i.e. Rs. 200 more than the present cost), the cost on the 6th day would be (120 × 5) = Rs. 600 (i.e. Rs. 400 less than the present cost) and the cost on the 7th day would be Rs. 1,000 (the same as the present cost). Hence, we can say that the total cost would actually come down by (+200 – 400 = – 200) Rs. 200.

Hence, this becomes the most cost-effective scheme. So we should hire trucks on 2nd, 4th, 5th and 7th days.

13. b If the storage cost is reduced to Re. 0.8 per cubic feet, then the cost pattern is as given in the following table.

Units produced	Units to be stored	Cost of storing (Rs.)	Cost of sending to the market (Rs.)	Should you hire truck?	Cost incurred (Rs.)
150	150	120	1,000	No	120
180	(150 + 180) = 330	264	1,000	No	264
120	(330 + 120) = 450	360	1,000	No	360
250	(450 + 250)	560	1,000	No	560
160	(700 + 160)	688	1,000	No	688
120	(860 + 120)	784	1,000	No	784
150	(980 + 150)	904	1,000	Yes **	1,000
			Total cost		3,776

** In spite of the fact that storing is cheaper than hiring truck on the last day, we have to do with the latter option because everything that is manufactured has to be sent to the market.

Hence, the most cost-effective scheme would be sending the entire production on the 7th day.

14. b To maximise the value of the wealth, we must carry more of the one whose value per kilogram is more.

Value per kilogram of ruby = $\left(\frac{4}{0.3}\right)$ = Rs. 13.33 crore, and value per rupee of each emerald = $\left(\frac{5}{0.4}\right)$ = Rs. 12.5 crore.

It is obvious that we should carry entire 12 kg of ruby. This would amount to $\left(\frac{12}{0.3}\right)$ = 40 rubies.

15. a Let the number of chocolates be c.

Number of apples has to be more than 3c, lets say 3c + k, k is a positive integer.

	Chocolate	Biscuits	Apple
No.	c	2c	3c + k
Cost per piece	1	0.5	2
Total cost	c	c	6c + 2k

Total spend = 8c + 2k

for c = 4, k = 2

Total spend = 34

Hence, (a) is the answer.

The cost of each chocolate is Re. 1. So the cost of apple should be Rs. 2 and that of one biscuit should be Re. 0.5. Thus, if he eats x chocolates, he has to eat 2x biscuits. Hence, the total value of chocolates will be Rs. x and that of biscuits will be (0.5)(2x)= Rs. x. Hence, we see that the value of chocolates is to the value of biscuits will always be 1 : 1. As per our assumption he will have to eat more than (x + 2x)= 3x apples and hence the total value of the apples will be more than (2)(3x) = 6x. In other words, the ratio of value chocolates to apples or biscuits to apples will be more than 1 : 6. In other words, if the value of chocolates and biscuits is Re. 1 each, then the value of apples has to be more than Rs. 6, or the combined value will be more than Rs. 8. This means that the value of apples will always constitute more than $\frac{6}{8}$ or $\frac{3}{4}$ of the entire bill. It can further be observed that the total value of chocolates and biscuits together will always be an even integer and so will be the value of apples. This means that the combined value of all three of them has to be even and not odd. So Rs. 33 cannot be the answer. Also Rs. 8 cannot be the answer as, if we take the value of chocolates and biscuits to be minimum, i.e. Re. 1 each, then the value of apples can be a minimum of Rs. 8. Hence, the total value will always be Rs. 10 or higher. The only option possible is Rs. 34. To verify this let us find two even numbers (one of them higher than $\frac{3}{4}$ of 34) which adds 34.

We can find many such numbers E.g. 32 + 2, 30 + 4, 28 + 6 and 26 + 8. All of these could be a possible combination.

16. c From the statement II, we can frame the equation that: (Cold drink) = 3(Tea) and (Coffee) = (Cold drink) – 5 = 3(Tea)– 5. So we have one equation in terms of prices of tea and coffee. Although, this alone may not be sufficient to answer the question, in the light of the equation provided by the first statement, viz. (Coffee) = (Tea) + 5, we can solve the two equations simultaneously and get the price of tea.

For questions 17 to 19:

17. d It is given that Q > P and R > S.

Q	P	R	S
4	2	3	1
2	1	4	3

The distribution of coins can be of two types in both the cases, S gets an odd number.

18. b

P	Q	R	S
1	3	4	2
2	4	3	1

Clearly, Q gets more coins than S in both the cases.

19. a

R	S	Q	P
4	2	3	1
4	1	3	2
4	3	2	1

Looking at the possible distribution of coins, we find that option (a)is not always true.

20. d Let m = 1. So, option (a)will give the answer as V_m and option (c)will give the answer as V_1. Both of these cannot be the answers as V_m and V_1 are the amount of volume filled.

Let m = 2. So, option (b)will give the answer as $2(1 - V_2)$ and option (d)will give the answer as $2(1 - V_1)$. Now consider option (b).

Actual empty volume > $2(1 - V_2)$. Therefore, for this situation $m(1 - V_1)$is the only possible answer.

21. b Let m = 1 and n = 1. Option (a) gives the answer as $\frac{1}{4}$ and option (d) gives the answer as 'greatest integer less than or equal to $\frac{1}{2}$'. So, both of these cannot be the answer. Option (b) gives the answer as 'smallest integer greater than or equal to $\frac{1}{2}$' and option (c)gives the answer as 1. But the actual answer can be greater than 1 as the volume of the vessel is 2 l. Hence, (b) is the answer.

22. b If N is a natural number such that $N = a^p b^q c^r ...$ where a, b, c etc are prime numbers, then Euler's Totient function is given by

$$\phi(N) = N\left(1-\frac{1}{a}\right)\left(1-\frac{1}{b}\right)\left(1-\frac{1}{c}\right).$$

If P is some other natural number which is prime to N, then the remainder when $P^{\phi(N)}$ is divided by N is 1.

To find the last two digits we need to find the remainder when 9483^{67483} is divided by 100.

$$\phi(100) = 100\left(1-\frac{1}{2}\right)\left(1-\frac{1}{5}\right) = 40$$

Required remainder = $83^{67483} = 83^{40k+3} = 83^3 = 87$.

23. d Let the time at which Mr. Clockilal entered the museum be 'm' minutes past 12 noon.

$$\therefore \quad \left|\frac{11}{2}m - 30\times 0\right| = 20 \Rightarrow m = 3\frac{7}{11}$$

As he spent more than 3 hours and less than 4 hours in the museum, and the angle between the minute and hour hands at the time of leaving was 220°, he must have left the museum between $3:3\frac{7}{11}$ p.m. and 4 p.m.

Let the time at which he left the museum be 'n' minutes past 3 p.m.

$$\therefore \quad \left|\frac{11}{2}n - 30\times 3\right| = 220 \Rightarrow n = 56\frac{4}{11} \text{ or } 41\frac{9}{11}$$

Hence, the time spent by Mr. Clockilal in the museum was either 3 hours $52\frac{8}{11}$ minutes or 3 hours $38\frac{2}{11}$ minutes.

24. b Let the fund value follow the quadratic polynomial

$f(x) = ax^2 + bx + c.$

When $x = 0, f(x) = 10 \Rightarrow c = 10$

When $x = 2, f(x) = 5$

$\Rightarrow \quad 4a + 2b + 10 = 5$

$\Rightarrow \quad 4a + 2b = -5 \quad \ldots$ (i)

When $x = 4, f(x) = 15$

$\Rightarrow \quad 16a + 4b + 10 = 15$

$\Rightarrow \quad 16a + 4b = 5 \quad \ldots$ (ii)

Solving (i) and (ii), we get

$$a = \frac{15}{8} \quad b = \frac{-25}{4}$$

$\therefore$ Required difference

$$= \left(\frac{15}{8}\times 8^2 - \frac{25}{4}\times 8 + 10\right) - 10 = 70.$$

■■