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Quantitative Aptitude

Practice Questions: Quantitative Aptitude

Section 1: Numbers

1.1 Basic Formulae

$(a+b)^2=a^2+b^2+2ab$ $(a-b)^2=a^2+b^2-2ab$

$(a+b)^2-(a-b)^2=4ab$

$(a+b)^2+(a-b)^2=2(a^2+b^2)$

$(a^2-b^2)=(a+b)(a-b)$

$(a+b+c)^2=a^2+b^2+c^2+2(ab+bc+ca)$

$(a^3+b^3)=(a+b)(a^2-ab+b^2)$

$(a^3-b^3)=(a-b)(a^2+ab+b^2)$

$(a^3+b^3+c^3-3abc)=(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

)

If $a+b+c=0$, then $a^3+b^3+c^3=3abc$

2. Types of Numbers I.

Natural Numbers

Counting numbers 1,2,3,4,5,...1,2,3,4,5,... are called natural numbers

II. Whole Numbers

All counting numbers together with zero form the set of whole numbers. Thus,

(i) 0 is the only whole number which is not a natural number. (ii) Every natural number is a whole number.

III. Integers

All natural numbers, 0 and negatives of counting numbers i.e.,

...,−3,−2,−1,0,1,2,3,.....,−3,−2,−1,0,1,2,3, together form the set of integers.

(i) Positive Integers: 1,2,3,4,.....1,2,3,4, is the set of all positive integers.

(ii) Negative Integers: −1,−2,−3,.....−1,−2,−3, is the set of all negative integers.

(iii) Non-Positive and Non-Negative Integers: 0 is neither positive nor negative. So, 0,1,2,3,....0,1,2,3,.... represents the set of non-negative integers, while 0,−1,−2,−3, 0,−1,−2,−3, Represents the set of non-positive integers.

IV. Even Numbers

A number divisible by 2 is called an even number, e.g.,2,4,6,82,4,6,8, etc.

V. Odd Numbers

A number not divisible by 2 is called an odd number. e.g.,1,3,5,7,9,11,1,3,5,7,9,11, etc.

VI. Prime Numbers

A number greater than 1 is called a prime number, if it has exactly two factors, namely and the number itself.

VII. Composite Numbers

Numbers greater than 1 which are not prime, are known as composite numbers, e.g., 4,6,8,9,10,12.4,6,8,9,10,12.

Note:

(i) 1 is neither prime nor composite.

(ii) 2 is the only even number which is prime.

(iii) There are 25 prime numbers between 1 and 100.

3 Remainder and Quotient

“The remainder is r when p is divided by k" means $p=kq+rp=kq+r$ the integer q is called the quotient.

For instance, "The remainder is 1 when 7 is divided by 3" means $7=3*2+17=3*2+1$. Dividing both sides of $p=kq+rp=kq+r$ by k gives the following alternative form $pk=q+rkpk=q+rk$

1.4. Even, Odd Numbers

A number n is even if the remainder is zero when n is divided by 2: $n = 2z+0$ or $n=2z$. A number n is odd if the remainder is one when n is divided by 2: $n=2z+1$.

1.5. Tests of Divisibility

Divisibility By 2

number is divisible by 4 if the number formed by the last two digits is divisible by 4.

Divisibility By 5

A number is divisible by 5 if its unit's digit is either 0 or 5. Thus, 20820 and 50345 are divisible by 5, while 30934 and 40946 are not.

Divisibility By 6

A number is divisible by 6 if it is divisible by both 2 and 3.

Divisibility By 8

A number is divisible by 8 if the number formed by the last Three digits of the given number is divisible by 8.

Divisibility By 9

A number is divisible by 9 if the sum of its digits is divisible by 9.

Divisibility By 10

A number is divisible by 10 if it ends with 0.

Divisibility By 11

A number is divisible by 11, if the difference of the sum of its digits at odd places and the sum of its digits at even places, is either 0 or a number divisible by 11.

Note:

If a number is divisible by p as well as q, where p and q are co-primes, then the given number is divisible by pq. If p and q are not co-primes, then the given number need not be divisible by pq, even when it is divisible by both p and q.

PRACTICE QUESTIONS

1. The number obtained by interchanging the two digits of a two-digit number is more than the original number by 27. If the sum of the two digits is 13, what is the original number?
a) 63 b) 74 c) 85 d) 58 e) None of these

2. The number obtained by interchanging the two digits of a two-digit number is less than the original number by 18. The sum of the two digits of the number is 16. What is the original number?
a) 97 b)87 c)79 d) Cannot be determined e) None of these

3. The sum of four consecutive even numbers is 44. What is the sum of the original squares of these numbers?
a) 288 b)502 c)696 d) 920 e) None of these

4. A, B, C, D and E are five consecutive odd numbers. The sum of A and C is 146. What is the value of E?
a) 75 b)81 c)71 d)79 e) None of these

5. What is the smallest number that should be added to 89357 to make it exactly divisible by 9?
a) 1 b) 3 c) 4 d) 7 e) None of these

6. Which smallest number should be added to 86237 to make it exactly divisible by 9?
a) 11 b) 9 c) 10 d) 2 e) None of these

7. The difference between two numbers is 4 and the difference between their squares is 128. What is the larger number?
a) 14 b)16 c)12 d) 18 e) None of these

8. The difference between two numbers is 3 and the difference between their squares is 63. What is the larger number?
a) 12 b)9 c)15 d) Cannot be determined e) None of these

9. What will be the smallest number divisible by 6, 8, 18, 24 and 36?
a) 36 b)72 c)48 d) 144 e) None of these

10. Which is the least number divisible by 10, 18 and 25?
a) 350 b)450 c)320 d) 500 e) None of these

11. The LCM and HCF of two positive numbers are 300 and 30 respectively. If one of the numbers is divided by 4, the quotient is 15, then what is the other number?
a) 360 b) 300 c) 150 d) 75 e) None of these

12. The HCF of two numbers is 11 and their LCM is 7700. If one of these numbers is 275, then what is the other number?
a) 279 b) 283 c) 308 d) 318 e) 320

13. Find the smallest number which gives a remainder 5, when divided by any of the numbers 8, 12 and 15.
a) 120 b) 240 c) 125 d) 65 e) 101

14. What is the smallest number which when divided by 16, 20, and 25 leaves remainder 7, 11, and 16 respectively?
a) 391 b) 404 c) 164 d) 146 e) None of these

15. Which is the smallest number which when divided by 20, 25, 35 and 40 leaves the remainder 14, 19, 29 and 34 respectively?
a) 1394 b) 1404 c) 1664 d) 1406 e) None of these

16. Find the greatest number of 4 digits, which is exactly divisible by 8, 12, 18, 15 and 20.
a) 9840 b) 9360 c) 9280 d) 9630 e) None of these

17. Find the greatest number that will divide 65, 81 and 145 leaving the same remainder in each case.
a) 32 b)50 c) 9 d) 16 e) None of these

18. What will be the greatest number that divides 68, 59 and 43 leaving the remainders 8, 9 and 3 respectively?
a) 8 b) 10 c) 24 d) 35 e) None of these

19. What is the least number of square tiles of uniform size required to pave the floor of a rectangular hall of length 20 m and breadth 16 m?
a) 15 b) 20 c) 35 d) 8 e) None of these

20. The length and breadth of a room are 13 m and 7.5 m respectively; the floor of the room is to be paved with square tiles of uniform size. What will be the length of the largest possible size of the tile?
a) 1.0m b) 0.5m c) 1.5m d) 5.0m e) 6.0m

21. There's an electric wire running 1 km from the side of a building. The number of poles in between them is placed in an interval of distance between each other. If one pole is removed then the distance between each pole becomes 1 2/3 meters. Find out how many poles were kept.
a)600 b)599 c)601 d)499 e)None of these

22. A frog falls into a well of height of 30 m. It tries to climb up in an erratic manner. In 24 hours it climbs 3m in daytime and slips 2m in the night. How many days does it take to climb the well?
a)10days b)9 days c)9.5 day d)10.5 day e)none of these

23. A research lab in Chennai requires 100 mice and 75 sterilized cages for a certain set of laboratory experiments . To identify the mice, the lab has prepared labels with numbers 1 to 100 , by combining tags numbered 0 to 9. The SPCA requires that the tags be made of toxin-free material and that the temperature of the cages be maintained at 27 degree Celsius. Also , not more than 2 mice can be caged together and each cage must be at least 2 sq.ft in area. The 5 experiments to be conducted by lab are to be thoroughly documented and performed only after a round of approval by authorities. The approval procedure takes around 48 hours. How many times is the tag numbered '4' used by the lab in numbering these mice?
a) 9 b)19 c) 20 d) 21

24. Nithin was counting down from 32. Sumit was counting upwards the numbers starting from 1 and he was calling out only the odd numbers. What common number will they call out at the same time if they were calling at the same speed?
A. 19 B. 21 C.22 D. They will not call out the same number E. None of these.

25. In a certain office, 1/3 of the workers are women, ½ of the women are married and 1/3 of the married women have children. If 3/4 th of the men are married and2/3 rd of the married men have children, what part of workers are without children?
A. 5/18 B. 4/9 C. 11/18 D17/18 E.17/36

26. There is a church tower 150 feet tall and another catholic tower at a distance of 350 feet from it which is 200 feet tall. There is one each bird sitting on top of both the towers. They fly at a constant speed and time to reach a grain in b/w the towers at the same time. At what distance from the church is the grain?
a)90 b)150 c)350 d)200 e)none of these

27. if a person is sitting in a exam having 30 questions (objective type) the examiner use the formula to calculate the score is S=30+4c- w ,here c is number of correct answer and w is number of wrong answer , the examiner find the score is more than 80, tell how may questions are correct ? if the score is little less but still more than 80 then u wont be able to answer.

28. if a person having 1000 rs and he want to distribute this to his five children in the manner that ecah son having 20 rs more than the younger one , what will be the share of youngest child

29. raju having some coins want to distribute to his 5 son , 5 daughter and driver in a manner that , he gave fist coin to driver and 1/5 of remaining to first son he again gave one to driver and 1/5 to 2nd son and so on at last
he equally distributed all the coins to 5 daughters. how many coins raju initially have???

30. Suppose 8 monkeys take 8 minutes to eat 8 bananas.
a) How many minutes would it take 3 monkeys to eat 3 bananas?
(b) How many monkeys would it take to eat 48 bananas in 48 minutes

31. There is a five digit number. It has two prime digits (1 is not a prime number). Third digit is the highest. Second digit is the lowest. First digit is one less than the third digit. The fifth digit is half of the fourth. The sum of 4th and 5th is less than the first. Find the number.

32. The ball has thrown from 180 feet height, every time it jumps 1/10 th of its height. How much distance it will travel.

Section 2 : Percentage

In mathematics, a **percentage** is a number or ratio expressed as a fraction of 100. It is often denoted using the percent sign, "%", or the abbreviations "pct.", "pct"; sometimes the abbreviation "pc" is also used. A percentage is a dimensionless number (pure number).

Important Points--

- To calculate p % of y
  (p/100) x y = (p x y)/100
  So, p % of y = y % of p
- To find what percentage of x is y: y/x × 100
- To calculate percentage change in value
  Percentage change = {change/(initial value)} x 100
- Percentage point change = Difference of two percentage figures
- Increase N by S % = N(1+ S/100)
- Decrease N by S % = N (1– S/100)
- If the value of an item goes up/down by x%, the percentage reduction/increment to be made to bring it back to the original point is 100x/ (100 + x) %.
- If A is x% more /less than B, then B is 100x/(100 + x) % less/more than a)
- If the price of an item goes up/down by x %, then the quantity consumed should be reducedby 100x/ (100 + x)% so that the total expenditure remains the same.
- Successive Percentage Change
  If there are successive percentage increases of a % and b%, the effective percentage increase is: {(a + b + (ab/100)}%
- **Percentage – Ratio Equivalence:**

1/3 X 100 = 33.33%	1/10 X 100 = 10%
1/4 X 100 = 25%	1/11 X 100 = 9.09%
1/5 X 100 = 20%	1/12 X 100 = 8.33%
1/6 X 100 = 16.66%	1/13 X 100 = 7.69%

N is Numerator, D is the Denominator

D/N	1	2	3	4	5	6	7	8	9	10
1	100	200	300	400	500	600	700	800	900	1000
2	50	100	150	200	250	300	350	400	450	500
3	33.33	66.66	100							
4	25	50	75	100						
5	20	40	60	80	100					
6	16.66	33.33	50	66.66	83.33	100				
7	14.28	28.56	42.85	57.14	71.42	85.71	100			
8	12.5	25	37.5	50	62.5	75	87.5	100		
9	11.11	22.22	33.33	44.44	55.55	66.66	77.7	88.8	100	
10	10	20	30	40	50	60	70	80	90	100
11	9.09	18.18	27.27	36.36	45.45	54.54	63.6	72.7	81.8	90.9
12	8.33	16.66	25	33.33	41.66	50	58.3	66.6	75	83.3
13	7.69	15.38	23.07	30.76	38.45	46.14	53.83	61.52	69.21	76.9
14	7.14	14.28	21.42	28.57	35.71	42.85	49.98	57.12	64.26	71.4
15	6.66	13.33	20	26.66	33.33	40	46.6	53.3	60	66.6
16	6.25	12.5	18.75	25	31.25	37.5	43.7	50	56.2	62.5

- **Product Stability Ratio**: A × B = P

If A is increased by a certain percentage, then B is required to be decreased by a certain percentage to keep the product P as shown in table. Expressing the percentage figures in

Change in A (INCREASE)	Change in B (DECREASE)	Change in P
$\frac{1}{1}$	$\frac{1}{2}$	0
$\frac{1}{2}$	$\frac{1}{3}$	0
$\frac{1}{3}$	$\frac{1}{4}$	0
$\frac{1}{4}$	$\frac{1}{5}$	0

If the price of a commodity increases by P%, then the reduction in consumption so as not to increase the expenditure is:

$$\left(\frac{P}{100+P}\times 100\right)\%.$$

If the price of a commodity decreases by P%, then the increase in consumption so as not to decrease the expenditure is:

$$\left(\frac{P}{100-P}\times 100\right)\%.$$

Results on Population:

Let the population of a town be P now and suppose it increases at the rate of R% per annum, then:

1. Population after *n* years = $P\left(1+\frac{R}{100}\right)^n$

2. Population *n* years ago = $\frac{P}{\left(1+\frac{R}{100}\right)^n}$

❖❖ **Results on Depreciation:**

Let the present value of a machine be P. Suppose it depreciates at the rate of R% per annum. Then:

1. Value of the machine after *n* years = $P\left(1-\frac{R}{100}\right)^n$

2. Value of the machine *n* years ago = $\frac{P}{\left(1-\frac{R}{100}\right)^n}$

3. If A is R% more than B, then B is less than A by $\frac{R(100-R)}{100}\%$.

4. If A is R% less than B, then B is more than A by $\left[\frac{R}{100-R}\times 100\right]\%$.

Practice Exercise:

1.44% of a number is 275, what is the 64% of same number?

a)450 b)400 c)375 d)500

2. If A salary is 20% more than that of B then how much percent is B's salary less than that of A?

a) 16 2/3% b)20% c)40% d)10%

3. If the price of 1 kg of rice is increased by 25% the increased amount is 12 and the new price of price per kg?

a) 48 b)60 c)72 d)36

4. A man spends 50% of his income in board and loading 20% of the remainder in other personal necessities and 25% of the rest in Charity find his income if he is left with 4200 rupees?

a) 14000 b)8000 c)12000 d)18000

5. The population of a town is 15625 it increases 8% annually what will it be in the end of 3 years?

a) 16983 b)18693 c)19683 d)19638

6. The population of a town increases by 12% during 1st year and decrease by 10% during 2nd year if the present population is 50400 but it was 2 year ago

a) 40000 b)50000 c)42000 d)40400

7. Student score 55% Mars in 8 paper of hundred marks each he scored 15% of the total marks in English how much does he scored in English?

a) 55 b)66 c)77 d)44

8. 60percent of the people of a certain village was illiterate. 28% of literate population are women if the number of literate Men bee 4320 then the total population of a village would be
a) 15000 b)6000 c)18000 d)12000

9. In a group of person 70% of the person is male and 30% of the person is married. if 2/7 of them are married what fraction of the female is single?

a) 2/7 b)1/3 c)3/7 d)2/3

10. Ram got 300 marks out of a total 500 marks find the percentage marks obtained by the RAM?

a) 26% b)36% c)30% d)40%

11. In an examination 10% of the students fail in maths, 20% fail in English and 5% failed in both what is the percentage of student who failed in at least one subject?

a) 75% b)25% c)35% d)40%

12. What quantity of water should be added to reduce 16 litre of 25% acidic liquid to 20% acidic liquid?

a) 5 liter b)4 liter c)12 liter d)8 liter

13. What quantity of water should be taken out to concentrate 12 Litres of 30% acetic liquid to 40% acidic liquid

a) 4 liter b)6 liter c)3 liter d)8 liter

14. In 50 kg mixture of sand and cement, 45% is cement how much sand should be added so that the proportion of cement becomes 10%?

a) 175kg b)225kg c)200kg d)150kg

15. In an examination the percentage of students qualified to the number of students appeared from school A is 80%. in school B the number of students appeared is 25% more than the student appeared from school A and the number of students qualified from school B is 40% more than the students qualified from school A. what is the percentage of students qualified to the number of students appeared from school B?

a) 45% b)90% c)89.5% d)89.6%

16. Square of a positive number is 2000 % greater than the number itself then the square of that number is

a) 1762 b)1635 c)441 d)139

17. The monthly salary of Shain and Kalpana together is $28,000 the salary of Shain and Klpana is increased by 25% and 12.5% respectively. the new salary of Klpana becomes 120% of the new salary of Shain the new salary of Shain is?

a) $15,000 b)$18,000 c)$14,000 d)$16,000

18. 80% of the smaller number is 4 less than 40% of the larger number the larger number is 85 greater than the smaller than the sum of these two number is

a) 325 b)425 c)235 d)500

19. 220% of a number X is 44. What is 44% of x

a) 88 b)8.8 c)66 d)can't determine

20. the shopkeeper increased the price of a product by 25% so that consumer find it difficult to purchase the required amount but somehow the customer manage to purchase only 70% of the required amount..What is the net difference and expenditure of that product?

a) 10% more b)5% more c)12.5% less d)17.5% less

Section 3: Profit, Loss and Discount

- Cost price (CP) is the price at which an article is purchased.
- Selling price (SP) is th e price at which an article is sold.
- If SP > CP, it is a profit or gain
- If CP > SP, it is a loss.
- Gain or Profit = SP – CP
- Loss = CP --- SP
- Loss or gain is always reckoned on CP.

Formula

$$\text{Profit Percentage (Profit \%)} = \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{(\text{SP} - \text{CP})}{\text{CP}} \times 100$$

$$\text{Loss Percentage (Loss \%)} = \frac{\text{Loss}}{\text{CP}} \times 100 = \frac{(\text{CP} - \text{SP})}{\text{CP}} \times 100$$

In the case of a gain or profit,

$$\text{SP} = \frac{(100 + \text{Gain\%})}{100} \times \text{CP}$$

In the case of a loss,

$$SP = \frac{(100 - \text{Loss\%})}{100} \times \text{CP}$$

SP

$$CP = \frac{100}{(100 - \text{Loss\%})} \times \text{SP}$$

If an article is sold at a gain of 20%, then SP = 120% of CP If an article is sold at a loss of 20% then SP = 80% of CP. If an article is sold at a loss of 20% then SP = 80% of CP.

If a person sells two items at the same price; one at a gain of x % and another at a loss of x %, then the seller always incurs a loss expressed as---

$$\text{Loss \%} = \left(\frac{\text{Common Loss and Gain \%}}{10}\right)^2 = \left(\frac{x}{10}\right)^2$$

If a trader professes to sell his goods at cost price, but uses false weights, then

$$Gain\% = \left[\frac{\text{Error}}{(\text{True Value} - \text{Error})} \times 100\right]\%$$

Discount

You always come across different offers attracting the customers such as “Buy 1 get 2 Free” or “Buy 3 get 5 Free” or “SALE 50% + 40%”.Can you calculate the discount offered to you? Most of us are not aware of the offer given to us. The percentage of the discount offered in the first case is not 200% but it is 66.66% only. The discount is always on the number of items sold, not on the number of items purchased. In case of successive discounts, we can treat the problem as the problem of successive percentage change and can use the formula---

Net discount = (a+ b – ab/100) %

Markup Price

It is also known as list price or Tag price which is written on the item. The markup price written is always greater than the actual c)P of the item and the percentage rise in the markup price is on the c)P of the item.

Percentage increase in the Markup price = (M.P– C.P)/C.P *100

Concept for successive percentage: When there are two successive Profit of x % and y % then the resultant profi per cent is given by
[x + y+ (x*y/100)]

If there is a Profit of x% and loss of y % in a transaction, then the resultant profit or loss% is given by
[x – y - (x*y/100)]

Note:- For profit use sign + in previous formula and for loss use – sign.
If resultant come + then there will be overall profit. If it come – then there will be overall loss.

If a cost price of m articles is equal to the selling Price of n articles, then Profit percentage
(m-n)/n×100%

If m part is sold at x% profit , n part is sold at y % profit, and p part is sold at z% profit and Rs. R is earned as overall profit then the value of total consignment
R×100 / (mx+ny+pz)

A man purchases a certain no. of article at m a rupee and the same no. at n a rupee. He mixes them together and sold them at p a rupee then his gain or loss %
[{2mn/(m+n)p} -1]× 100
Note + = profit, - = loss

When a person sells two similar items, one at a gain of say x%, and the other at a loss of x%, then in this transaction the seller always incurs a loss given by: = **{x^2/100}%**

A single discount equivalent to discount series of x% and y% given by the seller is equal to
(x +y - xy/100)%

If a seller marks his goods at x% above his cost price and allows purchasers a discount of y % for cash, then overall gain or loss
(x – y –xy/100)%
Profit or loss according to sign .+ = gain, - = loss

If a trader professes to sell his goods at cost price, but uses false weights, then
Gain% = {(Error)/(True value - Error)x 100] %

Practice Question:

1. The cost price of 10 articles is equal to the selling price of 9 articles. Find the profit percent?
a) 101/9 % b)100/9 % c)102/9 % d)103/9 %

2. To earn an extra profit, a shopkeeper mixes 30 kg of dal purchased at Rs.36/kg and 26 kg of dal purchased at Rs.20/kg. What will be the profit that he will make if he sells the mixture at Rs.30/kg?
a) Rs.60 b)Rs.80 c)Rs.50 d)Rs.100

3. The retail price of toothpaste of 140 grams is Rs 40, the shopkeeper gives a toothbrush whose actual price is Rs 10, free with it and still gains 25%. The cost price of the toothpaste is:
a) Rs.36 b)Rs.24 c)Rs. 30 d)None of the mentioned options

4. Manish sold two mobiles for Rs.9900 each. At one mobile, he gained 10% and on other, he lost 10%. Find his gain or loss in a transaction?
a) Loss 1% b)Neither loss Nor gain c)Gain 1% d)None

5. A Shopkeeper allows a discount of 20% on the marked price but charges 5% sales tax on the marked price and 5% service tax on the discounted price. If the customer pays Rs. 2670 as price including tax, then what is marked price of the item?
a) 3245 b)3000 c)3200 d)3500

6. Ashish sold an article for Rs 315 at a profit of 5%. What would have been the loss incurred by him it was sold for Rs. 275?
a) 7.625% b)4.5 % c)5.625% d)6.25%

7. If the selling price of an article is (2/3)rd of its cost price, then find the profit/loss percent.
a) 20% profit b)33% profit c)33% loss d)20% loss

8. An article was sold for Rs. 2770. Had it been sold for Rs. 3000 there would have been an additional gain of 10%. Cost Price of the article is:
a) Rs. 2100 b) Rs. 2200 c) Rs. 2300 d) Rs. 2400

9. Rahul buys a scooter worth Rs. 10,000. He sells it to Mohan at a profit of 10%. If after sometime Mohan sells it back to Rahul at a loss of 10%, then totally:
a) loses Rs. 100 b) loses Rs. 1100c) gains Rs. 100 d) gains Rs. 110

10. Pranjul bought 30 kg of rice at the rate of Rs. 8.50 per kg and 20 kg of rice at the rate of Rs. 9.00 per kg. He mixed the two. At what price (App.) per kg should he sell the mixture in order to get 20% profit?
a) Rs. 9.50 b) Rs. 8.50 c) Rs. 10.50 d) Rs. 12.00

11. The cash price of a television is Rs. 4022. A customer paid Rs. 1500 in cash and promised to pay the remaining money in 3 monthly equal installments at the rate of 5% per annum compound interest. What is the value of each installment?
a) Rs. 926.10 b) Rs. 903.33 c) Rs. 928.30 d) Rs. 940.50

12. The population of a village decreases at the rate of 20% per annum. If its population 2 years ago was 10000, what is its present population?
a) 6000 b) 10000/144 c) 6400 d) 7600

13. A man bought a number of clips at 3 for a rupee and an equal number at 2 for a rupee. At what price per dozen should he sell them to make a profit of 20% ?
a) Rs 4 b) Rs 5 c) Rs 6 d) Rs 7

14. The manufacturer of a certain item can sell all he can produce at the selling price of Rs. 60 each. It costs him Rs. 40 in materials and labor to produce each item and he has overhead expenses of Rs. 3000 per week in order to Answer rate the plant. The number:
a) 200 b) 250 c) 300 d) 400

15. 1/3 of a commodity is sold at 15% profit, ¼ is sold at 20% profit and the rest at 24% profit. If the Total profit is Rs. 80 is earned then find the value of commodity?
a) 350 b) 410 c) 400 d)300

16. A man purchases a certain no. of apple at 5 per rupee and same no. at 4 per rupee. He mixes them together and sells them at 4 per rupee. What is his gain or loss%?

a) Gain 20 % b) Gain 11.11% c) Loss 1e)11% d) Loss20%

17. If selling price is doubled, the profit triples. Find the profit percent?

a) 100% b) 116.67% c) 200% d)300%

18. The percentage profit earned by selling an article for Rs. 1920 is equal to the percentage loss incurred by selling the same article for Rs. 1280. At what price should the article be sold to make 25% profit?

a) 2200 b) 2400 c) 2500 d)2000

19. A man purchases 10 Cows at Rs. 3000 each. 1 Cow died. He sold 2 Cows at 5% loss, at what rate he should sale the remaining Cows, so as to gain a Profit of 10 % on the total Cost?

a) Rs.4000 b) Rs.3000 c) Rs.3900 d) Rs. 4500

20. Two merchants sell, each an article for Rs.1000. If Merchant A computes his profit on cost price, while Merchant B computes his profit on selling price, they end up making profits of 25% respectively. By how much is the profit made by Merchant B greater than that of Merchant A?

a) Rs.66.67 b)Rs.50 c)Rs.125d)Rs.200

21. The list price of an electric iron is Rs. 300. If two successive discounts of 15% and 10% are allowed, its selling price will be:

a) Rs. 229.50 b) Rs.231.50 c) Rs.232.50 d) Rs. 234.50

22. A trader allows a Discount of 5% for cash payment. How much approx % above cost price must he mark his goods to make a profit of 10%?

a) 8.9% b) 10% c) 12.75% d)15.8%

23. A shopkeeper sells some articles at the profit of 25% on the original price. What is the exact amount of profit? To find the answer, which of the following information given in Statements I and II is/are Sufficent?
I. Sale price of the article
II. Number of articles sold

a)Only I is sufficient. b)Only II is sufficient.
c) Both I & II are sufficient. d)Either I or II are sufficient.

24. If a merchant offers a discount of 40% on the marked price of his goods and thus ends up selling at cost price, what was the % mark up?

a) 28.57% b)40% c)66.66% d)58.33%

25. If a merchant offers a discount of 30% on the list price, then she makes a loss of 16%. What % profit or % loss will she make if she sells at a discount of 10% of the list price?

a)6% loss b)0.8% profit c)6.25% loss d)8% profit

26. A merchant marks his goods up by 60% and then offers a discount on the marked price. If the final selling price after the discount results in the merchant making no profit or loss, what was the percentage discount offered by the merchant?

a) 60% b)40% c)37.5% d)Depends on the cost price

27. A trader buys goods at a 19% discount on the label price. If he wants to make a profit of 20% after allowing a discount of 10%, by what % should his marked price be greater than the original label price?

a)+8% b)-3.8% c)+33.33% d)None of these

28. The Maximum Retail Price (MRP) of a product is 55% above its manufacturing cost. The product is sold through a retailer, who earns 23% profit on his purchase price. What is the profit percentage (expressed in nearest integer) for the manufacturer who sells his product to the retailer? The retailer gives 10% discount on MRP.

a) 31% b)22% c)15% d)13%

29. After applying successive discounts of 10% and 5% on an article, it was sold at Rs. 513. Find the marked price of the article.

a) Rs. 590 b) Rs. 600 c) Rs. 603.5 d) None

30. While selling to the retailer a company allows 30% discount on the market price of their product. If the retailer sells those Product at market price, his profit will be

a) 30% b)42 $\frac{1}{7}$ %c)40% d)42 $\frac{6}{7}$ %

Section 4: Time, Speed & Distance

2.1 Important Formulae

Speed=Distance/Time
Time=Distance/Speed
Distance = speed × time
1km/hr=5/18m/s
1m/s=18/5km/hr

If the ratio of the speed of A and B is a:b, then the ratio of the time taken by them to cover the same distance is 1/a:1/b1 or b:a

Suppose a man covers a distance at x kmph and an equal distance at y kmph, then the AVERAGE SPEED during the whole journey is 2xy/(x+y) kmph

Out of time, speed and distance we can compute any one of the quantities when we happen to know the other two. For example, suppose we drive for 2 hours at 30 miles per hour, for a total of 60 miles.

If we know the time and the speed, we can find the distance: 2 hour * 30 miles/hour=60 miles

If we know the time and the distance, we can find the speed: 60 miles/2 hours=30 miles/hour

2.2 Relative Speed

Case 1:

Two bodies are moving in opposite directions at speed V_1 & V_2 respectively. The relative speed is defined as $V_r=V_1+V_2$

Case 2:

Two bodies are moving in same directions at speed V_1 & V_2 respectively. The relative speed is defined as $V_r=|V_1-V_2|$

2.3 Train Problems

The basic equation in train problem is the same Speed=Distance/Time

The following things need to be kept in mind while solving the train related problems.

When the train is crossing a moving object, the speed has to be taken as the relative speed of the train with respect to the object.

The distance to be covered when crossing an object, whenever trains crosses an object will be equal to: Length of the train + Length of the object

Boats and Streams:

1. A boat is said to go downstream, if the boat goes in the direction of stream.
2. A boat is said to go upstream, if the boat goes opposite to the direction of stream.

Basic Formulas:

1. If speed of boat in still water is b km/hr and speed of stream is s km/hr,
   - Speed of boat in downstream = (b + s) km/hr , since the boat goes with the stream of water.
   - Speed of boat in upstream = (b - s) km/hr. The boat goes against the stream of water and hence its speed gets reduced.

2. Shortcuts With Explanation
3. Scenario 1: Given a boat travels downstream with speed d km/hr and it travels with speed u km/hr upstream. Find the speed of stream and speed of boat in still water.
   b = (d + u)/2
   s = (d – u)/2

   A man can row a boat, certain distance downstream in **td** hours and returns the same distance upstream in **tu** hours. If the speed of stream is **s** km/h, then the speed of boat in still water is given by

   Case
   downstream: d
   = (b + s) * td

Case upstream:
d = (b - s) * tu
=> (b + s) / (b - s) = tu / td

b = [(tu + td) / (tu - td)] * s

A man can row in still water at **b** km/h. In a stream flowing at **s** km/h, if it takes him t hours to row to a place and come back, then the distance between two places, **d** is given by

d = [t * (Speed to go downstream) * (Speed to go upstream)]/[2 * Speed of boat or man in still water]

2.5 Clock

For clock problems consider the clock as a circular track of 60km.

Min. hand moves at the speed of 60km/hr (think min. hand as a point on the track) and hour hand moves at 5km/hr and second hand at the speed of 3600 km/hr.

Relative speed between HOUR hand and MINUTE hand = 55 km/hr

Practice Questions

1. A bus covers a distance of 216 km in 4 hours. What is the speed of bus in m/s?
a) 5 m/s b) 20 m/s c) 15 m/s d) 18 m/s e) None of these

2. A bus covers a distance of 172 km in 4 hours. What is the speed of bus?
a) 52 kmph b) 47 kmph c) 43 kmph d) 38 kmph e) None of these

3. Two trains start at the same time from A & B and proceed towards B & A at 36 kmph & 42 kmph respectively. When they meet, it is found that one train has moved 48 km more than the other. What is the distance between A and B ?
a) 624 km b) 636 km c) 544 km d) 460 km e) None of these

4. The distance between two stations A and B is 300 km. A train leaves station A at the speed of 30 kmph. At the same time another train departs from station B at the speed of 45 kmph. What will be the distance of the point where both the trains meet from the point A?
a) 100 km b) 120 km c) 130 km d) 200 km e) None of these

5. A car covers the first 35 km of its journey in 45 minutes and the remaining 69 km in 75 minutes. What is the average speed of the car for the whole journey?
a) 42 kmph b)50 kmph c) 52 kmph d) 60 kmph e) None of these

6. Train covers a distance of 3735 km in 20 hours 45 minutes. What is the average speed of the train in kmph?
a) 160 b) 140 c) 190 d) Cannot decide e) None of these

7. Two trains start from two stations A and B at the same time and proceed towards each other to reach B and A respectively. After crossing each other, they take 36 and 49 hours respectively to reach their destinations. Find the speed of the second train, if the first train runs at 140 kmph?
a) 60 kmph b) 120 kmph c) 70 kmph d) 160 kmph e) None of these

8. A car starts from Hyderabad and moves towards Bangalore and at the same time, another car starts from Bangalore and moves towards Hyderabad. After crossing each other, they take 361 and 400 mins respectively to reach their destinations. What will be the speed of the first car, if the speed of second car is 76 kmph?
a) 90 kmph b) 120 kmph c) 80 kmph d) 60 kmph e) None of these

9. Excluding the stoppages, the speed of a bus is 64 kmph and including the stoppages, the speed of the bus is 48 kmph. For how many minutes does the bus stop per hour?
a) 12.5 min b) 15 min c) 10 min d) 18 min e) None of these

10. Without stoppages a train travels a certain distance at an average speed of 80 kmph and with stoppages it covers the same distance with an average speed of 60 kmph. What is the time in minutes per hour for which train stops?
a) 15 min/hr b) 10 min/hr c) 20 min/hr d) 25 min/hr e) None of these

11. Two cars starting from the same point and moving in the opposite directions will be 227.5 km apart in 3 hours 15 mins. Had they been travelling in the same direction, They would have been 32.5 km apart in the same time. Find the speed of both the cars?
a) 45 kmph, 25 kmph b) 40 kmph, 30 kmph c) 55 kmph, 15 kmph d) 80 kmph, 70 kmph e) None of these

12. Anita and Veena are running in opposite direction. Speed of Anita and Veena are 8 kmph and 10 kmph respectively. What will be the distance between them after 2.5 hours if both of them start from the same point?
a) 36 km b) 5 km c)5 km d) Cannot be determined e) None of these

13. A 270 m long train running at the speed of 120 kmph crosses another train running at the speed of 80 kmph in 9 seconds. What is the length of the other train?
a) 230 m b) 240 m c) 260 m d) 320 m e) None of these

14. A train running at the speed of 48 kmph crosses another train coming from the opposite direction in 18 seconds. What is the length of first train?
a) 200 m b) 100 m c) 150 m d) Cannot be determined e) None of these

15. A goods train runs at the speed of 72 kmph and crosses a 250 m long platform in 26 seconds. What is the length of the train?
a) 230 m b) 240 m c) 260 m d) 270 m e) None of these

16. A train of length 170 m running at 72 kmph cleared a tunnel in 18 sec. What is the length of the tunnel?
a) 200 m b)190 m c) 185 m d) 206 m e) None of these

17. A 180 m long train crosses a man standing on a platform in 20 seconds. What is the speed of train (in kmph)?
a) 24 b)18 c) 32.4 d)28.6 e) None of these

18. A 340 m long train crosses a pole in 20 seconds. What is the speed of train (in m/s)?
a) 15 b) 9 c)17 d)12 e) None of these

19. A man can swim with the stream at the rate of 3 kmph and against the stream at the rate of 2 kmph. How long will it take him to swim 7.5 km in still water?
a) 3 hours b) 2.8 hours c) 2.6 hours d) 3.2 hours e) None of these

20. A man can row 9 km in 3 hours against a stream running at 2 kmph. How long would he take in rowing the same distance down the stream?
a) 9/7 hours b) 7/9 hours c) 1.5 hours d) 3 hours e) None of these

21. A boat goes up a river 20 km and down the river 24 km in 8 hours. It also goes up the river 30 km and down the river 28 km in 11 hours. What is the speed of the boat and the river?
a) 6 kmph, 2 kmph b) 3 kmph, 1kmph c) 12 kmph, 4 kmph d) 2kmph, 6kmph e) None of these

22. The time taken to travel in train from Town A to Town B is 5 hours. There are trains starting from both towns at an interval of 1 hour.How many trains meet in 1 trip?
a) 8 b)9 c)10 d)11 e)None of these

23. A man jogs at 6 mph over a certain journey and walks over the same route at 4 mph. What is his average speed for the journey?
a) 4 mph b) 5 mph c) 2.4 mph d) 4.8 mph

24. A person says that their speed while going to a city was 10mph however while returning as there is no much traffic they came with a speed of 15mph. what is their average speed?
a) 12mph b)10mph c)15mph d)12.5mph

25. The boy goes to school reaches railway station at his 1/3 of his journey& mill at 1/4 of his journey the time taken him to walk between railway station & mill is 5 mins. Also he reaches railway station at 7.35am. when he started from house& when he reaches school?

26. if A wins in a race against B by 10 mts in a 100 Meter race. If B is behind of A by 10 mts. Then they start running race, who will won?

27. The distance between Station Atena and Station Barcena is 90 miles. A train starts from Atena towards Barcena. A bird starts at the same time from Barcena straight towards the moving train. On reaching the train, it instantaneously turns back and returns to Barcena. The bird makes these journeys from Barcena to the train and back to Barcena continuously till the train reaches Barcena. The bird finally returns to Barcena and rests. Calculate the total distance in miles the bird travels in the following cases:
the bird flies at 60 miles per hour and the speed of the train is 90 miles per hour
a) 65 miles b)60miles c)90 miles d)can't be determine

28. Jack, Doug and Ann, 3 children had a running race while returning from school. Mom asked who won the race. Then Jack replied" I won't tell u. I will give u a clue, When Ann takes 28 steps Doug takes 24 steps, meantime I take 21 steps. Jack explained that his 6 steps equals Droug's 7 steps and Ann's 8 steps. Who won the race?

29. A motorboat, whose speed in 15 km/hr in still water goes 30 km downstream and comes back in a total of 4 hours 30 minutes. The speed of the stream (in km/hr) is:
a). 4 b). 5 c). 6 d). 10

30. Speed of a boat in standing water is 14 kmph and the speed of the stream is 1.2 kmph. A man rows to a place at a distance of 4864 km and comes back to the starting point. The total time taken by him is:
a). 700 hours b). 350 hours c). 1400 hours d). 1010 hours

31. A boat running upstream takes 8 hours 48 minutes to cover a certain distance, while it takes 4 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and speed of the water current respectively?
a). 2 : 1 b). 3 : 2 c). 8 : 3 d). Cannot be determined

32. An individual can row a ship d km upstream and the identical distance downstream in 5 hours quarter-hour. Additionally, he can row the boat 2d km upstream in 7 hours. How lengthy will it take to row the identical distance 2d km downstream?
a). 3/2 hours b). 7 hours c). 7 (¼) d). 7/2 hours

33. A man takes twice as long to row a distance against the stream as to row the same distance in favour of the stream. The ratio of the speed of the boat (in still water) and the stream is:
a). 3 : 1 b). 1 : 3 c). 1 : 2 d). 2 : 1

34. A man can row at 5 kmph in still water. If the velocity of current is 1 kmph and it takes him 1 hour to row to a place and come back, how far is the place?
a). 2.4 km b). 2.5 km c). 3 km d). 3.6 km

35. A man can row three-quarters of a kilometre against the stream in 11 1/4 minutes and down the stream in 7 1/2minutes. The speed (in km/hr) of the man in still water is:
a). 4 kmph b). 5 kmph c). 6 kmph d). 8 kmph

Section 5: Time & Work

Important Formulae

If A can do a piece of work in n days, work was done by A in 1 day = 1/n

If A does 1/n work in a day, 'A' can finish the work in n days

If M1 men can do W1 work in D1 days working H1 hours per day and M2 men can do W2 work in D2 days working H2 hours per day (where all men work at the same rate), then

(M1 D1* H1) / W1 = (M2*D2*H2)/ W2*

If A is thrice as good as B in work, then

Ratio of work done by A and B = 3:1

Ratio of time taken to finish a work by A and B = 1:3

Practice Questions

1. 15 men can type 3240 pages in 6 days working 2 hours per day. How many men would be required to type 5400 pages working 4 hours per day for 3 days?
a) 10 b) 16 c) 12 d) 25 e) None of these

2. If 5 workers collect 60 kg wheat in 3 days, how many kilogram of wheat will 8 workers collect in 5 days?
a) 80 kg b) 100 kg c) 120 kg d) 160 kg e) None of these

3. A, B and C can finish a piece of work in 10, 15 and 30 days respectively. How many days will be required if A, B and C work together to finish the given work?
a) 5 b) 6 c) 7 d) 8 e) None of these

4. Govind alone can complete a work in 20 days. Jagdish alone completes it in 30 days. How many days will be required if both of them work together?
a) 12 days b) 24 days c) 25 days d)10 days e) None of these

5. A work is started by 15 people. After 5 days, 5 more people accompanied them to finish the work in next 10 days. How many people should have started the work to finish it in 11 days?
a) 24 b)22 c)20 d)25 e) None of these

6. A garrison of 1500 men is provisioned for 60 days. After 25 days, the garrison is reinforced by 500 men. How long will the remaining provisions last?
a) 24 days b) 21.75 days c) 26.25 days d) 52 days e) None of these

7.6 typists can do a piece of work in 8 hours. If 3 more typists whose working speed is double the earlier typists join together, then the work will be finished in how many hours?
a) 6hours b) 5hours c) 4hours d) Data inadequate e) None of these

8. 8 workers can do a work in 12 days. Two more workers whose efficiency is double than the earlier ones join them, in how many days they will be able to finish that work?
a) 6 b)8 c) 10 d) Cannot be determined e) None of these.

9. X alone can complete a piece of work in 12 days and Y alone can complete the same work in 24 days. If they work on alternate how many days will the work be completed?
a) 15 b) 16 c) 4 d) 8 e) None of these

10. A alone can complete a piece of work in 8 days and B alone can complete the same work in 16 days. If they work on alternate days with A working on first day, then in how many days will the work be completed?
a) 5.5 b) 10 c) 10.5 d)11 e) None of these

11. A can do a piece of work in 15 days and B in 20 days. They finished the work with the assistance of C in 5 days and got ` 45 as their wages. What is the share of each person?
a) `22.5,`12,`10.5 b)`10.5,`12,`22.5 c)`15,`11.25,`18.75
d) ` 12.5,`13,`19.5 e) None of these

12. A, B and C can do a piece of work in 6, 12 and 30 days respectively. They agreed to work together and finish the work for an amount of ` 3400. What will be the share of the person B from the given amount?
a) ` 1500 b) ` 1000 c) ` 2000 d) ` 400 e) None of these

13. Pipes A and B can fill a cistern in 10 and 12 hours respectively and pipe C can empty it in 6 hours. If all the three are opened simultaneously, then how much time is required for the tank to be full?
a) 20 hours b) 60 hours c) 80 hours d) 40 hours e) None of these

14. A cistern can be filled by two taps in 20 min and 30 min respectively and can be emptied by a third tap in 48 min. If they are all turned on at once, when will the cistern be half full?
a) 16 min b) 8 min c) 10 min d) 12 min e) None of these

15. A water tub can be filled by two taps in 8 min. One tap is closed after 3 min; the other tap fills the remaining tub in 15 min. How much time will the faster tap take to fill the tub?
a) 10 min b) 11 min c) 12 min d) 15 min e) None of these

16. Grass in lawn grows equally thick and in a uniform rate. It takes 40 days for 40 cows and 60 days for 30 cows to eat the whole of the grass. How many days does it take for 20 cows to do the same?
a) 20 b)60 c)120 d)180 e)None of these Ans: 120

17. Suppose 8 monkeys take 8 minutes to eat 8 bananas.
a) How many minutes would it take 3 monkeys to eat 3 bananas?
(b) How many monkeys would it take to eat 48 bananas in 48 minutes
Ans: a)8
B)6

18. There is a leak in the bottom of a cistern.When the cistern is thoroughly repaired. If would be filled in 12 minutes. It now take 18 minutes longer. If the cistern is full, how long would the leak take to empty the cistern?
a) 36 minutes b) 24 minutes c) 26 minutes d) 30 minutes

19. Tap A can fill a water tank in 25 minutes, tap B can fill the same tank in 40 minutes and tap C can empty the tank in 30 minutes. If all the three taps are opend together, in how many minutes will the tank be completely filled up or emptied ?
a) 4 days b)3 days c)3 11/19 days d)4 11/19 days

Section 6: Mixtures & Alligation

When two or more quantities are mixed together in different ratios to form a mixture, then ratio of the quantities of the two constituents is given by the following formulae: $Q_c/Q_d = (d-m)/(m-c)$

Toolkit

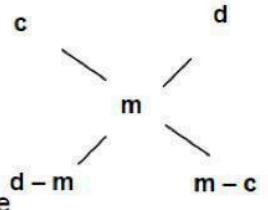
$Q_c \rightarrow$ Cheaper quantity

$Q_d \rightarrow$ Dearer quantity

$c \rightarrow$ C.P. of unit qty of 1st constituent.

$d \rightarrow$ C.P. of unit qty of 2nd constituent.

$m \rightarrow$ Mean Cost price of unit qty of mixture



$$\frac{Q_c}{Q_d} = \frac{d-m}{m-c}$$

Gives us the ratio of quantities in which the two ingredients should be mixed to get the mixture.

Important Concept

Always identify the ingredients as cheaper & dearer to apply the Alligation rule. In the Alligation rule, the variables c, d & m may be expressed in terms of **percentages** (e.g. A 20% mixture of salt in water), **fractions** (e.g. two-fifth of the solution contains salt) or **proportions** (e.g. A solution of milk and water is such that **Milk: Water = 2 : c)** . The important point is to remember is that c & d may represent pure ingredients or mixtures.

Replacement of Part of Solution Formula

Suppose a container contains a solution from which some quantity of solution is taken out and replaced with one of the ingredients. This process is repeated n times then,

Final Amount of ingredient that is not replaced=
Initial Amount×(Vol. after removal/Vol. after replacing) ^{n}
Above formula is not only true for absolute amounts but for ratios as well. So following formula is also valid:

Final ratio of ingredient not replaced to total =

Initial ratio *(Vol. after removal / Vol. after replacing) ^{n}

Practice Questions

1. A dairy man pays Rs.6.4 per litre of milk. He adds water and sells the mixture at Rs. 8 per litre, thereby making 37.5% profit. Find the proportion of the water to that of the milk received by the customers.

(a) 1 : 15 (b) 1 : 10 (c) 1 : 20 (d) 1 : 12 (e) None of these

2. Mr X mixed 10 kg of variety A rice with 15 kg of variety B rice and sold the mixture at a price 40% more than that of A. He did not get any profit. What is the ratio of the cost price of variety A to that of B
per kg?

(a) 2 : 5 (b) 3 : 5 (c) 4 : 5 (d) 5 : 8 (e) None of these

3. A trader has 50 kg of rice, a part of which he sells at 10 percent profit and the rest at 5 percent loss. He gains 7 percent on the whole. What is the quantity sold at 10 percent gain and 5 percent loss?
(a) 30 kg, 10 kg (b) 40 kg, 15 kg (c) 35 kg, 40 kg
(d) 40 kg, 10 kg (e) None of these

4. The wheat sold by grocer contained 10% low quality wheat. What quantity of good quantity wheat should be added to 150 kg of wheat so that the percentage of low quality wheat becomes 5%?

(a) 85 kg (b) 50 kg (c) 135 kg (d) 150 kg (e) None of these

5. One type of liquid contains 25% of milk; the other contains 30% of milk. A container is filled with 6 parts of the first liquid and 4 parts of the second liquid. The percentage of milk in the mixture is:

(a) 27% (b) 31% (c) 29% (d) 33% (e) None of these

6. Two gallons of a mixture of spirit and water contain 12% of water. They are added to 3 gallons of another mixture, containing 7% of water and half a gallon of water is then added to the whole. Find the percentage of water in the resulting mixture.

(a)17 3/11% (b)16 12/11% (c)14 1/11%
(d)18 2/11% (e)None of these

7. There are 2 bottles containing a mixture of wine, water and alcohol. The first bottle contains wine, water and alcohol in the ratio 3 : 5 : 2. The second bottle contains water and wine in the ratio 5 : 4. 1 litre of the first and 2 litres of the second are mixed together. What fraction of the mixture is alcohol?
(a) 1/15 litres (b) 6/13 litres (c) 2/15 litres (d) 6/19 litres (e) None of these

8. A bottle contains three-fourths of milk and the rest water. How much of the mixture must be taken away and replaced by an equal quantity of water so that the mixture has half milk and half water?

(a)25% (b)33 1/3% (c)45% (d)50% (e)none of these

9. A bottle is full of dettol. One-third of it is taken out and then an equal amount of water is poured into the bottle to fill it. This operation is done four times. Find the final ratio of dettol and water in the bottle.

(a) 13 : 55 (b) 20 : 74 (c) 16 : 65 (d) 10 : 48 (e) None of these

10. An alloy of gold and silver weighs 50 g. It contains 80% gold. How much gold should be added to the alloy so that percentage of gold is increased to 90?

(a) 50 g (b) 60 g (c) 30 g (d) 40 g (e) None of these

11. A jar contains a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture is taken out and 10 litres of liquid B is poured into the jar, the ratio becomes 2 : 3. How many litres of liquid A was contained in the jar?

(a) 14 litres (b) 18 litres (c) 20 litres (d) 16 litres (e) None of these

12. A can contains a mixture of two liquids A and B in the ratio 7:5 when 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7:9. How many litres of liquid A was contained by the can initially?

a) 28 litres b)21 litres c)45 litres d)36 litres

13. The ratio of chemical a and b is 3 : 1 in a container when 5 litre of mixture is taken out and replaced by chemical B, then the ratio becomes 1 : 1. What is the quantity of mixture?

a) 10 L b)5L c)15 L d)20 L

14. From a cask, 10 litres of wine is taken out and replaced by water. Again 10 litre of mixture is taken out and replaced by water. Thus the ratio of wine and water after Second replacement is 25 : 11. Find the original quantity of find in the car

a) 50 L b)40 L c)60 L d)30 L

15. A bartender stole mixture from a bottle containing 75% of alcohol and then replace the amount by mixing mixture containing 65% alcohol to the original mixture. Thus, there was only 72% alchol in the resultant mixture. how much of the original alcohol did the Bartender stole?

a) 70% b)30% c)82% d)75%

16. A container was full of milk. Munna Bhai withdrew 10% of the milk from the containers and replaced it with water. Next day he again withdraw10% of the mixture and replaced it with water. As a result at the end of the third day only 729 of milk was left in the container. Find the original quantity of milk.

a) 1200 L b)1500 L c)1300 L d)none of these

17. There are two containers the first container contains 500 ml of alcohol while second containers contain 500 ml of water. 3 cups of alcohol from the first container is taken out and is mixed well in the second container. Then 3 cups of the mixture is taken out and is mixed in the first container. Let A donate the preparation of water in the first container and B donate proportion of alcohol in the second container then

a) A>B b)A<B c)A=B d)Cannot be determine

18. From a cask, containing 250 litres of alcohol, A sells 15 litres of alcohol and add 15 litres of water to the Cask. again 15 litre of mixture is sold and again 15 litre of water is added to the mixture. Find the total amount of alcohol left in the Cask, after the mixture is replaced 4 times in all.

a) 195.1 L b)205.5 L c)182.6 L d)175 L

19. From a container containing milk, 20 litre is withdrawn and is replaced by same amount of water, again 20 litre of the mixture is withdrawn and is replaced by another 20 litre of water. After 3 such attempts the ratio of milk and water in the mixture is 1: 7. find the initial amount of milk that the container had.

a) 200 L b)40 L c)100 L d)150 L

20. From a container, 6 litres of milk was drawn out and replaced by water. After 6 litre of mixture was drawn out and was replaced by the water does the quantity of milk and water in the container after these two operations is 9 : 16 the quantity of mixture is:

a) 15 b)16 c)25 d)31

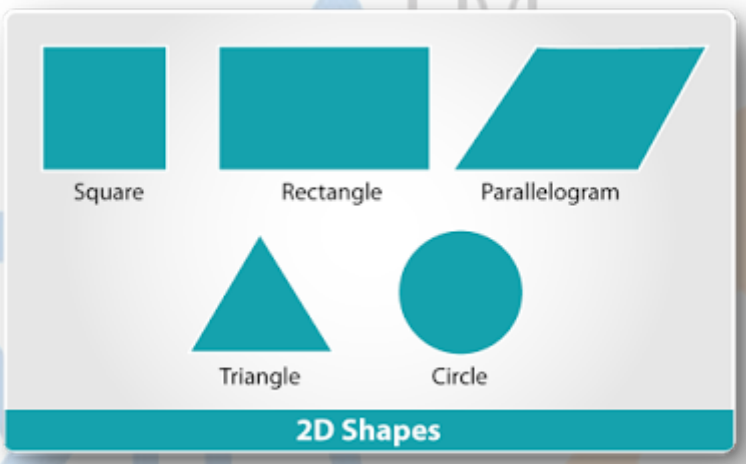
Section 7: Mensuration

What is Mensuration?

Mensuration is a topic in Geometry which is a branch of mathematics. Mensuration deals with length, area and volume of different kinds of shape- both 2D and 3D. So moving ahead in the introduction to Mensuration, let us discuss what are 2D and 3D shapes and the difference between them.

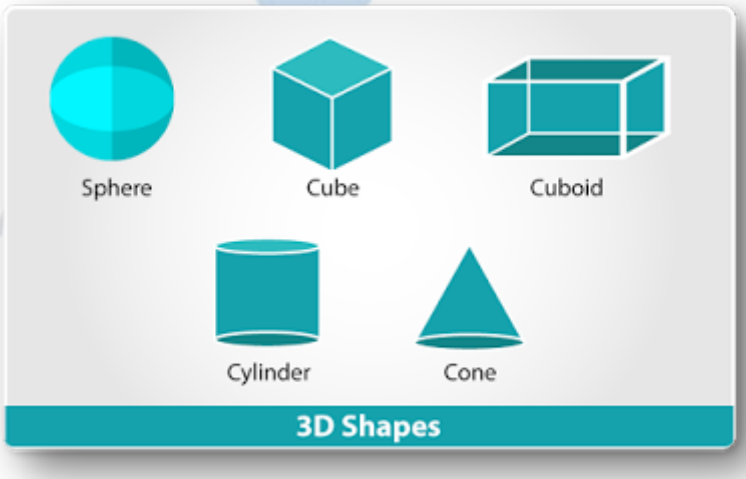
What is a 2D Shape?

Moving ahead with our introduction to Mensuration let's discuss what is a 2D shape. A ***2D shape*** is a shape that is bounded by three or more straight lines or a closed circular line in a plane. These shapes have no depth or height; they have two dimensions- length and breadth and are therefore called 2D figures or shapes. For 2D shapes, we measure area (A) and perimeter (P).



What is a 3D Shape?

The next step in introduction to Mensuration is finding out what is a 3D shape. A ***3D shape*** is a shape that is bounded by a number of surfaces or planes. These are also referred to as solid shapes. These shapes have height or depth unlike 2D shapes; they have three dimensions- length, breadth and height/depth and are therefore called 3D figures. 3D shapes are actually made up of a number of 2D shapes. Also, know as solid shapes, for 3D shapes we measure Volume (V), Curved Surface Area (CSA), Lateral Surface Area (LSA) and Total Surface Area (TSA).



Introduction to Mensuration: Important Terms

Before we move ahead to the list of important mensuration formulas, we need to discuss some important terms that constitutes these mensuration formulas.

Area (A) – The surface occupied by a given closed shape is called its ***area***. It is represented by the alphabet A and is measured in unit square- m2/ cm2.

Perimeter (P) – The length of the boundary of a figure is called its ***perimeter***. In other words, it is the continuous line along the periphery of the closed figure. It is represented by the alphabet P and is measures in cm/ m.

Volume (V) – The space that is contained in a three-dimensional shape is called its ***volume***. In other words, it is actually the space that is enclosed in a 3D figure. It is represented by the alphabet V and is measured in cm3/ m3.

Curved Surface Area (CSA) – In solid shapes where there is a curved surface, like a sphere or cylinder, the total area of these curved surfaces is the ***Curved Surface Area***. . The acronym for this is CSA and it is measured in m2 or cm2.

Lateral Surface Area (LSA) – The total area of all the lateral surfaces of a given figure is called its ***Lateral Surface Area***. Lateral Surfaces are those surfaces that surround the object. The acronym for this is LSA and it is measured in m2 or cm2.

Total Surface Area (TSA) – The sum of the total area of all the surfaces in a closed shape is called its ***Total Surface Area***. For example, in a cuboid when we add the area of all the six surfaces we get its Total Surface Area. The acronym for this is TSA and it is measured in m2 or cm2.

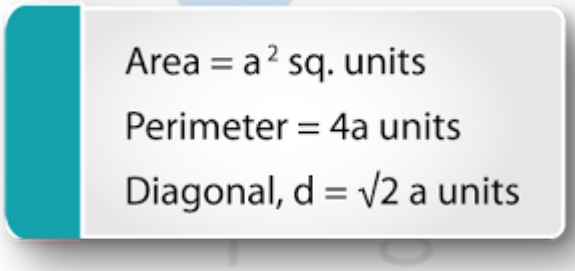
Square Unit (m2/ cm2) – One ***square unit*** is actually the area occupied by a square of side one unit. When we measure the area of any surface we refer to this square of side one unit and how many such units can fit in the given figure. It is expressed as m2 or cm2, depending on the unit in which the area is being measure.

Cube Unit (m3/ cm3) – One ***cubic unit*** is the volume occupied by a cube of side one unit. When we measure the volume of any figure we actually refer to this cube of side one unit and how many such unit cubes can fit in the given closed shape. It is written in ***m3 or cm3***, depending on the unit that is being used to measure.

List of Mensuration Formulas

Now that our introduction to mensuration and the important terms is over let's move to the mensuration formulas since this is a formula based topic. Every 2D and 3D figure has a list of mensuration formulas that establish a relationship amongst the different parameters. Let's discuss the mensuration formulas of some shapes.

Square:



Rectangle:

Area = l x b sq. units
Perimeter = 2(l+b) units
Diagonal, d = $\sqrt{(l^2 + b^2)}$ units

Scalene Triangle:

Area = s $\sqrt{}$ {(s – a)(s – b) (s – c)}sq. units; [s = (a+b+c)/2]
Perimeter = (a+b+c) units

Equilateral Triangle:

Area = $\sqrt{3}a^2/4$ sq. units
Perimeter = 3a units [a = side of the triangle]

Isosceles Triangle:

Area = (b /4) $\sqrt{}$ $(4a^2 - b^2)$ sq units
Perimeter = 2a + b units [b = base length; a = equal side length]

Right Angled Triangle:

Area = (½)b x h sq. units
Perimeter = b + h + hypotenuse
Hypotenuse = $\sqrt{(b^2 + h^2)}$ units

Circle:

Diameter, D = 2r units

Area = πr^2 sq. units

Circumference = $2\pi r$ units

Cube:

Volume = a^3 cubic units

LSA = $4\ a^2$ sq. units

TSA = $6a^2$ sq. units

Length of diagonal = $a\sqrt{3}$ units

Cuboid:

(Cross section area x Height) = l x b x h cubic units

Lateral Surface Area (LSA) = 2h(l+b) sq. units

Total surface area (TSA) = 2(lb+bh+hl) sq. units

Length of the diagonals = $\sqrt{\{h^2+ b^2 +l^2\}}$ units

Sphere:

Volume = $(4/3)\ \pi r^3$ cubic units

Surface Area = $4\pi r^2$ sq. units

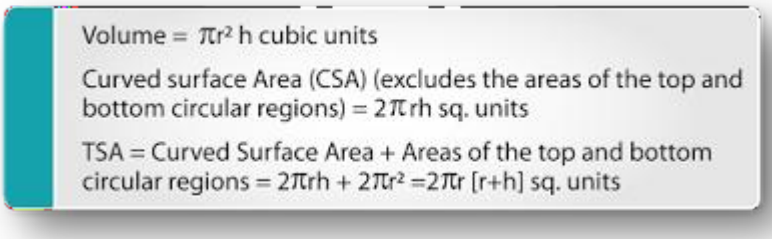
If R and r are the external and internal radii of a spherical shell, then its Volume = $4/3[R^3 - r^3]$ cubic units

Hemisphere:

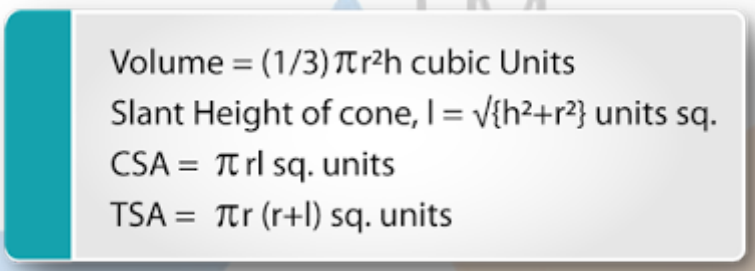
Volume = $(2/3)\ \pi r^3$ cubic units

TSA = $3\pi r^2$ sq. units

Cylinder:



Cone:



Practice Exercise:

1. The sides of a triangle are 51, 52, 53 cm, find the perpendicular from the opposite angle on the side of 52 cm. Also find the areas of the two triangles into which the original triangle is divided.
(a) 45 cm, 560 sq cm, 640 sq cm (b) 45 cm, 540 sq cm, 630 sq cm
(c) 48 cm, 540 sq cm, 630 sq cm (d) 48 cm, 530, sq cm, 640 sq cm

2. A plot of land is in the shape of a right angled isosceles triangle. The length of hypotenuse is $50\sqrt{2}$ m. The cost of fencing is Rs. 3 per metre. The cost of fencing the plot will be:
(a) less than Rs. 300 (b) less than Rs. 400 (c) more than Rs. 500 (d) more than Rs. 600

3. Perimeter of a square and an equilateral triangle is equal. If the diagonal of the square is $15\sqrt{2}$ cm, then find the area of the square.
(a) 144 sq cm (b) 225 sq cm (c) 288 sq cm (d) Data inadequate

4. The width of a rectangular hall is ¾ of its length. If the area of the hall is 300 sq m, then the difference between its length and width is:
(a) 3 m (b) 4 m (c) 5 m (d) 15 m

5. A ladder is placed so as to reach a window 63 m high. The ladder is then turned over to the opposite side of the street and is found to reach a point 56 m high. If the ladder is 65 m long, find the width of the street.
(a) 49 m (b) 45 m (c) 40 m (d) 59 m

6. The length of a rectangular field is twice its breadth. If the rent of the field at Rs. 3500 a hectare is Rs. 28000, find the cost of surrounding it with a fencing at Rs. 5 per metre.
(a) Rs. 6000 (b) Rs. 7000 (c) Rs. 6500 (d) Rs. 8000

7. A man walked 20 m to cross a rectangular field diagonally. If the length of the field is 16 m, the breadth of the field is:
(a)4 m (b) 16 m (c) 12 m (d) Can't be determined

8. A rectangular carpet has an area of 120 m^2 and a perimeter of 46 m. The length of its diagonal is:
(a) 15 m (b) 16 m (c) 17 m (d) 20 m

9. When the length of a rectangular plot is increased by four times its perimeter becomes 480 metres and area 12800 sq m. What was its original length (in metre)?
(a) 160 (b) 40 (c) 20 (d) Can't be determined

10. If the width of a rectangle is 2 m less than its length, and its perimeter is 32 m, the area of the rectangle is:

(a) 224 m^2 (b) 108 m^2 (c)99 m^2 (d)63 m^2

11. A hemispherical bowl has inner diameter 42 cm. The quantity of liquid that the bowl can hold (in cm^3)is: (a)$\frac{1}{3}2^2 X \frac{22}{7} X21^3$ (b) $\frac{1}{3}2^2 X 7 X21^3$ (c) $\frac{1}{2}2^3 X \frac{22}{7} X21^3$ (d) $\frac{1}{3}2^2 X 7 X42^3$

12. If a right circular cone of vertical height 24 cm has a volume of 1232 cm^3, then the area of its curved surface in is:
(a) 1254 (b) 704 (c) 550 (d) 154

13. A right cylindrical vessel is full with water. How many right cones having same diameter and height as those of right cylinder will be needed to store that water?
(a) 2 (b) 3 (c) 4 (d) 5

14. A reservoir is in the shape of a frustum of a right circular cone. It is 8 m across at the top and 4 m across the bottom. It is 6 m deep. Its capacity is:
(a)176 m^3 (b)196 m^3 (c)200 m^3 (d)110 m^3

15. How many bricks 20 cm × 10 cm × 7.5 cm can be carried by a truck whose load is 5 metric tons? The bricks in questions weigh 2500 kg per cubic meter.
(a) 1333 (b) 1233 (c) 1332 (d) 1433

16. The dimensions of an open box are 52 cm, 40 cm and 29 cm .Its thickness is 2 cm. If 2 $cm^3$of metal used in the box weight 0.5 gm., the weight of the box is:
(a) 8.56 kg (b) 7.76 kg (c) 7.756 kg (d) 6.832 kg

17. The water in a rectangular reservoir having a base 80 meters by 60 meters is 6.5 meters deep. In what time can the water be emptied by a pipe of which the cross section is a square of side 20 cm, if the water runs through the pipe at the rate of 15 km per hour?
(a) 26 hrs (b) 52 hrs (c) 65 hrs (d) 42 hrs

18. A cubic meter of copper weighing 9000 kilograms is rolled into a square bar 9 meters long. An exact cube is cut off from the bar. How much does it weigh?
(a) 444.3 kg. (b) 333.3 kg. (c) 222.2 kg. (d) 455.3 kg.

19. If 1 cm^3 cast iron weighs 21 gm, then weight of a cast iron pipe of length 1 m with a bore of 3 cm and in which thickness of metal is 1 cm, is:
(a) 21 kg (b) 24.2 kg (c) 26.4 kg (d) 18.6 kg

20. A cylinder of radius 2 cm and height 15 cm is melted and the same mass is used to create a sphere. What will be the radius of the sphere?
(a) $\sqrt[3]{45}$ (b) $\sqrt[3]{35}$ (c) $\sqrt[3]{55}$ (d) $\sqrt[3]{65}$

Section 8: Permutation & Combination

The study of permutations and combinations is concerned with determining the number of different ways of arranging and selecting objects out of a given number of objects, without actually listing them. There are some basic counting techniques that will be useful in determining the number of different ways of arranging or selecting objects. The two basic counting principles are given below-

Fundamental principle of counting

Suppose an event E can occur in m different ways and associated with each way of occurring of E, another event F can occur in n different ways, then the total number of the occurrence of the two events in the given order is $m \times n$.

Addition principle:

If an event E can occur in m ways and another event F can occur in n ways, and suppose that both cannot occur together, then E or F can occur in m + n ways.

Permutations:

A permutation is arrangement of objects in a definite order.

Permutation of n different objects:

The number of permutations of n objects taken all at a time, denoted by the symbol nPn, is given by

$^{n}P_{n} = n!$

where n = n(n – 1) (n – 2) ... 3.2.1, read as factorial n, or n factorial.

The number of permutations of n objects taken r at a time, where $0 < r \leq n$, is given by

$^{n}P_{r}$

Factorial:

Let n be a positive integer. Then n factorial (n!) can be defined as n! = n(n-1) (n-2) ...1

Combinations:

Each of the different groups or selections formed by taking some or all of a number of objects is called a combination.

Difference between Permutation and Combination

Sometimes, it will be clearly stated in the problem itself whether permutation or combination is to be used. However, if it is not mentioned in the problem, we have to find out whether the question is related to permutation or combination.

Consider a situation where we need to find out the total number of possible samples of two objects which can be taken from three objects P, Q, R. To understand if the question is related to permutation or combination, we need to find out if the order is important or not.

If order is important, PQ will be different from QP, PR will be different from RP and QR will be different from RQ. If order is not important, PQ will be same as QP, PR will be same as RP and QR will be same as RQ. Hence,

If the order is important, the problem will be related to permutations.

If the order is not important, the problem will be related to combinations.

For permutations, the problems can be like "What is the number of permutations the can be made", "What is the number of arrangements that can be made", "What are the different number of ways in which something can be arranged", etc.

For combinations, the problems can be like "What is the number of combinations the can be made", "What is the number of selections the can be made", "What are the different number of ways in which something can be selected", etc.

Mostly problems related to word formation, number formation etc. will be related to permutations. Similarly, most problems related to the selection of persons, the formation of geometrical figures, distribution of items (there are exceptions for this) etc. will be related to combinations.

Note: The term repetition is very important in permutations and combinations. Consider the same situation described above where we need to find out the total number of possible samples of two objects which can be taken from three objects P, Q, R.
If repetition is allowed, the same object can be taken more than once to make a sample.
i.e., if repetition is allowed, PP, QQ, RR can also be considered as possible samples.
If repetition is not allowed, then PP, QQ, RR cannot be considered as possible samples
Normally repetition is not allowed unless mentioned specifically.

Number of Combinations of n distinct things taking r at a time:
Number of combinations of n distinct things taking r at a time (${}^nC_r$) can be given by

${}^nC_r = n!(r!)(n-r)!=n(n-1)(n-2)\cdots(n-r+1)r!$where
$0 \le r \le n$ If r > n, ${}^nC_r = 0$
Special Case: ${}^nC_0 = 1$
${}^nC_r$ is also denoted by C (n, r). ${}^nC_r$ occurs in many other mathematical contexts as well where it is known as binomial coefficient and denoted by (nr)
Examples
i. ${}^8C_2 = 28$

ii. ${}^5C_4= 5$

Useful Relations -

$n! = n.(n-1)!$

${}^nC_r={}^nP_r*r!$

${}^nP_n = n!$

${}^nP_0 = 1$

${}^nP_1 = n$

${}^nP_n = {}_nP_{n-1}$

${}^nP_r =$

$nx({}^{n-1}P_{r-1})$ ${}^nC_r$

$= {}^nC_{(n-r)}$ ${}^nC_n =$

1

${}^nC_0 = 1$

${}^nC_0 + {}^nC_1 + {}^nC_2 + ... + {}^nC_n = 2^n$

${}^nC_{r-1} + {}^nC_r =$ ${}^{(n+1)}C_r$ (It is nothing but the famous Pascal's Law)

${}^nC_r /{}^nC_{r-1}=n-r+1/r$

If ${}^nC_x = {}^nC_y$ then either x = y or (n-x) = y

If you are dealing with identical objects-

The number of selections of r objects out of 'n' identical objects is 1.
A total number of selections of zero or more objects from 'n' identical objects is n+1.

Permutations of Objects when All Objects Are Not Distinct

The number of ways in which n things can be arranged taking them all at a time when p_1 of the things are exactly alike of 1st type, p_2 of them are exactly alike of a 2nd type, and p_r of them are exactly alike of rth type and the rest of all are distinct is-

$$\frac{n!}{p1! * p2! \ldots \ldots . pr!}$$

Permutations with Repetition: Number of permutations of n distinct things taking r at a time (Repetition allowed)-

The number of permutations of n distinct things taking r at a time when each thing may be repeated any number of times is $\mathbf{n^r}$.

Circular Permutations: Case 1: when clockwise and anticlockwise arrangements are different-
Number of circular permutations (arrangements) of n different things is (n-1)!

Circular Permutations: Case 2: when clockwise and anticlockwise arrangements are not different-

Number of circular permutations (arrangements) of n different things, when clockwise and anticlockwise arrangements are not different (i.e., when observations can be made from both sides), is-

½*(n-1)!

Practice Questions

1. In how many different ways can 5 persons stand in a row for a photograph?
a) 100 b) 120 c) 50 d) 5 e) None of these

2. How many different words can be formed using the letters of the word 'BANKER'?
a) 120 b) 6 c) 720 d) 12 e) None of these

3. A set of 12 books has 3 identical Quant books, 3 identical Reasoning books, 4 identical English books and 2 different books on General Awareness. In how many different ways can these 12 books be arranged in a book- shelf?
a) 12! b) 12!/(3!x3!x4!) c) 12!/(3!x3!x4!x2!) d) 126 e) None of these

4. In how many ways can a set of chess pieces consisting of a king, a queen, two identical rooks, two identical knights and two identical bishops be placed on the first row of a chessboard?
a) 8! b) 8^8 c) 5040 d) 4280 e) None of these

5. In how many ways can the letters of the word PLUMBER be arranged such that all the vowels are always together?
a) 6! x 2! b) 7! c) 5! x 2! d) 6! e) None of these

6. How many 4 digit numbers can be formed with the digits 0, 1, 3 and 6?
a) 6 b) 4! c) 9 d) 18 e) None of these

7. In how many ways can 6 persons be seated around a circular table for dinner?
a) 6! b) 5! c) 5!/2 d) 6!/2 e) None of these

8.How many different garlands can be made using 12 flowers of different colors?
a) 12! b) 11! c) 11!/2 d) 12!/2 e) None of these

9. How many bracelets can be made by stringing 9 different colored beads together?
a) 20160 b) 40320 c) 80640 d) 10080 e) None of these

10. Eight boys participated in each of 5 different competitions. In how many different ways can the winner prize be given for all the competitions?
a) 5 b) 5! c) 8^5 d) ${}^8P_5$ e) None of these

11. In how many ways can the top three ranks be awarded for a particular exam/competition involving 12 participants?
a) 12! b) 3! c) 12!/3! d) ${}^{12}P_3$ e) None of these

12. In how many different ways can a committee of 8 persons be formed out of 5 men and 3 women?
a) 8! b) 8 c) 1 d) ${}^8C_3$ e) None of these

13. In how many different ways can a cricket team of 11 players be chosen out of total 14 players?

a) 356 b) 364 c) 256 d) 712 e) None of these

14. A committee of 5 members is to be formed out of 5 professors, 6 Teachers and 3 Readers. In how many different ways can this be done such that.

(i). The committee consists of 2 Professors, 2 Teachers and 1 Reader

a) 450 b) 225 c) 55 d) 90 e) None of these

(ii).The committee includes all the 3 Readers

a)90 b) 180 c) 21 d) 55 e) None of these

15. A committee of 5 members is to be formed out of 3 trainees, 4 professors and 6 research associates. In how many different ways can this be done if

(i). The committee should have all 4 professors and 1 research associate or all 3 trainees and 2 professors

a) 12 b) 13 c) 24 d) 52 e) None of these

(ii). The committee should have 2 trainees and 3 research associates.

a) 15 b) 45 c) 60 d) 9 e) None of these

16. In how many ways can 3 women be selected out of 15 women if one particular woman is always included and two particular women are always excluded?

a) 66 b) 77 c) 88 d) 99 e) None of these

17. In how many ways can a person choose one or more out of 5 different subject books?

a) 15 b) 32 c) 31 d) 16 e) None of these

18. In how many ways can a person choose 1 or more out of 4 electrical appliances?

a) 10 b) 12 c) 14 d) 15 e) None of these

19. In a party, there are 15 persons and every person shakes hand with every other person. What will be the total number of handshakes?

a) 105 b) 120 c) 140 d) 210 e) None of these

20. How many parallelograms are formed by a set of 5 parallel lines intersecting another set of 8 parallel lines?

a) 56 b) 140 c) 280 d) 120 e) None of these

21. A sentence can be formed by choosing one word of each type from 7 nouns, 5 verbs and 2 adjectives written on a blackboard and we do not care about how much sense the sentence makes. How many different sentences can be formed?

a) $7^2\times 5^2\times 2^2$ b) $7^1\times 5^1\times 2^1\times 3^1$ c) $7!\times 5!\times 2!$ d) $2^7\times 2^5\times 2^2$ e) None of these

22. 1. There is a merry-go-round race going on.One person says,"1/3 of those in front of me and 3/4 of those behind me, give the total number of children in the race". Then the number of children took part in the race?

a) 10 b)12 c)13 d)15 e)can't be determine

23. 46. A set of football matches is to be organized in a "round-robin" fashion, i.e., every participating team plays a match against every other team once and only once. If 21 matches are totally played, how many teams participated?

a) 7 b)9 c)11 d)13 e)None of these

Section 9: Probability

Probability is that branch of mathematics which deals with the measure of uncertainty in a various phenomenon that gives several results/out comes instead of a particular one. A numerical measure of 'Uncertainty' and denoted by P(E).

Experiment: An activity that produces some well-defined outcomes.

Random Experiment: An experiment in which all possible outcomes are known but the results cannot be predicted in advance.
Trial: Performing an experiment.

Outcome: Result of the trial.

Equally likely outcomes: Outcomes that have equal chances of occurrence.

Sample space: Collection of all possible outcomes.

Some special sample spaces:

Coin tossed once S = {H, T}, n(s) = 2 = 2^1
Coin tossed twice or two coins tossed simultaneously, S = {HH, HT,TH,TT}, n(s) = 4 = 2^2.
Coin tossed S thrice or three coins tossed simultaneously = {HHH, HTH, HHT, THH, TTT, TTH, THT, HTT}, n(s) = 8 = 2^3.
Die is thrown once , S = {1, 2, 3, 4, 5, 6}, n(s) = 6 = 6^1
Die is thrown twice or two dice are thrown simultaneously, S = {(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (6,6)}
n(s)= 36 = 6^2.

Event: Collection of some including no outcome or all outcomes from the sample space.

Probability of an event: P(E)=N(E)/N(S)

Sure Event: If no. of outcomes favorable to the event is equal to no. of total outcomes of the sample space or an event whose probability is 1.

Impossible Event: Having no outcome or an event whose probability is 0.

Range of Probability: Probability of an event always lies between 0 and 1 (0 and 1 inclusive)
i.e. $0 \leq P(E) \leq 1$.

Complementary Event: Event which occurs only when E does not occur and denoted by E. Probability of a complementary Event P (E') = 1 – P(E).

Sum of Probabilities: Sum of all the probabilities is 1 i.e. P(E1) + P1(E2) + P(E3) +$P(E_n)$ = 1 and P(E) + P(E')=1.

Practice Questions

1. When two coins are tossed simultaneously, what is the probability that both the coins show heads as output?
a) 1/6 b) 1/3 c) 1/2 d) 1/4 e) None of these

2. When three coins are tossed simultaneously, what is the probability that two coins show tails as output?
a) 1/8 b) 3/8 c) 1/2 d) 5/8 e) None of these

3. When two dice are rolled together, what is the probability that the sum of the outputs is 8?
a) 1/36 b) 7/36 c) 5/36 d) 8/36 e) None of these

Directions: Study the given information carefully and answer the questions that follow:

4. A box contains 6 red, 4 blue, 2 green and 3 yellow marbles.If four marbles are picked at random, what is the probability that two are blue, one is green and one is yellow?
a) 12/455 b) 13/35 c) 11/15 d) 7/91 e) None of these

5. If three marbles are picked at random, what is the probability that all are red?
a) 1/6 b) 1/21 c) 2/15 d) 5/21 e) None of these

6. If two marbles are picked at random, what is the probability that either both are yellow or both are green?
a) 5/91 b) 1/35 c) 1/3 d) 4/10 e)None of these

7. If two marbles are picked at random, what is the probability that none is yellow?
a) 3/91 b) 1/5 c) 22/35 d) 7/15 e) None of these

8. If three marbles are picked at random, what is the probability that at least one is blue?
a) 4/15 b) 58/91 c) 11/15 d) 22/91 e) None of these

Directions: Study the following information carefully to answer the questions that follow:

A box contains 2 blue caps, 4 red caps, 5 green caps and 1 yellow cap.

9. If two caps are picked at random, what is the probability that both are blue?
a) 1/6 b) 1/10 c) 1/12 d) 1/45 e) None of these

10. If one cap is picked at random, what is the probability that it is either blue or yellow?
a) 2/9 b) 1/4 c) 3/8 d) 6/11 e) None of these

11. Find the probability that a leap year is selected at random will contain 53 Sundays.

a) 5/7 b)3/4 c)4/7 d)2/7

12. The odds in favour of an event are 2:7.Find the probability of this event?

a) 2/9 b)5/12 c)7/12 d)2/5

13. A basket contain 6 blue, 2 red, 4 green and 3 yellow balls .If 2 balls are picked at random, what is the probability that eithet both are green or both are yellow?

a). 2/5 b). 3/35 c). 1/3 d). 3/91 e). None of these

14. A basket contain 6 blue, 2 red, 4 green and 3 yellow balls .If 5 balls are picked at random, what is the probability that at least one is blue?
a). 137/143 b). 9/91 c). 18/455 d). 2/5 e). None of these

15. A basket contain 6 blue, 2 red, 4 green and 3 yellow balls .If 2 balls are picked at random ,what is the probability that both are blue?
a). 1/5 b). 8/91 c). 2/15 d). 7/27 e). None of these

16. A basket contain 6 blue, 2 red, 4 green and 3 yellow balls If 4 balls are picked at random, What is the probability that 2 are green and 2 are red?
a). 4/15 b). 5/27 c). 1/3 d). 2/455 e). None of these

17. One ball is picked up randomly from a bag containing 8 yellow, 7 blue and 6 black balls. What is the probability that it is neither yellow nor black?
a) 1/3 b) ¼ c) 1/2 d) 3/4

18. A bag contains 4 blue, 5 white and 6 green balls. Two balls are drawn at random. What is the probability that both the balls are blue?
a) 2/35 b) 1/17 c) 1/15 d) 2/21

19. A bag contains 4 blue, 5 white and 6 green balls. Two balls are drawn at random. What is the probability that one ball is white?
a) 10/21 b) 1/2 c) 3/4 d) 2/35

20. Five sweets are distributed among five children. Find the probability that at least one of them does not get any sweet.
a) 601/652 b)600/623 c)601/625 d)None of these

Section 10: Data Interpretation

DI- 1: Table gives the number of candidates appeared in the examination and percentage of students passed from various institutes over the year.

School	A		B		C		D		E		F	
Year	App	Pass	App	Pass	App	Pass	App	Pass	App	Pass	App	Pass
2001	450	60	540	40	300	65	640	50	600	45	680	60
2002	520	50	430	70	350	60	620	40	580	70	560	70
2003	430	60	490	70	380	50	580	50	680	70	700	66
2004	400	65	600	75	450	70	600	75	720	60	780	70
2005	480	50	570	50	400	75	700	65	700	48	560	50
2006	550	40	450	60	500	68	750	60	450	50	650	60
2007	500	58	470	60	470	60	720	70	560	60	720	50

1. What is the total number of students passed from all institutes together in the year 2006?
a) 1895 b)985 c)1295 d)1465 e) None of these

2. Approximately what is the overall percentage of students passed from institute C for all the year?

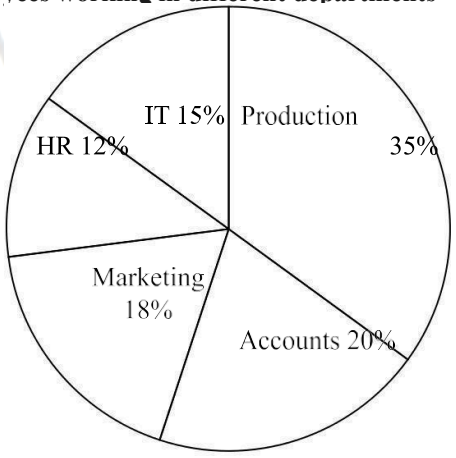
1) 160 b)70 c)75 d)55 e)65

3. What is the ratio of the number of students passed from institute F in 2003 to the number of students passed from institute B in 2005?
a) 95:154 b)154:95 c)94:155 d)155:94 e) None of these

4. What is the ratio of the average number of students appeared from institute A for all the years to that from institute D?
a) 463:33 b)353:463 c)461:333 d)333:461 e) None of these

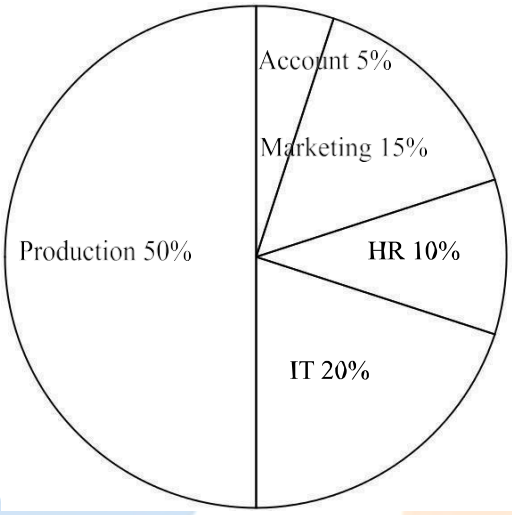
5. What is the overall percentage of students passed all the institutes together in 2004?
a) 68 b)70 c)69 4)71 e) None of these

DI 2: Study the following charts and answer the following questions
Break up of Employees working in different departments



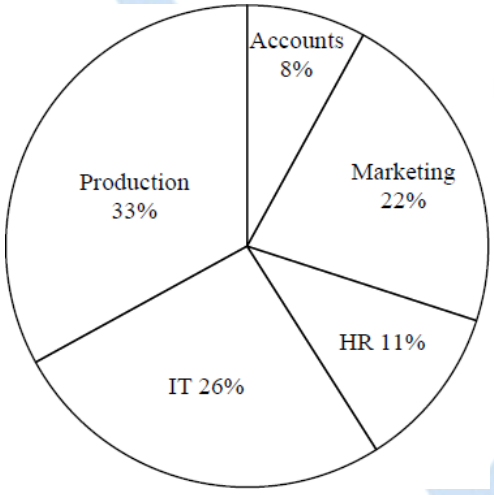
Total number of employees = 3600

Break up of the number of males working in each department



Total number of males in the organization=2,040

Break up of number of employees who recently got promoted in each department



Total Number of employees who got promoted=1,200

6. If half of the number of employees who got promoted from the IT department were males, what was the approximate percentage of males who got promoted from the IT department?
a) 61 b) 29 c) 54 d) 42 e) 38

7. What is the total number of females working in the Production and Marketing departments together?
a) 468 b) 812 c) 582 d) 972 e) None of these

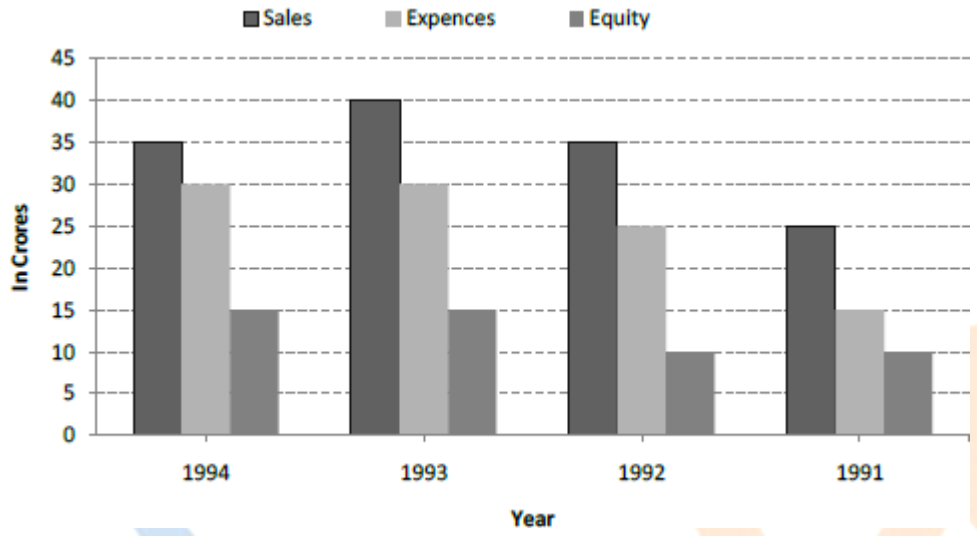
8. What will be the angle made at the centre by the sector showing the number of male in marketing department?
a) 54 b) 45 c) 64 d) 62 e) None of these

9. The total number of employee who got promoted from all the department together was what per cent of the total number of employees working in all the departments together? (Rounded off to the nearest integer).
a) 56 b) 21 c) 45 d) 33 e) 51

10. What is the ratio of the number of employees who got promoted from the HR department to the number of male employees in IT department?

a) 36.19 b) 11:34 c) 47:22 d) 28:17 e) None of these

DI 3: Sales (S), Expenses (E) and the Equity Base (EB) of a company ABC Ltd over different years in ` Crores
Profit = Sales - expenses
Shareholder's return = Profit/Equity Base
Profitability = Profit/Sales



11. Maximum profitability is attained during which year?
a) 1992 b) 1991 c) 1993 d)1994

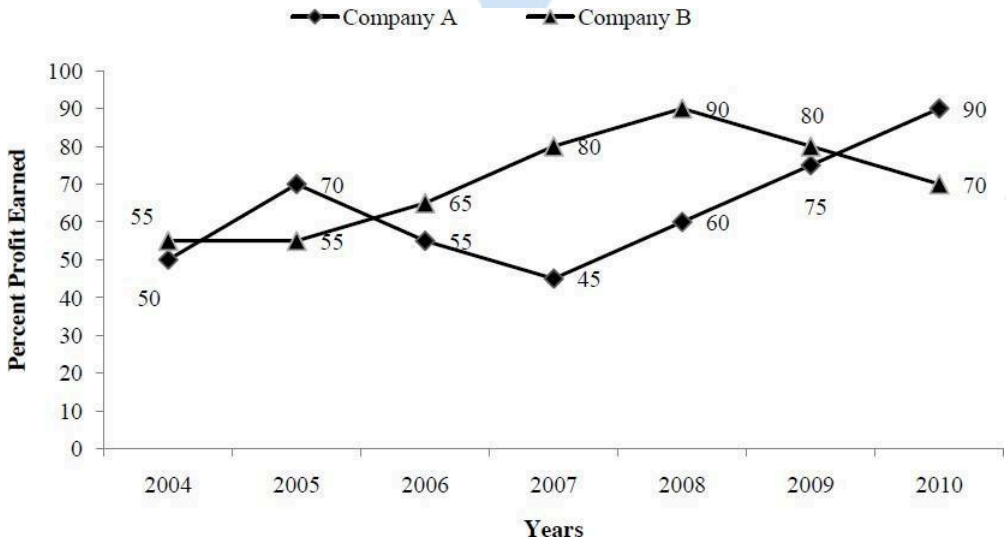
12. Minimum shareholder's return is observed during?
a) 1994 b) 1991 c) 1993 d) 1992

13. Minimum profitability is observed during which year?
a) 1991 b) 1992 c) 1993 d)1994

14. Total profit over the period shown is (crore)?
a) 30 b) 45 c) 35 d) 25 e) None of these

15. Expenses over the entire period as a percentage of Sales for the same period is
a) 68 % b) 74% c) 60% d) 80% e) None of these

DI 4: Percent profit made by two companies over the years



16. If the profit earned in 2006 by Company B was 8, 12,500.what was the total income of the company in that year?
a) 12,50,000 b)20,62,500 c) 16,50,000 d)18,25,000 e) None of these

17. If the amount invested by the two companies in 2005 was equal, what was the ratio of the total income of the Company A to that of B in 2005?
a) 31 : 33 b) 33: 31 c) 34 : 31 d) 14 : 11 e) None of these

18. If the total amount invested by the two companies in 2009 was ` 27 lakh, while the amount invested by Company B was 50% of the amount invested by Company A, what was the total profit earned by the two companies together?
a) 21.15 lakh b)20.70 lakh c)18.70 lakh d)20.15 lakh e) None of these

19. If the income of Company A in 2007 and that in 2008 were equal and the amount invested in 2007 was 12 lakh, what was the amount invested in 2008?
a) 10,87,500 b)10,85,700 c) 12,45,000 d) 12,85,000 e) None of these

20. If the amount of profit earned by Company A in 2006 was 10.15 lakh, what was the total investment?
a) 13.8 lakh b) 14.9 lakh c) 15.4 lakh d) 14.2 lakh e) None of these

DI 5 - Study the information carefully to answer the questions that follow:

A school consisting of a total of 1560 students has boys and girls in the ratio of 7:5. All the students are enrolled in different types of hobby classes, viz Singing, Dancing and Painting classes. Twenty per cent of the girls are enrolled in only painting classes. Ten per cent of the boys are enrolled in only Singing classes. Twenty four per cent of the girls are enrolled in both Singing and Dancing classes together. The number of girls enrolled in only Singing classes is two hundred per cent of the boys enrolled in the same. One-thirteenth of the boys are enrolled in all the three classes together.

The ratio of boys enrolled in Dancing and Painting classes together to the girls enrolled in the same is 2:1. Ten per cent of the girls are enrolled in only Dancing classes whereas eight per cent of the girls are enrolled in both Dancing and Painting classes together. The remaining girls are enrolled in all the three classes together. The number of boys enrolled in Singing and Dancing classes together is fifty per cent of the number of girls enrolled in the same. The remaining boys are enrolled in only Painting classes. Number of boys enrolled in only dancing is same as those of girls enrolled in singing.

21. What is the total number of boys who are enrolled in Dancing?
a) 318 b) 364 c)292 d) 434 e) none of these

22. Total number of girls enrolled in Singing is approximately what per cent of the total number of students in the school?
a) 37 b) 19 c) 32 d) 14 e) 26

23. What is the total number of students enrolled in all the three classes together?
1) 135 b) 164 c) 187 d) 142 e) None of these

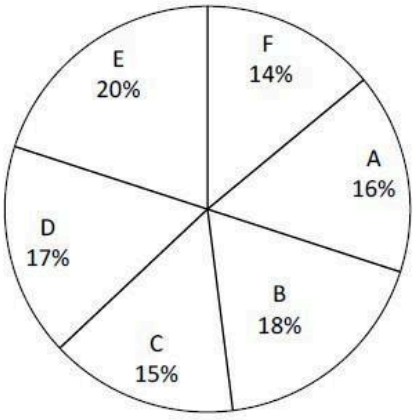
24. Number of girls enrolled in only Dancing classes is what percent of the boys enrolled in the same? (rounded off to two digits after decimal)
a) 38.67 b) 35.71 c) 41.83 d) 28.62 e) None of these

25. What is the ratio of the number of girls enrolled in only Painting classes to the number of boys enrolled in the same?
a) 77:26 b) 21:73 c) 26:77 d) 73:21 e) None of these

DI6: Study the following graph and answer the following questions

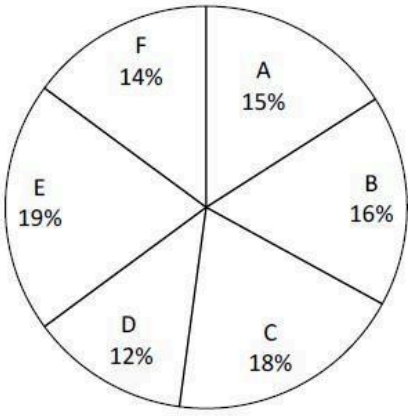
Percentage of adult population (Graduates and upto XII std pass) in various states of the country

Graduates



Total = 24 lakhs

Upto XII STD pass



Total = 32 lakhs

Male : Female Ratio of the adult population in various states of the country

State	Graduates	Upton XII Std Pass
	M : F	M : F
A	7 : 5	7 : 9
B	5 : 3	3 : 5
C	5 : 4	4 : 5
D	9 : 8	5 : 7
E	9: 7	9 : 10
F	4 : 3	3 : 2

26. What is the difference between the Graduate male population and XII Std male population from State A?
a) 24,000 b) 14,000 c) 28,000 d) 36,000 e) None of these

27. What is the ratio of the Graduate female population of State E to Std XII female population of State D?
a) 7:5 b) 5:7 c) 16:15 d) 15:16 e) None of these

28. The Graduate female population of State C is what per cent of the Std XII female population of that State?
a) 40 b) 62.5 c) 50 d) 52.5 e) None of these

29. Std XII male population of State C is what per cent of the total Std Xll population of all the states together?
a) 8% b)12% c)11% d)9% e)None of these

30. What is the ratio of the Graduate male population of State E to the Std XII female population of that State?
a) 28:35 b) 35:28 c) 32:45 d) 45:32 e) None of these

31. Total Graduate population of State F is what per cent of the total Std XII population of State A?

a) 56 b) 72 c) 68 d) 76 e) None of these

32. Std XII male population of State E is what per cent of the Std XII male population of State F?

a) 70 b) 75 c) 68 d) 72 e) None of these

33. What is the ratio of the total Graduate and Std XII male population of State A to the total Graduate and Std XII female population of that State?
a) 215 : 216 b) 214:215 c) 217: 215 d) 215: 217 e) None of these

34. What is the ratio of the total Graduate population of State D to the total Std XII population of that State?
a) 17: 19 b) 19: 17 c) 64:51 d) 51: 64 e) None of these

35. The Graduate female population of State B is what percent of the Graduate female population of State E? (rounded off to the nearest integer)
a) 129 b) 82 c) 77 d) 107 e) None of these

DI 7: Refer to the following Information to answer the question that follow ABC Ltd. is operating in 4 businesses Viz. beverages, automobiles, refrigeration and electronics. The net capital allotted for these four each year is in proportion to the profit they generated in the previous year. Furthermore, the capital allotted to them in the previous year was ` 32 Crores, ` 38 crores, `41 crores and `45 crores respectively for beverages, automobiles, refrigeration and electronics. The net profit generated in the previous year was shared in the ratio as follows – 20%, 30%, 15% and 35%, in the same order. The profit this year has increased by 3%, 2%, 6% and 7% in the same order. Further more, the company is planning to get out of the refrigeration business and divide its capital equally among the remaining three. The total capital to be allotted this year is `40 crores. The net profit last year was `10 crores.

36. The profit (in crores) for beverages this year is
a) 4.3 b)2.06 c) 1 d) 6.01 e) None of these

37. Total profits (in crores) generated this year is
a) 14.33 b) 22.22 c) 6.82 d) 10.46 e) None of these

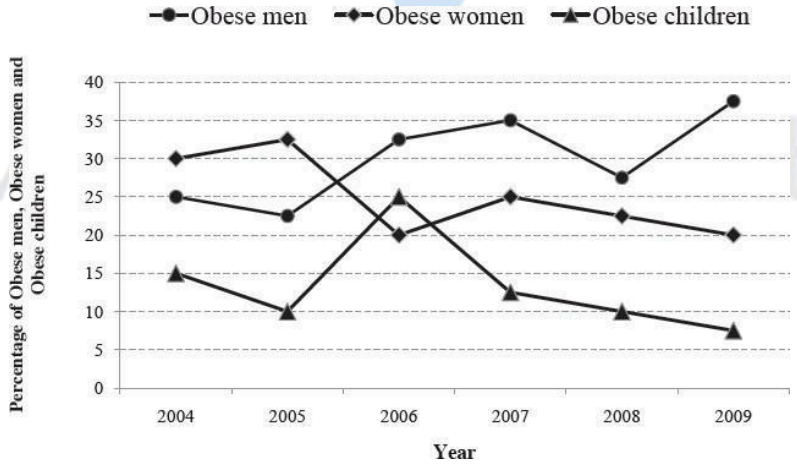
38. The capital (in crores) allotted for automobiles this year is
a) 8 b) 10 c) 12 d) 16 e) None of these

39. After the closure of the refrigeration business, the capital (in crores) allocated this year for electronics is
a) 16 b) 24 c) 10 d) 20 e) None of these

40. The capital (in crores) allotted for electronics this year is
a) 10 b) 12 c) 14 d) 16 e) None of these

DI 8: Study the following graph and answer the following questions

Percentage of Obese men. Obese women and obese children in the state for the give years



Total Number of Men, Women and Children in the state over the years

Years	Men	Women	Children
2004	54000	38000	15000
2005	75000	64000	21000
2006	63000	60000	12000
2007	66000	54000	16600
2008	70000	68000	20000
2009	78000	75000	45000

41. What was the approximate average of obese men, obese women and obese children in 2007?
a) 12,683 b) 12,795 c) 12,867 d) 12,843 e) 12,787

42. The number of obese men in the year 2009 was what percent of the men not suffering from obesity in the same year?
a) 55 b) 60 c) 50.5 d) 65.5 e) None of these

43. What was the ratio of the obese women in the year 2006 to the obese men in the year 2008?
a) 6 : 7 b) 21:65 c) 15:73 d) 48:77 e) None of these

44. What is the difference between the number of obese women and obese children together in the year 2006 and the number of obese men in the same year?
a) 5,475 b) 5,745 c) 4,530 d) 31,650 e) None of these

45. What was the total number of children not suffering from obesity in the year 2004 and 2005 together?
a) 4,350 b) 31,5 0 c) 4,530 d) 31,650 e) None of these

DI 9: The following table shows the number of new employees added to different categories of employees in a company and also the no of employees from these categories who left the company ever since the foundation of the company in 1995.

Year	Managers		Technicians		Operators		Accountants		Peons	
	New	Left	New	Left	New	Left	New	Left	New	Left
1995	760	---	1200	---	880	---	1160	---	820	---
1996	280	120	272	120	256	104	200	100	184	96
1997	179	92	240	128	240	120	224	104	152	88
1998	148	88	236	96	208	100	248	96	196	80
1999	160	72	256	100	192	112	272	88	224	120
2000	193	96	288	112	248	144	260	92	200	104

46. During the period of 1995 and 2000, the total no of operators who left the company is what percent of the total number of Operators who joined the company?
A. 19% B. 21% C. 27% D. 29% E. 32%

47. For which of the following categories the percentage increase in the number of employees working in the company from 1996 to 2000 was maximum?A. Managers B. Technicians C. Operators D. Accountant E. Peons.

48. What is the difference between total number of Technicians added to the company and total number of Accountants added to the company during the year 1996 to 2000 at the maximum?
A. 128 B. 112 C. 96 D. 88 E. 72

49. What was the total no. of peons working in the company in the year 1999?
A. 1312 B. 1192C.1088 D.968 E.908

50. What is the pooled average of all employees in the year 1997?
A. 1325 B. 1285 C. 1265 D.1235 E. 1195

Answer:
Numbers:

1.d	2.a	3.e	4.d	5.c	6.e	7.d	8.a	9.b	10.b
11.b	12.c	13.c	14.a	15.a	16.b	17.d	18.b	19.b	20.b
21.c	22.c	23.b	24.d	25.c	26.a	27.16	28.160	29.881	30.a.8
30.b.6	31.71842	32.220ft							

Percentage:

1.b	2.a	3.b	4.c	5.b	6.b	7.a	8.d	9.b	10.b
11.b	12.b	13.c	14.a	15.d	16.c	17.a	18.c	19.b	20.c

Profit and Loss:

1.B	2.B	3.B	4.A	5.B	6.C	7.C	8.C	9.D	10.C
11.A	12.C	13.C	14.A	15.C	16.B	17.A	18.D	19.C	20.B
21.A	22.D	23.C	24.C	25.D	26.C	27.A	28.D	29.B	30.D

Time, Speed and Distance:

1.c	2.c	3.a	4.b	5.c	6.e	7.b	8.c	9.a	10.b
11.c	12.a	13.d	14.d	15.b	16.c	17.c	18.a	19.a	20.a
21.a	22.c	23.d	24.a	25.7:15&8:15	26.A	27.b	28.Doug	29.b	30.a
31.c	32.d	33.a	34.a	35.b					

Time and Work:

1.d	2.d	3.a	4.a	5.d	6.c	7.c	8.b	9.b	10.c
11.c	12.b	13.b	14.b	15.c	16.c	17.a.8	17.b.6	18.a	19.c

Mixture and Alligation:

1.B	2.B	3.D	4.D	5.A	6.A	7.A	8.B	9.C	10.A
11.d	12.b	13.c	14.c	15.b	16.d	17.c	18.a	19.b	20.a

Mensuration:

1.b	2.c	3.b	4.c	5.a	6.a	7.c	8.c	9.b	10.d
11.a	12.c	13.b	14.a	15.a	16.d	17.b	18.b	19.c	20.a

Permutation and Combination:

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

Probability:

1.d	2.b	3.c	4.a	5.b	6.d	7.c	8.b	9.e	10.b
11.d	12.a	13.b	14.a	15.d	16.d	17.a	18.a	19.a	20.c

Data Interpretation:

1.a	2.e	3.b	4.d	5.c	6.e	7.c	8.a	9.d	10.b
11.b	12.a	13.d	14.c	15.b	16.b	17.c	18.b	19.a	20.e

21.d	22.e	23.a	24.b	25.c	26.b	27.d	28.c	29.a	30.e
31.e	32.b	33.c	34.a	35.c	36.b	37.d	38.c	39.a	40.c
41.c	42.b	43.d	44.a	45.d	46.d	47.a	48.d	49.b	50.e