Ratio, Proportion & Variation

1. Ratio:

The ratio of two quantities a and b in the same units, is the fraction $\frac{a}{b}$ and we write it as $a : b$.
In the ratio $a : b$, we call a as the first term or **antecedent** and b, the second term or **consequent**.

Eg. The ratio 5 : 9 represents $\frac{5}{9}$ with antecedent = 5, consequent = 9.

Rule: The multiplication or division of each term of a ratio by the same non-zero number does not affect the ratio.
Eg.4 : 5 = 8 : 10 = 12 : 15. Also, 4 : 6 = 2 : 3.

2. Proportion:

The equality of two ratios is called proportion.
If $a : b = c : d$, we write $a : b :: c : d$ and we say that a, b, c, d are in proportion.
Here a and d are called **extremes**, while b and c are called **mean terms**.

Product of means = Product of extremes.
Thus, $a : b :: c : d \Leftrightarrow (b \times c) = (a \times d)$.

i. **Fourth Proportional:**
If $a : b = c : d$, then d is called the fourth proportional to a, b, c.

ii. **Third Proportional:**
$a : b = c : d$, then c is called the third proportion to a and b.

iii. **Mean Proportional:**
Mean proportional between a and b are $\sqrt{ab}$.

3. Comparison of Ratios:

We say that $(a : b) > (c : d) \Leftrightarrow \frac{a}{b} > \frac{c}{d}$.

4. Compounded Ratio:
The compounded ratio of the ratios: $(a : b), (c : d), (e : f)$ is $(ace : bdf)$.

5. Duplicate Ratios:
Duplicate ratio of $(a : b)$ is $(a^2 : b^2)$.
Sub-duplicate ratio of $(a : b)$ is $(a : b)$.
Triplicate ratio of $(a : b)$ is $(a^3 : b^3)$.
Sub-triplicate ratio of $(a : b)$ is $(a^{1/3} : b^{1/3})$.
If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a+b}{a-b} = \frac{c+d}{c-d}$. [componendo and dividendo]

6. **Variations:**
We say that x is directly proportional to y, if $x = ky$ for some constant k and we write, $x \propto y$.
We say that x is inversely proportional to y, if xy = k for some constant k *and*
we write, $x \propto \frac{1}{y}$.

---

1. a : b = 2 : 3, b : c = 4 : 1, c : d=2 : 5, Find a : b : c : d. = 16 : 24 : 6 : 15

2. The ratio of A and B is 2 : 3 and the ratio of B and C is 4 : 5 . Then find A^2 : B^2 :B*C.
A. 15 : 20 : 25 B. 8 : 24 : 32 C. 16 : 36 : 45 D. 9 : 18 : 27

3. If (a + b) : (b + c) : (c + a) : : 4 : 7 : 9 & a + b + c = 30 then find c = ?
(a) 16 (b) 17 (c) 15 (d) 18

4. A, B and C play cricket. The ratio of the runs scored by A and B is 3 : 2. The ratio of the runs scored by B and C is 3 : 2. Together, they score 342 runs. How many runs did A make?
A. 162 B. 108 C. 72 D. None of these

5. A sum of Rs. 427 is to be divided among *A, B and C* such that 3 times *A's* share, 4 times *B's* share and 7 times *C's* share are all equal. The share of *C*is :
A)84 B) 140 C) 196 D) 240

6. Rs.432 is divided among three workers A, B and C such that 8 times A's share is equal to 12 times B's share which is equal to 6 times C's share. How much did A get?
A. 80 B. 120 C. 144 D. 184

7. The ratio of the number of boys and girls in a college is 7 : 8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?
A.8 : 9 B.17 : 18 C.21 : 22 D. Can't be determined

8. Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?
A.2 : 3 : 4 B.6 : 7 : 8 C.6 : 8 : 9 D.NOT

9. Total salary of A, B & C is Rs.350. If they spend 75%, 80% & 56% of their salaries respectively their savings are as 10 : 12 : 33. Find the salary of C?
A. 80 B. 150 C. 180 D. None of These

10. The ratio of a two-digit natural number to a number formed by reversing its digits is 4 : 7. Which of the following is the sum of all the numbers of all such pairs?
a. 99 b. 198 c. 330 d. 132

11. The income of A, B and C are in the ratio 7: 9: 12 and their expenditure are in the ratio 8 : 9 : 15. If a saves 1/4 of his income. Find the ratio of savings of A, B and C.
a) 56 : 99 : 69 b) 69 : 56 : 99 c) 99 : 56 : 69 d) 99 : 69 : 56

12. Two number are in the ratio of 3 : 5. If 9 is subtracted from both then ratio become 12 : 23. Then number is?
(a) 36, 60 (b) 33, 55 (c) 30, 50 (d) 24, 40

13. The monthly incomes of A and B are in the ratio 4 : 5, their expenses are in the ratio 5 : 6. If 'A' saves Rs.25 per month and 'B' saves Rs.50 per month, what are their respective incomes?
A. Rs.400 and Rs.500 B. Rs.240 and Rs.300 C. Rs.320 and Rs.400 D. Rs.440 and Rs.550

14. The income of A and B are in the ratio 3 : 5 and their expenses are in the ratio 1 : 5. If each saves Rs. 100 then find their income.
(a) 120, 200 (b) 300, 500 (c) 180, 300 (d) 150, 250

15. The income of A and B are in the ratio 5 : 3 and their expenses are in the ratio 9 : 5. If both saves respectively Rs. 1300 and Rs. 900, then find their income.
(a) 4500, 2700 (b) 4000, 2400 (c) 5000, 3000 (d) 1000, 600

16. A bag contains 50p, 25p and 10p coins. The ratio of coins is 5 : 9 : 4 and total amount is ` 206. Then find number of coins.
(a) 20, 36, 16 (b) 150, 180, 80 (c) 200, 360, 160 (d) 75, 180, 160

17. A bag contains 480 coins of 50p, 25p, 10p and the ratio of their value is 5 : 3 : 1. How many coins of these three types?
(a) 75, 90, 75 (b) 150, 180, 150 (c) 100, 99, 75 (d) 150, 120, 60

18. A bag contains 50 paisa, 20 paisa and 10 paisa coins in the ratio 5:3:1.If the total amount in the bag is Rs. 640. Find the difference in the amounts contributed by 50 paisa and 20 paisa coins.
a. Rs.300 b. Rs.400 c. Rs.380 d. None of these

19. If there are Rs. 495 in a bag in denominations of one-rupee, 50-paisa and 25-paisa coins which are in the ratio 1:8:16. How many 50 paisa coins are there in bag?
A. 400 B. 425 C. 440 D. 480

20. A bag contains 378 coins, Rs. 1, 50P and 25P. The ratio of their value is 13 : 11 : 7. Then find the number of 50 P coins.
A. 132 B. 130 C. 61 D. 65

21. Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11:9 respectively. What is Anand's present age in years?
A. 24 years B. 27 years C. 40 years D. Can't be determined E. NOT

22. The ratio of ages of Krishna and Balram is 3:4.Four years earlier the ratio was 5:7. Find the present ages of Krishna and Balram.
A. 15 yrs, 20 yrs B. 24 yrs, 32 yrs C. 16 yrs, 20 yrs D.32 yrs, 24 yrs

23. The ratio of the age of a man and his wife is 4 : 3. After 4 years, this ratio will be 9 : 7. If at the time of the marriage, the ratio was 5:3, then how many years ago they were married?
A. 12 years B. 8 years C. 10 years D. 15 years

24. Eight years ago, the ratio of ages of Akhil and Akash was 1:5. 12 years from now, the ratio changes to 7 : 15. Find the sum of the antecedent and the consequent of the ratio of their present ages, when the ratio is in its lowest form.
A. 3 B. 6 C. 4 D. 1

25. 4 years ago father's age is 3 times of his daughter. 3 years after the sum of ages of father and daughter is 94 years, Then what is the age of father?
A.64 years B.66 years C.69 years D.61 years E.None of these

26. The first, second and fourth terms of proportion are 5,15 and 90 respectively. Find the third term.
A. 20 B. 30 C. 40 D. 50

27. Find the mean proportion of 9 and 16.
A. 13 B. 16 C. 12 D. 5

28. Find the continue proportion of 24 and 36.
A. 45 B. 54 C. 60 D. 64

29. *A* varies directly as *B* and inversely as *C*. *A* is 12 when *B* is 6 and *C* is 2. What is the value of *A* when *B* is 12 and *C* is 3?
a. 10 b. 16 c. 20 d. 28

30. The value of a coin varies directly to the square of its radius, when its thickness is constant. The radius of a coin is 1.5 cm and its value is Rs. 2. What will be the radius of a coin if its value is Rs. 5?
a. 2.0 cm b. 2.2 cm c. 2.4 cm d. 3.0 cm

31. 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: 3: 4:5. When the pieces were sold, the merchant got Rs. 118,000 less. Find the original price of the diamond?
a) Rs. 1.4lakh b) Rs. 1.69 lakh c) Rs. 1 lakh d) Rs. 2.1 lakh

32. The reduction in the speed of an engine is directly proportional to the square of the number of bogies attached to it. The speed of the train is 100 km/hr when there are 4 bogies and 55 kmph when there are 5 bogies. What is the maximum number of bogies that can be attached to the train so that it can move?
A. 6 B. 5 C. 4 D. None of these

33. A heart is broken is number of feelings 1 : 2 : 3 : 4.The cost of heart is directly proportional to the square of number of feelings. There is loss of Rs. 700 on broken heart. Find the initial cost of the heart?
(a) 10000 (b) 5000(c) 1000 (d) 900

Partnership

1. Partnership:

When two or more than two persons run a business jointly, they are called **partners** and the deal is known as **partnership**.

---

1. A, B, C enter into a partnership investing Rs. 35,000 Rs. 45,000 and Rs. 55,000 respectively. Find the ratio of their profit.
A. 5 : 7 : 8 B. 7 : 9 : 11 C. 8 : 2 : 21 D.NOT

2. A, B and C started a business by investing Rs. 250000 Rs. 300000 and Rs.350000 respectively. Find the share of B, out of an annual profit of Rs.187200.
A. Rs. 65400 B. Rs. 62400 C. Rs. 63400 D. Rs. 66200

3. A, B and C started a business by investing Rs. 1,20,000, Rs. 1,35,000 and Rs. 1,50,000 respectively. Find the share of each, out of an annual profit of Rs. 56,700.
A. 16800, 18900, 21000 B. 14800, 19900, 21000 C. 16800, 19900, 21000 D. 18800, 18900, 31000

4. A, B and C started a business each investing Rs.10000. After 4 month A withdraws Rs.3000, B withdraws Rs.4000, C invest Rs.3000 more At the end of the years, a total profit was Rs.32800. Find the share of C.
A. Rs. 10000 B. Rs. 14400 C. Rs. 17600 D. Rs. 19200

5. Three partners shared the profit in a business in the ratio *5 : 7 : 8*. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?
A.5 : 7 : 8 B. 20 : 49 : 64 C. 38 : 28 : 21 D.NOT

6. A, B, C start a business by investing the capital in 5 : 6 : 8. At the end of business they receive the profit in the ratio of 5 : 3 : 12. Find the ratio of time for which they contribute their capital?
(a) 5 : 1 : 3 (b) 3 : 1 : 3 (c) 2 : 1 : 3 (d) 4 : 1 : 3

7. A began a business with Rs. 85,000. He was joined afterwards by B with Rs. 42,500. For how much period does B join, if the profits at the end of the year are divided in the ratio of 3:1?
A.4 months B.5 months C.6 months D.8 months

8. An invested Rs. 76,000 in a business. After few months, B joined him with Rs. 57,000. At the end of the year, the total profit was divided between them in the ratio 2 : 1. After how many months did B join?
A.4 months B.5 months C.6 months D.8 months

9. A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is:
A.Rs. 1425 B.Rs. 1500 C.Rs. 1537.50 D.Rs. 1576

10. A, B and C enter into a partnership. They invest Rs. 40,000, Rs. 80,000 and Rs. 1,20,000 respectively. At the end of the first year, B withdraws Rs. 40,000, while at the end of the second year, C withdraws Rs. 80,000. In what ratio will the profit be shared at the end of 3 years ?
A. 2 : 3 : 5 B. 3 : 4 : 7 C. 5 : 6 : 4 D. 1 : 3 : 5

Allegation & Mixture

1. **Allegation:**
   It is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of desired price.

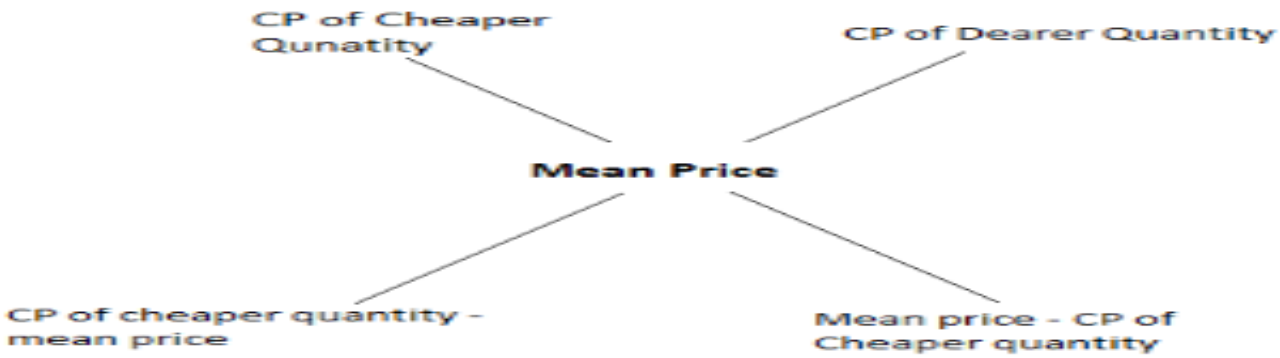
2. **Mean Price:**
   The cost of a unit quantity of the mixture is called the mean price.

3. **Rule of Allegation:**

   If two ingredients are mixed, then

$$\left(\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}}\right) = \left(\frac{\text{C.P. of dearer - Mean Price}}{\text{Mean price - C.P. of cheaper}}\right)$$

   We present as under:



4. Suppose a container contains x of liquid from which y units are taken out and replaced by water.

   After n operations, the quantity of pure liquid = $\left[x\left(1 - \frac{y}{x}\right)^n\right]$ units.

---

1. In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?
   A 3 : 7 B.5 : 7 C.7 : 3 D.7 : 5

2. If the average weight of a class is 15 kg and the average weight of another class is 30 kg, then find the ratio of the students of the first class to the another class students when the average weight of both the classes is 25 kg:
   A 3 : 7 B.5 : 7 C.1 : 2 D.7 : 5

3. A grocer wishes to sell a mixture of two variety of pulses worth Rs.16 per kg. In what ratio must he mix the pulses to reach this selling price, when cost of one variety of pulses is Rs.14 per kg and the other is Rs.24 per kg?
   A. 2:5 B. 4:3 C. 2:1 D. 4:1

4. A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:
   A.400 kg B.560 kg C.600 kg D.640 kg

5. One quantity of wheat at Rs 9.30 per Kg is mixed with another quality at a certain rate in the ratio 8:7. If the mixture so formed be worth Rs 10 per Kg, what is the rate per Kg of the second quality of wheat?
   A.Rs. 12.47 B.Rs. 10.80 C.Rs. 15.17 D.Rs. 47.66

6. There are some pigeons and sheep in a grazing field. The no. of total heads are 60 and total legs are 168 including both pigeons and sheep. The no. of sheep is:

A. 18 B. 26 C. 24 D. 36

7. In the Delhi zoo, there are deers and there are ducks. If the heads are counted, there are 180, while the legs are 448. What will be the number of deers in the zoo?
A. 180 B. 36 C. 44 D. 96

8. Rs. 43 is divided into 50 students. Each boy receives 94 paise and each girl receives 69 paise. How many boys and girls are present in the class?
A. Boys 34, Girls 16 B. Boys 44, Girls 16 C. Boys 34, Girls 26 D. Boys 44, Girls 16

9. A library has an average of 510 visitors on Sundays and 240 on other day. The average number of visitors in a month of 30 days starting with Sunday is:
A.280 B.285 C.290 D.295

10. A man travelled a distance of 90Km in 9 hours partly on foot at 8 kmph and partly on bicycle at 17 kmph. Find the distance travelled on foot.
A.46 km B.56 km C.62 km D.52 km

11. A person travelled 80 km in 8 hours partly by cycle and partly on foot. Speed of cycle is 16 km/h and speed on foot is 8 km/hr. Find the distance travelled by cycle and travelled on foot.
A.32 km, 46 km B.32 km, 48 km C.36 km, 62 km D.36 km, 52 km

12. Some amount out of Rs. 6000 was lent out at 10% per annum and the rest amount @ at 20% per annum and thus in 4 years the total interest from both the amounts collected was Rs. 3400. What is the amount which was lent out @ 10% per annum?
(a) R s. 2500 (b) Rs. 3500 (c) Rs. 3200 (d) Rs. 2800

13. Rs. 960 is received as an interest in 5 years at Rs. 3600, while some part of it is given on 4% rate and remaining part is given at 6% rate. Find both parts.
(a) Rs. 1200, R s. 2400 (b) Rs. 1500, Rs. 3500 (c) Rs. 1200, Rs. 3200 (d) Rs. 1800, Rs. 2800

14. In what ratio must a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a kg so that by selling the mixture at Rs. 68.20 a kg he may gain 10%?
A. 3 : 2 B.3 : 4 C.3 : 5 D.4 : 5

15. How many kilograms of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?
A) 36 kg B) 42 kg C) 54 kg D) 63 kg E) None of These

16. How many kg of Basmati rice costing Rs.42/kg should a shopkeeper mix with 25 kg of ordinary rice costing Rs.24 per kg so that he makes a profit of 25% on selling the mixture at Rs.40/kg?
A.20.0 kg B.12.5 kg C.16.0 kg D.200.0 kg

17. The milk and water in two vessels A and B are in the ratio 4:3 and 2:3 respectively. In what ratio the liquids in both the vessels be mixed to obtain a new mixture in vessel C consisting half milk and half water?
A. 8: 3 B.7: 5 C.4: 3 D.2: 3

18. In what ratio should the 2 mixtures of milk containing milk and water in ratios 3 : 4 and 10 : 7 should be mixed so that the resulting mixture has equal amount of milk and water?
a) 21 : 17 b) 13 : 11 c) 9 : 5 d) 17 : 13

19. Two vessels A and B contain spirit and water mixed in the ratio 5:2 and 7:6 respectively. Find the ratio in which these mixture be mixed to obtain a new mixture in vessel C containing spirit and water in the ratio 8:5?
A. 1 : 7 B.2 : 9 C.7 : 9 D.3 : 8

20. The ratio of milk and water in two vessels are 3 : 5 and 4 : 7. The capacity of both vessels are in the ratio 1 : 2. Both are poured into a third vessel, then find the ratio of milk and water in third vessel.

A. 10 : 117 B.92 : 197 C. 97 : 167 D.93 : 108

21. Three container have their volume in the ratio 3 : 4: 5. They are full of milk and water. The mixture contains milk and water are in the ratio of (4 : 1), (3 : 1) and (5 : 2) respectively. The content of these entire three containers are poured into fourth container. The ratio of milk and water in fourth container is:
A. 4 : 1 B. 151 : 48 C. 157 : 53 D. 5 : 2

22. On the whole surface of earth the ratio of land and water is 1 : 2 . The land and water in northern hemisphere is ratio 2 : 3. Then what is the ratio of land and water in southern hemisphere.
(a) 4 : 11 (b) 11 : 4 (c) 5 : 12 (d) 4 : 7

23. The ratio of milk and water in a mixture is *7 : 5*. We withdraw 9 *lt mixture and added same quantity of* water to the mixture, then ratio becomes *1 : 1*. Find the initial quantity of milk.
(a) 36.75 lt (b) 22.15 lt (c) 17.50 lt (d) 21.35 lt

24. The ratio of oil and kerosene in the container is *3 : 2* when 10 litres of the mixture is taken out and is replaced by the kerosene, the ratio becomes *2 : 3*. The total quantity of the mixture in the container is :
(a) 25 (b) 30 (c) 45 (d) cannot be determined

25. The ratio of milk and water in a mixture is *7 : 5*. We withdraw 9 lt mixture and added same quantity of water to the mixture, then ratio becomes *7 : 9*. Find the initial quantity of milk.
(a) 22 lt (b)17 lt (c) 19 lt (d) 21 lt

26. A container contains 40 liters of milk. From this container 4 liters of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?
A.26.34 liters B.27.36 liters C.28 liters D.29.16 liters

27. A container contains 50 liters of milk. From this container 5 liters of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?
A.36.34 liters B.45.36 liters C.48 liters D.36.45 liters

28. *8 liters* are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of water is *16 : 65*. How much wine did the cask hold originally?
A.18 liters B.24 liters C.32 liters D.42 liters

29. In what ratio must water be mixed with milk to gain 16.66 % on selling the mixture at cost price?
A. 1 : 6 B.6 : 1 C.2 : 3 D.4 : 3

Averages

Averages

Averages can be defined as the central value in a set of data. Average can be calculated simply by dividing the sum of all values in a set by the total number of values. In other words, an average value represents the middle value of a data set. The data set can be of anything like age, money, runs, etc.

$$\text{Average} = \frac{\text{Sum of Data (or observations) in a set}}{\text{Number of data (or observations) in that set}}$$

---

1. Find the Average of first 13 odd numbers
(a) 13 (b) 105 (c) 16 (d) 25

2. Find the Average of square of first 17 natural numbers.
(a) 13 (b) 105 (c) 16 (d) 25

3. The average of 41 consecutive odd numbers is 49. What is the largest number?
(a) 89 (b) 91 (c) 93 (d) 95

4. The average of all odd numbers from 113 to 159 is _
(a) 135 (b) 134 (c) 133 (d) 136

5. What is the average of all numbers between 100 and 200 which are divisible by 13?
(a) 147.5 (b) 145.5 (c) 143.5 (d) 149.5

6. Ballu buys 3 shirts at an average price of Rs. 1250. If he buys 2 more shirts at an average price of Rs. 1450 what will be the average price (in Rs.) of all the 5 shirts he buys?
(a) 1370 (b) 1330 (c) 1310 (d) 1390

7. The average weight of X, Y and Z is 74 kg. If the average weight of X and Y be 68 kg and that of Y and Z be 78 kg, then the weight (in kg) of Y is:
(a) 72 (b) 70 (c) 68 (d) 66

8. The average weight of L, M and N is 93 kg. If the average weight of L and M be 89 kg and that of M and N be 96.5 kg, then the weight (in kg) of M is:
(a) 92 (b) 86 (c) 101 (d) 95

9. Average weight of 10 people increased by 1.5 kg when one person of 45 kg is replaced by a new man. Then weight of the new man is :
A.50 B.55 C.60 D.65

10. In a class of 50 students there are 22 girls who scored an average of 35 marks in the test. What are the average marks of the boys if the class average is 42 marks?
(a) 50 (b) 52.5 (c) 47.5 (d) 55

11. In the afternoon, a student read 100 pages at the rate of 60 pages per hour. In the evening, when she was tired, she read 100 more pages at the rate of 40 pages per hour. What was her average rate of reading in pages per hour ?
(a) 60 (b) 70 (c) 48 (d) 50

12. The average weight of a class of 24 students is 36 years. When the weight of the teacher is also included, the average weight increases by 1kg. What is the weight of the teacher?
A.45 B.53 C.55 D.61

13. The average weight of a class of 24 students is 35 kg. If the weight of the teacher be included, the average rises by 400 g. The weight of the teacher is

A.45 B.50 C.55 D.60

14. Average weight of 17 players of a team is 22 kg. If a player leaves the team then the average becomes 23 kg then finds the weight of that player.
A.5 B.6 C.7 D.8

15. When a student weighing 45 kg left a class, the average weight of the remaining 59 students increased by 200g. What is the average weight of the remaining 59 students
A.55 B.56 C.57 D.58

16. In a hotel, the tariff for every odd dates is Rs.1000 and for even dates is Rs. 2000. If the man paid total of 30000 in all. For how many days did he stay in the hotel given that the first day is 5th date of the month?
A. 50 B. 20 C. 40 D. 60

17. The average salary of male employees in a firm was Rs. 6000 and that of females was Rs. 5600. The mean salary of all the employees was Rs. 5800. What is the % of female employees?
A. 60% B. 50% C. 70% D. 20% E. None of these

18. The average salary of all the employees in a small organization is Rs 8,000. The average salary of 7 technicians is Rs 12,000 and the average salary of the rest is Rs 6,000. The total number of employees in the organization is?
A. 21 B. 20 C. 26 D. 22

19. The average expenditure of a man for the first five months is Rs. 1200 and for the next seven months is Rs. 1300. Find his monthly average income if he saves Rs. 2900 during the year.
A. 1500 B. 2000 C. 2600 D. 2200

20. Average of 17 numbers is 67. If average of first nine numbers is 69 and average of last nine numbers is 66 then find the 9th number.
A. 69 B. 72 C. 76 D. 78

21. The Average of 9 observations is 87. If the Average of first five observations is 79 and the Average of next three is 92. Find the 9th observation.
A. 89 B. 72 C. 112 D. 88

22. The average of 17 numbers is 10.9. If the average of first nine numbers is 10.5 and that of the last nine numbers is 11.4, the middle number is
A. 11.8 B. 11.4 C. 10.9 D. 11.7

23. Three years ago, the average age of Nandu and Panna was 18 years. With Shubha joining them now their average age became 22 years. How old is Shubha now?
A. 29 B. 27 C. 24 D. 25

24. The average age of a family of 6 members is 22 years. If the age of the youngest member be 7 years, what was the average age of the family at the birth of the youngest member?
A. 15 B. 12 C. 18 D. 21

25. 3 years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of family is the same today. The present age of the baby is:
A.1 year B.1.5 years C.2 years D.3years

26. The average age of mother, father and son was 42 years at the time of the marriage of the son. After 1 year an infant was born and after 6 years of marriage the average age of the family becomes 36 years. Find the age of the bride at the time of the marriage.
(a) 13 years (b) 4 years (c) 25 years (d) 1 years

27. A batsman makes a score of 87 runs in the 17th match and thus increases his average by 3. Find his average after 17th match
A.36 B.37 C.38 D.39

28. Suraj has a certain average of runs for 12 innings. In the 13th innings he scores 96 runs thereby increasing his average by 5 runs. What is his average after the 13th innings?
A. 48 B. 64 C. 36 D. 72

29. There is some average of 8 innings of a batsman. He scores 100 runs in 9th innings then average is increased by 9 runs. Find his current average.
A. 22 B. 24 C. 26 D.28

30. If the bowling average of bowler is 12.4 run per wicket. He takes 10 wickets in his next innings by given 52 runs due to this his bowling average is improved by 0.4 run per wicket. Find the total no. of wickets taken by him at present.
(a) 180 (b) 170 (c) 220 (d) 140

31. The bowling average of a bowler in certain matches is 12.4 runs per wicket. If he takes 5 wickets for 26 runs in his next innings then its bowling average becomes 12 runs per wicket. Find the wickets taken by him in the last inning.
(a) 85 (b) 80 (c) 20 (d) 40

32. In a one day match of 50 overs in an innings the team A had a run rate of 5.3 runs per over. Team B is playing and 5 overs are left and the required run rate to tie the match is 7.2 per over to match the score of team A. What is team B's score?
(a) 265 (b) 238 (c) 254 (d) 229

33. The batting average of a batsman in his 40 innings is 50 runs, if the difference between his highest and lowest score is 172, if these both innings are excluded then his average becomes 48. Calculate the highest score?
(a) 174 (b) 172 (c) 220 (d) 140

34. The average temperature from Tuesday to Friday is 48°C and from Wednesday to Saturday is 52°C. If the temperature on Tuesday is 42°C, what was it on Saturday?
A. 52°C B. 55°C C. 58°C D. 51°C

35. The mean temperature from the 9th to the 16th of January, both days inclusive, was 11.6 degree Celsius and from the 10th to 17th was 12.2 degree Celsius. The temperature on the 9th was 10.8 degree Celsius. What was it on the 17th ?
A.15.6 degree B. 16.6 degree C. 11.6 degree D. None of the these

36. The average temperature on Wednesday, Thursday and Friday was 25 degree Celsius. The average temperature on Thursday, Friday and Saturday was 24 degree Celsius. If the temperature on Saturday was 27 degree Celsius, what was the temperature on Wednesday?
A.24 degree Celsius B.21 degree Celsius C.27 degree Celsius D.30 degree Celsius

37. The average marks of 50 students in an examination were 65. It was later found that the marks of one student had been wrongly entered as 83 instead of 38. The correct average is?
(a) 63.9 (b) 64.5 (c) 64.7 (d) 64.1

38. The average mark of 18 students in an examination was 60. It was later found that the marks of one student had been wrongly entered as 63 instead of 36. The correct average is:
(a) 59 (b) 59.5 (c) 58 (d) 58.5

39. A student finds the average of 10 positive integers. Each integer contains two digits. By mistake, the student interchanges the digits of one number say ba for ab. Due to this, the average becomes 1.8 less than the previous one. What is the difference between the two digits a and b?
A. 8 B. 6 C. 2 D. 4

Time & Work

Time and work deals with the time taken by an individual or a group of individuals to complete a piece of work and the efficiency of the work done by each of them.

Given below are the basic type of questions which may be asked in the exam with respect to the time and work topic:

- To find the efficiency of a person
- To find the time taken by an individual to do a piece of work
- To find the time taken by a group of individuals to complete a piece of work
- Work done by an individual in a certain time duration
- Work done by a group of individuals in a certain time duration

Important Time and Work Formula

Knowing the formulas can completely link you to a solution as soon as you read the question. Thus knowing the formula for any numerical ability topic make the solution and the related calculations simpler.Given below are a few such important time and work formulas for your reference:

- Work Done = Time Taken × Rate of Work
- Rate of Work = 1 / Time Taken
- Time Taken = 1 / Rate of Work
- If a piece of work is done in x number of days, then the work done in one day = 1/x
- Total Wok Done = Number of Days × Efficiency
- Efficiency and Time are inversely proportional to each other
- X:y is the ratio of the number of men which are required to complete a piece of work, then the ratio of the time taken by them to complete the work will be y:x
- If x number of people can do W1 work, in D1 days, working T1 hours each day and the number of people can do W2 work, in D2 days, working T2 hours each day, then the relation between them will be

$$\frac{M1 \times D1 \times T1}{W1} = \frac{M2 \times D2 \times T2}{W2}$$

==========

1. A can do a piece of work in 6 days and B can do the same work in 9 days. How many days will both take together to complete the same work?
(a) 7.5 days (b) 3.6 days (c) 5.4 days (d) 3 days

2. A and B can complete a work in 30 days and 20 days respectively. In how many days they together complete the work.
(a) 12 days (b) 5 days (c) 15 days (d) 10 days

3. A and B together can do a piece of work in 10 days. A alone can do the same work in 30 days. The time in which B alone can do it is?
(a) 10 days (b) 15 days (c) 12 days (d)20 days

4. A can do a work in 10 days B can do the same work in 12 days and C can do the same work in 15 days. If they all work together in how many days they will complete the same work?
(a) 8 days (b) 10 days (c) 4 days (d) 6 days

5. A can do 2/5 of a work in 6 days and B can do 1/3 of same work in 10 days. Working together A and B can do 4/5 of the work in :
(a) 4 days (b) 8 days (c) 5 days (d) 10 days

6. A can complete 50% of a job in 9 days and B can complete 25% of the job in 9 days if they worked alone. If they worked together how much of the job (in %) can they complete in 9 days?
(a) 80 (b) 90 (c) 75 (d) 100

7. A does 4/5 of a piece of work in 20 days; he then calls in B and they finish the remaining work in 3 days. How long B alone will take to do whole work?
(a) 75/2 days (b) 40 days (c) 37 days (d) 23 days

8. A can complete a work in 6 days and B can do the same work in 12 days. If they work together and complete it, the portion of the work done by A is:
(a) 1/3 (b) 1/4 (c) 2/3 (d) 1/2

9. A can do a piece of work in 15 days and B in 20 days. If they together work for 4 days then the fraction of the work that is left is:
(a) 8/15 (b) 1/4 (c)7/15 (d)1/10

10. A and B can do a work in 18 and 24 days respectively. They worked together for 8 days and then A left. The remaining work was finished by B in :
(a) 5 days (b) 8 days (c)16/3 days (d)10 days

11. A & B complete a piece of work in 10 and 15 days respectively. A and B start work together and after 2 days A left the work then calculate in how many days work will be completed ?
(a) 12 days (b) 5 days (c) 15 days (d) 10 days

12. A and B can do a piece of work in 6 and 12 days respectively. They began the work together but A leaves after 3 days. Then the total no. of days needed for the completion of the work is:
(a) 4 days (c) 6 days (c) 5 days (d) 9 days

13. A and B can complete a work in 10 days and 15 days respectively. A and B started working together but after some time A left the work and the whole work will complete in 9 days. Then calculate after how much time A left the work?
(a) 12 days (b) 4 days (c) 15 days (d) 10 days

14. A and B can do a piece of work in 28 days and 35 days respectively. If they began to work together but A leaves after sometime and B completed the remaining work in 17 days. After how many days did A leave?
(a) 72/5 days (b) 8 days (c) 9 days (d) 68/9 days

15. A and B alone can complete a work in 9 days and 18 days respectively. They started working together but A left the work 3 days before completion of the work. In how many days was the work completed?
(a) 13 days (b) 6 days (c) 8 days (d) 5 days

16. A can complete a work in 10 days, B in 15 days and C in 20 days, A and C worked together for 2 days and then A was replaced by B. In how many days, altogether, was the work completed?
(a) 12 days (b) 6 days (b) 10 days (d) 8 days

17. A and B together can complete a work in 12 days. A alone can complete in 20 days. If B does the work only half a day daily, then in how many days A and B will complete the work together?
(a) 10 days (b) 11 days (c) 20 days (d) 15 days

18. A and B can do a work in 20 and 30 days respectively. They worked together for 7 days then both of them left the work. Then C alone completed the remaining work in 10 days. In how many days will C alone complete the whole work?
(a) 25 days (b) 24 days (c) 30 days (d) 20 days

19. A, B and C can do a work in 16, 32 and 48 days respectively. They started the work together but B left off 8 days and C 6 days before completion of the work. In what time is the work finished?
(a) 10 days (b) 12 days (c) 9 days (d) 14 days

20. A and B working together can a piece of work in 10 days B and C can do the same work in 15 days while C and A can do the same work in 20 days. In how many days C alone will complete the work?
(a) 60 days (b) 80 days (c) 120 days (d) 30 days

21. A and B can do a work in 72 days. B and C can do it in 120 days, A and C can do it in 90 days. In how many days all the three together can complete the work?
(a) 80 days (b) 60 days (c) 100 days (d) 150 days

22. A and B together can complete the work in 8 days B and C can do the same work in 12 days. All of them together can complete the work in 6 days. In how many days A and C together can complete the work?
(a) 8 days (b) 12 days (b) 10 days (d) 20 days

23. A and B can do a piece of work in 30 days while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work?
(a) 18 days (b) 30 days (c) 24 days (d) 36 days

24. A and B and B and C can do a work in 12 days and 16 days respectively. If A work for 5 days and B work for 7 days on that work then C complete the remaining work in next 13 days. Then calculate in how much time C would complete the whole work?
(a) 10 days (b) 24 days (c) 4 4/5 days (d) 5 2/9 days

25. A, B and C can do a piece of work in 20, 30, 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?
(a) 10 days (b) 15 days (c) 12 days (d) 20 days

26. A, B and C can do a work in 12, 15 and 20 days respectively. If they work on alternate days starting with A, in how many days the work will be completed?
(a) 12 days (b) 10 days (c) 15 days (d) 9 days

27. A and B can complete a work in 12 and 15 days. They started the work alternatively for 1 day each & A started the work first. In how much time the whole work will be completed?
(a) 14 1/4 days (b) 13 1/4 days (c) 15 1/4 days (d) 18 days

28. A and B can complete a piece of work in 12 days and 18 days respectively. A begins to the work and they work alternatively one at a time for one day each. The work will be completed in:
(a) 43/3 days (b) 49/3 days (c) 47/3 days (d) 56/3 days

29. A can do a piece of work in 10 days B can do the same work in 20 days and C can demolish the work in 30 days. If they all work together in how many days the work will be completed?
(a) 60/7 days (b) 40/7 days (c) 50/7 days (d) none

30. A can build a wall in 30 days. B can demolish that wall in 60 days. If A and B work on alternate days and A started the work, when will the wall be completed for first time?
(a) 120 days (b) 119 days (c) 118 days (d) 117 days

31. While working 7 hours a day A can complete a piece of work in 6 days and B can complete the same work in 8 days. In what time would they complete it together working 8 hours a day?
(a) 3 days (b) 2.5 days (c) 4 days (d) 3.6 days

32. Babu and asha can do a job together in 7 days. Asha is 7/4 times as efficient as babu. The same job can be done by asha alone in:
(a) 49/4 days (b) 11 days (c) 49/3 days (d) 28/3 days

33. Jetha is twice as fast as babita. If both of them together complete a work in 12 days, jetha alone can complete it in:
(a) 15 days (b) 20 days (c) 18 days (d) 24 days

34. Tiwari is thrice as good a workman as Vibhuti is, therefore, able to finish a piece of work in 60 days less than vibhuti. In how many days both of them together can do the same work working together?
(a) 22 days (b) 23 days (c) 22.5 days (d) 93/4 days

35. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B working together can do it in 12 days, then find the time taken by B alone to complete the work?
(a) 30 days (b) 20 days (c) 27 days (d) 25 days

36. A alone takes 16 days more than A and B together take to complete a work. B takes 9 days more than A and B together. In how many days A alone will complete the same work?
(a) 12 days (b) 28 days (c) 21 days (d) data insufficient

37. A's 2 day's work is equal to B's 3 day's work. If A can complete the work in 8 days then to complete the work B will take:
(a) 14 days (b) 15 days (c) 12 days (d) 16 days

38. A is twice as good a workman as B and B is twice as good a workman as C. If A and B can together finish a work in 4 days, in how many days C can finish the work alone?
(a) 6 days (b) 24 days (c) 8 days (d) 12 days

39. A is 50% as efficient as B. C does half of the work done by A and B together. If C alone does the work in 20 days, then A, B and C together can do the same work in?
(a) 17/3 days (b) 6 days (c) 20/3 days (d) 7 days

40. A can do a work in 6 days and B can do the same work in 5 days. The contract for the work is of Rs. 220. How much shall B get if both of them work together?
(a) Rs. 180 (b) Rs. 120 (c) Rs. 100 (d) Rs. 150

41. A, B and C can do a work in 6, 8 and 12 days respectively. Doing that work together they get an amount of Rs. 1350. What is the share of B in that amount?
(a) Rs. 350 (b) Rs. 550 (c) Rs. 450 (d) Rs. 640

42. A man and a boy received Rs 800 as wages for 5 days for the work they did together. The man's efficiency in the work was three times that of the boy. What are the daily wages of the boy?
(a) Rs 76 (b) Rs 44 (c) Rs 56 (d) Rs 40

43. A, B and C completed a work costing Rs 1800. A worked for 6 days B for 4 days and c for 9 days. If their daily wages are in the ratio of 5:6:4. How much amount will be received by A?
(a) Rs 800 (b) Rs 900 (c) Rs 600 (d) Rs 750

44. A, B and C are employed to do a work for Rs 575. A and C are supposed to finish 19/23 of the work together. Amount which is paid to B is?
(a) Rs 210 (b) Rs 200 (c) Rs 100 (d) Rs 475

45. If 3 men or 6 women can do a piece of work in 16 days. In how many days can 12 men and 8 women do the same piece of work?
(a) 4 days (b) 3 days (c) 5 days (d) 2 days

46. If 3 men or 4 women can plough a field in 43 days, how long will 7 men and 5 women take to plough it?
(a) 10 days (b) 9 days (c) 11 days (d) 12 days

47. 5 men can do a piece of work in 6 days while 10 women can do it in 5 days. In how many days can 5 women and 3 men do it?
(a) 4 days (b) 6 days (c) 5 days (d) 8 days

48. If 6 men and 8 boys can do a piece of work in 10 days and 26 men and 48 boys can do the same work in 2 days, then the time taken by 15 men and 20 boys to do the same type of work will be:
(a) 5 days (b) 6 days (c) 4 days (d) 7 days

49. If 10 men or 20 boys can make 260 mats in 20 days, then how many mats will be made by 8 men and 4 boys in 20 days?
(a) 260 (b) 280 (c) 240 (d) 520

50. If 72 men can build a wall of 280 m length in 21 days, how many men could take 18 days to build a similar type of wall of length 100 m?
(a) 30 (b) 18 (c) 10 (d)28

51. A wall of 100 m can be built by 7 men or 10 women in 10 days. How many days will 14 men and 20 women take to build a wall of 600 m?
(a) 15 (b) 20 (c) 25 (d) 30

52. Some carpenters promised to do a job in 9 days but 5 of them were absent and remaining men did the job in 12 days. The original no of carpenters was:
(a) 24 (b) 16 (c) 20 (d) 18

53. X no of men can finish a piece of work in 30 days. If there were 6 men more, the work could be finished in 10 days less. The original number of men is:
(a) 6 (b) 12 (c) 10 (d) 15

54. If 10 men can do a work in 12 days. How many men will be required to complete double the work in 8 days?
(a) 30 (b) 10 (c) 20 (d) 15

55. A contractor undertook to finish a work in 92 days and employed 110 men. After 48 days, he found that he had already done 3/5 part of the work, the number of men he can withdraw so that the work may still be finished in time is:
(a) 45 (b) 35 (b) 40 (d) 30

56. A contractor undertook to finish a road in 40 days & he employs 100 men. After 35 days he employed 100 more men, the work finished on time. Then calculate if more men were not employed then work will complete how much late ?
(a) 3 days (b) 7 days (c) 1 days (d) 5 days

57. If 42 persons consume 144 kg of wheat in 15 days, then in how many days will 30 persons consume 48 kg of wheat?
(a) 8 days (b) 12 days (c) 7 days (d) 6 days

58. If 100 cats kill 100 mice in 100 days, then 4 cats would kill 4 mice in how many days?
(a) 4 days (b) 40 days (c) 3 days (d) 100 days

Pipes & Cistern

1. Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively. If both pipes are opened together, the time taken to fill the tank is:
(a) 50 minutes (b) 25 minutes (c) 12 minutes (d) 15 minutes

2. A tap can empty a tank in 90 minutes and a second tap empty it in 60 minutes. If both taps are operate simultaneously, how much time is needed to empty the tank?
(a) 36 minutes (b) 40 minutes (c) 35 minutes (d) 45 minutes

3. A cistern can be filled with water by a pipe in 15 hours and it can be empty by a second pipe in 30 hours. If both pipes are opened together when the cistern is full, the time in which it is emptied is:
(a) 9 hours (b) 30 hours (c) 18 hours (d) 20.5 hours

4. Two pipes can fill a cistern in 15 and 20 hours respectively. There is a third pipe which can empty the cistern in 10 hours. If all the pipes are opened together, the cistern will be filled in:
(a) 50 hours (b) 30 hours (c) 20 hours (d) 60hours

5. Two pipes A and b can separately fill a tank in 60 minutes and 75 minutes respectively. There is a third pipe in bottom of the tank to empty it. If all the three pipes are opened together the tank is filled in 50 minutes. In how much time third pipe alone can empty it?
(a) 110 minutes (c) 100 minutes
(b) 120 minutes (d) 90 minutes

6. A cistern has two pipes. One can fill it in 8 hours and other can empty it in 5 hours. In how many hours will the cistern be emptied if both the pipes are opened together when ¾ of the cistern is already full of water?
(a) 40/3 hours (b) 6 hours (c) 10 hours (d) 10/3 hours

7. If a pipe can fill 3/5 of the tank in 1 minute the time needed to fill the rest is?
(a) 40 sec (b) 36 sec (c) 30 sec (d) 24 sec

8. There are two pumps to fill a tank with water. First pump can fill the empty tank in 8 hours, while the second in 10 hours. If both the pumps are opened together and kept open for 4hours, the part of tank that will be filled up is:
(a) 9/10 (b) 2/5 (c) 1/10 (d)1/5

9. Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B and C are open for one hour each simultaneously, the tank will be full in:
(a) 6 hours (b) 7 hours (c) 13/2 hours (d) 15/2 hours

10. A pump can fill a tank in 2 hours but because of a leak it took 7/3 hours to fill it. In how many hours the leak can empty the full tank?
(a) 8 hours (b) 7 hours (c) 13/3 hours (d) 14 hours

11. A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the time taken to fill the tank completely?
(a) 4 hours (c) 3 hours 15 minutes
(b) 4 hours 15 minutes (d) 3 hours 45 minutes

12. Two Pipes A and B can fill a cistern in 37.5 minutes and 45 minutes respectively. Both pipes are opened. The cistern will be full after half an hour, If the pipe B is turned off after:
(a) 15 minutes (b) 5 minutes (c) 10 minutes (d) 9 minutes

13. A tap takes 36 hours extra to fill a tank due to a leakage equivalent to half of its inflow. The inflow can fill the tank in how many hours?
(a) 36 hours (b) 24 hours (c) 30 hours (d) 18 hours

14. A tank is fitted with 2 taps. The first tap can fill the tank in 45 minutes and the second tap can empty the full tank in one hour. If both the taps are opened alternatively for one minute each, then in how many hours the empty tank will be filled completely?

(a) 2 hours 55 minutes (c) 3 hours 40 minutes

(b) 4 hours 48 minutes (d) 5 hours 53 minutes

15. Three pipes A, B and can together fill a tank in 6 hours. After working together for 2 hours, C is closed and A, and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill the tank is?

(a) 10 hours (b) 14 hours (c) 12 hours (d) 16 hours

16. A leak in the bottom of the tank can empty the full tank in 6 hours. An inlet pipe fills water at the rate of 4 litres a minute. When the tank is full, the inlet pipe is opened and due to leak the tank is emptied in 8 hours. Find the capacity of the tank.

(a) 5760 litres (b) 10 litres (c) 96 litres (d) 24 litres

17. One pipe can fill a tank three times as fast as another. If together both the pipes can fill the tank in 36 minutes, the slower pipe alone will be able to fill the tank in?

(a) 81 minutes (b) 144 minutes (c) 108 minutes (d) 192 minutes

18. A pipe can empty a tank in 40 minutes. A second pipe with diameter twice as much as that of the first is also attached with the tank to empty it. The two together can empty the tank in?

(a) 8 minutes (b) 30 minutes (c) 40/3 minutes (d) 38 minutes

19. A pipe of diameter d can drain a certain water tank in 40 minutes. What will be the time taken by a pipe of diameter 2d for emptying the same tank?

(a) 5 minutes (b) 20 minutes (c) 10 minutes (d) 80 minutes

20. Two pipes A and B can fill a tank in 20 and 24 minutes respectively. A third pipe C can empty it at a rate of 3 litres per minute. If A, Band C are opened together to fill the tank in 15 minutes, the capacity of tank is?

(a) 180 litres (b) 120 litres (c) 150 litres (d) 60 litres

Time, Speed and Distance

Speed, Time and Distance:

Speed = $\left(\frac{\text{Distance}}{\text{Time}}\right)$, Time = $\left(\frac{\text{Distance}}{\text{Speed}}\right)$, Distance = (Speed x Time).

km/hr to m/sec conversion:

x km/hr = $\left(x \times \frac{5}{18}\right)$ m/sec.

m/sec to km/hr conversion:

x m/sec = $\left(x \times \frac{18}{5}\right)$ km/hr.

If the ratio of the speeds of A and B is $a : b$, then the ratio of the times taken by them to cover the same distance is $\frac{1}{a} : \frac{1}{b}$ or $b : a$.

Average Speed Formula:-

Average speed = $\frac{Total\ Distance\ covered}{Total\ Time\ Taken}$

When the distance is constant: Average speed = 2xy/x+y; Where, x and y are the two speeds at which the same distance has been covered.

When time taken is constant: Average speed = (x + y)/2; Where, x and y are the two speeds at which we travelled for the same time.

Relative Speed:-

Relative speed is defined as the speed of a moving object with respect to another. When two objects are moving in the same direction, relative speed is calculated as their difference. When the two objects are moving in opposite directions, relative speed is computed by adding the two speeds.

Problem on Trains:-

1. Time taken by a train of length l metres to pass a pole or standing man or a signal post is equal to the time taken by the train to cover l metres.
2. Time taken by a train of length l metres to pass a stationery object of length b metres is the time taken by the train to cover $(l + b)$ metres.
3. Suppose two trains or two objects bodies are moving in the same direction at u m/s and v m/s, where $u > v$, then their relative speed is = $(u - v)$ m/s.
4. Suppose two trains or two objects bodies are moving in opposite directions at u m/s and v m/s, then their relative speed is = $(u + v)$ m/s.
5. If two trains of length a metres and b metres are moving in opposite directions at u m/s and v m/s, then:
   The time taken by the trains to cross each other = $\frac{(a + b)}{(u + v)}$ sec.
6. If two trains of length a metres and b metres are moving in the same direction at u m/s and v m/s, then:
   The time taken by the faster train to cross the slower train = $\frac{(a + b)}{(u - v)}$ sec.
7. If two trains (or bodies) start at the same time from points A and B towards each other and after crossing they take a and b sec in reaching B and A respectively, then:
   (A's speed) : (B's speed) = $(\sqrt{b} : \sqrt{a})$

==========

1. An athlete runs 200 meter in 24 seconds. His speed in km/h is?
(a) 20 (b) 24 (c) 28.5 (d) 30

2. A man is travelling at a speed of 45km/hr. how many seconds will it take to cover 4/5 km?
(a) 36 seconds (b) 64 seconds (c) 90 seconds (d) 120 seconds

3. Two men start together to walk a certain distance, one at 4 km/h and another at 3 km/h. The former arrives half an hour before the later. Find the distance?
(a) 8 km (b) 7 km (c) 6 km (d) 9 km

4. A man covers a distance of 120 km in 15 hr. If he covers 1/2 of the distance in 3/5 the time, the speed to cover remaining distance in time left to be:
(a) 6.4 km/h (b) 6.67 km/h (c) 10 km/h (d) 15 km/h

5. A man rides at the speed of 18 km/h but stops for 6 minutes to change the horses at the end of every 7^{th} km. The time he will take to cover a distance of 90 km is?
(a) 6 hours (b) 6 hours 12 minutes (c) 6 hours 18 minutes (d) 6 hours 24 minutes

6. In covering a certain distance, the speed of A and B are in the ratio of 3:4. A takes 30 minutes more than B to reach the destination. The time taken by A to reach the destination is:
(a) 1 hour (b) 90 minutes (c) 2 hours (d) 2.5 hours

7. By walking at ¾ of his actual speed, a man reaches his office 20 minutes late. What is the actual time taken by to reach his office?
(a) 75 min. (b) 60 min. (c) 40 min. (d) 30 min.

8. A car covers a distance at 7/4 of its usual speed and reaches 15 minutes early. Find usual time to reach the destination?
(a) 50 minutes (b) 35 minutes (c) 30 minutes (d) none

9. A train running at 7/11 of its own speed reached a place in 22 hours. How much time could be saved if the train would run at its own speed?
(a) 14 hours (b) 7 hours (c) 8 hours (d) 16 hours

10. A student rides on bicycle at 8 km/h and reaches his school 2.5 minutes late. The next day he increases his speed to 10 km/h and reaches school 5 minutes early. Find distance between his house and school?
(a) 5/8 km (b) 8 km (c) 5 km (d)10 km

11. If a train runs at 40 km/h, it reaches its destination late by 11 minutes. But if it runs at 50 Km/h hours, it is late by 5 minutes only. The correct time (in minutes) for the train to complete the journey is:
(a) 13 min. (b) 15 min. (c) 19 min. (d) 21 min.

12. Two trains start running from to different stations towards each other on parallel tracks with speeds of 50 km/h and 60 km/h respectively. At the time of their meeting faster train has travelled 120 km more than the slower one. Find the distance between two stations?
(a) 990 km (b) 1320 km (c) 1200 km (d) 1440 km

13. Two trains starts at same time from Delhi and Jaipur towards each other with a speed of 80km/hr and 95 km/hr. When they meet the faster train covers 180km more distance than the other. Find the distance between Delhi & Jaipur.
(a) 2200 (b) 3300 (c) 2100 (d) 3200

14. A car can cover a certain distance in 9/2 hours. If the speed is increased by 5 km/h, it would take ½ hour less to cover the same distance. Find the slower speed of the car.
(a) 50 km/h (b) 40 km/h (c) 45 km/h (d) 60 km/h

15. A train covers a certain distance between stations A and B in 45 minutes. If the speed is reduced by 5 km/h, then the same distance is covered in 48 minutes. The distance between station A and B is:

(a) 60 km (b) 80 km (c) 64 km (d) 55 km

16. There is a tunnel AB on a railway track. A is the entry point of tunnel. A dog is sitting at 2/5 of the tunnel from its entry. A train running at a speed of 60 km/hr is approaching towards point A. When the train whistles the dog starts running towards point A but it is ran over by train exactly at point A. If the dog had run towards point B at listening the whistle of train the train would have killed the dog exactly at point B. What is the speed of dog?
(a) 12 km/h (c) 10 km/h (c) 15 km/h (d) data insufficient

Average Speed

17. A man goes from P to Q at a speed of 30 km/h and returns at a speed of 20 km/h. What is the average speed during whole journey?
(a) 25 km/h (b) 24 km/h (c) 26 km/h (d) none

18. A man covers 30 km of a journey at a speed of 6 km/h and remaining 40 km at a speed of 8km/h. what is his average speed of whole journey?
(a) 7 km/h (b) 10 km/h (c) 9 km/h (d) none

19. A train travels at a speed of 35 km/h for 10 minutes and at a speed of 20 km/h for 5 minutes. What is the average speed for entire journey?
(a) 30 km/h (b) 23 km/h (c) 31 km/h (d) 29 km/h

20. A train covers 1/3 of a journey at a speed of 50 km/h, ¼ at a speed of 60 km/h and remaining at a speed of 100 km/h. what is the average speed for entire journey?
(a) 60 km/h (b) 66 km/h (c) 66.5 km/h (d) 66.66 km/h

21. A train covers a distance of 3584 km in 2 days 8 hours. If it covered 1440 km on the first day and 1608 km on second day, by how much does the average speed of train for the remaining part of the journey differ from that for the entire journey?
(a) 3 km/h more (b) 3 km/h more (c) 4 km/h more (d) 5 km/h less

Relative Speed

22. Two persons A and B start running from same point but in opposite directions with speed 12 km/h and 13 km/h respectively. What will be the distance between them after 5 hours?
(a) 125 km (b) 100 km (c) 120 km (d) none

23. The distance between two places is 700 km. two trains start from these two places towards each other and meet after 5 hours. If speed of the first train is 80 km/h what is the speed of another train?
(a) 60 km/h (b) 40 km/h (c) 50 km/h (d) 55 km/h

24. Two trains start running from two different stations at the same time on parallel tracks towards each other with speeds 70 km/h and 50 km/h respectively. If the distance between both the stations is 1080 km. What is the time required for meeting of both the trains?
(a) 9 hours (b) 12 hours (c) 10 hours (d) none

25. Distance between two cities A and B is 330 km. A train starts from A at 8 a.m. with a speed of 60 km/h and another train starts from B at 9 a.m. at a speed of 75 km/h. they are travelling in opposite directions find at what time would they meet?
(a) 10 am (b) 11 am (c) 10:30 am (d) 11:30 am

26. Two stations A and B are 110 km apart. One train starts from A at 7:00 am and travel towards B at 20km/hr. Another train starts from B at 8:00 am towards A at 25km/hr. At what time will they meet?
(a) 10:00 am (b) 10:15 am (c) 10:05 am (d) 10:07 am

27. Train A start from station X at 10 am with speed of 80 km/h. Another train B starts from station Y at 11 am with a speed of 50 km/h. They run towards each other. At what distance from station A they meet if distance between A and B is 1380 km?
(a) 800 km (b) 880 km (c) 500 km (d) 580 km

28. A person from A starts to walk at 7 am and reaches B at 10 am similarly A person from B starts to walk at 8 am and reaches A at 11 am. Find the time at which the meet each other.
(a) 9:00 am (b) 10:00 am (c) 10:05 am (d) 10:30 am

29. A person starts to walk at 7 am from A and reaches B at 11 am and another person starts to walk from B at 8 am and reaches A at 11:30 am. Find the time at which they will meet each other.
(a) 9:00 am (b) 9:15 am (c) 9:24 am (d) 10:07 am

30. A thief is noticed by a policeman from a distance of 200 m. the thief starts running and the policeman chases him. The thief and the policeman run at the rate of 10 km/h and 11 km/h respectively. What is the distance between them after 6 minutes?
(a) 100 m (b) 200m (c) 190 m (d) 150 m

31. A constable is 114 m behind a thief. The constable runs 21 m in a minute and the thief runs 15 m in a minute. In what time will the constable catch the thief?
(a) 19 minutes (b) 17 minutes (c) 18 minutes (d) 16 minutes

32. A goods train starts running from a place at 1 pm at the speed of 18 km/h. Another goods train starts from the same place at 3 pm in the same direction and overtakes the first train at 9 pm. The speed of the seconds train in km/h?
(a) 24 km/h (b) 15 km/h (c) 30 km/h (d) 18 km/h

33. A thief steals a car at 1:30 pm and drives it off at 40 km/h. The theft is discovered at 2 pm and the owner sets off in another car at 50 km/h. He will overtake the thief at?
(a) 5 pm (b) 4:30 pm (c) 4 pm (d) 6 pm

34. A boy started from his house by bicycle at 10 am at a speed of 12 km per hour. His elder brother started after 1 hr 15 min by scooter along the same path and caught him at 1:30 pm. The speed of the scooter will be?
(a) 4.5 km/h (b) 56/3 km/h (c) 36 km/h (d) 9 km/h

35. A man covers 245 km in 6 hours partially by bus and train. Speed of bus is 30 km/h and speed of train is 50 km/h. How much distance was covered by train?
(a) 650/4 km (b) 550/3 km (c) 650/3 km (d) none

Problem on Trains

36. A train 100 m long is running at a speed of 30 km/h. The time in which it will pass a man standing near the railway line is?
(a) 10 sec (b) 11 sec (c) 12 sec (d) 15 sec

37. A train 180 meters long moving at speed of 20 m/s overtakes a man moving at a speed of 10 m/s in the same direction. The train will pass the man in?
(a) 6 sec (b) 9 sec (c) 18 sec (d) 27 sec

38. A train 125 m long takes 30 seconds to cross a tree by the railway line, and then the speed of the train is?
(a) 14 km/h (b) 15 km/h (c) 16 km/h (d) 12 km/h

39. A train 240 m long crosses a man walking along the line in opposite direction at the rate of 3 km/h in 10 seconds. The speed of the train is?
(a) 63 km/h (c) 75 km/h (c) 83.4 km/h (d) 86.4 km/h

40. A train passes two persons walking in the same direction at a speed of 3 km/h and 5 km/h respectively in 10 seconds and 11 seconds respectively. Find the speed of the train?
(a) 28 km/h (b) 25 km/h (c) 27 km/h (d) 24 km/h

41. A train 150 m long passes a km stone in 30 sec and another train of same length travelling in opposite direction in 10 seconds. The speed of the second train is?
(a) 90 km/h (b) 125 km/h (c) 25 km/h (d) 75 km/h

42. A train crosses two bridges of lengths 800 m and 400 m in 100 sec and 60 sec respectively. The length of the train is?
(a) 80 m (b) 90 m (c) 200 m (d) 150 m

43. A train 800 m is running at speed of 78 km/h. If it crosses a tunnel in one minute, then the length of the tunnel is?
(a) 77200 m (b) 500 m (c) 1300 m (d) 13m

44. A train takes 18 sec to pass through a platform 162 m long and 15 sec to pass through another platform 120 m long. The length of the train is?
(a) 70 m (c) 80 m (c) 90 m (d) 105 m

45. A train 150 long takes 30 seconds to cross a bridge 500 m long. How much time will it take to cross a platform 370 m long?
(a) 36 sec (b) 30 sec (c) 24 sec (d) 18 sec

46. A moving train passes a platform 50 m long in 14 sec and a lamp post in 10 sec. The speed of the train is?
(a) 24 km/h (b) 40 km/h (c) 36 km/h (d) 45 km/h

47. The ratio of length of two trains is 5:3 and the ratio of their speed is 6:5. The ratio of time taken by them to cross a pole is:
(a) 5:6 (b) 11:8 (c) 25:18 (d) 27:16

48. Two trains are moving on two parallel tracks but in opposite directions. A person sitting in the train moving at speed of 80 km/h passes the second train in 18 seconds. If the length of second train is 1000 m, find speed of second train?
(a) 100 km/h (b) 140 km/h (c) 120 km/h (d) 150 km/h

49. A train travels at an average speed of 60 km per hour without stoppages. But with stoppages its average speed is 54 km/h. How much time did it stop in an hour?
(a) 6 minutes (b) 12 minutes (c) 10 minutes (d) none

50. Speed of a car in 42 km/h. It is stops for a few minutes in an hour. Then its average speed becomes 28 km/h. Find out the times duration it step for in an hour.
(a) 6 minutes (b) 12 minutes (c) 20 minutes (d) none

51. Two trains started running at the same time. One from A to B and another from B to A on parallel tracks. If they arrived at B and a respectively 4 hours and 9 hours after they meet what is the speed of second train if the speed of first one is 90 km/h?
(a) 60 km/h (b) 50 km/h (c) 40 km/h (d) 80 km/h

52. After travelling a distance of 50 km train meets with an accident and its speed becomes 3/4th of its actual speed and reaches 35 minutes late. If this accident had occurred after travelling 24 km more train would have reached the station 25 minutes late. Find out the distance and speed of train.
(a) 134 km, 48 km/h (b) 120 km, 48 km/h (c) 134 km, 60 km/h (d) 120 km, 80 km/h

53. After travelling 200 km a train met with an accident and its speed became 4/5th of its actual speed and reached 45 minutes late. If this accident had happened after 40 more kms the train would have reached the station 30 minutes late. Find out the distance and speed of train.
(a) 40 km/h, 250 km (b) 60 km/h, 320 km (c) 60 km/h, 320 km (d) 40 km/h, 320 km

54. Ravi travels 300 km partly by train and partly by car. He takes 4 hours to reach his destination if he travels 60 km by train and rest by car. He will take 10 minutes more if he were to travel 100 km by train and rest by car. The speed of train is:
(a) 50 km/h (b) 40 km/h (c) 60 km/h (d) 80 km/h

Boats & Streams

1. A man rows a boat 18 kilometres in 4 hours downstream and returns upstream in 12 hours. What is the speed of stream?
(a) 1 km/h (b) 2 km/h (c) 1.5 km/h (d) 1.75 km/h

2. A boat covers a distance of 20 km downstream in 2 hours. While it covers the same distance upstream in 5 hours. What is speed of boat in still water?
(a) 7 km/h (b) 9 km/h (c) 8 km/h (d) 12 km/h

3. A motorboat in still water travels at a speed of 36 km/h. It goes 56 km upstream in 1 hour 45 minutes. The time taken by it to cover the same distance down the stream will be?
(a) 2 hours 45 minutes (c) 3 hours
(b) 1 hour 24 minutes (d) 2 hours 21 minutes

4. A swimmer swims from a point A against a current for 5 minutes and then swims backwards in favour of the current for the next 5 minutes and reaches point B. If AB is 100 m, the speed of the current is?
(a) 0.4 km/h (b) 1 km/h (c) 0.2 km/h (d) 0.6 km/h

5. A boat takes half time in moving a certain distance downstream than upstream. The ratio of speed of the boat in still water and that of the current is?
(a) 2:1 (b) 4:3 (c) 1:2 (d) 3:1

6. In a fixed time, a boy swims double the distance along the current that he swims against the current. If speed of current is 3 km/h, what is the speed of boy in still water?
(a) 6 km/h (b) 10 km/h (c) 9 km/h (d) 12 km/h

7. Two boats A and B start towards each other from two places, 108 km apart. Speed of the boat A in still water is 15 km/h and speed of boat B is 12 km/h. A proceeds downward and B proceeds upward. After what time will they meet
(a) 4.5 hours (b) 5.4hours (c) 4 hours (d) data insufficient

8. A boat covers a certain distance downward in a river in 3 hours and upstream in three hours and a half. If the speed of current is 1.5 km/h, what is the speed of boat in still water?
(a) 17 km/h (b) 17.5 km/h (c) 19.5 km/h (d) 19 km/h

9. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in 6.5 hours. What is the speed of current?
(a) 1.5 km/h (b) 2 km/h (c) 1 km/h (d) 2.5 km/h

10. A boat covers 24 km upstream and 36 km downstream in 6 hours, while it covers 36 km upstream and 24 km downstream in 6.5 hours. Find the speed of current?
(a) 1 km/h (b) 1.5 km/h (c) 2 km/h (d) 2.5 km/h

Races & Games

1. In a one- kilometre race A, B and C are the three participants. A can give B a start of 50 m and C a start of 69 m. The start, which B can allow C is:
(a) 17 m (b) 19 m (c) 20 m (d) 18 m

2. A can give 40 m start to B and 70 m to C in a race of one kilometre. How many meters start can B give to C in a race of one kilometre?
(a) 30 m (b) 31.75 m (c) 31.25 m (d) 32 m

3. In a race of 1000 m, A can beat B by 100 m. In a race of 400 m, B beats C by 40 m. In a race of 500 m. A will beat C by:
(a) 95 m (b) 45 m (c) 50 m (d) 60 m

4. In a race of 800 m, A can beat B by 40 m. In a race of 500 m, B can beat C by 5 m. In a race of 200 m A will beat C by:
(a) 11.9 m (b) 12.7 m (c) 1.19 m (d) 1.27 m

5. A, B and C are the three contestants in one km race. If A can give B a start of 40 metres and A can give C a start of 64 metres, how many metres start can B give C?
(a) 35 metres (b) 20 metres (c) 25 metres (d) none of these

6. In a 100 m race, Kamal defeats Bimal by 5 seconds. If the speed of Kamal is 18 Km/h, then the speed of Bimal Is?
(a) 15.4 km/h (b) 14.4 km/h (c) 14.5 km/h (d) 14 km/h

7. In a 100 m race covers the whole distance in 36 seconds and B in 45 seconds. In this race, A beats B by
(a) 20 m (b) 25 m (c) 22.5 m (d) 9 m

8. In a kilometre race, A beats B by 30 sec and B beats C by 15 sec. If A beats C by 180 m the time taken by A to run 1 kilometre is?
(a) 250 sec (b) 200 sec (c) 205 sec (d) 210 sec

9. A and B start running at the same time and from the same point around a circle. If A can complete one round in 40 seconds and B in 50 seconds, how many seconds will they take to reach the starting point simultaneously?
(a) 10 sec (b) 90 sec (c) 200 sec (d) 2000 sec

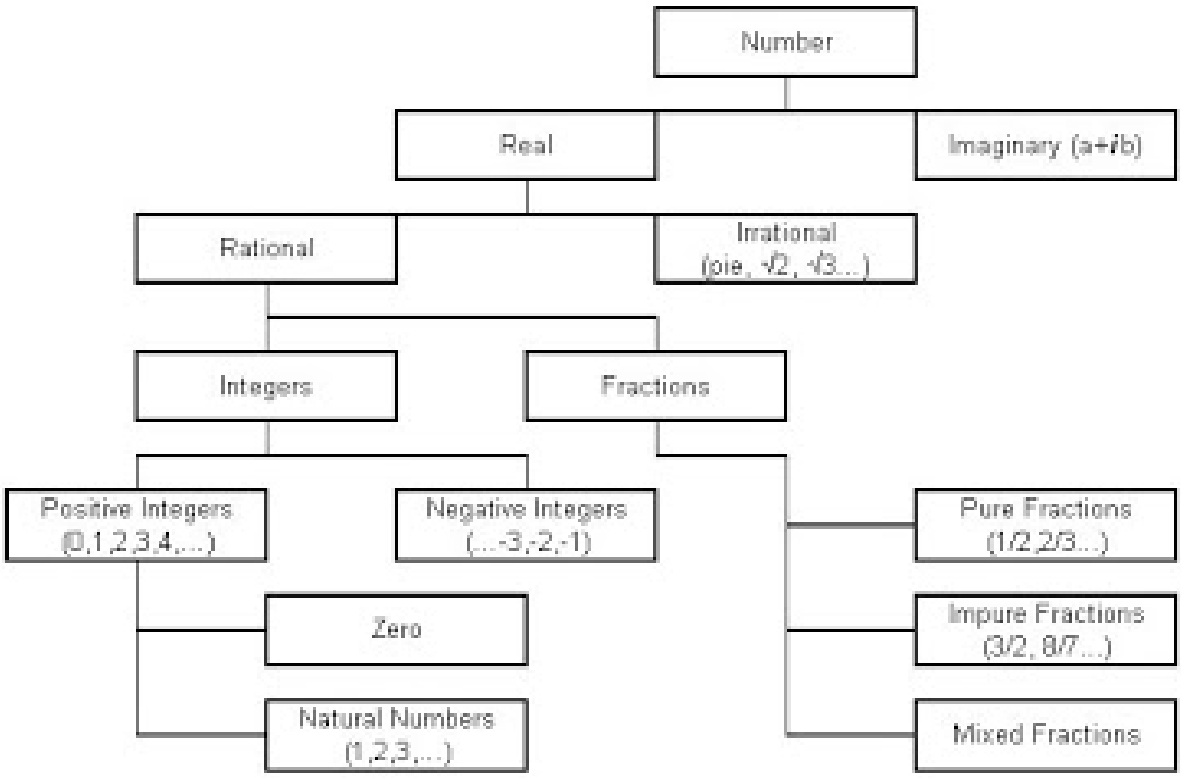
10. A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 sec, B in 308 sec and C in 198 sec, all starting at the same point. After what time will they next meet at the starting point again?
(a) 46 minutes 12 seconds (c) 45 minutes
(b) 42 minutes 36 seconds (d) 26 minutes 18 seconds

11. A, B and C walk 1 km in 5 minutes, 8 minutes and 10 minutes respectively. C starts walking from a point, at a certain time, B starts from the same point 1 minute later and a starts from the same point 2 minutes later than C. Then A meets B and C after?
(a) 5/3 min, 2 min (c) 1 min, 2 min
(b) 2 min, 3 min (d) 4/3 min, 3 min

12. Ravi and Ajay start simultaneously from a place A towards B, 60 km apart. Ravi's speed is 4 km/h less than that of Ajay. Ajay, after reaching B turns back and meets Ravi at a place 12 km away from B. Ravi's speed is?
(a) 12 km/h (b) 8 km/h (c) 10 km/h (d) 6 km/h

Number System

Classification of Numbers



Real numbers: Numbers which can be quantified and represented by a unique point on the number line are called real numbers.

Complex numbers: Complex numbers are the numbers which have both real and imaginary part.

Rational numbers: Numbers of the form p/q, where p and q are integers and $q \neq 0$ are called rational numbers.

Irrational numbers: Numbers which are not rational but can be represented on the number line are called irrational numbers.

Integers: Rational numbers of the form p/q, where p and q are integers and $q = \pm 1$ are called integers.

Fractions: Fractions are a type of rational numbers, which are of the form p/q, where p and q are integers and $q \neq 0$ and whose numerator is less than the denominator and both are in the lowest terms.

Whole numbers: Whole numbers are the set of positive integers from 0. They do not have any decimal or fractional part.

Natural numbers: Natural numbers are the set of positive integers, that is, integers from 1 to ∞, excluding fractional n decimal part. They are whole numbers excluding zero.

Even numbers: Numbers divisible by 2 are called even numbers.

Odd numbers: Numbers which are not divisible by 2 are called odd numbers. Odd numbers leave 1 as the remainder when divided by 2.

Prime numbers: Any number other than 1 which does not have any factor apart from one and the number itself is called a prime number.

Co-prime/relatively prime numbers: Two numbers are said to be co-prime or relatively prime if they do not have any common factor other than one.

Composite numbers: a number that has more than two distinct factors is called a composite number.

Perfect numbers: A number is said to be a perfect number if the sum of all its factors, excluding itself (but including 1) is equal to the number itself.

The following rules related to Even and Odd numbers are important:

$$\text{odd} \pm \text{odd} = \text{even};$$
$$\text{even} \pm \text{even} = \text{even};$$
$$\text{even} \pm \text{odd} = \text{odd}$$
$$\text{odd} \times \text{odd} = \text{odd};$$
$$\text{even} \times \text{even} = \text{even};$$
$$\text{even} \times \text{odd} = \text{even}.$$
$$\text{odd(any number)} = \text{odd}$$
$$\text{even(any number)} = \text{even}$$

Factors and Co-Primes

A number can be written in its prime factorization format. For example $72 = 2^3 \times 3^2$.

- The number of factors of a number $N = a^p x\, b^q x\, c^r \ldots = (p+1).(q+1).(r+1)\ldots$
- The sum of factors of a number $N = a^p x\, b^q x\, c^r \ldots$ can be written as $\frac{a^{p+1}-1}{a-1} \times \frac{b^{q+1}-1}{b-1} \times \frac{c^{r+1}-1}{c-1} \ldots.$
- The number of co-primes of a number $N = \phi(N) = a^p x\, b^q x\, c^r \ldots$ can be written as $N \times (1-\frac{1}{a}) \times (1-\frac{1}{b}) \times (1-\frac{1}{c})$.
- The sum of co-primes of a number $N = \phi(N) \times \frac{N}{2}$
- The number of ways of writing a number N as a product of two co-prime numbers = 2^{n-1} where n=the number of prime factors of a number.
- Product of all the factors of $N = N(\frac{Number\ of\ Factors}{2}) = N(\frac{(p+1).(q+1).(r+1)\ldots}{2})$

LCM or Least Common Multiple:

For two numbers, HCF x LCM = product of the two.

$$HCF\ of\ fractions = \frac{HCF\ of\ Numerator}{LCM\ of\ Denominator}$$

$$LCM\ of\ Fractions = \frac{LCM\ of\ Numerator}{HCF\ of\ Denominator}$$

TESTS OF DIVISIBILITY OF NUMBERS

Divisible by 2: if its unit digit of any of 0, 2, 4, 6, 8.

Divisibility by 3: When the sum of its digits is divisible by 3.

Divisibility by 9: When the sum of its digits is divisible by 9.

Divisibility by 4: if the sum of its last two digits is divisible by 4.

Divisibility by 8: If the number formed by hundred's ten's and unit's digit of the given number is divisible by 8.

Divisibility by 10: When its unit digit is Zero.

Divisibility by 5: When its unit digit is Zero or five.

Divisibility by 11: if the difference between the sum of its digits at odd places and the sum of its digits at even places is either o0 or a number divisible by 11.

Some important points

a. The greatest number of 'n' digits will have 'n' 9s straightaway e.g. the greatest five-digit number will have five 9s i.e. it will be 99999.
b. The smallest number of 'n' digits has 1 as the leftmost digit and the rest all the digits are zeroes. E.g. the smallest five-digit number is 10000.
c. The sum of a two-digit number and a number formed by reversing its digits is divisible by 11. E.g. 34 + 43 = 77, which is divisible by 11. At the same time, the difference between those numbers is divisible by 9. e.g. 43 – 34 = 9, which is divisible by 9.
d. $\sum n = (n(n+1)/2)$, $\sum n$ is the sum of first n natural numbers.
e. $\sum n^2 = (n(n+1)(2n+1)/6)$, $\sum n^2$ is the sum of first n perfect squares.
f. $\sum n^3 = (n^2(n+1)^2/4) = (\sum n)^2$, $\sum n^3$ is the sum of first n perfect cubes.
g. Local Value: The local value or face value of a digit in a number is the actual value of the digit. e.g. The local value of 5 in 7415236 is 5.
h. Place Value: The place value is the value of the digit at which it is placed. e.g. the place value of 5 in 7415236 is 5000 as 5 is placed at the thousand's place in the number.

ALGEBRAIC FORMULAE

- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a - b)^2 = a^2 - 2ab + b^2$
- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- $(a + b + c)^2 = a^2 + b2 + c^2 + 2ab + 2bc + 2ca$
- $(a + b + c)^3 = a^3 + b^3 + c^3 + 3a^2 b + 3a^2 c + 3b^2 c + 3b^2 a + 3c^2 a + 3c^2 b + 6abc$
- $a^2 - b^2 = (a + b)(a – b)$
- $a^3 – b^3 = (a – b)(a^2 + ab + b^2)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $(a + b)^2 + (a - b)^2 = 4ab$
- $(a + b)^2 - (a - b)^2 = 2(a^2 + b^2)$
- If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

Progression

A succession of numbers formed and arranged in a definite order according to a certain definite rule is called a progression.

1. Arithmetic Progression (A.P.)

If each term of a progression differs from its preceding term by a constant, then such a progression is called an *arithmetical progression*. This constant difference is called the *common difference* of the A.P.

An A.P. with first term a and common difference d is given by

a , (a + d), (a + 2d), (a + 3d), ...

The *nth term* of this A.P. is given by T_n = a + (n−1) d

Sum of n terms of AP = $\frac{n}{2}$ [2a + (n – 1) d]

2. Geometrical Progression (G.P.)

A progression of numbers in which every term bears a constant ratio with its preceding term, is called a geometrical progression. The constant ratio is called the common ratio of the G.P.

A G.P. with first term a and common ratio r is :

a, ar, ar^2,.....

Then nth term of a G.P. is given by: $T_n = ar^{n-1}$

Sum of n terms: $S_n = \frac{a(r^n-1)}{(r-1)}$

Division Algorithm

When a number is divided by another number then

Dividend = (Divisor x Quotient) + Reminder

Tips on Division

1. If a number 'n' is divisible by two co-primes numbers a and b then,'n' is also divisible by ab.
2. (a-b) always divides (a^n - b^n) if n is a natural number.
3. (a+b) always divides (a^n - b^n) if n is an even number.
4. (a+b) always divides (a^n + b^n) if n is an odd number.

==========

Question based on Basic Number System

1. Which of the following is an odd prime number?
1. 1 2. 9 3. 3 4. 15

2. There are two numbers, such that one number is 6 more than the other number. If the total of two numbers is 18, find the product of those numbers.
1. 72 2. 81 3. 80 4. None of these

3. What is the sum of first 10 perfect cubes?
1. 3025 2. 5625 3. 1225 4. None of these

4. What is the sum of this series 1 + 1 + 2 + 8 + 3+ 27 + 4 + 64 +----------+10 + 1000?
1. 308 2. 3008 3. 3800 4. 3080

5. If the fractions 1/2, 2/3, 5/9, 6/13, and 7/9 are arranged in ascending order of their values, which one will be the fourth?
1. (2/3) 2. (6/13) 3. (5/9) 4. (7/9)

6. Which one of the following is a prime number?
(a) 161 (b) 221 (c) 373 (d) None of these

7. If p is prime number, then which of the following may also be a prime number?
1. 2p 2. 3p 3. (p -3) 4. (p -2)

8. x, y and z are prime number and x + y + z = 38. What is the maximum value of x?
(a) 19 (b) 23 (c) 31 (d) 29

9. The difference between the squares of two consecutive odd integers is always divisible by:
1. 3 2. 6 3. 7 4. 8

10. The sum of first 100 natural numbers is ?
1. 5050 2. 10100 3. 2525 4. None of these

11. $(a^n - b^n)$ is completely divisible by (a - b), when
1. n is any natural number 2. n is an even natural number
3. n is and odd natural number 4. N is prime

12. If x is a whole number greater than 1, then $x^2(x^2 - 1)$ is always divisible by
1. 12-x 2. Multiple of 12 3. 12 4. 24

13. Two third of a positive number and 25/216 of its reciprocal are equal. The number is
1. 12/5 2. 25/144 3. 5/12 4. 144/25

14. The product of the 2 consecutive odd number is 6723.What is the greater number?
1. 80 2. 81 3. 82 4. 83

15. Which one cannot be the square of a natural number?
1. 2116 2. 2304 3. 2202 4. 2209

16. $31^2+32^2+33^2+\ldots\ldots\ldots\ldots\ldots\ldots 40^2 = ?$
1. 8640 2. 12460 3. 24680 4. None of these

17. Which of the following are Co-Prime Number?
1. (2,8) 2. (4,5) 3. (9,12) 4. (12,15)

18. Which number is neither Prime nor Composite?
1. 11 2. 40 3. 18 4. 1

19. Which number is Rational but not Integer?
1. 7 2. 0 3. 2.5 4. Pie (π)

20. Zero is what type of number?
1. Whole number 2. Prime number 3 Real number 4. Both (1) and (3)

21. Which one is True?
a) All Whole number can be Natural number but not Vice versa
b) All-Natural number can be Whole number But not Vice versa
c) Zero is a prime number
d) 4 is a Composite number

1. (a) and (c) 2. (a) and (d) 3. (b) and (d) 4. (b) and (c)

22. What is the Place value of 9 in 150592 ?
1. 90 2. 900 3. 92 4. 09

23. -4 is what type of number?
1. Real number 2. Integer 3. Whole number 4. Both (1) and (2) 5. None of these

24. Which one of the following is not a rational number?
1. 0.2333 2. 0.56666 3. $\sqrt{3}$ 4. 7

25. What is the product of smallest 15 whole numbers?
1. 1260 2. 60 3. 980 4. none of these

26. The product of 40 odd numbers is
1. even 2. Odd 3. 625 4. Can't say

27. The sum of first 49 natural numbers is ?
1. 1280 2. 2070 3. 1225 4. 1215

Question based on Divisibility Rule

1. The largest number which should replace$*$ in the number 2365$*$4 to make the number divisible by 4 is:
a) 9 b) 0 c) 2 d) 8

2. If the number 1005x4 is completely divisible by 8, then the smallest integer in place of x will be:-
a) 1 b) 0 c) 4 d) 2

3. If 746832*71 is divisible by 9, then the digit in place of * is:
a) 7 b) 1 c) 6 d) 9

4. For what value of x is the seven-digit number 46393x8 divisible by 11?
(a) 5 (b) 3 (c) 2 (d) 7

5. Which digits should come in place of * and # if the number 4675*2# is divisible by both 5 & 8?
(a) 4,5 (b) 4,0 (c) 1,0 (d) 8,0

6. If 8A5146B is divisible by 88, then what is the value of A x B?
a) 4 b) 16 c) 8 d) 12 e) 18

7. The product of 4 consecutive even numbers is always divisible by:
a) 600 b) 768 c) 864 d) 384

8. How many natural numbers are there between 200 and 400 which are divided by 4?
a) 48 b) 49 c) 50 d) None of these

9. What is the sum of the numbers between 500 & 700 which are divisible by 13?
(a) 14550 (b) 15448 (c) 15548 (d) 16548

10. How many natural numbers are there between 200 and 400 which are divisible by 4 or 5?
a) 78 b) 79 c) 80 d) 88

Question based on Factor Theorem

1. How many factors of $2^5 * 3^6 * 5^2$ are;
a) 18 b) 24 c) 36 d) None of these

2. Find the number of factors of $3^5 \times 5^7 \times 11^4$.
a) 240 b) 60 c) 140 d) 120

3. Find the total number of factors of 720?
(a)10 (b) 20 (c) 25 (d) 30

4. Find the number of factors of N = 420?
a) 24 b) 26 c) 20 d) 16

5. How many factors of 1020 are;
a) 24 b) 36 c) 20 d) 40

6. How many factors of $2^5 \times 3^6 \times 5^2$ are perfect squares?
(a)18 (b) 24 (c) 36 (d) 8

7. How many factors of $2^5 * 3^6 * 5^2$ are perfect squares?
a) 18 b) 24 c) 36 d) 8

8. How many factors of 1080 are perfect squares?
a) 4 b) 6 c) 8 d) 5

9. Number $N = 2^6 * 5^5 * 7^6 * 10^7$; how many factors of N are even numbers?
a) 1183 b) 1200 c) 1050 d) 840

10. Find the smallest number that has exactly 18 factors.
a) 180 b) 216 c) 240 d) 360

11. Find the number of prime factors and composite factors of N = 420?
a) 4 and 19 b) 4 and 20 c) 3 and 19 d) 5 and 2

12. If N = 1980, Find the number and sum of its even factors.
a) 28, 6552 b) 24, 5616 c) 24, 4630 d) 28, 5672

13. Find number of odd factors of $3^4 \times 5^3 \times 7^3 \times 13^2$.
a) 120 b) 240 c) 140 d) 220

14. Find the number of factors of 360 which are multiple of 20.
a) 8 b) 6 c) 4 d) 5

15. Find the number of even factors of 720?
a) 24 b) 30 c) 36 d) 12

16. Find the sum of all the factors of 480?
a) 2468 b) 3680 c) 4680 d) None of these

Question based on Unit digit

1. The unit digit of the sum 1289 × 2541 × 8215 × 6137 is:
a) 1 b) 2 c) 5 d) 3

2. What is the unit digit of 576846 × 564067 × 96468 × 45857?
a) 2 b) 4 c) 6 d) 8

3. The digit in unit's place of the product 49237 × 3995 × 738 × 83 × 9 is
a) 6 b) 0 c) 5 d) 7

4. If the unit digit of (433 × 456 × 43N) is (N+2), then what is the value of N?
a) 1 b) 8 c) 3 d) 6

5. Find the units digit of 7^{157}?
a) 1 b) 3 c) 4 d) 7

6. What is the units digit in the product $(3^{65} \times 6^{59} \times 7^{71})$
a) 1 b) 2 c) 4 d) 6

7. What is the units digit of $(6374)^{1793}$ x $(625)^{317}$ x $(341)^{491}$
a) 0 b) 2 c) 3 d) 5

8. Find the unit digit of $(7493)^{263}$ x $(151)^{29}$
a) 3 b) 9 c) 7 d) 1

9. What is the units digit in $(7^{95} - 3^{58})$
a) 0 b) 4 c) 6 d) 7

10. Find the units digit of $33^{43} + 43^{33}$
a) 0 b) 3 c) 7 d) 9

11. What is the digit expected at unit place of following mathematical operation: $(6^{15} - 7^4 - 91^3)$?
a) 0 b) 2 c) 4 d) 6

12. Find the unit digit of $634^{262} + 634^{263}$
a) 0 b) 1 c) 4 d) 6

13. Find the unit digit of $23^{24^{25}}$
(a) 0 (b) 5 (c) 3 (d) 1

14. Find the unit digit of $18^{19^{20}}$
(a) 8 (b) 4 (c) 2 (d) 6

15. Find the unit digit of 1! + 2! + 3! + 4! + 5! + ...1000!
(a) 0 (b) 1 (c) 2 (d) 3

16. Find the unit digit of $1!^{1!} + 2!^{2!} + 3!^{3!} + 4!^{4!} + 5!^{5!} + 6!^{6!} + \ldots\ldots\ldots\ldots + 1000!^{1000!}$
(a) 4 (b) 5 (c) 7 (d) 6

17. What is the unit digit of the sum of first 111 whole numbers?
a) 4 b) 6 c) 5 d) 0

18. What is the rightmost non-zero digit of number 770^{3430}?
a) 9 b) 4 c) 3 d) none of these

19. What is the right, most non-zero digit in 30^{2273}?
a) 4 b) 3 c) 9 d) NoT

Question based on Remainder Theorem

1. When a number is divided by 13, the remainder is 11. When the same number is divided by 17, then remainder is 9. What is the number?
a) 339 b) 349 c) 369 d) Data inadequate

2. A number when divided by 296 leaves 75 as remainder. When the same number is divided by 37, the remainder will be:
a) 1 b) 2 c) 8 d) 11

3. What is the remainder of 1421 * 1423 * 1425 when divided by 12?
a) 3 b) 4 c) 5 d) 7

4. What is the remainder when 2^{2004} is divided by 7?
a) 1 b) 4 c) 2 d) 6

5. What is the remainder when 4^{128} is divided by 15?
a) 1 b) 14 c) 4 d) 8

6. Find the remainder when 45^{134} divided by 4?
a) 1 b) 0 c) 3 d) 2

7. Find the remainder when 135^{184} divided by 19?
a) 15 b) 14 c) 12 d) 16

8. Find the remainder when 51^{203} is divided by 7?
a) 5 b) 4 c) 6 d) 7

9. Find the remainder when 21^{875} is divided by 17?
a) 11 b) 12 c) 13 d) 7

10. Find the remainder when $27^{87} \times 23^{45} \times 19^{92}$ is divided by 23?
a) 2 b) 21 c) 0 d) 4

11. What will be the remainder when $9^{83} \times 6^{53}$ is divided by 5?
a) 4 b) 3 c) 2 d) 1

12. What is the remainder when $15^{23} + 23^{23}$ is divided by 19?
a) 15 b) 4 c) 0 d) 18

13. Find the remainder when $16^3 + 17^3 + 18^3 + 19^3$ is divided by 70?
a) 8 b) 0 c) 2 d) 10

14. Find the remainder when 1 2 3 4 5 – – – –41 digits is divided by 4?
a) 3 b) 1 c) 0 d) 2

15. Find the remainder when 1! + 2! + 3! +4! + 5! + ———— + 1000! is divided by 8?
a) 6 b) 7 c) 4 d) 1

16. Find the remainder when 1! + 2! + 3! +4! + 5! + ———— + 1000! is divided by 14?
a) 5 b) 4 c) 7 d) 8

➢ **Based on Fermat's Theorem**

17. What is the remainder when 2^1040 is divided by 131?
a) 5 b) 1 c) 7 d) 8

18. What is the remainder when 2^89 is divided by 89?
a) 88 b) 41 c) 1 d) 2

19. What is the remainder when 2^1000 is divided by 59?
a) 59 b) 41 c) 1 d) 8

➢ **Based on Wilson's Theorem**

20. What is the remainder when 97! is divided by 101?
a) 98 b) 41 c) 1 d) 17

21. What is the remainder when 21! is divided by 361?
a) 359 b) 323 c) 1 d) 22

22. What is the remainder when 40! is divided by 83?
a) 81 b) 84 c) 7 d) 39

➢ **Based on Euler's Theorem (Totient method)**

23. The remainder when 2^256 is divided by 17 is

a) 9 b) 13 c) 11 d) 1

24. What is the remainder when 32^32^32 is divided by 7?
a) 0 b) 3 c) 1 d) 4

25. What is the remainder of 30^72^87 when divided by 11?
a) 3 b) 5 c) 10 d) 2

26. What is the remainder of 57 ^ 67 ^ 77 / 17 ?
a) 12 b) 14 c) 7 d) 9

27. What is the remainder of (121) ^ (121) divided by 144?
a) 9 b) 0 c) 1 d) 121

28. What is the remainder when 34^31^301 is divided by 9?
a) 7 b) 4 c) 1 d) 3

29. What is the remainder when polynomial $3x^3 + x^2$ + 2x + 5 divided by x + 1.
a) 5 b) 4 c) 1 d) 3

30. The expression $4x^2$ – px + 7 leaves a remainder of –2 when divided by x – 3. Find the value of p.
a) 15 b) 4 c) 1 d) 3

31. A number when successively divided by 3, 4 and 9 leaves respective remainders of 2, 3 and 7. What will be the remainders if the original number is divided successively by 3, 5 and 7?
a) 0,1 and 6 b) 2,3 and 6 c) 2,1 and 3 d) 2,1 and 6

32. A number when divided by 5 and 7 successively leaves a remainder 2 & 4 respectively. Find the remainder when the number is divided by 35.
a) 22 b) 12 c) 8 d) None of these

LCM AND HCF

1. What will be the least number which when doubled will be exactly divisible by 12, 18, 21 and 30?
A.196 B.630 C.1260 D.2520

2. The smallest number which when diminished by 7, is divisible 12, 16, 18, 21 and 28 is:
A.1008 B.1015 C.1022 D.1032

3. The least number, which when divided by 12, 15, 20 and 54 leaves in each case a remainder of 8 is:
A.504 B.536 C.544 D.548

4. The greatest number of four digits which is divisible by 15, 25, 40 and 75 is:
A.9000 B.9400 C.9600 D.9800

5. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together?
A.4 B.10 C.15 D.16

6. In every minute, a red light flashes 3 times whereas a green light sparks 5 times in 2 minutes at regular intervals. Find out the number of times both the light flashes together in each hour when the timing of their flashing is the same.
A. 30 B. 24 C. 20 D. 60

7. A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and c in 198 seconds, all starting at the same point. After what time will they again at the starting point?
A.26 mins and 18 s B.42 mins and 36 s C.45 mins D.46 mins and 12 s

8. The greatest possible length which can be used to measure exactly the lengths 7 m, 3 m 85 cm, 12 m 95 cm is:
A.15 cm B.25 cm C.35 cm D.42 cm

9. The G.C.D. of 1.08, 0.36 and 0.9 is:
A.0.03 B.0.9 C.0.18 D.0.108

10. Find the greatest number that will divide 43, 91 and 183 so as to leave the same remainder in each case:
A.4 B.7 C.9 D.13

11. Let N be the greatest number that will divide 1305, 4665 and 6905, leaving the same remainder in each case. Then sum of the digits in N is
A.4 B.5 C.6 D.8

12. The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively, is:
A.123 B.127 C.235 D.305

13. The H.C.F. of two numbers is 11 and their L.C.M. is 7700. If one of the numbers is 275, then the other is:
A.279 B.283 C.308 D.318

14. The product of two numbers is 4107. If the H.C.F. of these numbers is 37, then the greater number is:
A.101 B.107 C.111 D.185

15. Three number are in the ratio of 3 : 4 : 5 and their L.C.M. is 2400. Their H.C.F. is:
A.40 B.80 C.120 D.200

16. The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is:
A.1 B.2 C.3 D.4

17. The H.C.F. of two numbers is 23 and the other two factors of their L.C.M. are 13 and 14. The larger of the two numbers is:
A.276 B.299 C.322 D.345

18. Three numbers which are co-prime to each other are such that the product of the first two is 551 and that of the last two is 1073. The sum of the three numbers is:
A.75 B.81 C.85 D.89

19. If the sum of two numbers is 55 and the H.C.F. and L.C.M. of these numbers are 5 and 120 respectively, then the sum of the reciprocals of the numbers is equal to:
A.55/601 B.60/155 C.11/120 D.120/11

Coding – Decoding

➢ *Letter Coding*

1. If in a certain language GAMBLE is coded as FBLCKF, how can FLOWER be coded in that language?
(a) GKPVFQ (b) EMNXDS (c) GMPVDS (d) HNQYGT

2. In a certain code, MOTHER is written as ONHURF. How will ANSWER be written in that code?
(1) NBXSSE (2) NBWRRF (3) MAVSPE (4) NBWTRF

3. If POND is coded as RSTL, how is HEAR written in that code?
(a) GHIJ (b) GHIZ (c) JIGZ (d) JCLZ (e) None of these

4. In certain military code, SYSTEM is written as SYSMET, and NEARER as AENRER, what will be the code for FRACTION?
(1) CRAFNOIT (2) FRCAITNO (3) CARFNOIT (4) FRACNOIT

5. If in a certain code MICHAEL is coded as JGBHBGO, in this code AMERICA will be written as
(1) XKDRJEC (2) XKDRKED (3) XKDRJED (4) XKERJED

6. In a certain code language HJIZT code is deciphered as MONEY, in the same way NOVGZ will be deciphered as :
(1) STUMP (2) STALE (3) STICK (4) SPIRE

7. In a certain code JEALOUS is written as BFKKTVP. How is HEARTEN written in that code?
(1) OFUQBFI (2) BFIQOFU (3) BFIQUFO (4) UFOQIBF

8. If CONCEPT is written as UNMULQR and FRIEND is written as YSGLMT, then how is PREDICT written in that code?
(1) USYGMNL (2) SLMGTUR (3) QSLTGUR (4) QGMNLTR

9. If OPFGBCST stands for NEAR, in the same manner IJVWHI will stand for?
(1) HAG (2) HUG (3) HUT (4) KEG

10. In a certain Code ELECTION is written as GLGCVIQN, then VOTER will be coded as?
(1) XOVET (2) VOXET (3) WPUFU (4) VQTGR

11. In a certain code language, HAND is written as SZMW, and then what will be the code of MILK?
(1) ORNP (2) PNRO (3) NROP (4) RNOP

12. If BRIGHTEN is written as HJSCMDSG. How is COMPLETE written in that code?
(a) DSDKQNPD (b) QNPDDSDK (c) QNPDFUFM (d) OLNBFUFM

13. If in a certain language, POPULAR is coded as QPQVMBS, which word would be coded as GBNPVT?
a) FARMER b) FAMOUS c) FRAMES d) FARMES

14. In a certain code ALPACA is written as ACAPLA. How will ANIMAL be written in that code?
(1) LAMINA (2) ALAMIN (3) LAMNIA (4) AAMLIN

➢ *Number Coding*

15. In a certain code, 'MOBILE' is written as '56'. How will the word 'PHONE' be written in that code?
(1) 58 (2) 62 (3) 23 (4) 45

16. If BAD is coded as 7, HIS as 9, LOW will be coded as :
(1) 50 (2) 8 (3) 23 (4) 5

17. BOOK-PEN = 8 and PEN-NIB =?
(1) 6 (2) 8 (3) 10 (4) 12

18. If in a certain code, BAT = 23 and CAT = 24, then how will you code BALL?
(1) 27 (2) 28 (3) 32 (4) 120

19. In a certain code language 'CAT' is written as '3120' and 'DOG' is written as '4157'. What will be decoded form of '25144'?

(1) BEND (2) BEADD (3) YADD or YND (4) Cannot be determined

20. In a certain coding language, if GO = 32 & SHE = 49 then SOME will be equal to?
(1) 46 (2) 86 (3) 56 (4) 12

21. If A = 26, SUN = 27, then CAT =?
(1) 24 (2) 27 (3) 58 (4) 57

22. If REASON is coded as 5 and BELIEVED as 7, then what is the code for GOVERNMENT?
a) 6 b) 8 c) 9 d) 10

➢ ***Symbol Based Coding***

23. In a certain code, RAID is written as %#*$, RIPE is written as % * @ ©. How is DEAR written up in that code?
(a) $ * 37 (b) 3$7* (c) $©#* (d) $©#%

24. In a certain code, MODERN is written as 5%38#@ and WIN is written as 6©@. How is RIDE Written in that code?
(a) # ©38 (h) # @38 (c) # ©83 (d) ©@38

25. In a certain code, ROPE is written as %57$, DOUBT is written as 35#8* and LIVE is written as @24$. How is TROUBLE written in that code?
(a) *%5#8@$ (b) *%#58@$ (c) *%5#8@4 (d) *%#58$@

26. In certain code KNIFE is written as $3%#5 and LAKE is written as 7@$5. How is FAIL written in that code?
(1) %$#7 (2) #@%7 (3) $@%7 (4) $%@7

➢ ***Mixed Coding***

27. In certain code DEAF is written as 3587 and FILE is written as 7465. How is IDEAL written in that code?
(1) 43568 (2) 63548 (3) 48536 (4) 43586

28. In a certain code ORIENT is written as '532146' and SOUL is written as '7598'. How is LINE written in that code?
(1) 9241 (2) 8341 (3) 8241 (4) 6241

➢ ***Substitution Coding***

29. If 'black' means 'pink', 'pink' means 'blue', 'blue' means 'white', 'white' means 'yellow', 'yellow' means 'red' and 'red' means 'brown', then what is the color of clear sky ?
A) Brown B) Red C) Blue D) Pink

30. If 'black' means 'pink', 'pink' means 'blue', 'blue' means 'white', 'white' means 'yellow', 'yellow' means 'red' and 'red' means 'brown', then what is the color of blood?
A) Yellow B) Red C) Blue D) Pink

31. If 'light' is called 'morning', 'morning' is called 'dark', 'dark' is called 'night', 'night' is called 'sunshine' and 'sunshine' is called 'dusk' when do we sleep ?
(1) morning (2) night (3) sunshine (4) dark

32. If 'cages' are called 'rockets', 'rockets' are called 'traps', traps' are called 'planets', 'planets' are called 'aeroplanes', 'aeroplanes' are called 'cycles', 'cycles' are called 'cars', what is Earth?
(1) cycles (2) rockets (3) planet (4) aeroplanes

33. If 'red' is called 'air', 'air' is called 'black', 'black' is called 'sky', 'sky' is called 'blue', 'blue' is called 'wind' , 'and 'wind' is called 'white', where to birds fly ?
(1) air (2) red (3) blue (4) wind

34. On another planet, the local terminology for 'earth', 'water', 'light', 'air' and 'sky' are 'sky', 'light', 'air', 'water' and 'earth' respectively. If someone is thirsty there, what would he drink?
A) Light B) Air C) Sky D) Water

35. If orange is called butter, butter is called soap, soap is called ink, ink is called honey and honey is called orange, which of the following is used for washing clothes?
(a) Honey (6) Butter (c) Orange (d) Soap (e) Ink

36. If 'engineers' are 'carpenters', carpenters' are 'painters', 'painters' are cobblers', ' cobblers' are 'doctors', 'doctors' are 'authors', 'authors' are 'jewellers' and 'jewellers' are 'robbers', who cures the sick people ?
(1) jewellers (2) painters (3) author (4) doctors

➢ ***Decipher Coding***

37. In a certain code
'643' means 'she is beautiful' ,
'593' means 'he is handsome',
'567' means handsome meets beautiful'.
What number will indicate the word 'meets' ?
(1) 5 (2) 3 (3) 7 (4) 6

38. In a certain Language,
'FOR' stands for 'old is gold',
'ROT' stands for 'gold is pure',
'ROM' stands for 'gold is costly'.
How will 'Pure old gold is costly' be written ?
(1) TFROM (2) FOTRM (3) FTORM (4) TOMRF

Directions for Question no. 39-41:-
In a certain code language.
'134 'means 'you are well',
'758' means 'they go home',
'839' means 'we are home'.

39. Which of following represents 'they' in that code language?
(1) 5 (2) 7 (3) 3 (4) Data inadequate

40. Which of the following represents 'we' in the code language?
(1) 5 (2) 9 (3) 3 (4) Data inadequate

41. Which of following represents 'are' in that code language?
(1) 1 (2) 3 (3) 4 (4) 7

Directions for Question no. 42-45 :-
In a certain code
'for profit order now' is written as 'ho ja ye ga',
'right now for him' is written as 'gave ja se',
'place order for profit' is written as 'ga bi ho ye',
'only in right order' is written as 've du ye zo'.

42. What is the code for 'him'?
(1) ga (2) ve (3) ja (4) se (5) Cannot be determined

43. What does 'bi' stand for?
(1) profit (2) order (3) place (4) for (5) now

44. Which of the following may represent 'only for now'?
(1) ja bi zo (2) du zo ga (3) zo ga ja (4) zo ga ye (5) du bi ja

45. 'fo ve du' could be a code for which of the following?
(1) in right spirits (2) only in profit (3) order only him (4) place in right (5) order only now

Directions (Q. 46–47): Study the following information to answer the given questions
In a certain code language
"they have grown up" is written as "sit pit dip ra" ,
"grown up people" is written as "pit ra tik",
"they are up again" is written as "pt sit ja ka".

46. How is "people" written in that code language?
a) ra b) tik c) pit d) Can't be determined e) None of these

47. How is "have gone" written in that code language?

a) Sit ja b) pit tik c) ra dip d) dip ma e) Can't be determined

Directions (Q.46-50): Study the following information and answer the questions that follow:
In a certain code language,
"hope to see you" is coded as "re so na di",
"please come to see the party" is coded as "fi ge na di ke zo",
"hope to come" is coded as "di so ge" and
"see you the party" is coded as "re fi zo na".

48. How is "please" coded in the given code language?
a) fi b) ke c) di d) na e) None of these

49. What does the code "so" stand for in the given code language?
a) hope b) come c) to d) see e) None of these

50. Which of the following will be coded as "so di re" in the given code language?
a) the hope to b) hope you come c) hope you please d) you see hope e) you hope to

➢ *Matrix Coding*

51. In each of the following questions, a word is represented by only one set of numbers as given in any one of the alternatives. The sets of numbers given in the alternatives are represented by two classes of alphabets as in the two given matrices. The columns and rows of Matrix I are numbered from 0 to 4 and those of Matrix II from 5 to 9. A letter from these Matrixes can be represented first by its row and then the column number eg., in the matrixes for questions, M can be represented by 14,21 etc O can be represented by 20,32 etc. Similarly, you have to identify the correct set for the word ***STOP.***

Matrix I

	0	1	2	3	4
0	F	O	M	S	R
1	S	R	F	O	M
2	O	M	S	R	F
3	R	F	O	M	S
4	M	S	R	F	O

Matrix II

	5	6	7	8	9
5	A	T	D	I	P
6	I	P	A	T	D
7	T	D	I	P	A
8	P	A	T	D	I
9	D	I	P	A	T

a) 10,56,44,97 b) 41,68,01,77 c) 22,75,32,86 d) 33,99,42,59

52. In each of the following questions, a word is represented by only one set of numbers as given in any one of the alternatives. The sets of numbers given in the alternatives are represented by two classes of alphabets as in the two given matrices. The columns and rows of Matrix I are numbered from 0 to 4 and those of Matrix II from 5 to 9. A letter from these Matrixes can be represented first by its row and then the column number eg., in the matrixes for questions, M can be represented by 14,21 etc O can be represented by 20,32 etc. Similarly, you have to identify the correct set for the word ROAD.

Matrix I

	0	1	2	3	4
0	F	O	M	S	R
1	S	R	F	O	M
2	O	M	S	R	F
3	R	F	O	M	S
4	M	S	R	F	O

Matrix II

	5	6	7	8	9
5	A	T	D	I	P
6	I	P	A	T	D
7	T	D	I	P	A
8	P	A	T	D	I
9	D	I	P	A	T

a) 42,32,79,58 b) 23,32,98,99 c) 11,13,67,69 d) 04,20,55,78

Blood Relation

➢ Based on Puzzles

1. D is the brother of B. M is the Brother B. K is the father of M. T is the wife of K. How is B related to T?
(1) Son (2) Daughter (3) Son or Daughter (4) Data Inadequate (5) None of these

2. If 'A' is the mother of 'B' and 'C'; and 'D' is the husband of 'C', then what is 'A' to 'D'?
(1) Mother (2) Son-in-law (3) Mother-in-law (4) Aunt (5) Can't be determined

3. P and Q are sisters. R and S are brothers. P's daughter is R's sister. What is Q's relation to S?
(1) Mother (2) Grandmother (3) Sister (4) Aunt (5) None of these

4. A family has three generations and six members. Following information about the family is known. W is mother of U. V has only 1 daughter. X is the sister of V. S is T's husband. T has a son V who is married. There are two couples in the family.
How is U related to S?
1) Daughter 2) Son 3) Son-in-law 4) Granddaughter 5) Can't be determined

5. P is the father of D, D is the only son of T. T is the daughter of J. T is the mother of G. G is the sister of V.
If J is married to B, then how is B related to G?
1) Daughter-in-law 2) Son-in-law 3) Grandfather 4) Grandmother 5) Cannot be determined

6. P is the father of D, D is the only son of T. T is the daughter of J. T is the mother of G. G is the sister of V.
How is V related to P?
1) Daughter 2) Father 3) Mother 4) Son 5) Cannot be determined

Directions for Question no. 7 - 9:-
There are eight members in a family. P is the father of Q. R is the brother of Q. S is the son of Q. T and S are brothers. U is the mother of T. Z is the grandson of V. Q and R are the children of V.

7. How is U related to P?
1) Daughter 2) Daughter-in-law 3) Wife 4) Granddaughter 5) cannot be determined

8. How many male members are there in the family?
1) Two 2) Three 3) Four 4) Five 5) Six

9. Who is the father of Z?
1) P 2) R 3) Q 4) Either Q or R 5) Either P or R

10. H has only two children- B and C. B is the sister of C. D is the son of C. E is the brother of D. F is the mother of E. G who is sister of D, is the granddaughter of A who is the mother of B. How is A related to E?
(a) Grandmother (b) Son (c) Mother (d) Cousin Brother (e) None of these

11. There are nine members in three generations and three married couples in the family. There are only four male members in the family. Q is son of T who is the daughter-in-law of P. X is father of V. R is mother of S who is father of U. S is son-in-law of W. V is unmarried and aunt of U. X is not married to R.
Who among the following is Son-in-law of X?
(a) P (b) S (c) Q (d) R (e) U

12. A and B are a married couple, A being the male member. D is the only son of C, who is the brother of A. E is the sister of D. B is the daughter-in-law of F, whose husband has died. How many male members are there in the family?
(a) 2 (b) 4 (c) 1 (d) 3

13. There are six persons A, B, C, D, E and F. C is the sister of F. B is the brother of E's husband. D is the father of A and grandfather of F. There are two fathers, three brothers and a mother in the group.
How is F related to E?
1) Uncle 2) Husband 3) Daughter 4) Son 5) None of these

➢ Dialogue/ Conversation Based

14. Pointing to a woman in a photograph a man says: "She is the only daughter of my father's mother-in-law". How is the woman related to the man?

(1) Daughter 2) Mother 3) Daughter-in-law 4) Mother-in-law 5) None of these

15. Pointing a girl, Arun said, "She is the only daughter of my grandfather's son." How is girl related to Arun?
(1) Daughter (2) Sister 3) Cousin 4) Data Inadequate 5) None of these

16. Pointing a woman Nirmal said "She is the only daughter of my wife's grandfather's only child." How is the woman related to Nirmal?
1) Wife 2) Sister-in-law 3) Sister 4) Data Inadequate 5) None of these

17. Pointing to a picture hanging over the wall, Rohan says " She is the wife of my father's only son's son". How is the lady in the picture related to Rohan?
1) Daughter 2) Sister-in-law 3) Sister 4) Daughter-in-law 5) None of the above

18. Pointing to a girl in the photograph, Raju said, "Her mother's brother is the only son of my mother's father." How is the girl's mother related to Raju?
(A) Daughter (B) Mother (C) Grandmother (D) Aunt

19. Nandini is the only daughter of Madan's sister Sangita's brother. How is Nandini related to Madan?
1) Daughter 2) Niece 3) Cousin 4) Can't be determined 5) None of these

➢ Coded Relation based

Directions (8-9):-
'P ÷ Q' means 'P is son of Q'.
'P × Q' means 'P is sister of Q'.
'P + Q' means 'P is brother of Q'.
'P – Q' means 'P is mother of Q'.

20. How is T related to S in the expression 'T × R + V – S'?
1) Sister 2) Mother 3) Aunt 4) Uncle 5) None of these

21. How is S related to T in the expression 'T + R – V + S'?
1) Uncle 2) Nephew 3) Niece 4) Cannot be determined 5) None of these

Directions (22):-

'P × Q' means 'P is brother of Q'
'P - Q' means 'P is sister of Q'.
'P + Q' means 'P is father of Q'.
'P ÷ Q' means 'P is mother of Q'.

22. Which of the following represents 'M is nephew of N'?
1) N - K + M 2) N × K ÷ M 3) N ÷ K × M - T 4) N - K + M × T 5) None of these

Directions (23-25): Each of these questions is based on the following information:
A % B means A is the daughter of B.
A @ B means A is the mother of B.
A $ B means A is the father of B.
*A * B means A is the son of B.*
A © B means A is brother of B

23. If the expression *'D @ E * K © L % O'* is true, then which of the following statement is true?
(a) O is grandmother of E (b) L is uncle of E (c) D is son-in-law of O
(d) E is granddaughter of O (e) None is true

24. If the expression *'L % N $ T @ U © X * Z'* then who among the following is son-in-law of N?
(a) T (b) Z (c) U (d) X (e) None of these

25. If the expression *'H © F $ E % K @ R * F'* true, then which of the following is not true?
(a) R is nephew of H (b) K is mother of E (c) H is aunt of E (d) K is sister-in-law of H (e) All are true

26. 'P × Q' means 'P is brother of Q'
'P - Q' means 'P is sister of Q'.
'P + Q' means 'P is father of Q'.

'P ÷ Q' means 'P is mother of Q'.
Which of the following represents F is daughter of W?
1) W ÷ R + F 2) W × R × F 3) W + R × F - T 4) W + R - F + T 5) None of these

➢ Miscellaneous questions

Directions for Question no. 27 &28:-
There is family of six persons A, B, C, D, E and F. They are Teacher, Doctor, Lawyer, Student, Businessman and Architect.
1) There are two married couples in the family.
2) B is the mother of E and F.
3) The Businessman is the grandfather of F, who is a teacher.
4) The doctor D is married to the Businessman.
5) C, the lawyer is married to the lady Architect.

27. What is the profession of E?
1) Doctor 2) Teacher 3) Businessman 4) Student 5) Can't be determined

28. Who are the two married couples in the family?
1) EB and FC 2) AD and BC 3) EF and CB 4) AD and FC 5) None of these

29. A, B, C, D, E, F and G are members of a family consisting of four adults and three children, two of whom, F and G are girls. A and D are brothers and A is a doctor. E is an engineer married to one of the brothers and has two children. If is married to D and G is their child. Who is C?
(A) F's father (B) E's daughter (C) A's son (D) G's brother

30. P, Q, R, S, T and X are members of a family. There are two married couples. Q is an engineer and father of T. X is the grandfather of R and is a lawyer. S is the grandmother of T and is a housewife. There is one engineer, one lawyer, one teacher, one housewife and two students in a family. Which of the following two are married couples?
1) XS, QP 2) XS, QT 3) XS, RP 4) TS, RX 5) None of these

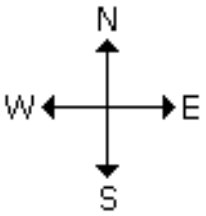
31. How is A related to B?

Statement 1 :- A is the sister-in-law of C, who is daughter-in-law of B, who is the wife of D.
Statement 2 :- B is mother of A's son's only uncle's son

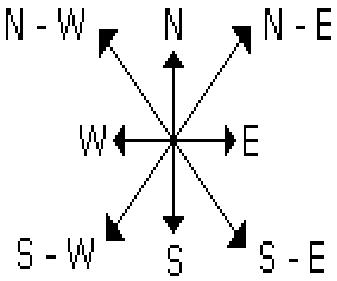
1) 1 alone is sufficient to answer
2) 2 alone is sufficient to answer
3) Either 1 or 2 is sufficient to answer
4) Both 1 and 2 are sufficient to answer
5) Neither 1 or 2 is sufficient to answer

Directions

Introduction:
There are four main directions - **East**, **West**, **North** and **South** as shown below:



There are four cardinal directions - **North-East (N-E)**, **North-West (N-W)**, **South-East (S-E)**, and **South-West (S-W)** as shown below:



1. At the time of sunrise if a man stands facing the east, his shadow will be towards west.
2. At the time of sunset the shadow of an object is always in the east.
3. If a man stands facing the North, at the time of sunrise his shadow will be towards his left and at the time of sunset it will be towards his right.
4. At 12:00 noon, the rays of the sun are vertically downward hence there will be no shadow.

Type 1:- Find the Direction

1. My dog Bunty, runs 30 m towards west, turns left and runs 10 m, then turns right, and runs 5 m, then turns left and runs 2 m and again turns right, runs 12 m. Finally it turns left and runs 7 m. In which direction is it running now.
(A) East (B) West (C) North (D) South (E) Can't be determined

2. Saurav walks 80 m to the east of post-office. He turns right and walks for 30 m and then walks 50 m towards north. Finally, he again starts walking towards the post-office along the straight line connecting the final point and the post-office. In which direction is he walking now?
(A) North (B) West (C) North-east (D) East (E) South-west

3. Sachin travels 16 km towards west and from there, he travels 8 km towards the east. Now, he goes 4 km towards the north. In which direction is he with respect to the starting point?
(A) North-west (B) West (C) South-east (D) North (E) None of these

4. My office is to the east of my house. My sister's office is to the south-east of my office. A park is to the south of my office. In which direction is my house located with respect to the park?
(A) North-east (B) South-west (C) North-west (D) South-east (E) None of these

5. Lalitha started from her house and walked 6 km towards north, then 3 km towards east, then 7 km towards her left, and then 4 km to her right, then 10 km towards south and finally 3 km to her right. In which direction is she from her house?
(A) South-east (B) South-west (C) North-east (D) North-west (E) South

6. Mr. Powar travels 10 km towards west and turns right to travel 4 km. Now he turns right and travels 7 km. In which direction is he now with respect to the starting position?
(A) South-east (B) South-west (C) North-east (D) North-west (E) North

7. Starting from his house Rahul walks 40 m towards south. Then he turns right and walks 20 m then turns right again and walks 15 m. He now travels 10 m towards east to reach the park. In which direction is the park with respect to his house?
(A) South-west (B) North-east (C) East (D) West (E) North-west

8. After walking for 7 m, I turned left and jogged 12 m. After this I turned left and walked for 3 m, then turned right and continued jogging. Now, I am moving towards east. In which direction did I start my journey?
(A) East (B) West (C) North (D) South (E) South-east

Type 2:- Find the Distance

9. A person walks 4 km towards west, then turns to his right to travel 9 km. He turns towards east and travels 12 km. Finally, he travels 3 km towards south. How far is he from the initial position (in km)?
(A) 15 (B) 23 (C) 18 (D) 10 (E) 28

10. Laxman travels 7 km towards south and then 5 km towards his left. He further travels 5 km towards south. How far is he from the starting point?
(A) 13 km (B) 9 km (C) 149 km (D) 119 km (E) 22 km

11. Mr. Kale travels 5 km towards west, turns left and travels 3 km and then travels another 5 km towards south. He then turns right and travels 1 km to reach a church. How far is the church from his starting position, in kilometers?
(A) 8 (B) 10 (C) 12 (D) 14 (E) 16

12. Rahul traveled 6 km towards north and then turned left and moved a distance of 3 km. From there, he turned left and moved a further distance of 2 km. How far is he from the starting point?
(A) 3 km (B) 4 km (C) 5 km (D) 6 km (E) 8 km

13. Mamta travels towards north for 10 km and then towards west for 4 km. She then travels a distance of 5 km towards her right and again 12 km towards right. What is the distance between the initial and the final positions?
(A) 16 km (B) 10 km (C) 15 km (D) 17 km (E) 22 km

14. A person starts from a point A, travels 3 km towards north, then turns right and travels 4 km and then travels 6 km towards south. He then turns right and travels 4 km. Finally, he travels 3 km towards north. How far is he from the starting point, in kilometers?
(A) 12 (B) 13 (C) 5 (D) 0 (E) 26

15. Shruti travels 7 km towards east then travels 25 km south. She then travels 10 km towards east and then travels 6 km towards her right. After this she travels 3 km towards west and stops. How far is she from starting point in vertical direction, in kilometers?
(A) 30 (B) 31 (C) 32 (D) 33 (E) 37

16. Mr. David starts jogging from his home to the nearby park. He jogs 7 m towards east and then jogs 9 m to his left. He then jogs 6 m to his right and then jogs 11 m towards north. He then jogs 13 m towards west. How far is he from the starting point, in meters?
(A) 16 (B) 25 (C) 20 (D) 18 (E) 28

Type 3:- Find the Distance and Direction

17. Happu Singh starts from his house, travels a distance of 2 km southwards, and then travels a distance of 4 km towards east, then a distance of 3 km to his right, and then he turned right and traveled 4 km and 2 km after the first and second turns respectively. Finally he traveled 4 km towards east. How far is he from his house and in which direction?
(A) 5 km and South-east (B) 5 km and North-west (C) 7 km and South (D) 7 km and South-east

18. Mr. Dabolkar starts from his house and travels 14 km towards north and then turns left and travels 30 km. He then turns right to travel 2 km followed by another right to travel 6 km. Finally, he travels 9 km southwards. Approximately, how far is the starting point from the final point and in which direction?
(A) 85 km and North-east (B) 9 km and North-west (C) 25 km and South-east (D) 9 km and South-west

19. Harry Potter hit the magic ball that can change directions on its own. It travelled 5 km towards east, turned left and travelled 20 km. Then, it turned right, travelled 11 km and then 5 km southwards. Then it further travelled 4 km towards east. How far is the ball from Harry Potter and in which direction?
(A) 21 km and North (B) 12 km and South-west (C) 12 km and North-east (D) None of these

20. Mr. Gaykwad walks 20 km towards north. Then he turns right and walks further 21 km. How far is he from the starting point and in which direction?
(A) 29 km and North-east (B) 29 2 km and South-west (C) 10 km and North-east (D) 20 km and North-west

21. Mr. Thakre travels 12 km towards east, then 8 km towards north and finally 6 km towards west. How far is he from the starting point and in which direction?
(A) 10 km and North-east (B) 10 km and North-west (C) 18 km and North-west (D) 24 km and North-east

22. Kalpana travels 3 km eastwards and then turns left and travels 6 km. She then turns right, and travels 2 km and then travels 3 km northwards. She finally travels 5 km westwards. How far is she from the starting position and in which direction?
(A) 9 km and North-east (B) 9 km and North-west (C) 13 km and North-east (D) 9 km and North

23. Aryan starts from point P and walks 50 m towards east. He then walks 10 m towards south and then walks 20 m to his right. Finally, he walks 50 m towards north to reach Q. How far and in which direction is P with respect to Q?
(A) 50 km and South-west (B) 30 km and North (C) 36 km and North (D) 36 km and North-east

Type 4:- Turn in Clockwise and Anticlockwise

24. Mr. Patekar traveled a distance of 60 m towards south. Now, he turns right and travels 45 m. He then travels 30 m towards north and further travels by turning 45° in clockwise direction. In which direct ion is he traveling now?
(A) East (B) South-west (C) North-east (D) North (E) None of these

25. Sristi started walking towards north to reach his school. After reaching the school she turned 180° in clockwise direction and 45° in anticlockwise direct ion. Which direction is she facing now?
(A) North-west (B) North-east (C) South-west (D) North (E) South-east

26. Surabhi, who is facing north, turns 90° in clockwise and then 135° in anticlockwise direction. Which direction is she facing now?
(A) North-east (B) North-west (C) South-east (D) South-west (E) North

Type 5:- Clock Problem

27. A clock is so placed that at 9 a.m. the minute hand points towards north-east. Which direction does the hour hand point at 3 p.m.?
(A) North-west (B) South (C) North-east (D) South-east (E) North

28. A clock is placed in such a way, that at 12'Oclock, the hands point towards north-east. In which direction does the hour hand point at 6 p.m.?
(A) South-west (B) South-east (C) East (D) South (E) North-east

29. When watch shows 5:15. if the minute hand points towards the east, then in which direction will the hour hand point at 6:00?
(A) North (B) South (C) North-west (D) South-west (E) East

30. A compass was damaged and its needle turned in such a manner that the pointer, which was showing east, is now showing south. One person went towards west as per above compass. In which direction did he actually go?
(A) North (B) South (C) East (D) West (E) North-east

Type 6:- Shadow Problem

31. One evening, Dileep was facing a tree. The shadow of the tree fell to his right. Which direction was he facing?
(A) North (B) South (C) East (D) South-east (E) West

32. One evening Dinesh and Swetha sat in a park such that their backs are towards each other. If Dinesh's shadow is falling to his left then which direction is Swetha facing?
(A) North-east (B) North (C) East (D) South (E) South-east

33. One morning, Ram and Shyam were talking, facing each other. It is observed that Ram's shadow fell to his left. Then which direction was Shyam facing?
(A) East (B) South (C) North-east (D) North (E) West

34. One morning Ravi observed that his shadow is falling to his right, which direction is he facing?
(A) North (B) South (C) East (D) West (E) Cannot be determined

35. One evening Avinash and Abhinav are talking to each other while sitting at either ends of See-Saw facing each other. Avinash observed that his shadow is falling to his left. Which direction is Abhinav facing?
(A) North (B) East (C) West (D) South (E) Cannot be determined

Series

Number Series:-

Type 1:- Missing Number

1. 30, 46, 78, 126, 190, 270, ?
1) 356 2) 366 3) 382 4) 398

2. 10, 14, 23, 39, 64, ?, 149
1) 78 2) 128 3) 103 4) 100

3. 7776, 1296, 216, 36, 6, ?
1) 6 2) 0 3) 3 4) 1

4. 2, 7, 11, 8, 13, 17, 14, 19, 23, ?
1) 22 2) 20 3) 18 4) 25

5. 9, 81, 90, 810, 819, ?
1) 7371 2) 900 3) 8100 4) 1638

6. 29282, 2662, 242, 22, ?
1) 1 2) 2 3) 0 4) 11

7. 186, 115, 71, 44, 27, ?
1) 19 2) 17 3) 13 4) 21

8. 4, 6, 9, 13.5, ?
1) 17.5 2) 19 3) 20.25 4) 22.75

9. 4/12/95, 1/1/96, 29/1/96, 26/2/ 96, ...
1) 24/3/96 2) 25/3/96 3) 26/3/96 4) 27/3/96

Type 2:- Wrong Number

10. 105, 85, 60, 30, 0, –45, –90
1) 0 2) 30 3) 85 4) -45

11. 2, 3, 4, 4, 6, 8, 9, 12, 16
1) 3 2) 9 3) 6 4) 12

12. 7, 11, 11, 9, 15, 7, 19, 5, 23, 1
1) 5 2) 7 3) 1 4) 9

13. 10, 100, 1100, 11000, 111000, 1210000
1) 10 2) 11000 3) 100 4) 111000

14. 3, 10, 41, 206, 1236, 8660
1) 10 2) 41 3) 206 4) 1236

15. 5040, 840, 160, 42, 14, 7
1) 7 2) 160 3) 14 4) 840

16. 3, 4, 10, 32, 136, 685, 4116
1) 10 2) 32 3) 136 4) 4116

Letter Series:-

17. a, d, c, f, ?, h, g, ?, i
1) e, j 2) e, k 3) f, j 4) j, e

18. B, D, F, I, L, P ?
1) R 2) S 3) T 4) U

19. B,A,F, E, J, I, P, O, ?, U
1) V 2) T 3) S 4) Q

20. POQ, SRT, VUW, ?
1) XYZ 2) XZY 3) YXZ 4) YZX

21. Z X Y W V T U S R P Q O ?
1) MN 2) MK 3) NL 4) LN

22. ECA, JHF, OMK, ?, YWU
1) TRP 2) LNP 3) QPN 4) RPT

Alpha Numeric Series:-

23. N5V, K7T, ? , E14P, B19N
1) H9R 2) H10Q 3) H10R 4) I10R

24. 1CV, 5FU, 9IT, ?, 17OR
1) 5FU 2) 13LS 3) 9IT 4) 17OR

25. W-144, ?, S-100, Q-81, O-64
1) U-121 2) U-122 3) V-121 4) V - 128

26. Q1F, S2E, U6D, W21C, ?
1) Y44B 2) Y66B 3) Y88B 4) Z88B

27. KM5, IP8, GS11, EV14, ?
1) BX17 2) BY17 3) CY17 4) CY18

28. G4T, J10R, M20P, P43N, S90L
1) G4T 2) J10R 3) M20P 4) P43N