

32. The best way is to consider some values in the proportion and verify the option, but care should be taken that in this type of question you are required to verify a possible correct option atleast with 2-3 times with different values.

Since, if you consider

$$p:q:r:s \Rightarrow 1:2::3:6$$

you will find answer (b) is also correct, but for only particular values. So it is not the general solution. Finally you will realize that option (d) is the most appropriate answer.

33. Solve by componendo and dividendo or as mentioned in the previous solution.

34. Since for the constant distance time is inversely proportional to the speed. So, the required ratio of time taken by each of the rickshaw, car and scooter is

$$\frac{1}{3} : \frac{1}{5} : \frac{1}{6} \Rightarrow 10:6:5$$

$$\left[\frac{1}{3} \times \frac{10}{10} : \frac{1}{5} \times \frac{6}{6} : \frac{1}{6} \times \frac{5}{5} = \frac{10}{30} : \frac{6}{30} : \frac{5}{30} = 10:6:5 \right]$$

35. $A:B = 2:3$ and $B:C = 3:5$

$$\Rightarrow A:B:C = 2:3:5$$

$$\therefore (A+B):C = 5:5 = 1:1$$

Hence, Share of $(A+B) = \frac{1}{2} \times 6940 = 3470$

36. $x+y = 93$... (1)

and $\frac{x+3}{y+2} = \frac{24}{25}$

$$\Rightarrow 25x - 24y = -27$$
 ... (2)

From equations number (1) and (2)

$$x = 45 \text{ and } y = 48$$

Alternatively: Go through options.

37. $\frac{a}{b} = \frac{4x}{9x} \text{ and } \frac{a+4}{b+4} = \frac{21}{46}$

$$\Rightarrow a = 80 \text{ and } b = 180$$

$$\therefore b-a = 100$$

38. $\frac{R}{D} = \frac{3x}{5x} \text{ and } \frac{R}{D} \Rightarrow \frac{3x+10}{5x+10} = \frac{5}{7}$

$$\Rightarrow x = 5$$

Hence, $\frac{R}{D} = \frac{15}{25}$

Alternatively: Go through options.

39. Let the fraction be $\frac{x}{y}$ then

$$\frac{x+5}{y+5} = \frac{11}{15} \Rightarrow 11y - 15x = 20$$

Since, we have only one equation in two variables, so we cannot find the solution.

40. $\frac{2x+3x+5x+8x+9x}{5} = \frac{162}{5} = 32.4$

41. The number of days required by a single Kirlosker pump to fill the tank = $6 \times 7 = 42$ days and the number of days required by a single USHA pump to fill the same tanks = $2 \times 18 = 36$ days. Now, since efficiency is inversely proportional to the number of days. Hence,

$$\frac{\text{Efficiency of one K-pump}}{\text{Efficiency of U-pump}} = \frac{36}{42} = \frac{6}{7}$$

42. $\frac{1}{5}$ th field can be reaped by 96 man days

$\therefore \frac{4}{5}$ th field can be reaped by $96 \times 4 = 384$ man days

Now, since there are only 8 days so required

$$\text{number of men} = \frac{384}{8} = 48 \text{ men}$$

210 = $2 \times 3 \times 5 \times 7$

$$\frac{N_1}{N_2} = \frac{2k \times 5 \times 7}{3k \times 5 \times 7}$$

$$\therefore N_1 : N_2 = 2 : 3$$

Therefore, $N_1 = 70$ and $N_2 = 105$

$$\therefore N_1 + N_2 = 70 + 105 = 175$$

$$44. \frac{(53-x)}{(21-x)} = \frac{(41-x)}{(17-x)} \Rightarrow x = 5$$

Alternatively : Go through options.

45. $2x + 3x + 4x = 180$

$$\Rightarrow x = 20 \therefore 4x = 80$$

46. $(25 \times 12x) + (50 \times 4x) + (100 \times 3x) = 800x = 60000$

$$\Rightarrow x = 75$$

$$\therefore \text{number of coins of 25 paise} = 12x = 12 \times 75 = 900$$

Alternatively : Go through options, choices (a), (b) and (c) are eliminated since neither of 200, 225, 275 is divisible by 12. Hence choice (d) is correct.

47. Go through options.

$$\text{Alternatively} : \frac{(x-a)}{11} = \frac{(x-b)}{9} = \frac{(x-c)}{5} = k$$

$$\Rightarrow a = x - 11k$$

$$b = x - 9k$$

$$c = x - 5k$$

$$\therefore x = \frac{(x-11k) + (x-9k) + (x-5k)}{2}$$

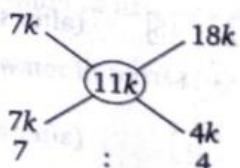
$$2x = 3x - 25k \Rightarrow x = 25k$$

$$a = 14k \Rightarrow b = 16k \text{ and } c = 20k$$

$$\therefore a:b:c = 14:16:20 = 7:8:10.$$

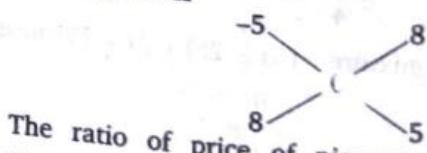
48. If the weight of kerosene be k kg/unit volume, then weight of petrol = $7k$ /unit volume
weight of castrol = $18k$ /unit volume
required weight of the mixture = $11k$ /unit volume

By Alligation



The required ratio is 7 : 4.

49. By Alligation



The ratio of price of pigeons sold at loss and profit respectively are in the ratio of 8 : 5

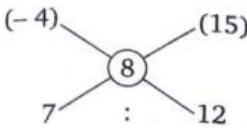
$$\text{Cost price of profitable pigeon} = \frac{5}{8+5} \times 182 = \text{Rs. } 70$$

$$\frac{C}{R} = \frac{3x}{5x}$$

50. Again $\frac{C}{R} = \frac{(3x)3}{(5x+100)} = \frac{4}{5}$
 $x = 16$

\therefore Price of Rotomac pen in 2000 was Rs. 80.

51. By Alligation



Now, we get the ratio of no. of rings sold at a loss and profit is 7:12

$$\therefore \text{Number of rings sold at profit} = \frac{12}{19} \times 361 = 228$$

Alternatively : Go through options.

52. Best way is to go through options.

consider option (d)

$$\frac{180}{30} + \frac{70}{35} = 6 + 2 = 8 \text{ hrs}$$

Hence, (d) is correct.

Alternatively : $\frac{x}{30} + \frac{250-x}{35} = 8$

$$\Rightarrow x = 180 \text{ miles}$$

Alternatively : Since the Average Speed

$$= \frac{\text{Total Distance}}{\text{Total Time}} = \frac{250}{8} \text{ miles/hr}$$

By Alligation



Therefore, the ratio of time taken @ 30 m/hr and @ 35 m/hr is in the ratio of 3 : 1. It means he has travelled @ 30 m/hr for 6 hr.

Therefore, the distance travelled by car is 180.

(\because Distance = Speed \times Time).

53. $\frac{22}{22} : \frac{17}{22} = 1 : 1$

54. $\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$

$$\Rightarrow \frac{20}{60} : \frac{15}{60} : \frac{12}{60} : \frac{10}{60} \quad (\text{by taking LCM})$$

$$\Rightarrow 20 : 15 : 12 : 10$$

Largest share = $\frac{20}{(20+15+12+10)} \times 171$

$$= \frac{20}{57} \times 171 = 60.$$

55. Let the present age of Karishma and Babita be x and y then,

$$\frac{x-10}{y-10} = \frac{1}{3} \quad \dots(1)$$

Again $\frac{x+14}{y+14} = \frac{5}{9} \quad \dots(2)$

By solving (1) and (2) we get $x = 26$ and $y = 58$

56. Let the fraction be $\frac{k}{5k}$

then, $\frac{k+x}{5k+5x} = \frac{(k+x)}{5(k+x)} = \frac{1}{5}$

57.

$$x \propto y \quad \text{and} \quad x \propto \frac{1}{z^2}$$

$$x \propto \frac{y}{z^2} \Rightarrow x = k \frac{y}{z^2}$$

$$6 = k \times \frac{75}{(5)^2} \Rightarrow k = 2$$

Again $x = 2 \times \frac{24}{(4)^2} \Rightarrow x = 3$

58. $x \propto (y^2 + z^2) \Rightarrow x = k(y^2 + z^2)$

$$15 = k(1^2 + 2^2) \Rightarrow k = 3$$

again

$$39 = 3 \times (2^2 + z^2)$$

\Rightarrow

$$13 = (4 + z^2) \Rightarrow z = 3$$

59. $W \propto HA \Rightarrow W = K \times H \times A$

Now, $48 = K \times 1.2 \times 20 \Rightarrow K = 2$

Again $W = 2 \times 1.5 \times 30$

$\therefore W = 90$

60. $(a+b):(b+c):(c+a) = 5x:6x:9x$

and $a+b+c=10$

$$\Rightarrow (a+b)+(b+c)+(c+a) = 20x$$

$$\Rightarrow a+b+c=10x$$

$$\Rightarrow a+b+c=10 \quad (\because x=1)$$

$\therefore c = (a+b+c) - (a+b)$

or $c = 10 - 5 = 5$

61. $A \quad B \quad C$

$$3x \quad 4x \quad 5x$$

$$(3x+x) \quad 2x \quad (5x+x) \quad (B \text{ gives } \frac{1}{4} \text{ to } A \text{ and } \frac{1}{4} \text{ to } C)$$

$$= 4x \quad 2x \quad 6x$$

$$(4x+x) \quad 2x \quad (5x) \quad (C \text{ gives } \frac{1}{6} \text{ to } A)$$

$$5x \quad 2x \quad 5x$$

$$5 : 2 : 5$$

$$6x - 5x = 8y - 7y$$

Therefore, $x = y$

$$\Rightarrow \frac{5x + 2}{8y + 2} = \frac{2}{3}$$

Again,

$$\Rightarrow \frac{5x + 2}{8x + 2} = \frac{2}{3}$$

∴

$$x = 2$$

∴ Therefore, the ages of Varsha, Vinay, Veera and Vikram are 10, 12, 14 and 16 years respectively.

Therefore, the ratio of ages of Vinay and Veera = 6 : 7

Bobby		Sunny	
Milk	Water	Milk	Water
1 : 50%	1 : 50%	1 : 50%	1 : 50%
②	②	By replacement method	

It means bobby will add up 1 litre of milk, in 4 litre of initial mixture, to prepare 5 litres mixture in the ratio of 3 : 2

$$\frac{2}{5} = \frac{2}{4} \left(1 - \frac{k}{4}\right)$$

$$\Rightarrow \frac{4}{5} = \left(1 - \frac{k}{4}\right)$$

$$\Rightarrow \frac{1}{5} = \frac{k}{4}$$

$$\Rightarrow k = \frac{4}{5}$$

It means Sunny will replace $\frac{4}{5}$ litre of initial mixture by the same quantity of pure milk.

Hence, the percentage of milk added by Bobby to that of replaced by Sunny = $\frac{1}{4/5} \times 100 = 125\%$

A		B	
Milk	Water	Milk	Water
After first operation	25l	0	0
	20l	0	25l

1 : 5

A		B	
Milk	Water	Milk	Water
After second operation	21l	5l	20l
	5l	4l	

Therefore, the ratio of water in A and B is 1 : 4

$$B = \frac{5}{6} A \quad \dots(i)$$

$$C = D = \frac{9}{10} B \quad \dots(ii)$$

$$B = \frac{2}{3} E \quad \dots(iii)$$

$$E - A = 3 \quad \dots(iv)$$

$$\text{From (i) and (iii) } \frac{A}{E} = \frac{4}{5} \text{ or } E = \frac{5}{4} A \quad \dots(v)$$

$$E - A = \frac{5A}{4} - A = 3 \text{ from (iv) and (v)}$$

$$\Rightarrow A = 12 \text{ and } E = 15 \text{ and } B = 10$$

Also C = D = 9 and F = 11, since B < F < A and F is integer

$$\therefore A : F = 12 : 11$$

14. The ratio of fees collected from B.Tech : MBA

$$= 4x \times 25y : 5x \times 16y$$

$$= 100xy : 80xy$$

$$= 5xy : 4xy = 5k : 4k$$

The amount collected only from MBA students

$$= \frac{4}{9} \times 1.62 \text{ lakh}$$

$$= \text{Rs. } 72,000$$

15.

$$C \propto (W)^2$$

$$W_1 : W_2 : W_3 = 3 : 4 : 5$$

$$\text{cost} = (3x)^2 + (4x)^2 + (5x)^2 = 50(x)^2$$

Again $W_1 : W_2 : W_3 = 4 : 4 : 4$ (when weights are equal)

$$\text{cost} = (4x)^2 + (4x)^2 + (4x)^2 = 48x^2$$

$$\text{loss} = 50x^2 - 48x^2 = 2x^2$$

$$1800 = 2x^2$$

$$x = 30$$

$$\therefore \text{Actual cost of unbroken marble} = (4x + 4x + 4x)^2$$

$$= (12x)^2 = 144x^2$$

$$= 144 \times x^2$$

$$= 144 \times 900 = 129600$$

Solutions for 16 and 17 :

	A	B	C	D
Initially	69	45	42	36
A \rightarrow B	24	90	42	36
B \rightarrow C	24	48	84	36
C \rightarrow D	24	48	48	72
D \rightarrow A	48	48	48	48

Solve it in reverse order (i.e., from the result side)

18. Ratio of price paid by Hari and Murli = 7 : 10

$$\text{or } (24 \times x) : 30 \times (30 - x) = 7 : 10$$

$$x = 14$$

or go through options.

19. Since distance is constant. Therefore ratio of speeds of scooter, car and train = 1 : 4 : 16 and therefore, ratio of time taken = 16 : 4 : 1

$$\text{Therefore, required ratio} = \frac{16}{1} : \frac{4}{4} : \frac{1}{16}$$

$$= 16 : 1 : \frac{1}{16} = 256 : 16 : 1$$

20. Since there are 12 bangles, then the no. of broken to unbroken bangles can not be 2 : 3, since $5x = (2x + 3x)$ can not divide 12 for any integral value of x i.e., all the sum of ratios which are the factors of 12 can possibly be the ratio of broken to unbroken.

21.

$$\begin{aligned}
 \frac{a}{b} &= \frac{c}{d} = \frac{e}{f} = k \\
 \Rightarrow \frac{a^n}{b^n} &= \frac{c^n}{d^n} = \frac{e^n}{f^n} = k^n \\
 \Rightarrow \frac{a^n p}{b^n p} &= \frac{c^n q}{d^n q} = \frac{e^n r}{f^n r} = k^n \\
 \therefore \frac{a^n p + c^n q + e^n r}{b^n p + d^n q + f^n r} &= (k^n) \\
 \therefore \left(\frac{a^n p + c^n q + e^n r}{b^n p + d^n q + f^n r} \right)^{1/n} &= (k^n)^{1/n} \\
 \therefore \left(\frac{a^n p + c^n q + e^n r}{b^n p + d^n q + f^n r} \right)^{1/n} &= k = \frac{a}{b} = \frac{c}{d} = \frac{e}{f}
 \end{aligned}$$

Hence (c) is the possible answer.

22. Maximum earning will be only when he will won on the maximum yielding table.

$$A \rightarrow 10:1$$

$$B \rightarrow 20:1$$

$$C \rightarrow 30:1$$

i.e., he won on B and C but lost on A

$$20 \times 200 + 30 \times 200 - 1 \times 200 = 9800$$

minimum earning will be when he won on table A and B and lose on that table 3.

$$\begin{aligned}
 \therefore 10 \times 200 + 20 \times 200 - 1 \times 200 \\
 6000 - 200 = 5800
 \end{aligned}$$

Therefore, difference = $9800 - 5800 = 4000$

Alternatively the difference

$$\begin{aligned}
 &= [(30 + 20 - 1) - (10 + 20 - 1)] \times 200 \\
 &= 20 \times 200 = \text{Rs. 4000.}
 \end{aligned}$$

23. $\frac{m+2p}{m-2p} + \frac{m+2q}{m-2q}$

$$= \frac{m}{2p} + \frac{m}{2q} \text{ (by componendo and dividendo)}$$

$$= m \left(\frac{p+q}{2pq} \right)$$

$$= \left(\frac{4pq}{p+q} \right) \left(\frac{p+q}{2pq} \right) \text{ substituting the value of } m = \frac{4pq}{p+q} = 2$$

24. Volume of a cube = $(\text{side})^3 = (a)^3$
surface area of a cube = $6(a)^2$ ($a \rightarrow \text{side}$)

$$a_1^3 : a_2^3 = 8 : 27$$

$$\Rightarrow a_1 : a_2 = 2 : 3$$

$$\Rightarrow a_1^2 : a_2^2 = 4 : 9$$

$$\Rightarrow 6a_1^2 : 6a_2^2 = 4 : 9$$

25. Clearly it can not be less than 75%. For clarification of concept consider some values and then verify it.

$$A : B : C = 3x : 4x : 5x$$

$$C - A = 5x - 3x \leq 3$$

$$C - A = 2x \leq 3 \Rightarrow x = 1$$

$$C - A = 2$$

but

or

\Rightarrow

Ratio, Proportion and Variation
A : B : C : 4 : 5
Therefore, number of assistant trainee (except project charge) of Q = 3 and assistant trainee of R = 4
Therefore, required percentage = $\frac{4-3}{4} \times 100$
 $= \frac{1}{4} \times 100 = 25\%$

27. $b = 3a$

$c = 3b = 9a$

$d = 3c = 9b = 27a$

$e = 3d = 9c = 27b = 81a$ and $f = 3e = 243a$

put the values and simplify.

or we know that $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} \dots = \frac{a+c+e}{b+d+f}$

28. Let w be the number of wagons and s be the speed of engine without wagon = $\frac{20}{3}$ m/s = 24 km/hr.

then speed of the train = $s - k\sqrt{w}$

$$20 = 24 - k\sqrt{4} \quad [\because \frac{50}{9} \text{ m/s} = 20 \text{ km/hr.}]$$

$$\therefore k = 2$$

when train will stop its speed becomes zero

$$0 = 24 - 2\sqrt{w}$$

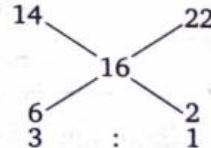
$$\Rightarrow w = 144$$

since at 144 wagons train will stop, so at 143 wagons train just can move with its least possible speed having maximum possible wagons.

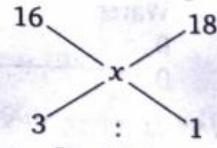
29. Cost of 1 kg (mixture) of sugar = Rs. 16/kg

since selling price is Rs. 20/kg

Therefore, ratio of quantity of sugar costing Rs. 14 and Rs. 16 per kg = 3 : 1



So, the available stock of mixture costing Rs. 16 = 3 quintal and the required stock of sugar costing Rs. 18 = 1 quintal. Therefore, the new price of mixture costing 3 quintal of sugar @ Rs. 16/kg and 1 quintal of sugar @ Rs. 18 per kg



$$x = \text{Rs. 16.5 per kg}$$

New price = Rs. 16.5 per kg

Now, original profit = $20 - 16 = \text{Rs. 4 per kg}$

New profit = $20 - 16.5 = \text{Rs. 3.5 per kg}$

∴ Percentage reduction in profit = $\frac{4 - 3.5}{4} \times 100 = 12.5\%$

30.

	P	Q
Initial amounts	a (petrol)	b (kerosene)
After one operation	a - c (petrol)	b - c (kerosene)
	c (petrol)	c (petrol)

Ratio, Proportion and Variation
Since there is no change in concentration in the second, third... etc operations.
In the vessel **P**;

The fraction of kerosene in **P** is $\frac{c}{a}$

In the vessel **Q**;

The fraction of kerosene in **Q** is $\left(\frac{b-c}{b}\right)$

$$\left(\frac{b-c}{b}\right) = \frac{c}{a}$$

$$c(a+b) = ab$$

$$c = \frac{ab}{a+b}$$

Hence (c)

Since at this moment the concentration in both vessels is same.

31. The minimum number of passengers n , at which there is no loss and number of passengers travelling = m and let the distance travelled is d , then

$$P \propto (m-n)d$$

$$\text{or } p = k(m-n)d; k \text{ is a constant.}$$

when $P = 3600$, $m = 29$ and $d = 36$, then

$$3600 = k(29-n) \times 36 \quad \dots(1)$$

Again, when $p = 6300$, $m = 36$, $d = 42 \text{ km}$

$$6300 = k(36-n) \times 42 \quad \dots(2)$$

Dividing equation (2) by (1)

$$\frac{6300}{3600} = \frac{k(36-n) \times 42}{k(29-n) \times 36}$$

$$\Rightarrow \frac{(36-n)}{(29-n)} = \frac{9}{6}$$

$$\Rightarrow 3n = 45 \Rightarrow n = 15$$

Hence to avoid loss, minimum number of 15 passengers are required.

32. Frequency of step of $A : B : C = 5 : 6 : 7$

but in terms of size of step, $6A = 7B = 8C$

∴ Ratio of speeds of A , B and $C = \frac{5}{6} : \frac{6}{7} : \frac{7}{8}$

$$= 280 : 288 : 294$$

$$= 140 : 144 : 147$$

33. Expenditure = 5 (no. of family members)²

$$\Rightarrow E_1 = 5(n)^2 \quad \dots(1)$$

$$\text{again } E_2 = 5(n-1)^2 \quad \dots(2)$$

$$\text{but } E_1 - E_2 = 95$$

$$\therefore 5[n^2 - (n-1)^2] = 95$$

$$5[n^2 - (n^2 + 1 - 2n)] = 95$$

$$n^2 - n^2 - 1 + 2n = 19$$

$$2n = 20 \Rightarrow n = 10$$

34. Finally I have Rs. 5
Consider option (a)
 $2 \times 100 + 3 \times 50 + 1 \times 25 = 375 \text{ paise}$
Its integer multiple can not give the value equals to 500. So can not be true.

Consider option (b)

$1 \times 100 + 7 \times 50 + 2 \times 25 = 500 \text{ paise}$, can be true

but we also check the option (c) and (d) now when you check the choices (c) and (d) you will find wrong as choice (a). So, only choice be could be the best answer.

35. By componendo and dividendo :

$$\frac{a}{b+c} = \frac{b}{c+a}$$

$$\frac{a+b+c}{a-b-c} = \frac{b+c+a}{b-c-a}$$

⇒

$$a-b-c = b-c-a$$

⇒

$$a = b$$

similarly

$$a = b = c$$

∴

$$\frac{b}{a+b+c} = \frac{1}{3}$$

36. Density of P_1 , P_2 and P_3 are 18, 14 and 10 gm/cc

again since volume = $\frac{\text{weight}}{\text{density}}$

now the weight of P_3 in 450 kg mixture = $\frac{450 \times 4}{15} = 120 \text{ kg}$

now the volume of $P_3 = \frac{120}{10} = 12 \text{ litre}$

∴ The cost of 12 litre P_3 petrol = $12 \times 40 = \text{Rs. 480}$

37. $26.65 + 42.75 + 53 = 122.40$

Proportionate amount of Amar, Akbar and Anthony in the ratio of 3 : 4 : 5 is Rs. 30.60, Rs. 40.80 and Rs. 51 respectively.

Now	Amar	Akbar	Anthony
30.60	40.80	51.00	
26.65	42.75	53.00	

So, Amar pays Rs. 1.95 to Akbar and Rs. 2 to Anthony.

38. The best way is to go through options

Alternatively: Solve by cross product rule and componendo.

39. Since Pooja and Shipra are twins so their ages be same. Let their ages be x and age of Monika be y , then,

$$x + x = y \quad \dots(1)$$

$$\text{and } \frac{(x-3)}{(y-3)} = \frac{2}{7}$$

$$\Rightarrow 7x - 2y = 15$$

Now, from equation (1),

$$7x - 4x = 15 \Rightarrow x = 5$$

So the age of Shipra 3 years hence will be $5 + 3 = 8$ years.

$$40. \frac{H-9}{W-9} = \frac{5}{4} \text{ and } \frac{H+6}{W+6} = \frac{8}{7}$$

∴ Thus the present age of Husband is 34 and age of his wife is 29 years.

Now, the maximum age of any child must be less than 9 years. Hence their ages can be 2, 3 and 4 years or 4, 6 and 8 years.

So the max. possible sum of age of this family

$$= 34 + 29 + (1 \times 4 + 2 \times 6 + 3 \times 8)$$

$$= 103 \text{ years}$$

41.

$$P \propto n\sqrt{r} \Rightarrow P = kn\sqrt{r}$$

where P is the price of necklace, n is number of pearls and r is the radius of a pearl.

Now $150 = k \times 75 \times \sqrt{1}$

$\Rightarrow k = 2$

again $600 = 2 \times 100 \times \sqrt{r}$

$\Rightarrow \sqrt{r} = 3 \Rightarrow r = 9 \text{ cm}$

42. $P \propto \frac{N}{T} \Rightarrow P = K \frac{N}{T}$

$P \rightarrow$ Price of a book, $N \rightarrow$ Number of Pages, $T \rightarrow$ Time period

$$P_1 = P_2$$

$$K \frac{N_1}{T_1} = K \frac{N_2}{T_2}$$

$$\Rightarrow \frac{3N}{18} = \frac{N}{T}$$

$$T = 6 \text{ years}$$

43. $\frac{5x + 40}{6x + 40} = \frac{7}{8} \Rightarrow \frac{\text{Akbar}}{\text{Birbal}}$

$\Rightarrow x = 20$

\therefore The actual number of shares of less salaried person

$$= 100 \quad \because (5 \times 20 = 100)$$

\therefore The salary of Akbar = $100 \times 75 = 7500$

44. $D \propto \frac{\sqrt{F} \times T}{W}$, $D \rightarrow$ Distance, $F \rightarrow$ Fuel, $T \rightarrow$ Time, $W \rightarrow$ No. of wagons

$$D = k \frac{\sqrt{F} \times T}{W}$$

$$192 = k \frac{\sqrt{256} \times 20}{10}$$

$\Rightarrow k = 6$

again $200 = \frac{6 \times \sqrt{F} \times 25}{15}$

$\Rightarrow \sqrt{F} = 20 \Rightarrow F = 400 \text{ litre}$

\therefore fuel used per km = $\frac{400}{200} = 2 \text{ l/km}$

45. Just go through option and factorize the product into two factors such that the given conditions must satisfy.

e.g.,

$$6 = 1 \times 6$$

$$2 \times 3$$

$$3 \times 2$$

$$6 \times 1$$

It is not true.

Again consider option (b)

$$12 = 1 \times 12$$

$$2 \times 6$$

$$3 \times 4 \rightarrow 3 \times 4 = 12$$

$$4 \times 3$$

$$6 \times 2 \rightarrow 6 \times 2 = 12$$

$$12 \times 1$$

Ratio, Proportion and Variation
Now you can see that the rate is being half from 4 to 2 so she can purchase double number of toffees as she was purchasing on the ground floor. Again to purchase the same number of toffees she had to spend Rs. 2 less than spending on the ground floor:

Rate	Number of toffee/Re	Total Number of toffees
4	3	= 12
2	6	= 12

and if you check other options (c) and (d) they will not satisfy the given conditions.

46. Go through options.

Total no. of plants	No. of plants	Days
Previous scheme $\Rightarrow 1800$	= 100	$\times 18$

Again after $\frac{1}{3}$ rd days, remaining plants

$$= \frac{1800 \times 2}{3} + 120 = 1320$$

$$1320 = (100 + 20) \times 11$$

This shows that in the second case 1 day was saved than planned no. of day.

47. Go through options.

$$\frac{810}{54} - \frac{900}{75} = 3 = (6 - 3 = 3)$$

$$15 - 12 = 3$$

$$3 = 3$$

Hence choice (c) is correct.

i.e., if A writes 54 page, then B writes 75 ($= 54 + 21$) page per hour.

48.

	A	B	C	D
Initial amount	$(x + 3)$	$(x + 1)$	(x)	0
amount of soda water				
final amount	$\left(\frac{3x}{4} + 1\right)$	$\left(\frac{3x}{4} + 1\right)$	$\left(\frac{3x}{4} + 1\right)$	$\left(\frac{3x}{4} + 1\right)$
soda water				

Therefore to be the integral value x must be $4m$; $m = 1, 2, 3, \dots$
So at $m = 1$

Hence option (a) is correct since B had contributed 1 tumbler.

	A	B	C	D
Initial amount	7	5	4	0
Final amount	4	4	4	4
	3	1	0	
	2	1		

49.

Ratio of fruits (by dozen) = $3 : 2 : 7$

Ratio of fruits by weight = $120 : 150 : 24$

\therefore Ratio of fruits (combined) by weight

$$= 3 \times 120 : 2 \times 150 : 7 \times 24$$

$$= 30 : 25 : 14$$

	1st Alloy		2nd Alloy	
	Iron	Copper	Iron	Copper
	4	3	6	1
Proportion of iron in the alloys	$\frac{4}{7}$	$\frac{3}{7}$	$\frac{6}{7}$	$\frac{1}{7}$

So in the new alloy total iron will be 44 kg and copper will be 12 kg.

$$\text{Iron} = 8 + 36 = 44$$

$$\therefore \text{Copper} = (14 + 42) - (8 + 36) = 12$$

\therefore Ratio of copper to iron = 12 : 44 = 3 : 11, hence (d)

2. Suppose there are all the pigeons then total no. of heads are 340 and total no. of legs are 680. Now since $380 = 1060 - 680$ legs are extra, it means there will be $190 = \frac{380}{2}$ rabbits. As we know a rabbit has 2 extra legs than that of a pigeon who has only two legs.

Therefore, number of rabbits = 190

and number of pigeons = $340 - 190 = 150$

Alternatively : go through options and consider choice (b)

Pigeons	Rabbits
Heads (340) 150	190] 340
Legs (1060) 300	760] 1060

$$\text{Alternatively : } P + R = 340 \quad \dots(1)$$

$$\text{and } 2P + 4R = 1060 \quad \dots(2)$$

Solve these two equations and you will get the answer.

Alternatively : It can be solved through alligation rule.

3. By the replacement formula

Decreased amount

$$= \text{Original amount} \left(1 - \frac{\text{replacing amount}}{\text{original amount}} \right)^{\text{no. of times (n)}}$$

Now, since the ratio of petrol and kerosene is 1701 and 27 it means initially there was $(1701 + 27) = 1728$ unit of kerosene and the decreased amount of kerosene is 27 unit.

$$\therefore 27 = 1728 \left(1 - \frac{6}{k} \right)^3 \Rightarrow k = 8 \text{ litre}$$

NOTE Here 27 : 1728 just show the ratio not the exact amount.

4. The ratio of milk in 3 vessels

$$= \frac{3}{4} \times \frac{5 \times 7}{5 \times 7} : \frac{2}{5} \times \frac{4 \times 7}{4 \times 7} : \frac{4}{7} \times \frac{4 \times 5}{4 \times 5}$$

$$= \frac{105}{140} : \frac{56}{140} : \frac{80}{140}$$

Remember, The value of 25 litre does not matter, the basic thing is that the amount of mixture in all the three quantities is same.

So the total quantity of milk in mixture = $105 + 56 + 80 = 241$

So the total amount of water in mixture

$$= [(3 \times 140) - 241] = 179 \text{ litre}$$

Therefore ratio of water to milk in the new mixture
 $= 179 : 241$

5. \because Profit = $33\frac{1}{3}\%$, it means cost price = Rs. 15

Now, by alligation

$$\frac{(x+7)-15}{(15-x)} = \frac{3}{4}$$

$$\Rightarrow x = 11$$

$$\therefore x = 11 \text{ and } (x+7) = 18$$

Thus the total value of both the prices = $11 + 18 = 29$

6.

A_1	A_2
C T	C T
1 3	2 5

$$\text{Copper} \rightarrow \frac{1}{4} \quad \text{Copper} \rightarrow \frac{2}{7}$$

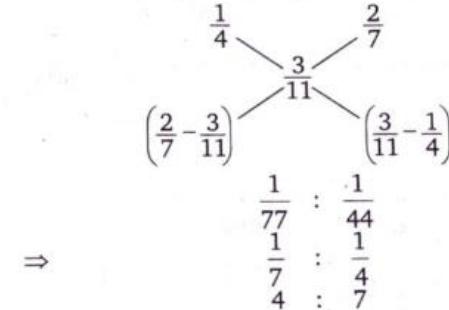
$$\text{Required copper} \rightarrow = \frac{3}{11}$$

So, the required ratio is 4 : 7

Since it is clear from the above values

$$(1+2 \rightarrow 3 \text{ and } 4+7 \rightarrow 11)$$

Alternatively : By Alligation



7. Ratio of $W_1 : M_1 : W_2 : M_2 : W_3 : M_3$
 $1 : 3 : 2 : 3 : 2 : 5$

$$\text{Proportion of water } \frac{1}{4} : \frac{2}{5} : \frac{2}{7}$$

$$\Rightarrow \frac{1}{4} \times \frac{5 \times 7}{5 \times 7} : \frac{2}{5} \times \frac{4 \times 7}{4 \times 7} : \frac{2}{7} \times \frac{4 \times 5}{4 \times 5}$$

$$\Rightarrow \frac{35}{140} : \frac{56}{140} : \frac{40}{140}$$

Now since all these three mixtures are mixed in the ratio of 2 : 3 : 5

$$\text{Therefore new ratio} = \frac{35}{140} \times \frac{2}{2} : \frac{56 \times 3}{140 \times 3} : \frac{40 \times 5}{140 \times 5}$$

$$= \frac{70}{280}, \frac{168}{420}, \frac{200}{700}$$

Now, the amount of water = $70 + 168 + 200 = 438$

\therefore The amount of milk = $(280 + 420 + 700) - 438 = 962$

\therefore Ratio of milk to water = 962 : 438

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8. $B_1 : B_2 : B_3 = 3x : 4x : 5x$
again $B_1 : B_2 : B_3 = 5y : 4y : 3y$

Since there is increase in no. of oranges in first two basket only, it means the no. of oranges remains constant in the third basket

$$\therefore 5x = 3y$$

Hence $3x : 4x : 5x$

$$\Rightarrow \frac{9y}{5} : \frac{12y}{5} : \frac{15y}{5} = 9y : 12y : 15y$$

and $5y : 4y : 3y \Rightarrow 25y : 20y : 15y$

Therefore, increase in first basket = 16

and increase in second basket = 8

the required ratio = 2 : 1

9. Amount of alcohol in first vessel = $0.25 \times 2 = 0.5$ litre

amount of alcohol in second vessel = $0.4 \times 6 = 2.4$ litre

Total amount of alcohol out of 10 litres of mixture is $0.5 + 2.4 = 2.9$ litre

Hence, the concentration of the mixture is $29\% \left(= \frac{2.9}{10} \times 100\right)$

10. Assume the weight of Alloy A is 100 kg

∴ The weight of Alloy B is 400 kg

	Gold	Silver	Copper
A	40 kg	60 kg	0 kg
B	140 kg	160 kg	100 kg
total \rightarrow	180 kg	220 kg	100 kg

$$\therefore \text{Ratio of Gold and Silver in new alloy} = \frac{180}{500} : \frac{200}{500} = 36\% : 44\%$$

11.

Urea			Dia		
N	P	K	N	P	K
x	y	0	20%	70%	10%
			Mixture		
			N	P	K
			26%	68%	6%

This 6% of K is obtained only from Dia.

Urea			Dia		
N	P	K	N	P	K
x	y	0	120	420	60
			Mixture		
			N	P	K
			260	680	60

$$N_U + N_D = N_M \Rightarrow N_U + 120 = 260$$

$N \rightarrow$ Nitrogen, $P \rightarrow$ Phosphorus

and $P_U + P_D = P_M \Rightarrow P_U + 420 = 680$

$U, D, M \rightarrow$ Urea, Dia and mixture

amount of Nitrogen in Urea = 140

and amount of Phosphorus in Dia = 260

∴ Ratio of $N : P = 7 : 13 \Rightarrow 35 : 65$

12.

X	Y
C N	C N
2 7	5 4

$$\text{Copper} \rightarrow \frac{2}{9} = \frac{4}{18} \text{ Copper} \rightarrow \frac{5}{9} = \frac{10}{18}$$

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By alligation

$$\begin{array}{c} 10 \\ 9 \\ 18 \\ 1 \quad : \quad 5 \\ \text{amount of } X = \frac{1}{6} \times 42 = 7 \text{ kg} \\ \text{amount of } Y = \frac{5}{6} \times 42 = 35 \text{ kg} \end{array}$$

and

13.

First	Alloy	Second	Alloy
C	Al	C	Al
1	2	3	1
Required	alloy	C	Al
		2	1

$$\therefore \text{Copper in first alloy} = \frac{1}{3}$$

$$\text{copper in second alloy} = \frac{3}{4}$$

$$\text{copper in required alloy (mixture)} = \frac{2}{3}$$

Now, by alligation

$$\begin{array}{c} \frac{1}{3} \\ \frac{2}{3} \\ \left(\frac{3}{4} - \frac{2}{3}\right) \\ \frac{1}{12} \\ \Rightarrow 1 \quad : \quad \frac{1}{3} \\ 1 \quad : \quad 4 \end{array}$$

Therefore, second alloy be mixed 4 times the first alloy.

14. Note in this type of question individual prices does not matter. To prove this solve it algebraically.

$$\begin{aligned} \text{Exchanged amount} &= \frac{3 \times 150 + 5 \times 90}{2(3+5)} \\ &= \frac{450}{8} = 56.25 \text{ litre} \end{aligned}$$

Here 3 and 5 are obtained from the ratio of amounts i.e., 90 and 150.

15. Here the ratio of mixtures (i.e., milk, water) does not matter. But the important point is that whether the total amount (either pure or mixture) being transferred is equal or not. Since the total amount (i.e., 5 cups) being transferred is equal, each one to another, hence $A = B$.

HINT You can verify it very easily by considering a simple example.

16. CP. of rasgulla = Rs. 9 (since profit is 66.66%)
Now by alligation

$$\begin{array}{c} (\text{Flour}) 3x \\ 9 \\ 7x (\text{Sugar}) \\ 5 \quad : \quad 3 \\ \frac{(9-3x)}{(7x-9)} = \frac{3}{5} \Rightarrow x = 2 \end{array}$$

Price of sugar = $7x = \text{Rs. 14 per kg}$

5

PERCENTAGES

It is one of the most important chapters which is the backbone of calculations either involved in commercial arithmetic or in real life. Personally I do maximum arithmetical calculation using percentage and others too. So in the context of calculation it is necessary to know the clear concepts of percentage which plays a very vital role in Data Interpretation

PERCENTAGE AND ITS APPLICATION

A fraction with denominator 100 is called a per cent. Per cent is an abbreviation for the latin word "percentum" meaning "per hundred" or "hundredths" and is denoted by symbol %.

NOTE A fraction with denominator 10 is called as decimal.

Since per cent is a form of fraction, we can express per cent as fractions (or decimals) and vice-versa.

CONVERSION OF A FRACTION INTO PERCENTAGE

To convert a fraction into a percentage, multiply the fraction by 100 and put "%" sign.

EXAMPLE 1 Convert the following fractions into percentages:

$$(i) \frac{1}{2} \quad (ii) \frac{3}{4} \quad (iii) \frac{4}{5} \quad (iv) \frac{7}{8}$$

SOLUTION (i) $\frac{1}{2} \rightarrow \frac{1}{2} \times 100 = 50\%$

(ii) $\frac{3}{4} \rightarrow \frac{3}{4} \times 100 = 75\%$

(iii) $\frac{4}{5} \rightarrow \frac{4}{5} \times 100 = 80\%$

(iv) $\frac{7}{8} \rightarrow \frac{7}{8} \times 100 = 87.5\%$

CONVERSION OF A PERCENTAGE INTO A FRACTION

To convert a percentage into a fraction, replace the % sign with $\frac{1}{100}$ and reduce the fraction to simplest form.

besides quantitative Aptitude section. On an average two problems i.e., nearly 4–5 % problems in QA only, are being asked in CAT every year.

In other entrance/competitive exams like MAT, XAT and UPMCAT, etc there are too many questions asked from this chapter.

EXAMPLE 2 Express the following percentage as fraction

- (i) 20% (ii) 30% (iii) 45% (iv) $5 \frac{1}{8}\%$
 (v) 155%

SOLUTION (i) $20\% = \frac{20}{100} = \frac{1}{5}$
 (ii) $30\% = \frac{30}{100} = \frac{3}{10}$
 (iii) $45\% = \frac{45}{100} = \frac{9}{20}$
 (iv) $5 \frac{1}{8}\% = \frac{41}{8 \times 100} = \frac{41}{800}$
 (v) $155\% = \frac{155}{100} = \frac{31}{20} = 1 \frac{11}{20}$

CONVERSION OF A PERCENTAGE INTO A RATIO

To convert a percentage into a ratio, first convert the given percentage into a fraction in simplest form and then to a ratio.

EXAMPLE 3 Solve the following :

- (i) 38% (ii) 25% (iii) 66.66%

SOLUTION (i) $38\% = \frac{38}{100} = \frac{19}{50} = 19 : 50$

(ii) $25\% = \frac{25}{100} = \frac{1}{4} = 1 : 4$

(iii) $66.66\% = 66 \frac{2}{3}\% = \frac{200}{3 \times 100} = \frac{2}{3} = 2 : 3$

CONVERSION OF A RATIO INTO A PERCENTAGE

To convert a ratio into a percentage, first convert the given ratio into a fraction then to a percentage.

EXAMPLE 4 Express the following ratios as percentage :

- (i) $1 : 5$ (ii) $2 : 3$ (iii) $4 : 9$

SOLUTION (i) $1 : 5 = \frac{1}{5} = \frac{1}{5} \times 100 = 20\%$

(ii) $2 : 3 = \frac{2}{3} = \frac{2}{3} \times 100 = 66.66\%$

(iii) $4 : 9 = \frac{4}{9} = \frac{4}{9} \times 100 = 44.44\%$

CONVERSION OF A PERCENTAGE INTO A DECIMAL

To convert a percentage into a decimal remove the % sign and move the decimal point two places to the left.

EXAMPLE 5 Convert the following percentages into decimals :

- (i) 36% (ii) 250% (iii) 57.5% (iv) $17 \frac{1}{5}\%$ (v) 7%

SOLUTION (i) $36\% = 0.36$

(ii) $250\% = 2.50 = 2.5$

(iii) $57.5\% = 0.575$

CONVERSION OF FRACTION INTO PERCENTAGE

NUMERATORS

DENOMINATORS	1	2	3	4	5	6	7	8	9	10	11	12
1	100	200	300	400	500	600	700	800	900	1000	1100	1200
2	50	100	150	200	250	300	350	400	450	500	550	600
3	33.33	66.66	100	133.33	166.66	200	233.33	266.66	300	333.33	366.60	400
4	25	50	75	100	125	150	175	200	225	250	275	300
5	20	40	60	80	100	120	140	160	180	200	220	240
6	16.66	33.33	50	66.66	83.33	100	116.66	133.33	150	166.66	183.33	200
7	14.28	28.56	42.85	57.13	71.42	85.71	100	114.28	128.56	142.85	157.13	171.42
8	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	137.5	150
9	11.11	22.22	33.33	44.44	55.55	66.66	77.77	88.88	100	111.11	122.22	133.33
10	10	20	30	40	50	60	70	80	90	100	110	120
11	9.09	18.18	27.27	36.36	45.45	54.54	63.63	72.72	81.81	90.9	100	109.09
12	8.33	16.66	25	33.33	41.66	50	58.33	66.66	75	83.33	91.66	100
15	6.66	13.33	20	26.66	33.33	40	46.66	53.33	60	66.66	73.33	80

(PERCENTAGE-FRACTION CONVERSION TABLE)

Remember : $\frac{1}{7} = 14.28\%$ and $\frac{1}{14} = 7.14\%$

$\frac{1}{6} = 16.66\%$ and $\frac{1}{15} = 6.66\%$

$\frac{1}{9} = 11.11\%$ and $\frac{1}{11} = 9.09\%$

$\frac{1}{15} = 6.66\%$ and $\frac{1}{16} = 6.25\%$

$\frac{1}{3} = 33.33\%$ and $\frac{3}{10} = 30\%$

99.99% is equivalent to 100% (in calculation)

(iv) $17 \frac{1}{5}\% = 17.2\% = 0.172$

(v) $7\% = 0.07$

CONVERSION OF A DECIMAL INTO A PERCENTAGE

To convert a decimal into a percentage, move the decimal point two places to the right (adding zeros if necessary) and put % sign.

EXAMPLE 6 Convert the following decimals into percentages :

- (i) 0.35 (ii) 8.12 (iii) 0.018

SOLUTION (i) $0.35 = 35\%$

(ii) $8.12 = 812\%$

(iii) $0.018 = 1.8\%$

• Work out some more examples so that all these things are on your finger tips.

Remember $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \dots = 50\%$ etc.

Learn and practice all the values given below.

SOME OTHER TYPICAL VALUES

$\frac{1}{13} = 7.69\% \approx 7.7\%$, $\frac{1}{17} = 5.88\%$, $\frac{1}{19} = 5.26\%$,

$\frac{1}{21} = 4.76\%$, $\frac{1}{23} = 4.35\%$, $\frac{1}{24} = 4.166\%$

Learnings from the table :

- This table is a first hand support as a percentage values of some frequently used fractions.
- All the percentage values whose decimal part is 0.33, 0.66, 0.00 contain the denominator 3 in the fraction.
- Similarly if there is 0.16, 0.33, 0.50, 0.66, 0.83, 0.00 means there is a 6 in the denominator of the fraction.

- Percentages
- (iv) Similarly if there is 0.28, 0.50, 0.85, 0.13, 0.42, 0.71 it means there is a 7 as denominator.
 - (v) If there is 0.11, 0.22, 0.33, 0.44 ... 0.99 etc. It means there is 9 as the denominator of the fraction.

PERCENTAGE OF A QUANTITY

EXAMPLE 1 Find the no. of male students (i.e., boys), if there are 42% male students in the school and the total no. of students in the school is 1000.

SOLUTION Required number of male students

$$= 42\% \text{ of } 1000 \\ = \frac{42}{100} \times 1000 = 420$$

EXAMPLE 2 A student scored 85% marks. Total marks were 400. How much did he score?

SOLUTION Marks scored = 85% of 400

$$= \frac{85}{100} \times 400 \\ = 340$$

- (vi) If there is 0.09, 0.18, 0.27 ... it means there is 11 as the denominator of the fraction.
- (viii) If two percentage values have different decimal values (there must be different denominators) then their addition or subtraction results always in decimal i.e., never as an integer.

EXAMPLE 3 In an orchard $16\frac{2}{3}\%$ of the trees are mango trees. If the total number of trees in the orchard is 360, find the number of other types of trees in the orchard.

SOLUTION Total number of trees = 360

$$\text{Number of mango trees} = 16\frac{2}{3}\% \text{ of } 360 \\ = \frac{50}{3 \times 100} \times 360 = 60$$

Therefore, the number of other trees = $360 - 60 = 300$

Alternatively: Number of mango trees = $16\frac{2}{3}\%$

$$\text{It means no. of other types of trees} = \left(100 - 16\frac{2}{3}\%\right) \\ = 83\frac{1}{3}\%$$

Thus number of other types of trees = $83\frac{1}{3}\% \text{ of } 360 = 300$

INTRODUCTORY EXERCISE-5.1

1. Find the value of :
 - (i) 25% of 200
 - (ii) 30% of 180
 - (iii) 37.5% of 300
 - (iv) 83.33% of 480
 - (v) 100% of 2 quintal
 - (vi) 165% of 330 litre
 - (vii) $5\frac{1}{2}\%$ of Rs. 1600
 - (viii) 10% of 1 hour
 - (ix) 66.66% of 300
 - (x) 20% of 1 million rupees.
2. Mr. Arvind Vidyarthi spends 30% of his money on education and he has total Rs. 15,000. How many rupees he spends on education?
3. Sonia purchased 80 metres of cloth, out of which 35% was used for making trousers. How much cloth was used by her for making trousers?
4. The total no. of students in the school are 1250. 40% of the students are girls. Find the number of boys.
5. William's monthly salary was Rs. 1140. His salary is increased by 16.66%. How much increase has he

CAT Tips Now I would like to suggest you that all the problems mentioned in the exercise must be done using fractions instead of percentage, in order to make the calculation simple and handy.

For example see the solution of question 2 :

$$15000 \times 0.3 = 4500 \quad \left[\text{Recall } \frac{x \times 30}{100} = 0.3x \right]$$

Solution for question 5 : Since $16.66\% = \frac{1}{6}$ Compiled By Jasjeet

gotten? Also find the salary if his salary increased by 33.33%.

6. The population of Vatican city is 700. If it increases by 7.14% per annum (i.e., every year). Find the population of the Vatican city after one year.
7. The speed of a car is 85 km/hr. It is increased by 20%. Find the increased speed of the car?
8. A shopkeeper announces a reduction of 8.33% on all its prices after new year. If a wrist watch was earlier for Rs. 2400. How much would it costs now?
9. 44% of the students in a class are females and the number of male students is 42. Find the total no. of students in the class.
10. 30% of a number is 225. Find the number.
11. A horse costing Rs 80,000 one year ago now costs 25% less. Find the changed price.
12. 1700 students took an exam 85% students passed it. Find the number of students who failed in the exam.

So the new salary will increase by $\frac{1}{6}$ it means the absolute

value of new salary will be $\frac{7}{6} \left(= 1 + \frac{1}{6}\right)$ times of the original

salary.

So the increase in salary = $1140 \times \frac{1}{6} = \text{Rs. } 190$

and increased salary = original salary + increase in salary

$$= 1 + \frac{1}{6} = \frac{7}{6} = \frac{7}{6} \times 1140 = \text{Rs.}1330$$

Similarly if the salary is increased by 33.33% it means

$$33.33\% = \frac{1}{3}$$

$$\text{Therefore new salary} = 1 + \frac{1}{3} = \frac{4}{3} = \frac{4}{3} \times 1140 = 1520$$

Solution for question 6: Since $7.14\% = \frac{1}{14}$

EXPRESSING ONE QUANTITY AS A PERCENTAGE OF ANOTHER QUANTITY

EXAMPLE 1 What per cent is number 3 of number 20?

SOLUTION As per cent means out of 100. Then by unitary method

$$\text{out of } 20 \rightarrow 3$$

$$\text{out of } 1 \rightarrow \frac{3}{20}$$

$$\text{out of } 100 \rightarrow \frac{3}{20} \times 100 = 15\%$$

Hence to find what per cent the first number is of second number, we divide the first number by the second number and multiply the result by 100.

EXAMPLE 2 Ravi obtained 325 marks out of a maximum of 400 marks. Find the percentage of marks obtained by him.

1. What per cent is :

- (i) 30 out of 600?
- (ii) 25 out of 160?
- (iii) 75 out of 225?
- (iv) 36 kg of 150 kg?
- (v) 90 cm of 4.5 metre.
- (vi) 60 litres of 40 litres
- (vii) 800 shirts out of 1200 shirts?
- (viii) 875 m of 2 km?

2. Express:

- (i) 20 as a percentage of 500.
- (ii) 60 kg as a per cent age of 80 kg.
- (iii) 350 ml as a percentage of 5.6 litre.
- (iv) Rs. 13 as a percentage of Rs. 39.
- (v) 15 seconds as a percentage of 1 hour.
- (vi) 27° as a percentage of 360° .

3. Manu scored 384 marks out of 450. What per cent marks did she get?

4. In an election, out of 60,000 eligible voters 42000 cast their vote. Calculate the percentage of voters casting their votes.

$$\text{So the new population of the city} = 700 \times \left(1 + \frac{1}{14}\right) \\ = 700 \times \frac{15}{14} = 750$$

Solution for question 8: The reduced price of the watch

$$= 2400 \left(1 - \frac{1}{12}\right) \\ \left\{ \because 8.33\% = \frac{1}{12} \right. \\ = 2400 \times \frac{11}{12} = 2200$$

SOLUTION Required percentage of marks = $\frac{325}{400} \times 100 = 81.25\%$

EXAMPLE 3 In a factory of 150 workers, 18 were absent in a day. What percentage were present?

$$\text{SOLUTION} \quad \text{Present} = 150 - 18 = 132$$

$$\text{Percentage presence} = \frac{132}{150} \times 100 = 88\%$$

EXAMPLE 4 Kurla obtained 480 marks out of 600 and Birla obtained 560 marks out of 800. Whose performance is better?

SOLUTION % marks of Kurla = $\frac{480}{600} \times 100 = 80\%$

$$\% \text{ marks of Birla} = \frac{560}{800} \times 100 = 70\%$$

So, obviously Kurla's performance is better than that of Birla even though getting less absolute marks.

INTRODUCTORY EXERCISE-5.2

5. A tin contains 24 litres of milk. Due to leakage, 720 ml is lost. What per cent of milk is still present in the tin?
6. Price of an item increased from 16.50 to Rs. 41.25. Find the percentage increase in price.
7. The excise duty on a certain item has been reduced to Rs. 3480 from Rs. 5220. Find the percentage reduction in the excise duty for that item.
8. Out of total production of 6450 tonnes of a coalmine a quantity of 645 tonnes was lost during extraction. What per cent of the total production was the net coal extracted?
9. A cricket team played 24 matches. The team won 9 matches and lost 3 matches. 12 matches ended in draw. What per cent of the total matches did the team lose?
10. In a particular month, Rs. 10,000 were allocated for the food items in a hostel out of total Rs. 50,000 budget. Further Rs. 2000 is allocated for the fruits out of Rs. 10,000 (allocated for food items) what per cent of total budget is spent on fruits only?

SOME MOST IMPORTANT VALUES	
1 → 50%,	$\frac{1}{3} = 33.33\%$,
2 → 66.66%,	$\frac{1}{4} \rightarrow 25\%$,
3 → 75%,	$\frac{1}{5} \rightarrow 20\%$,
4 → 40%,	$\frac{3}{5} \rightarrow 60\%$,
5 → 16.66%,	$\frac{5}{6} \rightarrow 83.33\%$
6	

NOTE The application of percentage is very diverse in nature e.g. profit and loss, Simple and compound interest etc. All these are exactly based on the percentage increase/decrease of the original (or actual) value.

Percentage increase/decrease in a quantity

$$= \left(\frac{\text{change in quantity}}{\text{original quantity}} \times 100 \right) \%$$

EXAMPLE 1 The height of Abhimanyu some times ago was 110 cm. Now his height is 120 cm. Find the percentage change in his height.

SOLUTION $\frac{120 - 110}{110} \times 100 = 9.09\%$

PERCENTAGE CHANGE AND PERCENTAGE POINT CHANGE

Last year Abhijeet's salary was Rs. 10,000 and Sonu's salary was Rs. 8,000. This year Abhijeet's salary is Rs. 12,000 while Sonu's salary is Rs. 10,000.

- What is the percentage increase of Abhijeet's salary?
- What is the percentage increase of Sonu's salary?
- Percentage increase in Sonu's salary is how much percent greater than the percentage increase in Abhijeet's salary?
- What is the percentage point change in the salary of Sonu and Abhijeet?

SOLUTION (i) $\frac{12,000 - 10,000}{10,000} \times 100 = 20\%$

or $\frac{2}{10} \rightarrow \frac{1}{5} \rightarrow 20\%$

ADVANCED CONCEPT OF PERCENTAGE CHANGE

(A) If a value p is increased by $x\%$, then we have to decrease the resultant value by $\left(\frac{x}{x+100} \times 100 \right)\%$ to get back to the original value p .

$$\begin{aligned} \text{Original value } p &\xrightarrow{\text{increasing value}} \frac{p \times x}{100} \xrightarrow{\text{increasing value}} \left(p + \frac{px}{100} \right) \\ &= p \left(\frac{100+x}{100} \right) \end{aligned}$$

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SHORTCUT

$$\frac{10}{110} \rightarrow \frac{1}{11} \rightarrow 9.09\%$$

Alternatively: $\frac{12}{11} \rightarrow 109.09\%$, so increase = 9.09%

EXAMPLE 2 The total expenses of a hostel were Rs. 8000 per month. Some students left the hostel due to which the new expenses come down by Rs. 1000. Find the percentage decrease in expenses of the hostel.

SOLUTION

$$\frac{1000}{8000} \rightarrow \frac{1}{8} \rightarrow 12.5\%$$

EXAMPLE 3 Salary of Raja is Rs. 9000 per month and salary of Rani is Rs. 10,000 per month.

- What per cent is the salary of Rani to that of Raja?
- What per cent is the salary of Raja to that of Rani?

SOLUTION (i) $\frac{10,000}{9,000} \times 100 = 111.11\%$

Alternatively:

$$\frac{10}{9} \rightarrow \frac{9}{9} + \frac{1}{9} \rightarrow 100\% + 11.11\% \rightarrow 111.11\%$$

$$\text{(ii) } \frac{9}{10} \rightarrow 90\% \quad \left(\because \frac{1}{10} \rightarrow 10\% \right)$$

Hence, salary of Raja is 90% to the salary of Rani.

(ii) $\frac{2}{8} \rightarrow \frac{1}{4} \rightarrow 25\%$

(iii) Percentage increase of Sonu's salary = 25
Percentage increase of Abhijeet's salary = 20

$$\text{So the required percentage} = \frac{25 - 20}{20} \times 100 = 25\%$$

It means percentage increase of Sonu's salary is 25% greater than the percentage increase of Abhijeet's salary.

(iv) Percentage point change

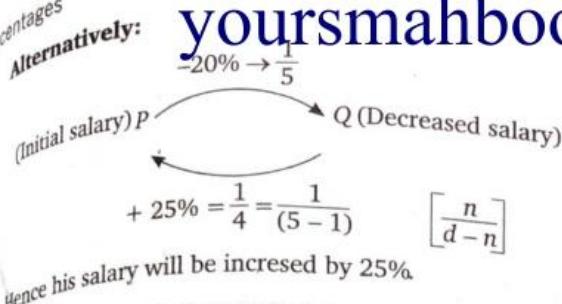
$$\begin{aligned} &= (\text{Percentage increase in Sonu's salary} \\ &\quad - \text{Percentage increase in Abhijeet's salary}) \\ &= 25 - 20 = 5 \text{ percentage point} \end{aligned}$$

Infact percentage point change is the difference between two percentage values.

Now the percentage decrease

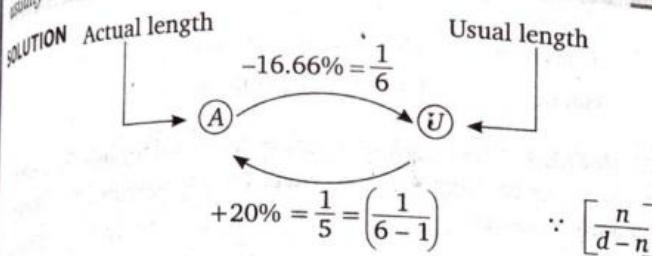
$$= \left[\frac{p \left(\frac{100+x}{100} \right) - p}{p \left(\frac{100+x}{100} \right)} \right] \times 100 = \left(\frac{x}{100+x} \times 100 \right)\%$$

In other words (i.e., in terms of fraction) if a value is increased by $\frac{n}{d}$ then to get back the same number p from the resultant value, we have to decrease the increased value by $\left(\frac{n}{d+n} \right)$.



Hence his salary will be increased by 25%.

EXAMPLE 6 Kajol usually wears saree, which is 16.66% less than the actual length of the saree. By how much per cent the actual length of the saree is greater than the length of saree which kajol usually wears?



So the actual length of the saree is 20% greater than the usually used saree.

- NOTE**
- (1) If a value X is first increased by $p\%$ to Y then Y is again decreased to X by $q\%$ then p is always greater than q (for positive values)
 - (2) If a value X is first decreased by $p\%$ to Y and then Y is increased by $q\%$ to X , then p is always less than q .

CONCEPT OF PRODUCT CONSTANCY

It is the same as we know the inverse proportion in the chapter of Ratio, Proportion and Variation.

e.g., When the rate of a pencil is Rs. 1.25 then we can purchase 16 pencils by paying Rs. 20. If the rate of a pencil is decreased by Rs. 0.25 then we can purchase 20 pencils by paying Rs. 20.

Explanation : Rate \times No. of pencils = Price

$$1.25 \times 16 = 20$$

$$1.00 \times 20 = 20$$

So you can see that here the product (20) is constant in both the cases. Thus it is clear that if we reduce the price of a pencil to Rs. 0.50, then we can purchase 40 pencils in Rs. 20.

Some more examples of product constancy :

- (i) speed \times time = distance
- (ii) rate \times time = cost
- (iii) efficiency \times time = work
- (iv) length \times breadth = area
- (v) average \times no. of elements = total value
- (vi) rate \times quantity = price (or expenditure)

e.g., The price of sugar is increased by 25% then by how much per cent should a customer reduce the consumption (i.e., quantity used) of sugar so that he has not to increase his expenses on sugar.

$$\text{price} \times \text{quantity} = \text{expenditure}$$

- (3) If a value A is increased by $p\%$ then again by $q\%$ once again it is increased by $r\%$, then the final value will be same as if you change the order of p, q, r i.e., A can be first increased by $r\%$ then by $q\%$ and then by $p\%$ still the result will be same.
- (4) The rule 3 is also applicable for the decreasing of the values. A value ' A ' is first decreased by $p\%$, then by $q\%$ and then by $r\%$ and so on, the resultant value will be same as when A is first decreased by $q\%$ then by $p\%$ and then by $r\%$ etc.
- Note :** In case 3 and 4 we are discussing the successive increase or decrease in the value.
- (5) A value ' A ' is first increased by $p\%$ then by $q\%$ and then it is reduced by $r\%$ will give the same results as when A is first decreased by $r\%$, then increased by $q\%$ and then by $p\%$ etc.

EXAMPLE 7 Initially Ms. Rakhi Sawant has Rs. 200 in her wallet then she increased it by 20%. Once again she increased her amount by 25%. The final value of money in her wallet will be how much per cent greater than the initial amount.

SOLUTION $200 \xrightarrow{+ 20\%} 240 \xrightarrow{+ 25\%} 300$

$$\text{So the required \% increase} = \frac{300 - 200}{200} \times 100 = 50\%$$

EXAMPLE 8 The age of B is 50% greater than the age of A . The age of C is 20% less than the age of B . By how much percentage the age of C is greater than the age of A .

SOLUTION $A \xrightarrow{+ 50\%} B \xrightarrow{- 20\%} C$

$$\text{So the required percentage change} = \frac{20}{100} \times 100 \\ = 20\%$$

$$100 \times 100 = 10,000$$

$$125 \times x = 10,000$$

$$\Rightarrow x = \frac{10,000}{125} = 80. \text{ Therefore \% reduction} = 20\%$$

or

$$1 \times 1 = 1$$

$$1.25 \times k = 1 \Rightarrow k = 0.8$$

thus there will be 20% decrease in the consumption of sugar in order to maintain the same expenditure on sugar.

PRODUCT CONSTANCY CONDITIONS

- When one factor of a product is increased by $p\%$ then the other factor will be decreased by $\left(\frac{p}{100+p} \times 100 \right)\%$

It means when one factor of a product is increased by $\frac{n}{d}$ then the other factor is decreased by $\frac{n}{(d+n)}$

- When one factor of a product is decreased by $p\%$ then the other factor will be increased by $\left(\frac{p}{100-p} \times 100 \right)\%$

It means when one factor of a product is decreased by $\frac{n}{d}$ then the other factor will be increased by $\frac{n}{(d-n)}$.

EXAMPLE 1 If the price of a commodity be raised by 20% then by how much per cent a house holder reduce his consumption of the same commodity so that his expenditure does not increase.

SOLUTION Since here product (i.e., expenditure) is constant
 $\text{rate} \times \text{consumption} = \text{expenditure}$

$$\text{initially} \rightarrow 1 \times 1 = 1$$

$$\text{After change} \quad 1.2 \times x = 1$$

$$\Rightarrow x = 0.833 \therefore \text{decrease in value} = 16.66\%$$

Alternatively:

$$\begin{array}{ccc} \text{Increase in rate} & & \text{Decrease in consumption} \\ + 20\% = + \frac{1}{5} & \longrightarrow & - 16.66\% = - \frac{1}{6} \end{array}$$

EXAMPLE 2 If the price of petrol falls down by 20% by how much per cent must a person increase its consumption, so as not to decrease the expenditure on this item?

SOLUTION Since product is constant

$$\begin{array}{ccc} \text{decrease by} & & \text{increase by} \\ 20\% = \frac{1}{5} & \longrightarrow & \frac{1}{4} = 25\% \quad \left[\because \frac{n}{d} \rightarrow \frac{n}{(d-n)} \right] \end{array}$$

EXAMPLE 3 Due to 50% increase in the price of rice. We purchased 5 kg less rice with the same amount of Rs. 60. What is the new price of rice?

CONCEPT OF 'BY' AND 'TO'

Please note that there is a clear difference between "by" and "to". e.g., the income is reduced by 40% it means the new income is 60% of the original and the income is reduced to 40% means the new income is 40% of the original value. Thus "by"

EXAMPLE 1 In an election between two candidates, the candidate who got 57% valid votes won by a majority of 420 votes. Find the total no. of valid votes.

SOLUTION Winner Loser
 $0.57x \quad 0.43x$
 $0.14x \quad [100 - 57 = 43]$
 $0.14x = 420 \quad [57 - 43 = 14]$
 $x = 3000$
Hence total valid votes = 3000

EXAMPLE 2 Due to fall in manpower, the production in the factory decreases by 60%. By what per cent should the working hours be increased to restore the original production in the factory?

SOLUTION Manpower \times Working hours = Production
 $\downarrow \quad \uparrow$
 $(- 60\%) = \frac{3}{5} \longrightarrow \frac{3}{2} = (+ 150\%) \quad \left[\frac{3}{5} \rightarrow \frac{3}{5-3} = \frac{3}{2} \right]$
Hence by 150% working hours will be increased. It means the new working hours will be 2.5 times (not 1.5 times) of the original time.

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- (a) Rs. 4.66
 (c) Rs. 4

- (b) Rs. 5
(d) Rs. 6

SOLUTION Increase in price

$$50\% = \frac{1}{2} \longrightarrow$$

$$\text{Decrease in amount} \quad \frac{1}{3} = 33.33\%$$

Since the new quantity of rice decreases by 33.33% which is equal to 5 kg it means initially there was 15 kg rice to be used.

So, the initial price = Rs. 4

and final price = Rs. 6

Alternatively: From the options.

Let us consider choice (d).

Therefore $[6 \times 10 = 60]$ (finally)

Hence $[4 \times 15 = 60]$ (initially)

EXAMPLE 4 The length of a plot is decreased by 33.33%. By how much % the breadth of the plot will be increased so that the area remains constant?

SOLUTION (Decrease) (Increase)

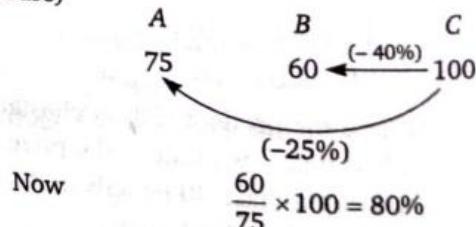
$$33.33 = \frac{1}{3} \longrightarrow \frac{1}{2} = 50\% \quad \left[\frac{1}{2} = \frac{1}{3-1} \right]$$

represents difference and "to" represents final value.

e.g., The income of Sarika is increased by 20% means new income is $100 + 20 = 120\%$ of the original income. The income of Sarika is increased to 120% means the new income of Sarika is 120% of the original income.

EXAMPLE 3 Two numbers are respectively 25% and 40% less than a third number. What per cent is the second of the first?

SOLUTION Consider A, B, C three numbers and assume $C = 100$ (as a base)



Now

$$\frac{60}{75} \times 100 = 80\%$$

EXAMPLE 4 A person gives 10% to his wife 10% of the remaining to a hospital (as a donation) again 10% of the remaining to the minister's relief Fund. Then he has only 7290 Rs. with him. What was the initial sum of money with that person?

SOLUTION Since he gives 10% so he is left with 90% of the original sum and since he does the same with the remaining (or left) amount. So it forms a chain.

$$\therefore \text{Remaining amount} = (x) \times 0.9 \times 0.9 \times 0.9$$

$$= 0.729 x = 7290$$

$x = 10,000$, where x is supposed to be initial amount.

EXAMPLE 5 Initially a shopkeeper had n chocolates. A customer bought 10% chocolate from n then another customer bought 20% of the remaining chocolates, after that one more customer purchased 25% of the remaining chocolates. Finally shopkeeper is left with 270 chocolates in his shop. How many chocolates were there initially in his shop?

- (b) 450 (c) 500 (d) 600

$$n \times 0.9 \times 0.8 \times 0.75 = 270$$

SOLUTION

- (a) 300

POPULATION RELATED MATHEMATICAL PROBLEMS

If the original population of a locality (i.e., region) be P and the annual growth rate be $r\%$. The population after n years

$$P \left(1 + \frac{r}{100}\right)^n$$

change (or increase) in the population

$$= P \left[\left(1 + \frac{r}{100}\right)^n - 1 \right]$$

EXAMPLE 1 If the annual increase in the population be 20% and the present population be 10,000. What will be the population after 3 years hence?

- (a) 16,000 (b) 17,280
(c) 14,400 (d) 1,728

$$\text{SOLUTION } 10,000 \left(1 + \frac{20}{100}\right)^3 = 10,000 \left(\frac{6}{5}\right)^3$$

$$= 10,000 \times (1.2)^3 = 17,280$$

Hence (b) is correct.

EXAMPLE 2 The population of a town in the first year increases by 10% in the next year it decreases by 10% Once again in the third year it increase by 10% and in the fourth year it decrease by 10%. If the present population be 20,000 then the population after four years will be :

- (a) 16,902 (b) 19,602
(c) 20,000 (d) none of these

$$\text{SOLUTION } 20,000 \left(1 + \frac{10}{100}\right) \left(1 - \frac{10}{100}\right) \left(1 + \frac{10}{100}\right) \left(1 - \frac{10}{100}\right)$$

$$= 20,000 (1.1) (0.9) (1.1) (0.9)$$

$$= 20,000 \times 1.21 \times 0.81 = 19,602$$

Thus option (b) is correct.

NOTE If the value of a number is first increased by $x\%$ and then decreased by $x\%$, the net change is always a decreases (or loss) in original value.

Hence,

$$\% \text{ loss} = \left(\frac{x}{10}\right)^2 \%$$

EXAMPLE 1 Shweta is a very expert in bargaining. Once she went to a nearby shop. When Shweta asked the price of Shampoo Sachet the shopkeeper told her the price by increasing 15% of the original cost. But Shweta insisted to decrease the price by 15% so the shopkeeper sold it by decreasing the price by 15% What is the loss or profit of shopkeeper and by how much percent?

$$n = \frac{270 \times 10,000}{9 \times 8 \times 75}$$

$$n = 500$$

NOTE

These type of problems (see example no. 4 and 5) can be solved with a great convenience if we solve in reverse order, with the aid of given choices.

Let us consider option (c)

$$500 \times 0.9 = 450$$

$$450 \times 0.8 = 360$$

$$360 \times 0.75 = 270$$

Hence presumed option is correct.

If there is decrease in population be $r\%$ then,

$$\text{total population after } n \text{ years} = P \left(1 - \frac{r}{100}\right)^n$$

$$\text{and decrease in population} = P \left[1 - \left(1 - \frac{r}{100}\right)^n\right]$$

- (a) no loss

- (c) loss of 2.25%

- (b) profit of 1.5%

- (d) none of these

SOLUTION Let the actual price be 100

$$100 \xrightarrow{+15\%} 115 \xrightarrow{-15\%} 97.75 \quad (\text{loss of } 2.25\%)$$

$$\text{Alternatively: loss\%} = \left(\frac{15}{10}\right)^2 = 2.25\%$$

There is always a loss.

EXAMPLE 2 If the length and breadth of a rectangle are changed by + 20% and - 10% What is the percentage change in area of rectangle?

- (a) 8% (b) 10.8%
(c) 20% (d) data insufficient

SOLUTION

$$l \times b = \text{area}$$

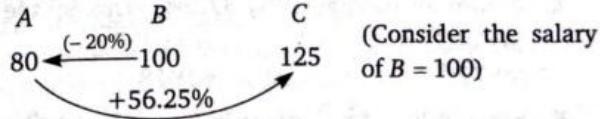
$$1 \times 1 = 1$$

$$1.2 \times 0.9 = 1.08$$

So there is 8% increase in the area of rectangle.

EXAMPLE 3 The salary of A is 20% lower than B's salary and the salary of C is 56.25% greater than A's salary. By how much percent the salary of B is less than the salary of C.

SOLUTION



(Consider the salary of B = 100)

$$\text{The required value} = \frac{25}{125} \times 100 = 20\%$$

Remember: Percentage change

$$= \left(\frac{\text{difference between original value and new value}}{\text{original value}} \right) \times 100$$

$$\text{Percentage increase} = \frac{\text{increased value} - \text{original value}}{\text{original value}} \times 100$$

SOLUTION

20% = $\frac{20}{5}$

$$\text{Percentage decrease} = \frac{\text{original value} - \text{decreased value}}{\text{original value}} \times 100$$

NOTE (1) There is a huge difference between "decreased value" and "decrease in value" and between "increased value" and "increase in value".

For example : Initial value = 70

Final value = 90

it means increased value is = 90

but increase in value is 20

$$\text{and \% increase} = \frac{90 - 70}{70} \times 100 = 28.57\%$$

(2) If there is increase of $\frac{x}{y}$ in any value P then the increased value will be $P \left(1 + \frac{x}{y}\right)$.

(3) If there is decrease of $\frac{x}{y}$ in any value, then the decreased value will be $P \left(1 - \frac{x}{y}\right)$.

$$\text{So new salary} = 80,000 \left(1 - \frac{1}{5}\right)$$

$$= 80,000 \times \frac{4}{5} = \$ 64,000$$

NOTE Remember this type of problems can also be solved through percentages.

$$\text{As } 80,000 \times 0.8 = 64,000$$

but the technique given above is not less important. Some times it becomes very necessary to solve through fractions. So, keep your eyes open mind focussed and use your wits to solve the problems intelligently as per the situation.

EXAMPLE 3 Which one of the following is greatest?

$$\frac{3}{4} = 75\%$$

$$\frac{7}{8} = 87.5\%$$

$$\frac{16}{19} = 84.21\%$$

$$\frac{13}{15} = 86.66\%$$

So, $\frac{7}{8}$ is the greatest fraction (or rational number)

SOLUTION

EXAMPLE 1 Nishith is now 20 years old. Some years later his age will increase by 50% of himself. What will be the new age at that time?

$$\text{SOLUTION } 20 \left(1 + \frac{1}{2}\right) = 30 \text{ years } \left[\because 20 + 20 \times \frac{1}{2} = 20 \left(1 + \frac{1}{2}\right)\right]$$

EXAMPLE 2 The average salary of Purushottam in Infosys is 20% less than that was in Microsoft. If the salary of Purushottam in Microsoft be \$ 80,000 per month then what is the salary of Purushottam in Infosys?

INTRODUCTORY EXERCISE-5.3

- What per cent of $\frac{3}{7}$ is $\frac{1}{105}$?
 - 10%
 - 2.22%
 - 45%
 - 450%
- What per cent is 3% of 15%?
 - 15%
 - 20%
 - 40%
 - 66.66%
- If the cost of a calculator worth Rs 250 is increased by Rs. 100, the rate of increase is
 - 100%
 - 40%
 - 25%
 - none of these
- A number increased by 37.5% gives 99 the number is
 - 140
 - 61.5
 - 72
 - 48
- When 40% of a number is added to 42, the result is the number itself. The number is:
 - 105
 - 72
 - 70
 - 82
- In an examination 52% of the candidates failed in Science 42% in Mathematics and 17% in both. The no. of those who passed in both the subjects, is :
 - 30%
 - 33.33%
 - 55%
 - 28%

LEVEL 1

15. Three candidates A, B and C contested an election. Out of the total votes on a voter list 25% did not vote and 6.66% votes polled were invalid. C got 2450 valid votes, which were 40% more than that of B. If A got only 40% of the total votes, then who is the winner?
 (a) A (b) B
 (c) C (d) can't be determined

16. The cost of a car is 400% greater than the cost of a bike. If there is an increase in the cost of the car is 15% and that of bike is 20%. Then the total increase in the cost of the 5 cars and 10 bikes is :
 (a) 17.5% (b) $16\frac{3}{7}\%$
 (c) 18.5% (d) 18.25%

17. The square of a positive number is 2,000% greater than the number itself, then the square of that number is :
 (a) 1762 (b) 1635
 (c) 441 (d) 139

18. The monthly salary of Shahid and Kareena together is \$ 28,000. The salary of Shahid and Kareena is increased by 25% and 12.5% respectively then the new salary of Kareena becomes 120% of the new salary of Shahid. The new (or increased) salary of Shahid is :
 (a) \$ 15,000 (b) \$ 18,000
 (c) \$ 14,000 (d) \$ 16,000

19. 80% of a smaller number is 4 less than 40% of a larger number. The larger number is 85 greater than the smaller one. The sum of these two numbers is :
 (a) 325 (b) 425
 (c) 235 (d) 500

20. 220% of a number 'X' is 44. What is 44% of 'X'?
 (a) 88 (b) 8.8
 (c) 66 (d) data insufficient

21. The shopkeeper increased the price of a product by 25% so that customer finds it difficult to purchase the required amount. But somehow the customer managed to purchase only 70% of the required amount. What is the net difference in the expenditure on that product ?
 (a) 10% more (b) 5% more
 (c) 12.5% less (d) 17.5% less

22. In the previous government, party Q was in the opposition. Now increasing the seats by 33.33% Q is the ruling party and thus party Q enjoys twice the majority than that of party P in the previous government. If there were only two parties P and Q and the fix no. of seats be 500 in the parliament of Hum-Tum, then the no. of seats of the Q in the new government is :
 (a) 225 (b) 200
 (c) 275 (d) 300

23. In an examination a candidate got 30% marks and failed by 30 marks. If the passing marks are 60% of the total marks, then the maximum marks will be :
 (a) 450 (b) 600
 (c) 300 (d) 100

24. In a school there are 1800 students. Last day except 4% of the boys all the students were present in the school. Today except 5% of the girls all the students are present in the school, but in both the days no. of students present in the school, were same. The no. of girls in the school is :
 (a) 1200 (b) 800
 (c) 1000 (d) 600

25. In a library remaining books are in English and rest of the books are in Urdu. If there are 3600 books in English, then the total no. of books in Urdu are :
 (a) 2400 (b) 2500
 (c) 3000 (d) none of these

26. In a test there are total n questions. Bhanu answers 20 out of 25 questions correctly in the first section. In the second section he answers 60% question correct and thus his total score is 66.66% in the test. Given that all the questions carry equal marks, without any negative marking. The total no. of question in the test is :
 (a) 50 (b) 60
 (c) 75 (d) 100

27. In a class of MBA students 16.66% students are from Science background and 12.5% students are from commerce background and 6.66% students from arts background and rest are from Engineering background. The minimum possible students of engineering background are :
 (a) 45 (b) 77
 (c) 100 (d) 120

28. An alloy contains the copper and aluminium in the ratio of 7 : 4. While making the weapons from this alloy, 12% of the alloy got destroyed. If there is 12 kg of aluminium in the weapon, then the weight of the alloy required is :
 (a) 48 kg (b) 40 kg
 (c) 37.5 kg (d) 14.4 kg

29. Hariharan goes to a shop to buy an FM radio costing Rs. 1404 including sales tax at 8%. He asks the shopkeeper to reduce the price of radio so that he can save the amount equal to the sales tax. The reduction of the price of the radio is :
 (a) Rs. 108 (b) Rs. 104
 (c) Rs. 112.32 (d) none of these

30. The average weight of a class of students is 67.5 kg. The weight of the class teacher is 25% more than the average weight of the class. The average weight of the class is less than the class teacher by $x\%$. The value of x is :
 (a) 33.33% (b) 25%
 (c) 20% (d) can't be determined

31. Last year in CAT, each section of the question paper had different weightage. The weightage of QA, DI and VA/RC sections was 8, 9 and 10 respectively. The maximum marks in all the three sections together were 810. Wrong answer did not carry negative marks as a penalty. If Padma had gotten 20% more marks in QA and 8% more marks in DI and 7.14...% more marks in VA/RC, then she must have gotten 100% marks in all the three sections. The total marks that Padma had scored :
 (a) 730 (b) 700
 (c) 750 (d) 775

32. A salesman gets commission on total sales at 9%. If the sale is exceeded Rs. 10,000 he gets an additional commission as bonus of 3% on the excess of sales over Rs. 10,000. If he gets total commission of Rs. 1380, then the bonus he received is :
 (a) Rs. 180 (b) Rs. 120
 (c) Rs. 480 (d) data insufficient

33. In Veeru Bhai Pvt. limited company 60% of the employees are men and 48% of the employees are Engineers and 66.6% of these are men. The

44. Initially Veer had 60% more love letters than that of Zara. In the last month the no. of love letters of Veer increased by 25% and that of Zara decreased by 25%. Again in the present month the no. of love letters of Veer decreased to 60% and that of Zara increased by 60%. Then which of the following statements is correct regarding the present no. of love letters :

- (a) Veer has 40% more letters than that of Zara
- (b) Zara has 20% less letters than that of Veer
- (c) Veer and Zara have equal no of letters
- (d) Zara has 37.5% less letters than that of Veer.

45. The charges per hour of internet surfing is increased by 25% then find the percentage decrease in the time period of surfing of a user (a net savvy) who can afford only a 10% increase in expenditure :

- (a) 22% (b) 12%
- (c) 15% (d) 9.09%

46. The average earning of each member of the Ambani family is 20% less than the average earning of each member of the Sahara family and the total earning of Ambani's family is 20% more than the total earning of Saharas's family. The no. of family members in the Sahara is what per cent of the no. of family members of Ambani :

- (a) 25% (b) 20%
- (c) 66.66% (d) none of these

47. From 2000 onwards, till 2003 the price of computers increased every year by 10%. After that due to government subsidy the price of computers decreases every year by 10%. The price of a computer in 2006 will be approx. how much per cent less than the price in 2000 if the same pattern of price is continued :

- (a) 2 (b) 3
- (c) 4 (d) none of these

48. A book consists of 30 pages, 25 lines on each page and 35 characters on each line. If this content is written in another note book consisting of 30 lines and 28 characters per line, then the required no. of pages will how much per cent greater than the previous pages?

- (a) 4.16% (b) 5%
- (c) 6.66% (d) none of these

49. The rate of increase of the price of sugar is observed to be two per cent more than the inflation rate expressed in percentage. The price of sugar on January 1, 2004 is Rs. 20 per kg. The inflation rates of the years 2004 and 2005 are expected to be 8% each. The expected price of sugar on January 1, 2006 would be :

- (a) Rs. 23.60 (b) Rs. 24.00
- (c) Rs. 24.20 (d) Rs. 24.60

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

- (a) 250 (b) 300
- (c) 400 (d) 600

51. A number x is mistakenly divided by 10 instead of being multiplied by 10. What is the percentage error in the result?

- (a) -99% (b) + 99%
- (c) -100% (d) + 100%

42. What is the percentage change in the result when we add 50 to a certain number x , instead of subtracting 50 from the same number x ?

- (a) 50% (b) 100%
- (c) 300% (d) can't be determined

43. In the Regional Science Centre, Lucknow the rate of ticket is increased by 50% to increase the revenue, but simultaneously 20% of the visitors decreased. What is percentage change in the revenue of Regional Science Centre. If it is known that the centre collects the revenue only from the visitors and it has no other financial supports :

- (a) + 20% (b) - 25%
- (c) + 30% (d) can't be determined

44. Recently when I visited a show room of shoes shopkeeper told me that he could reduce the price of Bata shoes by 49% and if I were to purchase woodland shoes he could reduce the price to 51% of the original price. If the marked price (i.e., printed price) of both the shoes was same, then which shoes was cheap to buy :

- (a) Wood land (b) Bata
- (c) both (d) can't say

45. Selling price of a shirt and a coat is Rs. 4000. The cost price of a shirt is 58.33% of the cost price of a coat and so amount of profit on both the shirt and coat is same, then the price of the shirt could be :

- (a) Rs 2100 (b) Rs. 2525
- (c) Rs. 2499 (d) Rs. 1120

46. On the April 1, 2005 my salary increased from Rs. 10,000 to Rs. 16,000. Simultaneously the rate of income tax decreased by 37.5%, So the amount of income tax paid by me remains constant what is the value of income tax paid by me :

- (a) Rs. 3000 (b) Rs. 6000
- (c) Rs. 1600 (d) can't be determined

47. In the previous question, if the difference in the rate of income tax be 9 (in percent) then the income tax paid by me :

- (a) Rs. 2000 (b) Rs. 2400
- (c) Rs. 1600 (d) none of these

48. The average of a set of whole numbers is 27.2. When the 20% of the elements (ie numbers) are eliminated from the set of numbers then the average becomes 34. The number of elements in the new set of numbers can be :

- (a) 27 (b) 35
- (c) 52 (d) 63

49. In a class, the no. of boys is more than the no. of girls by 12% of the total strength. The ratio of boys to girls is :

- (a) 15 : 11 (b) 11 : 14
- (c) 14 : 11 (d) 8 : 11

50. The population of a village is 5000 and it increases at the rate of 2% every year. After 2 years, the population will be :

- (a) 5116 (b) 5202
- (c) 5200 (d) 5204

51. A customer asks for the production of x number of goods. The company produces y number of goods daily. Out of which $z\%$ are unfit for sale. The order will be completed in :

- (a) $\frac{x}{100y(1-z)}$ days (b) $\frac{100yz}{x}$ days
- (c) $\frac{100x}{y(100-z)}$ days (d) $\frac{100}{y(z-1)}$ days

LEVEL (2)

1. In the Awadh school Gomti Nagar, there are 500 students. 60% of the students are boys, 40% of whom play hockey and the girls don't play hockey. 75% of girls play badminton. There are only two games to be played. The number of students who don't play any game is :
 (a) 10% (b) 36%
 (c) 46% (d) can't be determined
2. A fraction in reduced form is such that when it is squared and then its numerator is increased by 25% and the denominator is reduced to 80% it results in $\frac{5}{8}$ of the original fraction. The product of the numerator and denominator is :
 (a) 6 (b) 12
 (c) 10 (d) 7
3. In the Chidambaram's family the ratio of expenses to the savings is 5 : 3. But his expenses is increased by 60% and income increases by only 25% thus there is a deficit of Rs. 3500 in the savings. The increased income of Mr. Chidambaram's family is :
 (a) Rs. 35,000 (b) Rs. 28,000
 (c) Rs. 25,000 (d) Rs. 18,500
4. In the Presidency College two candidates contested a presidential election. 15% of the voters did not vote and 41 votes were invalid. The elected contestant got 314 votes more than the other candidate. If the elected candidate got 45% of the total eligible votes, which is equal to the no. of all the students of the college. The individual votes of each candidate are :
 (a) 2250 and 1936 (b) 3568 and 3254
 (c) 2442 and 2128 (d) 2457 and 2143
5. The annual earning of Mr. Sikkawala is Rs. 4 lakhs per annum for the first year of his job and his expenditure was 50%. Later on for the next 3 years his average income increases by Rs. 40,000 per annum and the saving was 40%, 30% and 20% of the income. What is the percentage of his total savings over the total expenditure if there is no any interest is applied on the savings for these four years :
 (a) $49\frac{37}{87}\%$ (b) $41\frac{73}{83}\%$
 (c) 53% (d) none of these
6. In an election only two candidates contested 20% of the voters did not vote and 120 votes were declared as invalid. The winner got 200 votes more than his opponents thus he secured 41% votes of the total voters on the voter list. Percentage votes of the defeated candidate out of the total votes casted is :
 (a) 47.5% (b) 41%
 (c) 38% (d) 45%
- Directions for questions 7, 8 and 9:** Pujari ji, the chief of a temple's trust, has a beautiful daughter Nirjala and a son in law, Radhey. Pujarin, the wife of Pujariji, lives her own life by receiving the alms from the devotees and receives 9.09% of her husband and the daughter together. The earning of Nirjala in each month is Rs. 8000 less than her husband Radhey. The earning of Pujariji and Radhey together is Rs. 30,000 per month. The earning of Radhey and Nirjala together is Rs. 133.33% greater than that of Pujariji.
7. The average earning of each Pujari ji, Nirjala and Radhey is :
 (a) Rs. 13333.33 (b) Rs. 888.88
 (c) Rs. 15,000 (d) none of these
8. What is the earning of Pujarin from the alms?
 (a) Rs. 1800 (b) Rs. 2000
 (c) Rs. 3600 (d) can't be determined
9. The earning of Radhey is how much per cent greater than that of his wife?
 (a) 50% (b) 80%
 (c) $\frac{11}{13}\%$ (d) none of these
10. A sales executive gets 20% bonus of the total sales value and 10% commission besides the bonus on the net profit after charging such commission. If the total sales value be Rs. 10 lakh per annum and the total profit of the company be Rs. 1.32 lakh, then his total earning per annum will be, given that he is not entitled to receive any fixed salary from the company :
 (a) 2.3 lakh (b) 3.2 lakh
 (c) 2.32 lakh (d) 2.12 lakh
11. Mr Scindia after selling 5.5% stock at Rs. 92 realizes Rs. 32200. Then he invested $\frac{1}{3}$ of the amount in 4.5% stock at Rs. 92, $\frac{2}{5}$ of the amount at Rs. 115 in 5% stock and the remaining in 6% stock at Rs. 56. The change in his income is :
 (a) Rs. 56 loss (b) Rs. 78 profit
 (c) Rs. 80 profit (d) Rs. 70 loss
12. Each edge of a cube is increased by 20% then the percentage increase in surface area of the cube is :
 (a) 144% (b) 40%
 (c) 44% (d) 72.8%
- Directions for question number 13 and 14:** Pati, Patni and Woh (the three persons) were playing a game. At the beginning of the game Pati and Patni together had 100% more money than Woh. Patni and Woh together had 300% more than Pati. By the end of the game Pati and Patni together had 100% more money than Woh had and Pati had 12.5% less money than Patni and Woh together had. Finally Pati gained Rs. 800 by the end of the game.
13. Who has suffered the loss?
 (a) Patni (b) Woh
 (c) Patni and Woh both (d) can't be determined
14. The percentage change of money of Patni is :
 (a) 40% (b) 30%
 (c) 57.1428% (d) 42.857%
15. The raw material and manufacturing cost formed individually 70% and 30% of the total cost and the profit percentage is 14.28% of the raw material. If the cost of raw material increase by 20% and the cost of manufacturing is increased by 40% and the selling price is increased by 80% then the new profit percentage is :
 (a) 57% (b) 65.8%
 (c) 60% (d) can't be determined

16. A, B, C and D purchased a fine house for Rs. 56 lakhs. The contribution of B, C and D together is 460% that of A, alone. The contribution of A, C and D together is 366.66% that of B's contribution and the contribution of C is 40% that of A, B and D together. The amount contributed by D is :
 (b) 12 lakh
 (d) 18 lakh
 (c) 16 lakh

17. In a village three people contested for the post of village pradhan. Due to their own interest, all the voters voted and no one vote was invalid. The losing candidate got 30% votes. What could be the minimum absolute margin of votes by which the winning candidate led by the nearest rival, if each candidate got an integral per cent of votes?
 (b) 2
 (d) none of these

18. Every day a mango seller sells half his stock, 10% of the stock overnight gets spoiled. If 1983 mangoes rotted over 3 nights then how many did he start with on the first day?
 (b) 24,000
 (d) 32,000
 (a) 25,000
 (c) 30,000

19. A man lost half of his initial amount in the gambling after playing 3 rounds. The rule of gambling is that if he wins he will receive Rs. 100, but he has to give 50% of the total amount after each round. Luckily he won all the three rounds. The initial amount with which he had started the gambling was :
 (a) $\frac{500}{3}$
 (b) $\frac{700}{3}$
 (c) 300
 (d) 600

20. In a factory there are three types of Machines M_1 , M_2 and M_3 which produces 25%, 35%, and 40% of the total products respectively. M_1 , M_2 and M_3 produces 2%, 4% and 5% defective products, respectively. What is the percentage of non-defective products?
 (a) 89%
 (b) 97.1%
 (c) 96.1%
 (d) 86.1%

21. A company has 12 machines of equal efficiency in its factory. The annual manufacturing expenses are Rs. 24,000 and the establishment charges are Rs. 10,000. The annual output of the company is Rs. 48,000. The annual output and manufacturing costs are directly proportional to the no. of machines while the share holders get the 10% profit, which is directly proportional to the annual output of the company. If 8.33% machines remained close throughout the year. Then the percentage decrease in the amount of Share holders is :
 (a) 16.66%
 (b) 14.28%
 (c) 8.33%
 (d) none of these

22. In every month Ravindra consumes 25 kg rice and 9 kg wheat. The price of rice is 20% of the price of wheat and thus he spends total Rs. 350 on the rice and wheat per month. If the price of wheat is increased by 20% then what is the percentage reduction of rice consumption for the same expenditure of Rs. 350? Given that the price of rice and consumption of wheat is constant :
 (a) 36%
 (b) 40%
 (c) 25%
 (d) 24%

23. My friend Siddhartha Ghosh is working in the life insurance Corporation of India (LIC). He was hired on the basis of commission and he got the bonus only on the first years period of 10 year. His commission in the first second, third, fourth and for the rest of the years is 20%, 16% 12% 10% and 4% respectively. The bonus is 25% of the commission. If the annual premium is Rs. 20,000 then what is his total commission if the completion of the maturity of all the policies is mandatory :
 (a) Rs. 174,00
 (b) Rs. 23,600
 (c) Rs. 15,000
 (d) Rs. 15,500

24. **Directions for question number 24 and 25:** DELL Computer has two branches : One in Ohio and second in Texas : The total no. of employees in Ohio office grew this year by 25% to 750 but the ratio of male to female employees is same as in the previous year. The no. of employees in the Texas office grew this year by 9.09% to 1200. The ratio of male to female employees last year in the Texas office was 5 : 6 and the no. of male employees in the Ohio office was 20% less than that of Texas office.

24. The total no. of female employees this year in both the offices is :
 (a) 654
 (b) 546
 (c) 950
 (d) can't be determined
25. The total no. of employees in both the offices last year was :
 (a) 1500
 (b) 1700
 (c) 1650
 (d) can't be determined
26. A shepherd had n goats in the year 2000. In 2001 the no. of goats increased by 40%. In 2002 the no. of goats declined to 70%. In 2003 the no. of goats grew by 30%. In 2004, he sold 10% goats, then he had only 34,398 goats. The percentage increase of the no. of goats in this duration was :
 (a) 14.66%
 (b) 16.66%
 (c) 20%
 (d) 33.33%

27. In the above question in which year the no. of goats was minimum?
 (a) 2000
 (b) 2001
 (c) 2002
 (d) 2004

28. **Directions for questions number 28, 29 and 30:** In the IGNOU (Indira Gandhi National Open University) there are total 16,000 students pursuing MBA, which offers the specialization only in Finance, HR and Marketing. IGNOU accepts only Science, Commerce and Engineering students for the two years course of MBA. The number of science students is 166.66% of the Commerce students. Number of Engineering students is equal to the number of Science and Commerce students together. Each student can specialize in only one of the marketing, HR and Finance. 20% of Science students opted the Finance, which is 16.66% less than the no. of Commerce students who opted Finance. The total Finance students is equal to 18% the total strength of the MBA students. 32% of Science students opted HR. Commerce students who opted HR is equal to 25% of total students specializing in Finance and Engineering students equal to 6.5% of the total strength of the MBA students opted HR.

28. The number of Engineering students who opted marketing is :
 (a) 7850 (b) 7500
 (c) 8850 (d) none of these

29. The percentage of Commerce students who opted HR over the total strength of the MBA students is :
 (a) 6.6% (b) 42.5%
 (c) 4.5% (d) 62.5%

30. The most preferable course among the MBA students is :
 (a) Finance (b) HR
 (c) Marketing (d) I. T and systems

31. $P\%$ of the students of a class passed the exam. $g\%$ of the passed students are girls and $b\%$ of the fail students are boys. The percentage of passed boys over the failed girls is :
 (a) $\left(\frac{bg}{p} \times 100 \right)$ (b) $\frac{100(100-g)p}{(100-p)(100-b)}$
 (c) $\frac{(100-g)(100-b)}{(100-p)}$ (d) none of these

2. In the Polo hospital some patients who were suffering from the Hepatitis-B were admitted for the treatment, but 9% of the patients were died within half an hour. After treatment, the percentage of patients cured out of the remaining was only 80%. Out of these patients only 70% are completely cured out and the remaining were partially cured out which were equal to 153 patients. The no. of patients (approx.) who were admitted for the treatment for the same was :
 (a) 400 (b) 678
 (c) 560 (d) 700

The total cost of setting up a sugar cane factory is Rs. 1 crore, which produces 5000 ton per annum. Sugar is being sold at Rs. 18 per kg. Manufacturing cost including raw material is Rs. 3.2 per kg, labour and packing charges are Rs. 1.8 per kg. Maintenance and utilities expenses are Rs. 2 per kg and the general expenses (ie all the rest charges) are Rs. 3 per kg, 20% taxes are being paid of the gross annual earnings, then the net profit of the production of the factory per annum is :
 (a) Rs. 4.2 crore (b) Rs. 3.2 crore
 (c) 5.4 crore (d) none of these

A student appeared in the Mock CAT. The test paper contained 3 sections namely QA, DI and VA. The percentage marks in VA was equal to the average of the percentage marks in all the 3 sections. Coincidentally, if we reverse the digits of the percentage marks of QA we get the percentage marks of DI. The percentage marks in VA scored by the student could be :
 (a) 48 (b) 66
 (c) 69 (d) 81

The pressure of a definite mass of a gas is directly proportional to the temperature and inversely proportional to the volume under the given conditions. If temperature is increased by 40% and the volume is decreased by 20% then the new pressure will:
 (a) be increased by 75% (b) reduce to 25%
 (c) increase by 20% (d) increase by 28%

A computer typist types a page with 20 lines in 10 minutes but leaves 8% margin on the left side of the page. Now he has to

Page Now has ^{(c) 1300} Compiled By Jasjeet

- Percentage
per

to type 23 pages with 40 lines on each page which he leaves 25% more margin than before. How much time is now required to type these 23 pages

(a) $7\frac{1}{2}$ hrs (b) $7\frac{2}{3}$ hrs
(c) $23\frac{1}{2}$ hrs (d) 3.916 hrs

37. A company made a cuboidal box of size $16 \times 12 \times 5$ to sell the ice cream, but later on it was found that the capacity of the box was 14.28% less than the required capacity while the height of the box was correct, which is 5 inches. As per the requirement he had to increase the length and breadth of the box in equal amount then the percentage increase in the area of the base of the box is
(a) 12.5% (b) 6.66%
(c) 16.66% (d) none of these

38. In Sabarmati Express, there are as many wagons as there are the no. of seats in each wagon and not more than one passenger can have the same berth (seat). If the middlemost compartment carrying 25 passengers is filled with 71.428% of its capacity, then find the maximum no. of passengers in the train that can be accommodated if it has minimum 20% seats always vacant
(a) 500 (b) 786
(c) 980 (d) can't be determined

39. The prepaid card of Reliance Infocom gives 19% less talktime than the prepaid card of Tata Indicom, having same price. Again the post-paid card of same price of Tata Indicom gives 10% less talktime than its prepaid card.
Similarly the post paid card of same price of Reliance gives 11.11% less talk time than its prepaid card. How much percent less talk time we get from the Reliance post paid card than the post paid card of Tata Indicom?
(a) 21.11% (b) 20%
(c) 30.11% (d) none of these

40. In the half yearly exam only 70% of the students were passed. Out of these (passed in half yearly) only 60% student are passed in annual exam. Out of those who did not pass the half yearly exam, 80% passed in annual exam. What per cent of the students passed the annual exam?
(a) 42% (b) 56%
(c) 66% (d) none of these

1. The marks obtained by the students of a school is given below : maximum marks are 50.

Marks	Percentage of Students
< 10	15%
< 20	32%
< 30	40%
< 40	70%
< 50	100%

The ratio of no. of boys to no. of girls who passed the exam is 7 : 6. It is known that a student can pass the exam only when he obtained at least 20 marks in the exam. The total no. of students in the school if the no. of girls who are passed is 408.

Percentages

Direction for question number 42 to 45: After defeating Ravana, Ram and his family won a lot of valuable assets in the war. It consists of horses, chariots and some land of Ravans's kingdom. The cost of each horse and chariot was Rs. 20,000 and Rs. 8,000 respectively while the cost of 1 acre land was Rs. 5000. All the property was shared among the four persons in such a way that Ram and Sita got together the same wealth as Laxman and Urmila got together. Ram got more than Sita and Laxman got more than Urmila. Ram got $\frac{1}{3}$ rd horses and 20%

chariots while Laxman received 50% chariots as the 50% of his total wealth. The no. of horses that Ram and Sita got together was 50% more than that of Laxman and Urmila together had. Sita got 8 horses and Urmila got 7 horses but the Ram and Sita got equal no. of Chariots and Urmila got 20 chariots less than that of Laxman. Urmila got twice the land than that of Sita but 20% less than Laxman.

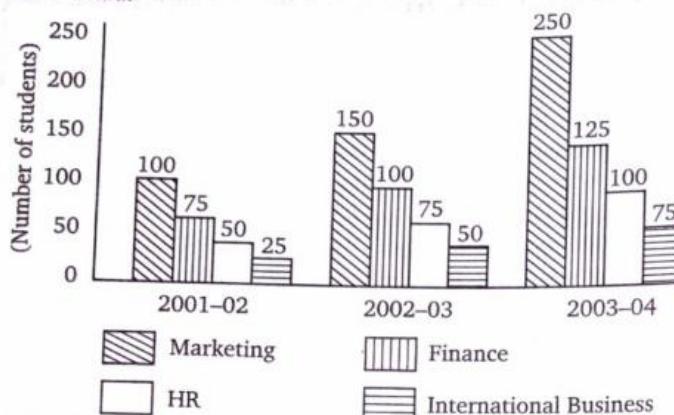
42. What is the difference between the wealth of Ram and wealth of Urmila?
 - (a) 1.2 lakh
 - (b) 1 lakh
 - (c) 1.4 lakh
 - (d) can't be determined
43. If Laxman wanted to exchange all his chariots with the horses, then who can exchange with his/her horses in terms of wealth :
 - (a) Ram
 - (b) Sita
 - (c) Urmila
 - (d) can't be determined
44. The wealth of Urmila is how many per cent less than that of Laxman :
 - (a) 42%
 - (b) 45%
 - (c) 35%
 - (d) none of these
45. The wealth due to land and chariot together is how much greater, in per cent, than the wealth due to horses.
 - (a) 25%
 - (b) 20%
 - (c) 33.33%
 - (d) none of these
46. A big cube is formed by rearranging the 160 coloured and 56 non-coloured similar cubes in such a way that the exposure of the coloured cubes to the outside is minimum. The percentage of exposed area that is coloured is:
 - (a) 25.9%
 - (b) 44.44%
 - (c) 35%
 - (d) none of these
47. Selection into IIMs (Indian Institutes of Management) is quite simple. In our coaching institute some students qualified CAT

(The first stage of entrance into IIMs) but coincidentally the no. of boys who qualified the CAT was equal to the no. of girls. Besides these boys and girls got the calls from only IIM Ahmedabad and IIM Bangalore, but each of these from both the IIMs. 60% of the boys failed in the group discussion (the second phase of the selection process) and thus equal no of boys (but distinct) appeared for the personnel interview of IIM-A and IIM-B (interview is the third and final stage of selection of a candidate) but 20% of the boys who appeared for the interview of IIM-A and 60% of the boys who appeared for the interview of IIM-B failed. If it is possible that a candidate can receive the calls from more than one IIMs but he/ she can face the interview of only one IIM. Given that only 24 boys from our coaching institute were selected by the IIM-A and IIM-B also a candidate can appear for the next stage only if he/she qualifies the previous stage of the exam, then find the no. of girls who qualified the CAT (Common Admission Test).

- (a) 100
 - (b) 250
 - (c) 300
 - (d) 600
48. In an office there were initially n employees. The HR manager first hired $P\%$ employees then after a month $q\%$ employees left the office, then there were finally n employees remained in the office, the value of $p - q$ is :
- (a) pq
 - (b) $\frac{pq}{100}$
 - (c) $\frac{p}{q}$
 - (d) none of these
49. In the Garbar Jhala, Aminabad a shopkeeper first raises the price of a Jewellery by $x\%$ then he decreases the new price by $x\%$. After one such up down cycle, the price of a Jewellery decreased by Rs. 21025. After a second updown cycle the jewellery was sold for Rs. 484416. What was the original price of the jewellery.
- (a) Rs. 5,00,000
 - (b) Rs. 6,00,625
 - (c) Rs. 525625
 - (d) RS. 5,26,000
50. The amount of work in a leather factory is increased by 50%. By what per cent is it necessary to increase the number of workers to complete the new amount of work in previously planned time, if the productivity of the new labour is 25% more.
- (a) 60%
 - (b) 66.66%
 - (c) 40%
 - (d) 33.33%



Directions for question number 1, 2 and 3: The bar graph shown below reveals the data about the no. of students in different disciplines of MBA at a prominent Business School in India.



- The growth rate of Finance compared to that of marketing is:
 - less
 - equal
 - greater
 - none of these
- Total no. of MBA students in the session of 2004-05 if the no. of students in 2004-2005 is increasing by 9.09% over the previous year :
 - 555
 - 600
 - 777
 - none of these
- In the session of 2002-03 what percentage of MBA students are studying International Business?
 - 13.33%
 - 25%
 - 6.66%
 - 24%

Directions for question number 4 to 7: The following table gives the sales details of the books for CAT written by Sarvesh.

Year	Quant. Aptitude	Data Interpretation	Verbal Ability	Log. Reasoning
2000	4000	3750	4140	4350
2001	4200	3870	4260	4400
2002	4370	3990	4255	4500
2003	4268	3868	5371	4690
2004	4750	4900	5476	4710
2005	4800	5000	5500	4800

- What is the growth rate of sales of Quantitative Aptitude from 2000 to 2005?
 - 8%
 - 25%
 - 20%
 - 40%
- Which of the categories shows the lowest growth rate from 2000 to 2005?
 - Q.A
 - DI
 - VA
 - LR
- Which category had the highest growth rate in the period?
 - QA
 - DI
 - VA
 - LR

- Which of the categories had either a consistent growth or consistent decline in the period shown?
 - QA
 - DI
 - VA
 - LR

Directions for question number 8 to 10: In India there were only three bicycle making companies in the given period. The following table shows the production of units (in 000).

Year	HERO	ATLAS	AVON
1990	2.97	1.75	3.77
91	4.22	2.48	4.55
92	5.95	3.14	4.5
93	6.28	3.01	4.76
94	6.33	4.12	4.74
95	8.50	4.21	4.26

UPTREND IN BICYCLES PRODUCTION IN INDIA

- The simple average rate of growth of production of Hero cycles from 1990-95 :
 - 37%
 - 42%
 - 27%
 - 31.5%
- Which of the following statements is/are correct ?
 - Atlas cycles have recorded the fastest growth rate.
 - Total bicycles production was the highest in 1993
 - Hero cycles on an average account for 48% of total bicycles production
 - I only
 - II only
 - III only
 - none of these
- Atlas cycles on an average account for what percentage of the total bicycles production :
 - 15%
 - 23.4%
 - 34.5%
 - 29%

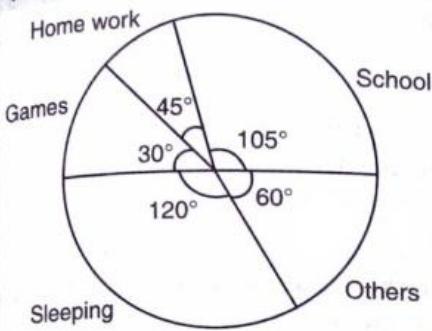
Directions for question number 11 to 14: Answer the questions based on the following information, which gives data about certain butter producer companies in India.

Name of the Company	Production ('000 tonnes)	Capacity Utilisation (%)	Sales ('000 tonnes)	Total sales value (in crore)
Amul	1.54	59.35	1.47	17.45
Nestle	1.64	64.80	1.26	15.25
Parag	2.48	71.20	2.03	26.75
Amrit	2.97	76.50	2.55	31.15
Total (including others)	11.60	61.30	10.67	132.80

- What is the maximum production capacity (in '000 tonnes) of Nestle for Butter?
 - 2.53
 - 2.84
 - 2.07
 - 2.97
- Which company out of the four companies mentioned above has the maximum unutilised capacity in ('000 tonnes)?
 - Amul
 - Nestle
 - Parag
 - Amrit

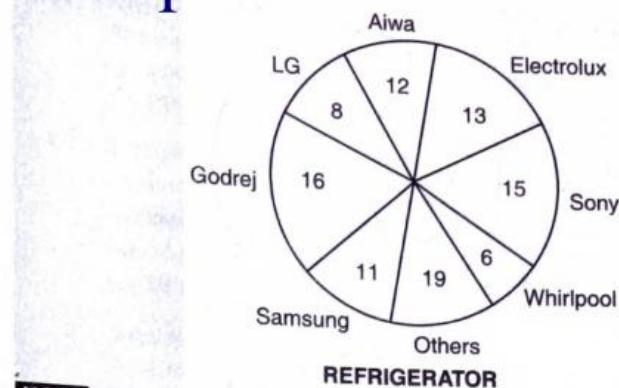
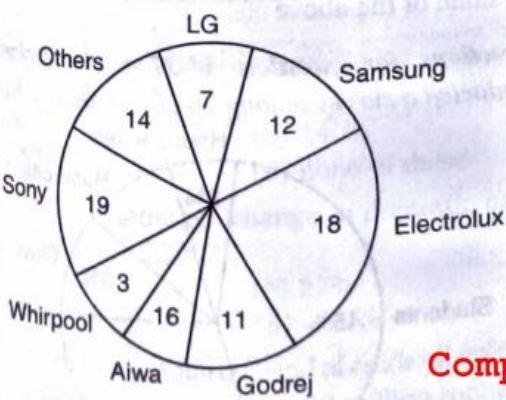
13. What is the approximate total production capacity (in tonnes) for butter in India?
 (a) 7.8
 (b) 18.9
 (c) 11.60
 (d) data insufficient
14. What per cent of the total market share (by sales value) is controlled by others?
 (a) 32%
 (b) 83%
 (c) 67%
 (d) data insufficient

Directions for (Q. no. 15 to 19): The following pie chart shows the hourly distribution of all the major activities of a student.



15. The percentage of time which he spends in school is :
 (a) 38%
 (b) 30%
 (c) 40%
 (d) 25%
16. How much time (in per cent) he spends in games in comparison to sleeping?
 (a) 30%
 (b) 40%
 (c) 25%
 (d) none of these
17. If he spends the time in games equal to the home work and remains constant in other activities, then the percentage decrease in time of sleeping :
 (a) 15%
 (b) 12.5%
 (c) 20%
 (d) none of these
18. What is the difference in time (in hours) spends in school and in home work :
 (a) 2
 (b) 3
 (c) 4
 (d) 8
19. If he spends $\frac{1}{3}$ rd time of home work in Mathematics then the no. of hours spends in rest of the subjects in homework :
 (a) 1
 (b) 2
 (c) 3
 (d) 4

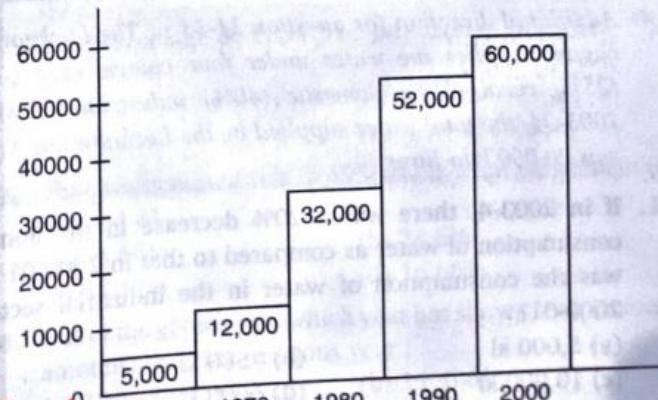
Directions for question number 20 to 23 : The two pie charts show the market share of different companies which produces TV and Refrigerator (both) in the first quarter of 2005-06.



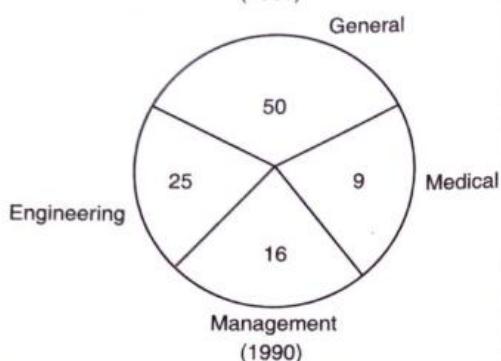
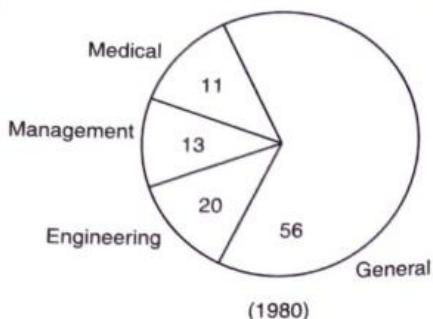
NOTE The graph is not shown to scale.

20. The difference in the angle subtended by Sony TV. and refrigerator is :
 (a) 7.2°
 (b) 14.4°
 (c) 21.6°
 (d) none of these
21. If the turn over of Samsung TV is Rs. 31 crores and of Samsung refrigerator is Rs. 9 crore, then what is the overall market share of Electrolux TV and refrigerator combined?
 (a) 33.33%
 (b) 28%
 (c) 16.7%
 (d) 65%
22. If the turnover in the first quarter of 2005-06 of Electrolux TV and Refrigerator is Rs. 42 crores and Rs. 6 crores respectively, then what is the average annual turnover of Godrej and Aiwa in both the product categories together?
 (a) Rs. 304 crores
 (b) Rs. 284 crores
 (c) RS. 178 crores
 (d) none of the above
23. Which of the following can't be deduced from the given data :
 (a) The angular difference between Samsung TV and Electrolux refrigerator is 3.6° .
 (b) Sony is the market leader in the TV and Refrigerator segment combined.
 (c) For every Rs. 100 turnover of Whirlpool Refrigerator, the difference in the turnover of Electrolux and Samsung Refrigerator is Rs. 33.34 crore
 (d) none of the above

Directions for question number 24 to 28 : Number of different colleges in India in different years is given in the graph below. Distribution of different colleges in the years 1980 and 1990 shown in the pie charts below :



NOTE General courses include all the courses except Medical Engineering and management



24. What is percentage increase in the number of colleges from 1960 to 1990?
 (a) 1000% (b) 940%
 (c) 1040% (d) 470%
25. The growth rate in no. of medical colleges in 1980 to 1990 is
 (a) 33% (b) 52%
 (c) 36% (d) 39%
26. By what percentage did the no. of Engineering colleges go up from 1960 to 1970?
 (a) 38% (b) 28%
 (c) 42% (d) can't be determined
27. Till 1990 what was the highest increase in the number of colleges in any decade?
 (a) 150% (b) 166.66%
 (c) 200% (d) 140%
28. If the projected increase in the number of colleges in 2000 over 1990 is to be the same in all the categories of colleges, the percentage of Medical colleges in 2000 will be:
 (a) 9% (b) 11%
 (c) 7% (d) 13%

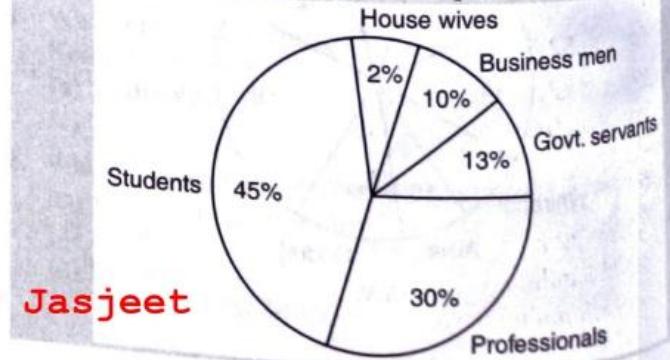
Directions for question number 29 to 33 : Answer the questions based on the following information. The following table gives the tariff (in paisa per kilo-litre) levied by the Lucknow Jal Nigam in 2003-04 in four sectors and the region within them. (Each sector is divided into 5 regions). The table gives the percentage change in the tariff as compared to 2000-01.

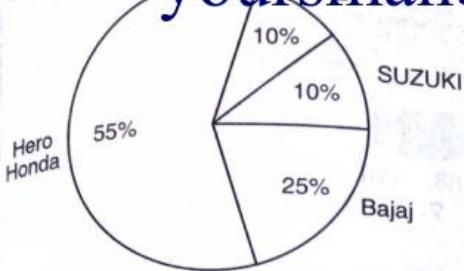
	Region 1		Region 2		Region 3		Region 4		Region 5	
	P/kl	%								
Sector 1	1000	+ 25	400	+ 14.28	250	- 16.66	625	+ 4.166	720	+ 20%
Sector 2	800	+ 33.33	375	+ 7.14	350	- 12.5	750	+ 7.14	360	- 10
Sector 3	625	- 16.66	525	- 12.5	400	+ 14.28	240	- 4%	320	- 20
Sector 4	575	- 4.166	800	- 20%	500	- 16.66	360	+ 20%	400	- 11.11

29. If the amount of water consumed by the various regions in sector 1 is the same, then as compared to 2000-01 the net tariff in 2003-04 :
 (a) increased by 20% (b) increased by 13%
 (c) decreased by 12% (d) decreased by 20%
30. What was the approximate average tariff in region 2 in 2000-01?
 (a) 450 (b) 675
 (c) 575 (d) 525
- Additional direction for question 31-33 :** The Lucknow Jal Nigam supplies the water under four categories : Urban (25%) rural (15%) domestic (40%) industrial (20%). In 2003-04, the total water supplied by the Lucknow Jal Nigam was 20,000 kilo-litres.
31. If in 2003-4, there was a 20% decrease in the domestic consumption of water as compared to that in 2000-01 what was the consumption of water in the industrial sector in 2000-01?
 (a) 5,000 kl (b) 7500 kl
 (c) 10,000 kl (d) 6000 kl

32. In the given two years, what is the total tariff paid by the Urban sector?
 (a) Rs. 16,000 (b) Rs. 48,000
 (c) Rs. 23,000 (d) can't be determined
33. Which of the following statements is true?
 (a) The average tariff in region 2 is 625
 (b) The average tariff in region 4 is greater than the average tariff in region 5
 (c) In 2000-01 the industrial sector contributed about 30% of the total revenue from water supply
 (d) none of the above

Directions for question 34-37 : A marketing company conducted a survey among 10,000 person in Kanpur :





It was observed that some people have more than one bike but from only one company i.e., a particular person can have more than one bike of Hero Honda, but not from Bajaj etc. and vice versa. Thus there were total 12,000 bikes with 10,000 persons used for survey. There are only four companies operating in this market.

34. If each of Students, Govt. Servants and housewives use a Hero Honda bike (motorcycle), what per cent of the remaining people drive Hero Honda bike?
 (a) 15% (b) 25%
 (c) 20% (d) none of these

35. If the number of people who drive one, two and three bikes are in the ratio 15 : 3 : 1 what is the number of people in the survey who do not drive even a single bike?
 (a) 750 (b) 400
 (c) 600 (d) 500

36. If all the persons driving more than one bike drive only Hero Honda what is the number of people who drive single Hero Honda bike (the data can be used from previous question if necessary)?
 (a) 2400 (b) 2100
 (c) 4200 (d) 2600

37. If 20% of the persons who drive Bajaj's bike also drive another bike. What is the number of people who drive only Bajaj's bike?
 (a) 2400 (b) 2500
 (c) 2660 (d) none of these

4 Directions for question 38-42 : A table below shows the production and imports of crude oil (in '000 tonnes). Domestic production of crude oil is total of on-shore and off-shore production, which is supplemented by imports to meet the total demand of crude oil in the country.

Year	2001	2002	2003
On shore	12,000	11,500	11,000
Off shore	11,000	19,000	16,000
Imports	21,000	24,000	30,000

(in '000 tonnes)

38. What was the percentage of domestic production of crude oil over imports in 2001?
 (a) 80% (b) 140%
 (c) 109.52% (d) none of these
39. What was the percentage change in domestic production of crude oil from 2001-2003?
 (a) 14% (b) 27%
 (c) 17.4% (d) - 10%
40. What is the average of total demand of crude oil over the period?
 (a) 185 million tonnes (b) 52 million tonnes
 (c) 18.5 million tonnes (d) 35 million tonnes

41. What was the approx-percentage increase in imports of crude oil from 2001 to 2003 :
 (a) 49% (b) 65%
 (c) 43% (d) none of these

42. If in the year 2004, off-shore production declines by 12.5% production on-shore remains the same and total demand increases by 2% what will be the imports of crude oil in 2004?
 (a) 33.14 million tonnes (b) 63 million tonnes
 (c) 39 million tonnes (d) 25 million tonnes

43. Directions : (Q. no. 43 to 50) Solve the following question on the basis of given data in the following table :

Production of Rice in India

Year	Quantity (in tonnes)	Percentage change over the previous year
1920-21	1,34,300	+ 06.25%
1930-31	10,97,172	+ 12.50%
1940-41	2,64,280	+ 11.11%
1950-51	1,27,890	- 09.09%
1960-61	2,01,924	+ 20.00%
1970-71	1,12,325	- 16.66%
1980-81	2,13,465	- 25.00%
1990-91	1,69,368	+ 33.33%
2000-01	100,956	+ 50.00%
2010-11	23,800	- 83.33%

43. What is the production of rice in 1959-60?
 (a) 1,84,250 (b) 1,68,270
 (c) 242308.8 (d) none of these
44. What is the production of rice in 1949-50?
 (a) 116263.63 (b) 1,23,460
 (c) 1,40,679 (d) none of these
45. What is the total production of rice in 1919-20 and 1929-30 and 1939-40?
 (a) 13,26,400 (b) 13,39,516
 (c) 1142693.75 (d) can't be determined
46. The production of rice in 2000-01 forms what percentage of total production out of the given years?
 (a) 3.12% (b) 3.23%
 (c) 4.128% (d) 6.45%
47. What is the difference in production of rice in 1969-70 and 1979-80?
 (a) 149830 (b) 175752
 (c) 53,890 (d) none of these
48. The percentage decrease in production of rice from 1929-30 to 1949-50
 (a) 88.3% (b) 85.57%
 (c) 66.66% (d) none of these
49. The production of rice in 1959-60 is what percentage of rice in 1960-61.
 (a) 86.66% (b) 75.6%
 (c) 83.33% (d) 16.66%
50. Out of the given years which year has shown least increase (in amount) over the previous year?
 (a) 1940-41 (b) 1960-61
 (c) 1920-21 (d) 2000-01



Answers

INTRODUCTORY EXERCISE-5.1

1. (i) 50, (ii) 54, (iii) 112.5, (iv) 400, (v) 2 quintal, (vi) 544.5, (vii) 88, (viii) 6 minutes, (ix) 200, (x) 2 lakh rupees
 2. Rs. 4,500 3. 28 metres 4. 750 5. 190 and 1520 6. 750 7. 102 km/hr 8. Rs. 2200 9. 75 10. 750
 11. 60000 12. 255

INTRODUCTORY EXERCISE-5.2

1. (i) 5%, (ii) 15.625, (iii) 33.33%, (iv) 24%, (v) 20%, (vi) 150%, (vii) 66.66%, (viii) 43.75%
 2. (i) 4%, (ii) 75%, (iii) 6.25%, (iv) 33.33%, (v) 0.4166%, (vi) 7.5%
 3. 85.33% 4. 70% 5. 97% 6. 150% 7. $33\frac{1}{3}\%$ 8. 90% 9. 12.5% 10. 4%

INTRODUCTORY EXERCISE-5.3

1. (b)	2. (b)	3. (b)	4. (c)	5. (c)	6. (c)	7. (d)	8. (c)	9. (a)	10. (b)
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LEVEL-1

1. (b)	2. (b)	3. (b)	4. (c)	5. (d)	6. (d)	7. (d)	8. (c)	9. (b)	10. (d)
11. (d)	12. (b)	13. (c)	14. (b)	15. (a)	16. (b)	17. (c)	18. (a)	19. (c)	20. (b)
21. (c)	22. (d)	23. (d)	24. (b)	25. (a)	26. (c)	27. (b)	28. (c)	29. (b)	30. (c)
31. (a)	32. (b)	33. (b)	34. (c)	35. (b)	36. (c)	37. (b)	38. (c)	39. (c)	40. (b)
41. (a)	42. (d)	43. (a)	44. (c)	45. (d)	46. (d)	47. (b)	48. (c)	49. (c)	50. (b)
51. (c)									

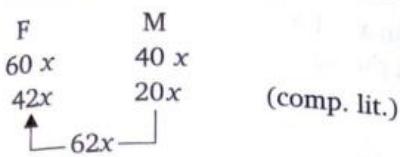
LEVEL-2

1. (d)	2. (c)	3. (a)	4. (d)	5. (d)	6. (d)	7. (a)	8. (d)	9. (b)	10. (d)
11. (c)	12. (c)	13. (a)	14. (c)	15. (a)	16. (d)	17. (c)	18. (b)	19. (b)	20. (c)
21. (b)	22. (a)	23. (a)	24. (d)	25. (b)	26. (a)	27. (c)	28. (d)	29. (c)	30. (c)
31. (b)	32. (d)	33. (b)	34. (b)	35. (a)	36. (a)	37. (c)	38. (c)	39. (b)	40. (c)
41. (c)	42. (a)	43. (a)	44. (c)	45. (b)	46. (b)	47. (a)	48. (b)	49. (c)	50. (c)

FINAL ROUND

1. (a)	2. (b)	3. (a)	4. (c)	5. (d)	6. (b)	7. (d)	8. (a)	9. (d)	10. (b)
11. (a)	12. (a)	13. (b)	14. (a)	15. (b)	16. (c)	17. (b)	18. (c)	19. (b)	20. (b)
21. (c)	22. (a)	23. (b)	24. (b)	25. (a)	26. (d)	27. (b)	28. (b)	29. (b)	30. (c)
31. (a)	32. (d)	33. (b)	34. (a)	35. (d)	36. (b)	37. (a)	38. (c)	39. (c)	40. (b)
41. (c)	42. (a)	43. (b)	44. (c)	45. (b)	46. (c)	47. (a)	48. (b)	49. (c)	50. (c)

LEVEL 1



∴ Female comp. literate $1600 \times \frac{42}{100} = 672$

2. $(10,00,000) \times 0.75 \times 0.80 \times 0.85 = \text{Rs.} 5,10,000$

3. $2000 \times \frac{x}{100} + 4000 \times \frac{y}{100} = 320$

and $2000 \times \frac{x}{100} + 10,000 \times \frac{y}{100} = 680$

$x = 4$ and $y = 6$

$x - y = -2$

4. Go through option $(40 \times 0.4) + (40)^2 = 1616$

$$\left(100 \times \frac{1616}{40} = 4040 \right)$$

Alternatively: $(x \times 0.4) + x^2 = \frac{x \times 4040}{100}$

$\Rightarrow x^2 = 40x \Rightarrow x = 40$

5. Can't be determined. We don't know whether there are some male employees who have exactly Rs. 8000 per month as their salary or not.

	Physics	Chemistry
Failed	35%	45%
Passed	65%	55%

Passed in both = 22% of total student

Percentage of students who are passed in any of the Physics or Chemistry or both = $(65 + 55) - 22 = 98\%$

So, the percentage of students who are failed in both = 2%

Therefore total failed (in both the subject) students = 12

	History	Geography
Pass	$70x$	$50x$
Fail	$30x$	$50x$

both $20x$

∴ Total failed candidates = $(30x + 50x) - 20x = 60x$

Passed in both = $(100x - 60x) = 40x = 500$

Therefore total students = $100x = 1250$ $\therefore x = \frac{25}{2}$

My salary = 100

Salary of my brother = 110

Salary of my sister = 120

Salary of my wife = $230 - \left(230 \times \frac{1300}{23 \times 100} \right) = 100$

$$56 \frac{12}{23} = \frac{1300}{23}$$

9. $\frac{60 \times 8 + 16 \times 30}{16 \times 60 \times 60} \times 100 = 1.66\%$

10. Total land of Sukhiya $= \frac{480x}{0.6} = 800x$

∴ Cultivated land of village = $384000x$

∴ Required percentage $= \frac{800x}{384000} \times 100 = 0.20833$

11. Area = $l \times b$

$l = 1 \times 1$

$l = 0.8 \times 1.25$

So the area remained constant

12. Cost of fresh Mangoes + Packaging cost = Total cost

$$\begin{array}{rcl} 1 & + & 0.4 \\ 1.3 & + & 0.2 \end{array} = \begin{array}{l} 1.4 \\ 1.5 \end{array}$$

Percentage increase in cost = $\frac{0.1}{1.4} \times 100 = 7.14\%$

13. $\frac{80}{100} + \frac{66}{100} + \frac{x}{200} = \frac{320}{400}$

$\Rightarrow x = 174 \Rightarrow 87\%$

14. Male $55x$ Female $45x$

$\Rightarrow 10x = 72$

$x = 7.2$

$100x = 7.2 \times 100$

15. Let the total votes be x ,

Polled votes = $0.75x$

valid votes = $0.70x$

$A + B + C = 0.70x$

2450

0.4x

It means $B + C = 0.3x$ since given that $A = 0.4x$

Hence A is the winner.

16. Bike x Car $5x$
1.2x 5.75x

Initially total cost = $25x + 10x = 35x$

Changed cost = $28.75x + 12x = 40.75x$

Percentage change = $\frac{5.75}{35} \times 100 = 16 \frac{3}{7}\%$

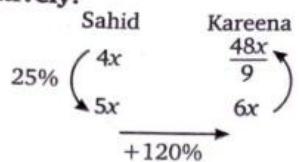
18. Go through option

S	K
15,000	18,000
12,000	16,000

Going in the reverse direction.

Hence, the presumed option is correct.

Alternatively:



$$\Rightarrow \text{Initially } S : K = 4x : \frac{48x}{9} = 3 : 4$$

$$\Rightarrow \text{Sahid's initial salary} = 12,000 \\ \text{Sahid's changed salary} = 15000$$

19. Let the smaller number be x and larger number be y

$$0.8x + 4 = 0.4y$$

$$\Rightarrow 4y - 8x = 40$$

$$\text{and } y - x = 85$$

$$\Rightarrow x = 75 \text{ and } y = 160$$

$$\therefore x + y = 235$$

$$20. \frac{x \times 220}{100} = 44$$

$$\Rightarrow x = 20 \text{ So } \frac{20 \times 44}{100} = 8.8$$

$$21. \text{Quantity} \times \text{Rate} = \text{Price}$$

$$1 \times 1 = 1$$

$$0.7 \times 1.25 = 0.875$$

$$\therefore \text{Decrease in price} = \frac{0.125}{1} \times 100 = 12.5\%$$

22. Go through options

P Q

In the 1st government $275 \leftarrow 225$ Difference = 50

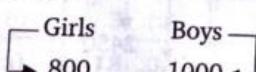
In the 2nd government $200 \leftarrow 300$ Difference = 100
Hence, the presumed option (d) is correct

NOTE It can also be solved through the equation and variables

23. Passing marks are $0.6x$

$$\text{So } 0.3x + 30 = 0.6x \Rightarrow x = 100$$

24. Go through options

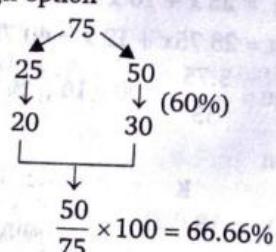


$$\text{Now, } 0.95 \times 800 + 1000 = 0.96 \times 1000 + 800$$

Hence the presumed option is correct.

$$25. \begin{array}{ccc} H & E & U \\ 0.6x & 0.24x & \rightarrow 0.16x \\ \downarrow & & \\ 3600 & \longrightarrow 2400 & (\because E : U = 24 : 16 = 3 : 2) \end{array}$$

26. Go through option



$\frac{50}{75} \times 100 = 66.66\%$

Hence, the presumed option is correct.

$$27. \begin{array}{ccc} \text{Science} & \text{Commerce} & \text{Arts} \\ \frac{x}{6} & + \frac{x}{8} & + \frac{x}{15} \\ \hline K \end{array}$$

$$\text{No. of Engineering student} = 1 - \left(\frac{x}{6} + \frac{x}{8} + \frac{x}{15} \right) = k = \frac{77x}{120}$$

When $x = 120$ (the least possible number)
then the no of Engineering students = 77

$$28. \begin{array}{ccc} \text{Copper} & & \text{Aluminium} \\ 7 & : & 4 \\ 21 \text{ kg} & & 12 \text{ kg} \\ \hline \end{array} \rightarrow 33 \text{ kg}$$

$$\text{Required total alloy} = \frac{33}{0.88} = 37.5 \text{ kg}$$

$$29. \begin{array}{c} 1.08x = 1404 \\ x = 1300 \end{array}$$

Therefore reduction in price = $1404 - 1300 = \text{Rs. 104}$

$$\left[\text{Since } 1300 + 1300 \times \frac{8}{100} = 1404 \right]$$

So you can solve it by using options.

30. Very fundamental question.

$$31. 8x + 9x + 10x = 810$$

$$\Rightarrow x = 30$$

$$\text{Total marks in QA} \longrightarrow 240$$

$$\text{DI} \longrightarrow 270$$

$$\frac{\text{VA}}{\text{RC}} \longrightarrow 300$$

$$\text{Now her score in QA} \longrightarrow \frac{240}{1.2} = 200$$

$$\text{Her score in DI} = \frac{270}{1.08} = 250$$

$$\text{Her score in VA} = \frac{300}{1.0714} = 280$$

$$\text{Her total score} = 200 + 250 + 280 = 730$$

$$32. \text{Commission up to } 10000 = 10000 \times \frac{9}{100} = 900$$

Again after 10000,

$$\text{Commission} : \text{Bonus}$$

$$9 : 3$$

$$3x : x$$

$$\therefore \text{Bonus} = (1380 - 900) \times \frac{1}{4} = \text{Rs. 120}$$

33.

$$\begin{array}{ccc} \text{Men} & & \text{Women} \\ 600x & & 400x \end{array}$$

$$\text{Total Engineer} = 480x$$

$$\text{Male Engineer} = 480x \times 0.66 = 320x$$

$$\therefore \text{Women who are Engineers} = 160x$$

$$\therefore \text{Women who are not Engineers} = 400x - 160x = 240x$$

$$\text{Required percentage} = \frac{240}{400} \times 100 = 60\%$$

34.

	Veer	Zara
In the last month	160	100
After the first change	200	75
After final change	120	120

Time \times Rate = Total earning
 $1 \times 1 = 1$
 $x \times 1.25 = 1.1$
 $x = \frac{1.1}{1.25} \times 100 = 88\%$

Thus decrease in time = 12%

Average earning	Ambani	Sahara
No. of family members	$4x$ k $6y$	$5x$ 1 $5y$
Total earning		

Average earning \times Number of family members = Total earning

$$l = \frac{5y}{5x} = \frac{y}{x}$$

$$k = \frac{6y}{4x}$$

$$\text{Required percentage} = \frac{l}{k} \times 100 = \frac{\frac{y}{x}}{\frac{6y}{4x}} \times 100$$

$$= \frac{4}{6} \times 100 = 66.66\%$$

Alternatively : After some steps you can use the options.

Year	Value
2000	100
2001	110
2002	121
2003	133.1
2004	119.79
2005	107.811
2006	97.0299

HINT $(100) \times 1.1 \times 1.1 \times 1.1 \times 0.9 \times 0.9 \times 0.9 = 97.0299$

Now, $\frac{100 - 97.0299}{100} \times 100 \approx 3\%$

30 \times 25 \times 35 = $x \times 30 \times 28$

$\Rightarrow x = 31.25$

It means 32 pages.

So, the percentages increase in the no. of pages

$$= \frac{2}{30} \times 100 = 6.66\%$$

Rate of increase of the price

$$= (\text{rate of inflation} + 2)\% = 8 + 2 = 10\%$$

Jan 2004 Jan 2005 Jan 2006

$$20 \rightarrow 20 \rightarrow 22 \rightarrow 24.2$$

$$+2 \rightarrow +2.2 \rightarrow 2.2$$

Alternatively: Expected price after 2 years

$$= 20 \times 1.1 \times 1.1 = 24.2$$

Let the total number of people = x

then the amount donated by 0.6x people

$$= 600 \times 0.6x = 360x$$

Now since Rs. $360x$ is equal to 75% of the required amount. Hence we need only 25% more amount from the rest of the people i.e., from $0.4x$ people

$$\text{Hence average requirement} = \frac{120x}{0.4x} = 300$$

$$\text{Alternatively: } (600 \times 0.6 + k \times 0.4) \frac{3}{4} = 600 \times 0.6$$

$$\Rightarrow k = 300$$

41. By mistake $= \frac{x}{10}$

$$\text{Actual value} = x \times 10$$

$$\% \text{ change} = \frac{10x - \frac{x}{10}}{10x} \times 100 = \frac{99}{100} \times 100$$

$$= 99\% \text{ (negative)}$$

Since actual value is greater than the wrong value

Alternatively :

$$\text{Actual result} = 10 \times 10 = 100 \quad (\text{suppose } x = 10)$$

$$\text{wrong result} = \frac{10}{10} = 1$$

$$\% \text{ change} = \frac{100 - 1}{100} \times 100 = 99\%$$

NOTE Percentage error is always calculated on the basis of actual (i.e., correct) value.

42. Use some different values for x then verify.

$$\text{Let } x = 150 \text{ then } \% \text{ error} = \frac{200 - 100}{100} \times 100 = 100\%$$

$$\text{Again if } x = 100 \text{ then } \% \text{ error} = \frac{150 - 50}{50} \times 100 = 200\%$$

Hence, we cannot determine.

43. Number of visitors \times Rate = Revenue collected

$$(-20\%) \left(\begin{matrix} 1 & \times 1 \\ 0.8 & \times 1.5 \end{matrix} \right) = 1 \quad (+50\%) \left(\begin{matrix} 1 & = 1 \\ 1.5 & = 1.2 \end{matrix} \right)$$

Therefore percentage change in the revenue

$$= \frac{1.2 - 1}{1} \times 100 = 20\%$$

44. Bata Woodland

$$\begin{matrix} \text{M.P.} & 100 & 100 \\ \text{S.P.} & 51 & 51 \end{matrix}$$

(Since the marked prices are same)

NOTE M.P. \rightarrow Marked price, S.P. \rightarrow Selling price
decreased by 49% = reduced to 51%

45. Selling price = cost price + profit

$$\text{Shirt} = 7y + x$$

$$\text{Coat} = 12y + x$$

Since, the profit is same, so the selling price of shirt will certainly be less than Rs. 2000 (which is half of the total value) as it is clear that cost price of shirt is less than the cost price of coat.

NOTE If selling price of shirt is equal to or greater than the selling price of coat then the C.P. of coat will be equal to or less than the C.P. of shirt which is wrong. Hence the only possible choice is (d).

46. Since we don't have sufficient data. Further any value is possible as the required income tax.

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47. $2004 \rightarrow 10000 \times x\% = k$

$2005 \rightarrow 16000 \times \frac{5}{8} x\% = k$

but $x - \frac{5}{8} x = 9 \Rightarrow x = 24\%$

So, the income tax = 2400.

48. Only (c) is correct since it is divisible by 4.

Let the original number of element be x then the new no. of elements will be

$$\frac{4x}{5} = K$$

So K must be divisible by 4

Since, $x = \frac{K \times 5}{4}$

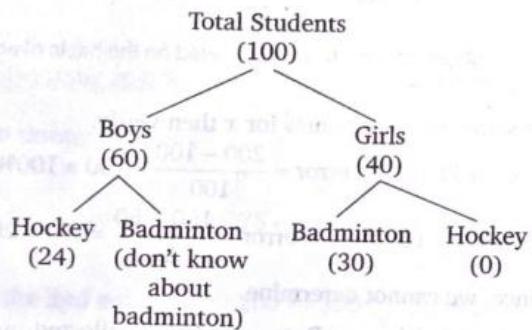
49. Go through option

Boys	Girls	Total
14	11	25
56	44	100

(12)

LEVEL (2)

1.



Since we do not have information that whether the rest of the boys playing badminton or not. So we can not determine the total no. of students who are not playing any of the two games.

2. Go through option. Let us assume option (c)

$$10 = 2 \times 5 = 5 \times 2 = 1 \times 10 \times 10 \times 1$$

Consider the proper fraction $= \frac{2}{5}$

[Since the given percentage values are 25% and 20% that's why we have picked up option (c)].

$$\frac{2}{5} \rightarrow \frac{4}{25} \rightarrow \frac{5}{20}$$

To verify: $\frac{2}{5} \times \frac{5}{8} = \frac{1}{4} = \frac{5}{20}$

Hence presumed option is correct

Alternatively: $\frac{x}{y} \rightarrow \frac{x^2}{y^2} \rightarrow \frac{1.25 x^2}{0.8 y^2} = \frac{25 x^2}{16 y^2}$

Now since $\frac{25 x^2}{16 y^2} = \frac{5}{8} \left(\frac{x}{y} \right)$

$$\Rightarrow \frac{x}{y} = \frac{2}{5}$$

3. Income = Expenditure + Savings

$$\begin{cases} 8x = (5x + 3x) \\ 10x = (8x + 2x) - x \end{cases}$$

Since $8x < 10x$ i.e. 20% of boys are greater than the no. of girls by 12 i.e., 12% Hence correct.

Alternatively :

Let the no. of boys and girls be x and y respectively
then $(x - y) = \frac{12 \times (x + y)}{100}$

$$\Rightarrow \frac{x}{y} = \frac{14}{11}$$

50. Population after 2 years $= 5000 \left(1 + \frac{2}{100} \right)^2$

$$5000 \times \frac{51}{50} \times \frac{51}{50} = 5202$$

51. Daily supply $= (100 - z)\% \text{ of } y = \frac{(100 - z)y}{100}$

∴ Required no. of days $= \frac{x \times 100}{(100 - z)y}$

Now the deficit $= (3x - 2x) = x = 3500$

and ∴ the new salary $= 10x = 35,000$

Alternatively : Go through options.

4. Go through options

$$2457 - 2143 = 314$$

Again $(2457 + 2143) + 41 = 4641$

Now $\frac{4641}{0.85} \rightarrow 5460$

Again $\frac{5460 \times 45}{100} = 2457$

Hence the presumed option is correct.

Alternatively: Let there be total x eligible voters, and the no. of votes goes to loser is k then

$$0.85x - 41 = 2k + 314$$

$$k + 314 = 0.45x$$

$$x = 5460$$

then, $5460 \times 0.85 = 4641$

Again $4641 - 41 = 4600$

Again $k + (k + 314) = 4600$

⇒ $k = 2143$

and $k + 314 = 2457$

5. Income → 4 4.4 4.8 5.2] 18.4

Saving → 2 1.76 1.44 1.04] 6.24

Exp. → 2 2.64 3.36 4.16] 12.16

So, $\frac{6.24}{12.16} \times 100 = 51 \frac{6}{19} \%$

6. Let there be x voters and k votes goes to loser then

$$0.8x - 120 = k + (k + 200)$$

$$k + 200 = 0.41x$$

$$k = 1440$$

$$(k + 200) = 1640$$

Therefore $\frac{1440}{3200} \times 100 = 45\%$

Percentages
Solutions for 7-9:

$$P + R = 30,000$$

$$N = R - 8000$$

... (1)

$$(R + N) = 233.3 (P)$$

... (2)

$$3(R + N) = 7P$$

... (3)

$$6R - 7P = 24,000$$

... (4)

$$R = 18,000$$

$$P = 12,000$$

$$N = 10,000$$

$$7. \frac{P + R + N}{3} = \frac{40,000}{3} = 1333.33$$

Can't be determined

$$8. \frac{8}{10} \times 100 = 80\%$$

$$9. \text{ (Bonus) Commission} = \frac{20 \times 10,00,000}{100} = 2 \text{ lakh}$$

$$10. \text{ but total profit} = \text{net profit} + \frac{10}{100} \times \text{net profit}$$

$$1.32 \text{ lakh} = 1.1 \times \text{net profit}$$

$$11. \text{ net profit} = 1.2 \text{ lakh} = 1,20,000$$

$$12. \text{ commission} = \text{total profit} - \text{net profit} = 1,32,000 - 1,20,000 = 12,000$$

$$13. \text{ hence total earning} = 2,00,000 + 12,000 = 2,12,000$$

$$14. \text{ Let Mr. Scindia has } x \text{ shares of } 5.5\%$$

$$x \times 92 = 32,200$$

$$15. x = 350 \text{ shares}$$

$$16. \text{ Income} = 350 \times 5.5 = 1925$$

Now, after investment his income is

$$17. \left(\frac{1}{3} \times \frac{32200}{92} \times 4.5 \right) + \left(\frac{2}{5} \times \frac{32200}{115} \times 5 \right) + \left(\frac{4}{15} \times \frac{32200}{56} \times 6 \right)$$

$$18. = 525 + 560 + 920 = 2005$$

$$19. \text{ Profit} = 2005 - 1925 = \text{Rs. } 80$$

$$20. \text{ The surface area of a cube} = 6a^2 = 6 \times (\text{side})^2$$

$$21. \text{ New surface area} = 6 \times 1.44 a^2$$

$$22. \frac{0.44 a^2}{a^2} \times 100 = 44\%$$

23. Solution for 13 and 14 :

Pati \rightarrow Pt, Patni \rightarrow Pn, Woh \rightarrow W

$$(Pt + Pn) = 2W \quad \dots (i)$$

$$(Pn + W) = 4 Pt \quad \dots (ii)$$

Solving equation (i) and (ii) we get

$$24. \frac{Pn}{W} = \frac{7}{5} \text{ and } \frac{Pt}{W} = \frac{3}{5}$$

$$25. Pt : Pn : W = 3 : 7 : 5$$

$$(Pt + Pn) = 2W \quad \dots (iii)$$

$$(Pn + W) \times 7 = 8 \times Pt \quad \dots (iv)$$

$$26. \frac{Pn}{W} = \frac{3}{5}, \frac{Pt}{W} = \frac{7}{5}$$

$$27. Pt : Pn : W = 7 : 3 : 5$$

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$$Gain of Pati = 7x - 3x = 4x = 800$$

$$\Rightarrow x = 200$$

$$28. \text{ Pati} \quad \text{Patni} \quad \text{Woh}$$

$$29. \text{ Amount at the begining of Game} = 600 \quad 1400 \quad 1000$$

$$30. \text{ Amount at the end of the game} = 1400 \quad 600 \quad 1000$$

13. Only Patni has suffered the loss

$$14. \frac{1400 - 600}{1400} \times 100 = 57.1428\%$$

15.

$$RM + MC = \text{Total cost}$$

$$31. \text{ Total cost} + \text{Profit} = \text{Sale price}$$

$$32. 70 + 30 = 100 \quad 100 + 10 = 110 \quad 84 + 42 = 126 \quad 126 + 72 = 198 \quad + 80\%$$

$$33. \text{ Therefore profit \%} = \frac{72}{126} \times 100 = 57.14\%$$

16.

$$A + B + C + D = 56$$

$$B + C + D = 4.6A$$

$$34. \Rightarrow A + B + C + D = 5.6A \quad (\text{adding } A \text{ in both sides})$$

$$35. 56 \text{ lakh} = 5.6A$$

$$36. \Rightarrow A = 10 \text{ lakh}$$

$$37. \text{ Similarly } A + C + D = \frac{11}{3} B$$

$$38. \Rightarrow A + B + C + D = \frac{14}{3} B$$

$$39. \Rightarrow B = 12 \text{ lakh}$$

$$40. \text{ Similarly } 4(A + B + D) = C$$

$$41. \Rightarrow A + B + D = 2.5C$$

$$42. \Rightarrow A + B + C + D = 3.5C$$

$$43. \Rightarrow C = 16 \text{ lakh}$$

$$44. \text{ Therefore } D = (A + B + C + D) - (A + B + C) = 18 \text{ lakh}$$

17. Losing candidate = $0.3x$

∴ Other two candidates = $0.7x$

The share of winning candidate = $0.36x$

and the second ranker = $0.34x$

∴ Margin (min. possible) = $0.02x$

∴ 2% of x

Let the minimum possible voters be 50 then

$$\frac{2 \times 50}{100} = 1$$

Hence the minimum possible margin of votes = 1

Day	Initial amount	Sales	Remaining over night	Rotten	Stock for next day
I	x	0.5x	0.5x	0.05x	0.45x
II	0.45x	0.225x	0.225x	0.0225x	0.2025x
III	0.2025x	0.10125x	0.10125x	0.010125x	

$$45. \text{ Total rotten amount} = 0.082625x = 1983$$

$$46. \Rightarrow x = 24,000$$

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19. Check through option

Alternatively : Let the initial amount be x (with gambler), then

$$\begin{aligned} & \left(\left((x + 100) \frac{1}{2} + 100 \right) \frac{1}{2} + 100 \right) \frac{1}{2} = \frac{x}{2} \\ \Rightarrow & x = \frac{700}{3} \end{aligned}$$

20. Non-defective products

$$\frac{25 \times 0.98 + 35 \times 0.96 + 40 \times 0.95}{100} \times 100 = 96.1$$

No. of Machines	Output	Manf. cost	Est. cost	Total cost	Profit
12	48,000	24,000	10,000	34,000	14,000
11	44,000	22,000	10,000	32,000	12,000

$$\begin{aligned} \text{Profit} &= \text{out put} - \text{Total cost} \\ &= 44,000 - 32,000 = 12,000 \\ \text{Initial value of share holders} &= 14,000 \times \frac{10}{100} = 1400 \\ \text{Changed value of share holders} &= 12,000 \times \frac{10}{100} = 1200 \\ \% \text{ decrease} &= \frac{200}{1400} \times 100 = 14.28\% \end{aligned}$$

$$\begin{array}{rcl} \text{Rice} & & \text{Wheat} \\ 25 & & 9 \\ \times x & & \times 5x \\ \hline 25x & & 45x \\ 70x & = 350 \\ \Rightarrow & & x = 5 \end{array}$$

Hence the price of Rice = Rs. 5 per kg

Price of wheat = Rs. 25 per kg

Now, the price of wheat = Rs. 30 per kg

Let the new amount of Rice be M kg, then

$$M \times 5 + 9 \times 30 = 350$$

$$M = 16$$

Hence decrease (in%) of amount of rice

$$= \frac{25 - 16}{25} \times 100 = 36\%$$

Year	Rate of Commission	Commission in values
1	20%	$0.2 \times 20,000 = 4000$
	25% (bonus)	$0.25 \times 4000 = 1000$
2	16%	$0.16 \times 20,000 = 3200$
3	12%	$0.12 \times 20,000 = 2400$
4	10%	$0.1 \times 20,000 = 2000$
5-10	4%	$6 \times 0.04 \times 20,000 = 4800$

Total commission

$$= (4000 + 3200 + 2400 + 2000 + 4800) + (1000) = 17,400$$

Solution for 24-25

	OHIO	TEXAS
Last year :	$600 \leftarrow (2:1)$	$(M:F) \rightarrow 1100$
This year :	$750 \leftarrow (2:1)$	$(\text{unknown}) \rightarrow 1200$

24. Since we don't know the number of female employees in Texas office this year so we can't determine

$$25. 1100 + 600 = 1700$$

26. There is no need to use the no. of goats i.e., initially there be 1000 goats then $1000 \rightarrow 1400 \rightarrow 980 \rightarrow 1274 \rightarrow 1146.6$

$$\text{Thus the \% increase} = \frac{1146.6 - 1000}{1000} \times 100 = 14.66\%$$

27. In 2002 (980 goats) as per the flow chart

Optional	Science	Commerce	Engineering	Total
	5000	3000	8000	
Finance	1000	1200	680	16,000
HR	1600	720	1040	2880
Marketing	2400	1080	6280	3360
				9760

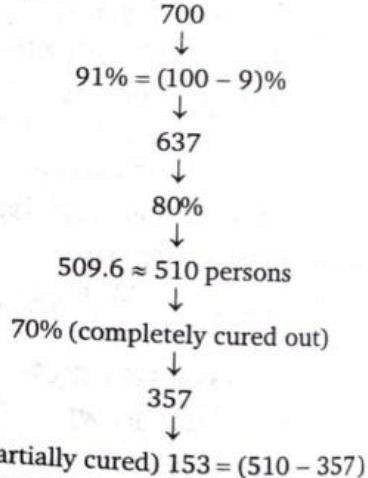
28. 6280 Students of Engineering opted marketing

$$29. \frac{720}{16,000} \times 100 = 4.5\%$$

30. Marketing, since maximum students have opted marketing

31. Consider some values and then verify the option.

32. Go through option :



33. Total expenditure per kg

$$= 3.2 + 1.8 + 2 + 3 = 10 = \text{cost price}$$

Selling price = Rs. 18 (per kg)

Gross profit = Rs. 8 per kg = $(18 - 10)$

$$\text{Net profit} = 8 \times \frac{80}{100} \text{ (since 20\% is tax)} = \text{Rs. 6.4}$$

Hence the net profit of the factory = $6.4 \times 50,00,000$

$$= \text{Rs. 3,20,00,000} = \text{Rs. 3.2 crore}$$

34. Let the percentage marks in QA = $(10a + b)\%$

Let the percentage marks in DI = $(10b + a)\%$

Let the percentage marks in VA = $x\%$

then $\frac{(10a + b) + x + (10b + a)}{3} = x$

$$\Rightarrow 11a + 11b + x = 3x$$

$$\Rightarrow x = \frac{11}{2}(a + b)$$

Thus the percentage of the VA section is a multiple of 11

$$P_1 = k \frac{T}{V}$$

$$P_2 = k \frac{1.4T}{0.8} = K \frac{7T}{4V}$$

$$\frac{P_2 - P_1}{P_1} = \frac{\frac{7T}{4V} - \frac{T}{V}}{\frac{T}{V}} = \frac{\frac{3T}{V}}{\frac{T}{V}} = \frac{3}{4}$$

Hence, the new pressure will be increased by 75%.

$$\text{Q. } 20 \times 0.92 \Rightarrow 10 \text{ minutes.}$$

$$\frac{23 \times 40 \times 0.90}{20 \times 0.92} = 45$$

Thus the required time is 45 times than the previous time

$$\text{Hence, } 450 \text{ minutes} = 7 \frac{1}{2} \text{ hrs.}$$

$$\text{Q. Original volume} = 16 \times 12 \times 5 = 960 \text{ (inch)}^3$$

$$\text{Required capacity} = 1120 \text{ (inch)}^3$$

$$\text{Increase in area} = \frac{1120}{5} - 16 \times 12$$

$$= 224 - 192 = 32 \text{ (inch)}^2$$

$$\% \text{ increase} = \frac{32}{192} \times 100 = 16.66\%$$

$$\text{Q. The total passengers in each compartment} = 25 \times \frac{7}{5} = 35$$

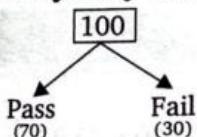
$$\text{Total no. of seats} = (35)^2 = 1225$$

$$\text{Maximum available capacity} = 1225 \times \frac{80}{100} = 980 \text{ seats}$$

	Tata	Reliance
Prepaid	100	81
Postpaid	90	72

$$\text{Thus the \% decrease in talk time} = \frac{90 - 72}{90} \times 100 = 20\%$$

Half yearly exam



Annual exam

$$\underbrace{70 \times 0.6}_{42} + \underbrace{30 \times 0.8}_{24}$$

$$\therefore \text{Total pass in annual exam} = 42 + 24 = 66$$

$$\text{Q. Percentage of passed students} = 68\% [100 - 32]\%$$

$$\text{Number of girls passed the exam} = 408$$

$$\text{Number of boys passed the exam} = 476$$

$$\text{Total passed students} = 884$$

$$\text{Therefore total no. of students} = \frac{884}{68} \times 100 = 1300$$

Solution for 42- 45 :

Name	Horse	Chariot	Land	Total (in Rs.)
Ram	2 lakh (10)	80,000 (10)	20 acre = 1 lakh	3.8 lakh
Sita	1.6 lakh (8)	80,000 (10)	8 acre = 40,000	2.8 lakh
Laxman	1 lakh (5)	2 lakh (25)	20 acre = 1 lakh	4 lakh
Urmila	1.4 lakh (7)	40,000 (5)	16 acre = 80,000	2.6 lakh

- $R + S = L + U$ and $R > S$ and $L > U$
- Horses $\rightarrow (R + S) : (L + U) = 3x : 2x = 18x : 12x$

Again Ram have $\frac{1}{3}$ rd horses

$$\text{Therefore } 30x \times \frac{1}{3} = 10x$$

$$\text{Therefore the horse of Sita} = 18x - 10x = 8x$$

$$\Rightarrow x = 1$$

$$\text{Therefore the horse of Ram} = 10 \text{ and Laxman} = 5$$

$$\text{No. of chariots of Sita} = \text{No. of chariots of Ram} = \frac{K}{5}$$

$$\text{and} \quad \text{no. of chariots of Laxman} = \frac{K}{2}$$

$$\text{Hence the no. of chariots of Urmila} = K - \left(\frac{K}{5} + \frac{K}{5} + \frac{K}{2} \right) = \frac{K}{10}$$

$$\text{Again} \quad \frac{k}{2} - \frac{k}{10} = 20 \Rightarrow k = 50 \text{ chariots}$$

Now the 50% property of Laxman = 25 chariots = 2,00,000

Hence the total property of Laxman = 4,00,000

$$\text{Thus the area of Land of Laxman} = \frac{2,00,000 - 5 \times 20,000}{5000}$$

$$= 20 \text{ acre} = (1 \text{ lakh})$$

Total property of Urmila

$$= 1,40,000 + 40,000 + 80,000 = 2,60,000$$

Thus the total property of Laxman and Urmila = 6.6 lakh

$$\text{42. } 3.8 - 2.6 = 1.2 \text{ lakh}$$

$$\text{43. Value of chariots of Laxman} = 2 \text{ lakh}$$

Now since only Ram has the horses of worth Rs. 2 lakh. So only Ram can exchange with Laxman.

$$\text{45. } \frac{7.2 - 6.0}{6.0} \times 100 = 20\%$$

$$\text{46. Total cubes } 160 + 56 = 216$$

Therefore the side of cube = 6 unit

$$\text{No. of cubes without any exposure} = (6 - 2)^3 = 64$$

Thus 64 cubes will be inside of the big cube

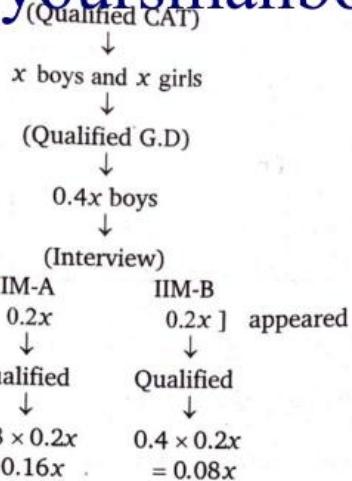
$$\text{Now rest of the cubes} = 160 - 64 = 96$$

$$\text{Again the no. of cubes with one face outside}$$

$$= 6 \times (4 \times 4) = 96$$

$$\text{Hence the required percentage} = \frac{96}{216} \times 100 = 44.44\%$$

Dividing equation in equation (i)



Total boys qualified the final stage = 0.24%

Thus $0.24x = 24$

$$\Rightarrow x = 100$$

48. Go through option and consider some appropriate values

$$\text{Alternatively : } \frac{p}{100+p} = \frac{q}{100}$$

$$\Rightarrow 100(p-q) = pq$$

$$\Rightarrow (p-q) = \frac{pq}{100}$$

49. Let the original price be P , then the decrease in value of P after one cycle

$$= P \left(\frac{x}{100} \right)^2 = 21025 \quad \dots \text{(i)}$$

Again the final value after second cycle

$$\Rightarrow P \left(1 + \frac{x}{100} \right) \left(1 - \frac{x}{100} \right) \left(1 + \frac{x}{100} \right) \left(1 - \frac{x}{100} \right) = 484416$$

$$\Rightarrow P \left[1 - \left(\frac{x}{100} \right)^2 \right]^2 = 484416 \quad \dots \text{(ii)}$$

$$\left[1 - \left(\frac{x}{100} \right)^2 \right]^2 = \frac{484416}{21025} = \frac{2304}{100}$$

$$\Rightarrow \frac{1 - \left(\frac{x}{100} \right)^2}{\left(\frac{x}{100} \right)^2} = \sqrt{\frac{2304}{100}} = \frac{48}{10}$$

$$\text{Let } \frac{x}{100} = k, \text{ then}$$

$$\frac{1 - k^2}{k} = \frac{48}{10}$$

$$\Rightarrow 10k^2 + 48k - 10 = 0$$

$$\Rightarrow 5k^2 - 24k - 5 = 0$$

$$\Rightarrow k = 5 \text{ or } k = -\frac{1}{5} \quad \text{(inadmissible value)}$$

$$\text{So } x = 20\%$$

$$\text{Hence, } P \left(\frac{x}{100} \right)^2 = 21025$$

$$\Rightarrow P = 525625$$

50. Men × Time = Work

$$100 \times 1 = 100 \text{ unit}$$

$$150 \times 1 = 150 \text{ unit}$$

Extra man power required = 50

but since new workers are $\frac{5}{4}$ times as efficient as existing workers.

$$\therefore \text{Actual no. of workers} = \frac{50}{5/4} = 40 \text{ men}$$

$$\text{Hence, required percentage} = \frac{40}{100} \times 100 = 40\%$$

Final Round

1. Growth rate of Finance

$$= \frac{125 - 75}{75} \times 100 = \frac{2}{3} \times 100 = 66.66\%$$

$$\text{Growth rate of Marketing} = \frac{250 - 100}{100} \times 100 = 150\%$$

2. Total no. of students in 2003-04 is

$$= (250 + 125 + 100 + 75) = 550$$

No. of student in 2004-05

$$= 550 \left(1 + \frac{1}{11} \right) = 600 \text{ students}$$

$$3. \frac{50}{(150 + 100 + 75 + 50)} \times 100 = \frac{50}{375} \times 100 = 13.33\%$$

$$4. \frac{4800 - 4000}{4000} \times 100 = 20\%$$

$$5. \frac{450}{4350} \times 100 = 10.34\%, \text{ which is lowest in comparison to others}$$

Thus the growth rate of logical reasoning book is lowest.

$$6. DI \rightarrow \frac{5000 - 3750}{3750} \times 100 = 33.33$$

$$\text{and VA} \rightarrow \frac{5500 - 4140}{4140} \times 100 = 32.85\%$$

7. Only LR has consistent growth, others have been fluctuating (QA - 2003, DI - 2003, VA - 2002)

$$8. \frac{\frac{8.5 - 2.97}{2.97} \times 100}{5} = 37.23\%$$

9. Growth rate of Hero = 37.23%

Growth rate of Atlas = 28.1%

Avon is least which is clear from the data.

Total bicycle production is highest in 95 hence false

$$\text{Hero cycle's share} = \frac{2.97 + 4.22 + \dots + 8.5}{79.84} = 43\%$$

Hence, (d) since none of (a), (b) and (c) is correct.

10. $\frac{1.75 + 2.48 + \dots + 4.1}{79.84} \times 100 = 23.44\%$
 11. $\frac{1.64}{64.8} \times 100 = 2.53$
 12. Amul has max. unutilised capacity
 Hint: $\left(\frac{1.54}{59.35} \times 100 \right) - 1.54 = 1.05$
 Similarly for others can also be find out

13. $\frac{11.6}{61.3} \times 100 \approx 18.9$
 14. $\frac{42.20}{132.8} \times 100 = 31.81\%$
 15. $\frac{105}{360} \times 100 = \frac{7}{24} \times 100 = 29.166\%$
 16. $\frac{30}{120} \times 100 = 25\%$
 17. $\frac{15}{120} \times 100 = 12.5\%$
 18. $105 - 45 = 60^\circ = 4$ hours
 19. $15^\circ = 1$ hour (Maths)
 $30^\circ = 2$ hours (other subjects)
 20. Sony TV $\rightarrow 19\%$
 Sony Refrigerator $\rightarrow 15\%$
 difference $= 4\% = 14.4^\circ$ (Since $1\% = 3.6^\circ$)

21. $12\% \rightarrow$ Samsung TV = 31 crore
 $18\% \rightarrow$ Electrolux TV = 46.5 crore
 $100\% \rightarrow$ Total market = 258 crore
 $11\% \rightarrow$ Samsung Refrg. = 9 crore
 $13\% \rightarrow$ Electrolux Refrg. = 10.6 crore
 $100\% \rightarrow$ Total market = 81.8 crore
 Market share $= \frac{46.5 + 10.6}{258 + 81.8} \approx 16.7\%$

22. $18\% =$ Rs. 42 crores, so $27\% (= 16 + 11) =$ Rs. 63 crore
 $13\% =$ Rs. 6 crore, so $28\% (= 12 + 16) =$ Rs. 13 crore
 Total Rs. 76 crores

23. Annual approx. turnover $= 4 \times 76 =$ Rs. 304 crores
 (a) $(13 - 12) = 1\% = 3.6$
 (b) We don't know the turnover of TV and refrigerator market for each brand.
 (c) 6% total refrigerator market = 100 crore
 \Rightarrow Total refrigerator market ≈ 1667 crore
 \therefore Difference = 2% of 1667 = 33.34 crore
 Thus, (b) can't be inferred.

24. $\frac{52,000 - 5,000}{5000} \times 100 = 9.4 \times 100 = 940\%$

25. Medical college in 1980 $= \frac{11}{100} \times 32,000 = 3520$

$1990 = \frac{9}{100} \times 52,000 = 4680$

$\frac{4680 - 3520}{3520} \times 100 = 32.95$

26. We don't have the information about the proportion (share) of Engineering colleges in the given years.

27. $\frac{32,000 - 12,000}{12,000} \times 100 = 166.66\%$

28. Number of medical colleges in 1990
 $= \frac{52,000 \times 9}{100} = 4680$

Increase in the total no. of colleges
 $= 60,000 - 52,000 = 8000$

Increase in the no. of medical colleges $= \frac{8000}{4} = 2000$
 Therefore, percentage of medical colleges in 2000
 $= \frac{4680 + 2000}{60,000} \times 100 = 11\%$

29. If the amount of water consumed of sector 1 is the same then we can directly compare the tariffs to the two years.

	Tariff 2003-04	% change	Tariff 2000-01
Region 1	1000	+ 25%	800
Region 2	400	+ 14.28%	350
Region 3	250	-16.66%	300
Region 4	625	+ 4.166%	600
Region 5	720	+ 20%	600
	2995		2650

$$\frac{2995 - 2650}{2650} \times 100 = \frac{345}{2650} \times 100 = 13.01\%$$

	Tariff 2003-04	% change over 2000-01	Tariff 2000-01
Sector 1	400	+ 14.28%	350
Sector 2	375	+ 7.14%	350
Sector 3	525	-12.5%	600
Sector 4	800	-20%	1000
	2100		2300

$$\text{Average tariff} = \frac{2300}{4} = 575$$

31. In 2003-04 the water consumed by various sectors out of 20,000 kilo-litres can be given as follow:

Category	Percentage	Consumption in 2003-04
Domestic	40	8,000
Urban	25	5,000
Rural	15	3,000
Industrial	20	4,000
		20,000

Since there was a 20% decrease in the domestic consumption in 2003-04 the domestic consumption in 2000-01 $= \frac{8,000}{0.8} = 10,000$

But this constitutes 40% of total water consumed in 2000-01 and the industrial consumption constitutes 20% of total water in 2000-01. Hence in 2000-01 the industrial consumption = $10,000 \times \frac{20}{40} = 5,000$ kilo-liters

32. We do not know the category-wise break up of tariffs ie the rates of Urban sector is unknown.

33. The average of Region 2 = $\frac{400 + 375 + 525 + 800}{4} = 525$

Average tariff in region 4 = $\frac{62.5 + 750 + 240 + 360}{4} = 487.5$

Average tariff in region 5 = $\frac{220 + 360 + 320 + 400}{4} = 450$

Statements (c) can not be determined

34. Total number of people = 10,000

Business men	10%	1000	LML	1200
Govt. Servant	13%	1300	SUZUKI	1200
Professionals	30%	3000	BAJAJ	3000
Students	45%	4500	HERO HONDA	6600
Housewives	2%	200		

The total number of Hero Honda bikes = 6600

Total numbers of Government servants housewives and students = 6000

Total no. of Businessmen and professional = 4000

∴ Percentage of remaining (i.e., Businessmen and prof.)

$$\text{driving Hero Honda} = \frac{600}{4000} \times 100 = 15\%$$

35. Let the no. of people who drive one two and three bikes be 15k, 3k and k respectively.

Number of bikes which are being driven

$$= 15k + 2(3k) + 3(k) = 24k$$

Since LML and Suzuki can not be driven by same person and a person can drive maximum 3 bikes.

Total bikes which are being used to drive = 12,000

$$\therefore 24k = 12,000 \Rightarrow k = 500$$

Total number of people driving the bikes

$$= 15k + 3k + k = 19k = 9500$$

∴ Number of people who do not drive any bike

$$= 10,000 - 9500 = 500$$

36. From the previous solution, number of people who drive more than 1 bike i.e., 2 bikes and 3 bikes are 1500 and 500 respectively.

These people have total 4500 bikes

$$= 1500 \times 2 + 500 \times 3$$

Hence, the remaining Hero Honda bikes

$$= 6600 - 4500 = 2100$$

Thus, the number of persons who drive single Hero Honda

$$= 2100$$

37. Since 20% drive other bikes 80% drive only bajaj bike

$$\text{number of people who drive only Bajaj bike} = 0.8 \times 3000 = 2400$$

38. $\frac{11000 + 12000}{21,000} \times 100 = 109.52\%$

39. $\frac{27,000 - 23,000}{23,000} \times 100 = 17.4\%$

40. Demand = Domestic Production + Imports

Average demand = $\frac{44 + 54.5 + 57}{3} \approx 52$ million tonnes

41. (c) $\frac{30,000 - 21,000}{21,000} \times 100 \approx 43\%$

42. Offshore production in 2004 = $16,000 \times 0.875 = 14,000$ thousand tonnes

Onshore production = 11,000 thousand tonnes

Demand in 2004 = $57,000 \times 1.02 = 5814$ thousand tonnes
imports = 33.14 million tonnes
($\because 1$ million = 10^6)

43. $201924 \times \frac{5}{6} = 33654 \times 5 = 168270$

44. $127890 \times \frac{11}{10} = 140679$

45. $126400 + 975264 + 237852 = 1339516$

46. $\frac{100956}{2445480} \times 100 = 4.128\%$

Alternatively: $\frac{1}{24} \times 100 \approx 4.16\%$

47. $1969 - 70 \rightarrow 134790$ 149830
 $1979 - 80 \rightarrow 284620$ 149830

48. $1929 - 30 \rightarrow 9,75,264$

$1949 - 50 \rightarrow 1,40,679$

% decrease = $\frac{975264 - 140679}{975264} \times 100 = 85.57\%$

49. $1959 - 60 \rightarrow 1960 - 61$

$168020 \xrightarrow{+ 20\%} 201924$

Therefore $\frac{168020}{201924} \times 100 = 83.33\%$

Alternatively: From percentage charge graphic

Increase	Decrease
20%	16.66%
1/5	1/6

∴ The required value = 83.33% (100 - 16.66%)

Alternatively: $x \times \frac{6}{5} = k$

$\Rightarrow x = \frac{5k}{6}$

$(x)\% = \frac{5k}{6} \times 100 = 83.33\% \text{ of } k$

50. Only 7,900 tonnes increase over the 1919 - 20.

7

CI/SI/INSTALMENTS

The concept of simple interest and compound interest is one of those concepts which are widely used in Business and Banking etc. Questions are rarely asked in CAT from this chapter, but it is important for the purpose of Data interpretation. Since the questions based on the concept of 'interest' are rather easy so it is common that MAT, FMS, CET etc. asked enough questions from this chapter. The questions of this chapter are so easy that 95% questions can be solved orally or using unitary methods *i.e.*, sometimes you don't need to apply the given formula and I think that is essential.

Simple interest is nothing but the fix percentage of the principal (invested/borrowed amount of money)

Some key words used in the concept of interest.

Principal :(P) It is the sum of money deposited/loaned etc. also known as **capital**.

Interest : It is the money paid by borrower, calculated on the basis of **Principal**.

Time (T/n) : This is the duration for which money is lent/borrowed.

Rate of Interest (r/R) : It is the rate at which the interest is charged on principal.

Amount (A) = Principal + Interest

Simple Interest : When the interest is calculated uniformly only on the principal for the given time period.

Compound Interest : In this case for every next period of time the interest is charged on the total previous amount (which is the sum of principal and interest charged on it so far.) *i.e.*, every time we calculate successive increase in the previous amount.

IMPORTANT FORMULAE

Simple Interest (SI)

$$SI = \frac{P \times r \times t}{100}$$

P = Principal

r = rate of interest (in %)

t = time period (yearly, half yearly etc.)

$$\text{Amount (A)} = P + \frac{Prt}{100} = P \left(1 + \frac{rt}{100} \right)$$

NOTE Out of the five variables A , SI , P , r , t we can find any one of these if we have the requisite information.

CONVERSION OF TIME PERIOD-RATE OF INTEREST

Given (r%)	Given (t)	Required (r%)	Required (t)
$r\%$ annual	t years	$\frac{r}{2}\%$ half-yearly	$2t$
$r\%$ annual	t years	$\frac{r}{4}\%$ quarterly	$4t$
$r\%$ annual	t years	$\frac{r}{12}\%$ monthly	$12t$

Compound Interest (CI)

1. $CI = A - P$ [A is the amount including interest and principal (P) both]

$$2. \text{Amount (A)} = P \left(1 + \frac{r}{100} \right)^t$$

3. When rate of interest is half-yearly

$$A = P \left(1 + \frac{(r/2)}{100} \right)^{2t}$$

4. When the rate of interest is quarterly

$$A = P \left(1 + \frac{r/4}{100} \right)^{4t}$$

Difference between CI and SI for two years

$$(\text{also in second year}) = P \left(\frac{r}{100} \right)^2$$

Difference between CI and SI for three years

$$= P \left(\frac{r}{100} \right)^2 \left(\frac{r}{100} + 3 \right)$$

Depreciation : It is known that the prices of some articles depreciates in their values over a time period. When the value in terms of currency decreases, we say that the value of the article is depreciating.

$$V_f = V_i \left(1 - \frac{r}{100} \right)^t$$

Population : It has been observed that the population of a particular locality/nation etc. increases or decreases successively over its previous value i.e., it increases or decreases as compound interest for the money. Thus we use similar formulae for the calculation of population.

$$(\text{Total population}) P = P_0 \left(1 + \frac{r}{100}\right)^n,$$

when population increases

$$(\text{Total population}) P = P_0 \left(1 - \frac{r}{100}\right)^n,$$

when population decreases.

Instalments : When a borrower paid the sum in parts (i.e., not in a single amount) then we say that he/she is paying in instalments. For example A borrowed Rs. 100 from B and he pays back it to B in several parts i.e., Rs. 20 in 5 times or Rs. 50 in 2 times etc. But the important point is that borrower has to also pay the interest for using the borrowed sum/or purchased article. In general the value of each instalment is kept constant even when the interest charged on each instalment vary for each instalment.

For Simple Interest

$$A = \left[x + \left(x + \frac{x \times r \times 1}{100} \right) + \left(x + \frac{x \times r \times 2}{100} \right) + \left(x + \frac{x \times r \times 3}{100} \right) + \dots \right]$$

A = Total amount paid

x = Value of each instalment

EXAMPLE 1. Find the simple interest on Rs. 1000 at 12% per annum for 5 years.

$$\text{SOLUTION} \quad SI = \frac{Prt}{100} = \frac{1000 \times 12 \times 5}{100} = \text{Rs. 600}$$

{Total amount = $P + SI = 1000 + 600 = \text{Rs. 1600}$ }

EXAMPLE 2. Find the simple interest on Rs. 800 at 7% per annum and on Rs. 700 at 16% p.a. and on Rs. 500 at 4% p.a. for 2 years.

$$\begin{aligned} \text{SOLUTION} \quad SI &= \frac{P_1 r_1 t_1}{100} + \frac{P_2 r_2 t_2}{100} + \frac{P_3 r_3 t_3}{100} \\ &= \frac{800 \times 7 \times 2}{100} + \frac{700 \times 16 \times 2}{100} + \frac{500 \times 4 \times 2}{100} \\ &= 112 + 224 + 40 \\ &= \text{Rs. 376} \end{aligned}$$

EXAMPLE 3. A sum of money (P) doubles in 10 years. In how many years it will be treble at the same rate of simple interest?

Also,

$$A = P + \frac{P \times n \times r}{100}$$

P is the principal

n is the number of instalments

r is the rate of interest

For Compound Interest

(loan amount)

$$P = \left[\left(\frac{x}{1 + \frac{r}{100}} \right) + \left(\frac{x}{(1 + \frac{r}{100})^2} \right) + \dots \right]$$

$$\left. \frac{x}{(1 + \frac{r}{100})^3} + \dots + \frac{x}{(1 + \frac{r}{100})^n} \right]$$

$x \rightarrow x$ is the value of each instalment.

$$\text{Total amount paid in instalments } (A) = P \left(1 + \frac{r}{100}\right)^n$$

n is the number of instalments.

Difference between CI and SI for n^{th} year

$$= \frac{Pr}{100} \left[\left(1 + \frac{r}{100}\right)^{n-1} - 1 \right]$$

For Compound Interest

$$\frac{\text{increase in amount in } n^{\text{th}} \text{ year}}{\text{increase in amount in } (n+1)^{\text{th}} \text{ year}} = \frac{100}{(100+r)}$$

Similarly,

$$\frac{\text{decrease in amount in } n^{\text{th}} \text{ year}}{\text{decrease in amount in } (n+1)^{\text{th}} \text{ year}} = \frac{100}{(100-r)}$$

where r is rate of interest.

SOLUTION

$$A = 2P$$

$$SI = P$$

$$(SI = 2P - P)$$

$$P = \frac{P \times r \times 10}{100}$$

$$r = 10\%$$

\Rightarrow

So, the new amount = $3P$

But the new SI = $2P = (3P - P)$

$$2P = \frac{P \times 10 \times t}{100} \quad (r = 10\%)$$

$$t = 20 \text{ years}$$

EXAMPLE 4. A sum of money in 3 years becomes 1344 and in 7 years it becomes Rs. 1536. What is the principal sum where simple rate of interest is to be charged?

- (a) 4000 (b) 1500 (c) 1200 (d) 2800

SOLUTION It would be very time saving if we do it by unitary method.

$$1536 - 1344 = \text{Rs. 192}$$

EXAMPLE 14. Jadeja purchased a car 3 years ago for Rs. 2 lakhs. Its value depreciated each year @ 25% p.a. What is the present value of the car?

SOLUTION $200000 \left(1 - \frac{25}{100}\right)^3 = 200000 \times \left(\frac{3}{4}\right)^3$
 $= 84,375$

EXAMPLE 15. The difference between CI and SI for 3 years @ 20% p.a. is Rs. 152. What is the principal lent in each case?
 (a) 1200
 (b) 1155
 (c) 1187.5
 (d) none of these

SOLUTION Difference between CI and SI for 3 years = Rs. 152

$$P \left(\frac{r}{100}\right)^2 \left(\frac{r}{100} + 3\right) = 152$$

$$P \left(\frac{1}{25}\right) \left(\frac{16}{5}\right) = 152$$

$$P = \frac{152 \times 25 \times 5}{16}$$

$$P = 9.5 \times 25 \times 5 = 1187.5$$

EXAMPLE 16. A sum is being lent at 20% p.a. compound interest. What is the ratio of increase in amount of 4th year to 5th year?

- (a) 4 : 5
 (b) 5 : 4
 (c) 5 : 6
 (d) can't be determined

SOLUTION
$$\frac{P \left(1 + \frac{r}{100}\right)^4}{P \left(1 + \frac{r}{100}\right)^5} = \frac{1}{\left(1 + \frac{r}{100}\right)}$$

$$= \frac{100}{100+r} = \frac{100}{120} = \frac{5}{6}$$

EXAMPLE 17. Rs. 12000 amounts to Rs. 20736 in 3 years at r% p.a. of compound interest. What is the value of r?
 (a) 10%
 (b) 25%
 (c) 12%
 (d) 20%

SOLUTION
$$A = P \left(1 + \frac{r}{100}\right)^3$$

$$20736 = 12000 \left(1 + \frac{r}{100}\right)^3$$

$$\Rightarrow \frac{20736}{12000} = \left(1 + \frac{r}{100}\right)^3$$

$$\Rightarrow \frac{1728}{1000} = \left(1 + \frac{r}{100}\right)^3$$

$$\Rightarrow \left(\frac{12}{10}\right)^3 = \left(1 + \frac{r}{100}\right)^3$$

$$\Rightarrow \left(1 + \frac{2}{10}\right)^3 = \left(1 + \frac{r}{100}\right)^3$$

$$r = 20\%$$

Alternatively : The best way for this problem is to go through options.

$$12000 \times 1.2 \Rightarrow 14400 \times 1.2 \Rightarrow 17280 \times 1.2 \Rightarrow 20736$$

EXAMPLE 18. A certain sum amounts to Rs. 14641 in 4 years @ 10% p.a. compounded annually. What is the value of principal?
 (a) Rs. 6000
 (b) Rs. 12000
 (c) Rs. 10000
 (d) data insufficient

SOLUTION
$$14641 = P \left(1 + \frac{10}{100}\right)^4$$

$$14641 = P \left(\frac{11}{10}\right)^4$$

$$P = 14641 \times \left(\frac{10}{11}\right)^4$$

$$= 10000$$

EXAMPLE 19. A sum of Rs. 10000 is borrowed at 8% p.a. compounded annually which is paid back in 3 equal annual instalments. What is the amount of each instalments?

SOLUTION
$$10000 = x \left[\frac{25}{27} + \left(\frac{25}{27}\right)^2 + \left(\frac{25}{27}\right)^3 \right]$$

$$= x \times \frac{25}{27} \left[1 + \frac{25}{27} + \frac{625}{729} \right]$$

$$= \frac{25x}{27} \left[\frac{2029}{729} \right]$$

$$\Rightarrow x = \text{Rs. } 3880.335$$

Alternatively :

$$10000 (1.08)^3 = x [1 + (1.08) + (1.08)^2]$$

$$\Rightarrow x = 3880.335$$

EXAMPLE 20. A scooty is sold by an automobile agency for Rs. 19200 cash or for Rs. 4800 cash down payment together with five equal monthly instalments. If the rate of interest charged by the company is 12% per annum find each instalment.

SOLUTION Balance of the price to be paid through instalments
 $= \text{Rs. } 14400$

Rate of interest (r) = 12% p.a.

$$\therefore \left(14400 + \frac{14400 \times 12 \times 5}{100 \times 12}\right) = \left[x + \left(x + \frac{12x}{1200}\right) + \left(x + \frac{12x \times 2}{12 \times 100}\right) + \dots + \left(x + \frac{12x \times 4}{12 \times 100}\right)\right]$$

$\Rightarrow x = \text{Rs. } 2964.70$, where x is the value of each instalment.

NOTE In the left hand side and right hand side given amounts are equal. Each amount is equal to the total amount payable after 5 months.

Important : For quick and smooth calculation to the problems of this chapter you can remember the following values :

Rate of Interest	For Rs. 100, amount				
	after one year	after 2 years	after 3 years	after 4 years	after 5 years
5%	105	110.25	115.7625	121.550625	127.62815625
6%	106	112.36	119.1016	126.247696	133.82255776
8%	108	116.64	125.9712	136.048896	146.93280768
10%	110	121.00	133.1000	146.4100	161.051
12%	112	125.44	140.4928	157.351936	176.23416832
15%	115	132.25	152.0875	174.900625	201.13571875
20%	120	144.00	172.80	207.36	248.832
25%	125	156.25	195.3125	244.140625	305.17578125
30%	130	169.00	219.70	285.61	371.293
50%	150	225.00	337.50	506.25	759.375

EXERCISE

LEVEL (1)

- A man borrows Rs. 4000 and pays back after 5 years at 15% simple interest. The amount paid by the man is :
 (a) Rs. 1800 (b) Rs. 4800
 (c) Rs. 7500 (d) Rs. 7000
- What is the time period for which Rs. 8000 amounts to Rs. 12000 at 20% p.a. of simple interest?
 (a) 4 years (b) 2.5 years
 (c) 3.25 years (d) 6 years
- What is the rate of simple interest at which Rs. 14,000 gives interest of Rs. 1960 in two years?
 (a) 4% (b) 5%
 (c) 7% (d) 10%
- What is the sum of amount which gives Rs. 6300 as interest @ 7% per annum of simple interest in $7\frac{1}{2}$ years?
 (a) 36000 (b) 24000
 (c) 63000 (d) 12000
- If the rate of simple interest is 12% per annum, the amount that would fetch interest of Rs. 6000 per annum is :
 (a) Rs. 7200 (b) Rs. 48000
 (c) Rs. 50000 (d) Rs. 72000
- A sum was put at simple interest at a certain rate for 2 years. Had it been put at 4% higher rate, it would have fetched Rs. 112 more. The sum is :
 (a) 1120 (b) 1400
 (c) 1200 (d) 8000
- In what time will a sum of money double itself @ 20% per annum (p.a.) simple interest?
 (a) 10 years (b) 5 years
 (c) 2 years (d) 4 years
- At $r\%$ per annum a sum doubles after 20 years. The rate of interest per annum is :
 (a) 4% (b) 5%
 (c) 8% (d) 10%
- A sum of money trebles (i.e., 3 times) in 15 years at $r\%$ of simple interest per annum. What is the value of r ?
 (a) 12% (b) $\frac{40}{3}\%$
 (c) $\frac{50}{3}\%$ (d) can't be determined
- A sum of money doubles itself in 12 years. In how many years would it treble itself?
 (a) 36 years (b) 18 years
 (c) 24 years (d) 15 years
- Out of a sum of Rs. 625, a part was lent at 5% SI and the other at 10% SI. If the interest on the first part after 2 years is equal to the interest on the second part after 4 years, then the second sum (in Rs.) is :
 (a) 120 (b) 100
 (c) 80 (d) 78

- (a) 250 (b) 300
 (c) 125 (d) 275
- A sum of Rs. 2500 is lent out in two parts; one at 12% p.a. and another at 12.5% p.a. for one year. If the total annual income is Rs. 306, the money lent at 12% is :
 (a) 1000 (b) 1200
 (c) 1500 (d) 1300
- Akul lent Rs. 6000 to Bakul for 2 years and Rs. 1500 to Camlin for 4 years and received altogether from both Rs. 900 as simple interest. The rate of interest is :
 (a) 4% (b) 8%
 (c) 10% (d) 5%
- A person takes a loan of Rs. 200 at 5% simple interest. He returns Rs. 100 at the end of one year. In order to clear his dues at the end of 2 years, he would pay :
 (a) 125.50 (b) 110
 (c) 115.50 (d) none of these
- A lends a sum of money for 10 years at 5% SI. B lends double the amount for 5 years at the same rate of interest. Which of the following statements is true in this regard?
 (a) A will get twice the amount of interest that B would get
 (b) B will get twice the amount of interest that A would get
 (c) A will get the same amount of interest that B would get
 (d) B will get four times the amount of interest that A would get
- Consider the following statements.
 If a money is loaned at simple interest then the :
 (i) money gets doubled in 5 years if the rate of interest is $16\frac{2}{3}\%$.
 (ii) money gets doubled in 5 years if the rate of interest is 20%.
 (iii) money becomes four times in 10 years if it gets doubled in 5 years.
 of these statements :
 (a) (i) and (iii) are correct (b) (iii) alone is correct
 (c) (ii) alone is correct (d) (ii) and (iii) are correct
- Pratibha invests an amount of Rs. 15,860 in the names of her three daughters A, B and C in such a way that they get the same interest after 2, 3 and 4 years respectively. If the rate of simple interest is 5% p.a., then the ratio of the amounts invested among A, B and C will be :
 (a) 5 : 10 : 12 (b) $\frac{1}{12} : \frac{1}{10} : \frac{1}{8}$
 (c) 6 : 7 : 8 (d) 0.5 : 4
- What annual payment will discharge a debt of Rs. 580 in 5 years, the rate being 8% p.a.?
 (a) 120 (b) 100
 (c) 80 (d) 78

34. A certain sum amounts to Rs. 8988.8 in two years and to Rs. 9528.128 in three years, at compound interest per annum. What is the principal and rate of interest?
 (a) Rs. 12,000, 5% (b) Rs. 6,000, 8%
 (c) Rs. 8,000, 6% (d) Rs. 10,000, 8.5%

35. The compound interest and the simple interest for two years on a certain sum of money at a certain rate of interest are Rs. 2257.58, Rs. 2100 respectively. Find the principal and rate percent :
 (a) 6000, 7% (b) 7500, 8%
 (c) 14000, 10% (d) 7000, 15%

36. The compound interest on a certain sum at a certain rate of interest for the second year and third year is Rs. 21780 and Rs. 23958 respectively. What is the rate of interest?
 (a) 6% (b) 12%
 (c) 10% (d) 15%

37. Amit borrowed Rs. 800 at 10% rate of interest. He repaid Rs. 400 at the end of first year. What is the amount required to pay at the end of second year to discharge his loan which was calculated at compound interest?
 (a) 420 (b) 440
 (c) 450 (d) 528

38. A sonata watch is sold for Rs. 440 cash or for Rs. 200 cash down payment together with Rs. 244 to be paid after one month. Find the rate of interest charged in the instalment scheme :
 (a) 10% (b) 15%
 (c) 20% (d) 25%

39. A cellphone is available for Rs. 600 or for 300 cash down payment together with Rs. 360 to be paid after two months. Find the rate of interest charged under this scheme :
 (a) 20% (b) 50%
 (c) 120% (d) none of these

40. Abhinav purchases a track suit for Rs. 2400 cash or for Rs. 1000 cash down payments and two monthly instalments of Rs. 800 each. Find the rate of interest :
 (a) 75% (b) 120%
 (c) 50% (d) none of these

41. Indicom cell-phone is available for Rs. 2500 cash or Rs. 520 cash down payments followed by 4 equal monthly instalments. If the rate of interest charged is 25% per annum, calculate the monthly instalment :
 (a) 520 (b) 480
 (c) 550 (d) none of these

42. An article is sold for Rs. 500 cash or for Rs. 150 cash down payments followed by 5 equal monthly instalments. If the rate of interest charged is 18% p.a., compute the monthly instalment :
 (a) 63.07% (b) 37.06%
 (c) 75.0% (d) 73.06%

43. A sum of Rs. 390200 is to be paid back in three equal annual instalments. How much is each instalment, if the rate of interest charged is 4% per annum compounded annually?
 (a) Rs. 140608 (b) Rs. 120560
 (c) Rs. 10000 (d) Rs. 18000

Purnima borrowed a sum of money and returned it in three equal quarterly instalments of Rs. 17576 each. Find the sum borrowed, if the rate of interest charged was 16% per annum compounded quarterly. Find also the total interest charged.
 (a) 46900 and 4700 (b) 48775 and 3953
 (c) 68320 and 1200 (d) none of these

45. Sunidhi borrowed Rs. 10815, which is to be paid back in 3 equal half yearly instalments. If the interest is compounded half yearly at $\frac{40}{3}\%$ per annum, how much is each instalment?

- (a) 2048 (b) 3150 (c) 4096 (d) 5052

46. Sapna borrowed some money on compound interest and returned it in three years in equal annual instalments. If the rate of interest is 15% per annum and annual instalment is Rs. 486680, find the sum borrowed :

- (a) 111220 (b) 1111200 (c) 1122000 (d) none of these

47. P and Q invest some amount under SI and CI respectively but for the same period at 6% per annum. Each gets a total amount of Rs. 65,000 at the end of 6 years. Which of the following is definitely true?

- (i) Q's initial principal is less than that of P
 (ii) Q's initial principal is equal to that of P
 (iii) P's percentage earning is less than that of Q
 (a) (i) only (b) (ii) only (c) (iii) only (d) (i) and (iii) only

48. In the above (i.e., previous) problem, what is the ratio of P's final amount to that of Q, if P and Q invest the same amounts?

- (a) $(1.06)^6$ (b) $\frac{136}{100} \times \left(\frac{100}{106}\right)^6$
 (c) $\frac{100}{136} \times \left(\frac{106}{100}\right)^6$ (d) none of these

49. Mr. Lala Ram has lent some money to Aaju at 6% p.a. and the Baaju at 8% p.a. At the end of the year he has gain the overall interest at 7% per annum. In what ratio has he lent the money to Aaju and Baaju?

- (a) 2 : 3 (b) 1 : 1 (c) 5 : 6 (d) 4 : 3

LEVEL (2)

1. The compound interest on a certain sum for 2 years is Rs. 756 and SI (simple interest) is Rs. 720. If the sum is invested such that the SI is Rs. 900 and the number of years is equal to the rate per cent per annum, find the rate per cent :

- (a) 4 (b) 5 (c) 6 (d) 1.0

2. Jalela and Dalela have to clear their respective loans by paying 3 equal annual instalments of Rs. 30000 each. Jalela pays @ 10% per annum of simple interest while Dalela pays 10% per annum compound interest. What is the difference in their payments?

- (a) Rs. 300 (b) Rs. 425 (c) Rs. 245 (d) Rs. 333.33

3. Akbar lends twice the interest received from Birbal to Chanakya at the half of the interest at which he lent to Birbal. If Akbar lent Rs. P @ $r\%$ per annum for 1 year to Birbal then the interest received by Akbar from Chanakya is :

- (a) $\frac{Pr^2}{100}$ (b) $\left(\frac{Pr}{10}\right)^2$
 (c) $P\left(\frac{r}{10}\right)^2$ (d) $P\left(\frac{r}{100}\right)^2$

50. The difference between simple and compound interest for the fourth year is Rs. 7280 at 20% p.a. What is the principal sum?

- (a) 10000 (b) 50000 (c) 1 lakh (d) 40000

51. The simple interest on certain sum at 5% for 9 month is Rs. 10 greater than the simple interest on the same sum @ 3% for 14 months. What is the sum of interest in both the cases (i.e., total sum of interest)?

- (a) Rs. 130 (b) Rs. 290 (c) Rs. 120 (d) Rs. 330

52. Mr. Bajaj invested $\frac{1}{7}$ of his total investment at 4% and $\frac{1}{2}$ at 5% and rest at 6% for the one year and received total interest of Rs. 730. What is the total sum invested?

- (a) Rs. 70000 (b) Rs. 14000 (c) Rs. 24000 (d) Rs. 38000

53. The rate of interest in two banks DNB and HBI are in the ratio of 7 : 8. If a person invested some amount in both the banks and received equal amounts from both the banks in two year. The ratio of amount invested in DNB and HBI respectively is :

- (a) 15 : 1 (b) 8 : 7 (c) 7 : 8 (d) 108 : 107

54. The ratio of CI for 3 years and SI for 1 year for a fixed amount at a rate of $r\%$ is 3.64. What is the value of r ?

- (a) 10% (b) 15% (c) 20% (d) none of these

55. A sum of money becomes $\frac{13}{5}$ times of itself in 32 years at $r\%$ of SI. What is the value of r ?

- (a) 6% (b) 7% (c) 5% (d) 18%

56. The difference between interest received by A and B is Rs. 18 on Rs. 1500 for 3 year. What is the difference in rate of interest?

- (a) 1% (b) 2.5% (c) 0.5% (d) 0.4%

4. Equal amounts of each Rs. 43892 is lend to two persons for 3 years. One @ 30% SI and second @ 30% CI annually. By how much per cent the CI is greater than the simple interest received in this 3 years duration?

- (a) 23% (b) 33% (c) 33.33% (d) none of these

5. Rs. 3500 was lent partly @ 4% and partly @ 6% SI. The total interest received after 3 years is 498. What is the amount lent @ 4% SI?

- (a) Rs. 1300 (b) Rs. 1800 (c) Rs. 200 (d) Rs. 2200

6. The population of vultures in a particular locality is decreases by a certain rate of interest (compounded annually). If the current population of vultures be 29160 and the ratio of decrease in population for second year and 3rd year be 10 : 9. What was the population of vultures 3 years ago?

- (a) 30000 (b) 35000 (c) 40000 (d) 50000

7. The ratio of the amount for two years under CI annually and for one year under SI is 6 : 5. When the rate of interest is same, then the value of rate of interest is :

- (a) 12.5% (b) 18%
(c) 20% (d) 16.66%
8. A bicycle can be purchased on cash payment of Rs. 1500. The same bicycle can also be purchased at the down payment (initial payment, at the time of purchasing) of Rs. 350 and rest can be paid in 3 equal installments of Rs. 400 for next 3 months. The rate of SI per annum charged by the dealer is :
(a) $23\frac{9}{17}\%$ (b) $17\frac{9}{23}\%$
(c) $13\frac{9}{17}\%$ (d) none of these
9. Data Ram lends equal sum of money at the same rate of interest to A and B. The money lends to A becomes twice of the original amount in just four years at simple interest. While Data Ram lends to B for the first two years at compound interest and for the rest two years at simple interest. If the difference between the amount of A and B after 4 years is Rs. 2750. What is the amount of money that Data Ram lends to each one?
(a) Rs. 40000 (b) Rs. 6000
(c) Rs. 8000 (d) Rs. 80000
10. Akram Ali left an amount of Rs. 340000 to be divided between his two sons aged 10 years and 12 years such that both of them would get an equal amount when each attain 18 years age. What is the share of elder brother if the whole amount was invested at 10% simple interest :
(a) 12000 (b) 16000
(c) 160000 (d) 180000
11. Satyam took loan from IDIDI Bank for his 2 years course of MBA at IMD. He took the loan of Rs. 6 lakh such that he would be charged at 8% per annum at CI during his course and at 10% CI after the completion of course. He returned half of the amount which he had to be paid on the completion of his studies and remaining after 2 years. What is the total amount returned by Satyam ?
(a) Rs. 7.73323 lakh (b) Rs. 7.58 lakh
(c) Rs. 7.336 lakh (d) none of these
12. We had 1000 goats at the beginning of year 2001 and the no. of goats each year increases by 10% by giving birth (compounded annually). At the end of each year we double the no. of goats by purchasing the same no. of goats as there is the no. of goats with us at the time. What is the no. of goats at the beginning of 2004?
(a) 10600 (b) 10648
(c) 8848 (d) 8226
13. Rs. 100000 was invested by Mohan in a fixed deposit @ 10% per annum at CI. However every year he has to pay 20% tax on the compound interest. How much money does Mohan has after 3 year?
(a) 128414 (b) 108000
(c) 126079.2 (d) none of these
14. A property dealer bought a rectangular plot (of land) in Noida 5 years ago at the rate of Rs. 1000 per m^2 . The cost of plot is increases by 5% in every 6 years and the worth of a rupee falls down at a rate of 2% in every 5 years. What is the approximate value of the land per meter² 25 years hence?
(a) Rs. 995 (b) Rs. 1134
(c) Rs. 1500 (d) Rs. 1495
15. A and B are in the ratio 28 : 15. A invest his share at the start of the year and B joins in after 9 months of the same year. What is the ratio of their initial investment respectively?
(a) 7 : 15 (b) 8 : 13
(c) 5 : 17 (d) 15 : 7
16. In the previous problem if A gets a profit of Rs. 4200 the amount invested by B is :
(a) 2250 (b) 2600
(c) 1350 (d) can't be determined
17. Arvind and Govind each invested Rs. 15000 for 3 years at the same rate of interest but Arvind's investment is compounded annually while Govind's investment is charged on simple interest. What amount did Arvind receive more than Govind?
(a) Rs. 680 (b) Rs. 3450
(c) data insufficient (d) none of these
18. Shyam Lal takes a loan of Rs. 10500 at 10% p.a. compounded annually which is to be repaid in two equal annual instalments. One at the end of one year and the other at the end of the second year. The value of each instalments is :
(a) 5987 (b) 6050
(c) 6352.5 (d) 5678.5
19. Hari Lal and Hari Prasad have equal amounts. Hari Lal invested all his amount at 10% compounded annually for 2 years and Hari Prasad invested $1/4$ at 10% compound interest (annually) and rest at $r\%$ per annum at simple interest for the same 2 years period. The amount received by both at the end of 2 year is same. What is the value of r ?
(a) 14% (b) 12.5%
(c) 10.5% (d) 11%
20. The annual sales of a company in the year 2000 was Rs. 1000 and in the year 2005 was Rs. 2490. Find the compounded annual growth rate (CAGR) of sales in the given period of the same company :
(a) 14.289% (b) 10%
(c) 15% (d) 20%
21. HDFC lends 1 million to HUDCO at 10% simple interest p.a. for 2 years and HUDCO lends the same amount to SAHARA STATES HOUSING corporation at 10% p.a. of compound interest for 2 years. What is the earning of HUDCO in this way?
(a) Rs. 133100 (b) Rs. 33100
(c) Rs. 131000 (d) no profit no loss
22. ICICI lent Rs. 1 lakh to captain Ram Singh @ 6% per annum of simple interest for 10 years period. Meanwhile ICICI offered a discount in rate of interest for armed forces. Thus the rate of interest ICICI decreased to 4%. In this way Ram Singh had to pay total amount 1.48 lakh.
After how many year Ram Singh got the discount in rate of interest?
(a) 3 years (b) 4 years
(c) 6 years (d) 5 years
23. Sanjay purchased a hotel worth Rs. 10 lakh and barkha purchased a car worth Rs. 16 lakh. The value of hotel every year increases by 20% of the previous value and the value of car every year depreciates by 25%. What is the difference between the price of hotel and car after 3 years?
(a) Rs. 925000 (b) Rs. 10,53,000
(c) remains constant (d) can't be determined



Answers

LEVEL-1

1. (d)	2. (b)	3. (c)	4. (d)	5. (c)	6. (b)	7. (b)	8. (b)	9. (b)	10. (c)
11. (c)	12. (d)	13. (d)	14. (c)	15. (c)	16. (c)	17. (b)	18. (b)	19. (c)	20. (b)
21. (a)	22. (a)	23. (c)	24. (c)	25. (b)	26. (c)	27. (b)	28. (a)	29. (b)	30. (b)
31. (b)	32. (c)	33. (b)	34. (c)	35. (d)	36. (c)	37. (d)	38. (c)	39. (c)	40. (b)
41. (a)	42. (d)	43. (a)	44. (b)	45. (c)	46. (b)	47. (d)	48. (b)	49. (b)	50. (b)
51. (b)	52. (b)	53. (b)	54. (c)	55. (c)	56. (d)				

LEVEL-2

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



Hints & Solutions

LEVEL (1)

1. $4000 + (4000 \times 5 \times 0.15) = \text{Rs. } 7000$

2. $(12000 - 8000) = \frac{8000 \times t \times 20}{100}$
 $\Rightarrow t = \frac{5}{2} \text{ years}$

3. $1960 = \frac{14000 \times r \times 2}{100} \Rightarrow r = 7\%$

4. $6300 = \frac{P \times 7 \times 15}{100 \times 2}$
 $\Rightarrow P = \text{Rs. } 12000$

5. $6000 = \frac{P \times 12 \times 1}{100}$
 $\Rightarrow P = 50000$

6. In my opinion this question should be solved by unitary method instead of making complex solution

Years	Rate of Interest	Interest
2	4%	112
2	1%	28
1	1%	(14)

It means the principal sum is Rs. 1400

Alternatively: $\frac{P}{100} \times 2[(r + 4) - r] = 112$

$\Rightarrow P = 1400$

7. $SI = 2P - P = P$ (Interest = Amount - Principal)

$P = \frac{P \times 20 \times t}{100} \Rightarrow t = 5 \text{ years}$

8. $P = \frac{P \times r \times 20}{100}$ (Interest = Amount - Principal)

$\Rightarrow r = 5\% \text{ p.a.}$

9. $2P = \frac{P \times 15 \times r}{100}$ $(2P = 3P - P)$
 $r = \frac{40}{3}\% \text{ p.a.}$

10. $P = \frac{P \times r \times 12}{100} \Rightarrow r = \frac{100}{12}\% \text{ p.a.}$

Now, $2P = \frac{P \times 100 \times t}{12 \times 100} = 24 \text{ years}$

Shortcut (for SI) Since SI in second case is double the SI in first case, so the time period will also be double since SI is directly proportional to the time period, provided that rate of interest be same and principal as well.

11. $\frac{P_1 \times 5 \times 2}{100} = \frac{P_2 \times 10 \times 4}{100}$
 $\Rightarrow P_1 : P_2 = 4 : 1$

Therefore second principal is Rs. 125 ($= 625 \times \frac{1}{5}$)

Alternative: Go through options.

12. Best way is to go through option

So, $1300 \times 0.12 + 1200 \times 0.125 = 306$

Hence, (d) is the correct option.

Alternatively: Solve through alligation

Therefore the ratio of first principal to the second principal is

13 : 12.

$$\begin{array}{ccc}
 12 & & 12.5 \\
 & \diagup & \diagdown \\
 & 12.24 & \\
 & \diagdown & \diagup \\
 0.26 & & 0.24 \\
 \hline
 13 & : & 12
 \end{array}
 \quad \left| \quad \begin{array}{l}
 306 = \frac{2500 \times r \times 1}{100} \\
 r = \frac{306}{25} = 12.24
 \end{array}
 \right.$$

13. $\left(\frac{6000 \times 2 + 1500 \times 4}{100} \right) r = 900$

$\Rightarrow r = 5\%$

14. Amount to be paid in first year $= \frac{200 \times 5 \times 1}{100} + 200 = 210$

Amount left as a principal for the second year

$= 210 - 100 = 110$

\therefore Amount paid in second year $= 110 + \frac{110 \times 5 \times 1}{100} = 115.5$

15.

$$\begin{array}{ccc}
 A & & B \\
 P_A = P & & P_B = 2P \\
 r_A = 5\% & & r_B = 5\% \\
 t = 10 \text{ years} & & t = 5 \text{ years} \\
 \text{Interest of } A = \frac{P \times 5 \times 10}{100} & & \text{Interest of } B = \frac{2P \times 5 \times 5}{100} \\
 & & = \frac{P}{2}
 \end{array}$$

Hence (c) is correct

16. **Statement (I)**

$$\frac{P \times 5 \times 50}{100 \times 3} \neq P, \text{ hence wrong}$$

Statement (II)

$$SI = \frac{P \times 5 \times 20}{100} = P, \text{ hence correct}$$

Statement (III)

$$P = \frac{P \times 5 \times r}{100} \Rightarrow r = 20\%$$

Again $SI = \frac{P \times 10 \times 20}{100} = 2P$ hence wrong

17. $\frac{P_1 \times 2 \times 5}{100} = \frac{P_2 \times 3 \times 5}{100} = \frac{P_3 \times 4 \times 5}{100}$

$\Rightarrow 10P_1 = 15P_2 = 20P_3$

$\Rightarrow P_1 : P_2 : P_3 = 30 : 20 : 15 = \frac{1}{10} : \frac{1}{15} : \frac{1}{20}$

Q/SI/Instalments

18. $580 = \left[(x) + \left(x + \frac{x \times 1 \times 8}{100} \right) + \left(x + \frac{x \times 2 \times 8}{100} \right) + \left(x + \frac{x \times 3 \times 8}{100} \right) + \left(x + \frac{x \times 4 \times 8}{100} \right) \right]$

$580 = 5x + \frac{8x}{10} = \frac{58x}{10}$

$x = 100$

19. Time period = Feb 24 + March 31 + April 18

$= 73 \text{ days} = \frac{1}{5} \text{ year}$

20. $2500 + \frac{2500 \times 12 \times 1}{100 \times 5} = \text{Rs. 2560}$

21. $1700 + \frac{1700 \times 16 \times 2}{100} = \text{Rs. 2244}$

$A = P \left(1 + \frac{r}{100} \right)^n$

$A = 1000 \left(1 + \frac{10}{100} \right)^3$

$A = 1000 \times (1.1)^3$

$A = 1331$

$CI = A - P = 1331 - 1000 = 331$

22. $A = 10000 \times (1.2)^4$

$A = 10000 \times 2.0736$

$A = 20736$

$CI = A - P$

$CI = 20736 - 10000 = 10736$

23. $CI = [4000 \times (1.25)^3] - (4000)$

$= 4000 \times 1.953125 - 4000$

$= 4000 \times 0.953125$

$= 3812.5$

24. $CI = 5000 \times (1.3)^4 - 5000$

$= 5000 \times 2.8561 - 5000$

$= 5000 (1.8561)$

$= 9280.5$

25. $441 = 400 \left(1 + \frac{r}{100} \right)^2$

$\frac{21}{20} = 1 + \frac{r}{100}$

$r = 5\%$

26. Since, $A = 2P$, then

$2P = P \left(1 + \frac{r}{100} \right)^n$

$2 = \left(1 + \frac{r}{100} \right)^n$

$4 = (2)^2 = \left[\left(1 + \frac{r}{100} \right)^n \right]^2 = \left[\left(1 + \frac{r}{100} \right)^{2n} \right]$

time period = $2n$ $\{ \because (a^m)^n = a^{m \cdot n} \}$

(This question can be easily done by considering some appropriate values)

27.

$7986 = 6000 \left(1 + \frac{r}{100} \right)^3$

$\frac{7986}{6000} = \left(1 + \frac{r}{100} \right)^3$

$\frac{1331}{1000} = \left(1 + \frac{r}{100} \right)^3$

$\frac{11}{10} = \left(1 + \frac{r}{100} \right)$

$r = 10\%$

Alternatively: Go through options.

$6000 \xrightarrow{+10\%} 6600 \xrightarrow{+10\%} 7260 \xrightarrow{+10\%} 7986$

Hence, assumed option is correct.

28. Go through option

$1 \times (1.2) = 1.2$

$1 \times (1.2)^2 = 1.44$

$1 \times (1.2)^3 = 1.728$

$1 \times (1.2)^4 = 2.0736$

Hence minimum 4 years are required to double the sum.

29. $A = P \left(1 + \frac{R_1}{100} \right) \left(1 + \frac{R_2}{100} \right) \left(1 + \frac{R_3}{100} \right) \dots$

$A = 5000 (1.08) (1.1) (1.12)$

$A = 6652.8$

$CI = 1652.8 = (6652.8 - 5000)$

30. $2P = P \left(1 + \frac{r}{100} \right)^5$

$2 = \left(1 + \frac{r}{100} \right)^5$

Now, $(2)^4 = \left(\left(1 + \frac{r}{100} \right)^5 \right)^4 = \left(1 + \frac{r}{100} \right)^{20}$

\Rightarrow The amount becomes 16 ($= 2^4$) times

\therefore Hence (b) is correct, $\because (2400 \times 16 = 38400)$

31. $550 = x \left[\left(\frac{1}{1.2} \right) + \left(\frac{1}{1.2} \right)^2 \right]$

$550 = x \left[\frac{2.2}{1.44} \right]$

$x = \text{Rs. 360}$

32. Difference between CI and SI for 2 years = $P \left(\frac{r}{100} \right)^2$

$40 = P \left(\frac{10}{100} \right)^2 \Rightarrow P = 4000$

Alternatively: Go through options

First year	Second year
SI 400	400
CI 400	440

Alternatively: Go back in the reverse process.

Rs. 40 at 10% implies that the principal for this interest was Rs. 400. Again by the same logic Rs. 400 as interest obtained at the principal of Rs. 4000 at 10%.

33. $6000 \left(\frac{10}{100} \right)^2 = 60$

34. $\frac{P \left(1 + \frac{r}{100} \right)^3}{P \left(1 + \frac{r}{100} \right)^2} = \left(1 + \frac{r}{100} \right)$

$$\therefore \frac{9528.128}{8988.8} = \left(1 + \frac{r}{100} \right)$$

$$\Rightarrow \left(1 + \frac{84270}{1404500} \right) = \left(1 + \frac{r}{100} \right)$$

$$\Rightarrow \left(1 + \frac{6}{100} \right) = \left(1 + \frac{r}{100} \right)$$

$$\Rightarrow r = 6\%$$

So, $8988.8 = P \left(1 + \frac{6}{100} \right)^3$

$$\Rightarrow P = 8000$$

Alternatively: Best way is to go through options.

35. Difference between CI and SI for 2 years will be equal to the interest on SI for first year.

Hence, $6000 \times 0.07 \Rightarrow 420 \times 0.07 = 29.4 \neq 157.5$

and $7500 \times 0.08 \Rightarrow 600 \times 0.08 = 48 \neq 157.5$

and $14000 \times 0.1 \Rightarrow 1400 \times 0.1 = 140 \neq 157.5$

and $7000 \times 0.15 \Rightarrow 1050 \times 0.15 = 157.5 = 157.5$

Thus option (d) is correct.

36. $\frac{P \left(1 + \frac{r}{100} \right)^3}{P \left(1 + \frac{r}{100} \right)^2} = \left(1 + \frac{r}{100} \right)$

$$\frac{23958}{21780} = \left(1 + \frac{r}{100} \right)$$

$$1 + \frac{2178}{21780} = 1 + \frac{r}{100}$$

$$r = 10\%$$

Alternatively: Remember the difference between compound interest of any two consecutive years will be same as the interest on the amount of total previous years.

So, $23958 - 21780 = 2178$

Now

$$r = \frac{2178}{21780} \times 100$$

$$r = 10\%$$

37. Amount to be paid at the end of 2 year

$$= \frac{800 \times 10 \times 2}{100} + 800 = 880$$

Amount left as principal for the second year

$$= 480 = (880 - 400)$$

Amount to be paid after 2nd year = $480 + \frac{480 \times 10}{100}$
 $= 528$

38. Principal for next month = $440 - 200 = 240$

Amount paid after next month = 244

Therefore interest charged at Rs. 240 = 4

$$4 = \frac{240 \times r \times 1}{12 \times 100}$$

$$\therefore r = 20\% \text{ per annum}$$

39. Amount as a principal for first and second month = $600 - 300 = \text{Rs. } 300$

Now, interest = $360 - 300 = \text{Rs. } 60$

$$60 = \frac{300}{100} \times \frac{2}{12} \times r$$

$$\therefore r = 120\%$$

40. Amount as a principal for 2 month = $2400 - 1000 = 1400$
At the rate of $r\%$ per annum after 2 months, Rs. 1400 will amount to

$$\text{Rs. } \left(1400 + \frac{1400 \times r \times 2}{100 \times 12} \right)$$

Again total amount for the 2 instalments at the end of second month will be

$$\text{Rs. } \left[800 + \left(800 + \frac{800 \times r \times 1}{100 \times 12} \right) \right]$$

from (i) and (ii), we get

$$1400 + \frac{2800r}{1200} = 1600 + \frac{800r}{1200}$$

$$\frac{2000r}{1200} = 200$$

$$\Rightarrow r = 120\%$$

41. Balance price to be paid in instalments = 1980

At the rate of $r\%$ per annum after 4 months, Rs. 1980 will amount to $\text{Rs. } \left(1980 + \frac{1980 \times 4 \times 25}{12 \times 100} \right) = \text{Rs. } 2145$

Now, the total amount for the 4 instalments at the end of fourth month will be

$$\left[x + \left(x + \frac{25x \times 1}{12 \times 100} \right) + \left(x + \frac{25x \times 2}{12 \times 100} \right) + \left(x + \frac{25 \times 3x}{12 \times 100} \right) \right]$$

$$= 4x + \frac{25x}{1200} (1 + 2 + 3)$$

$$= \frac{33x}{8}$$

from (i) and (ii) $\frac{33x}{8} = 2145$

$$x = 520$$

42. Balance price to be paid in instalments = 350
At the rate of $r\%$ per annum after 5 months, Rs. 350 will amount to

$$\text{Rs. } \left(350 + \frac{350 \times 18 \times 5}{12 \times 100} \right) = \left(350 + \frac{1750 \times 18}{1200} \right)$$

Again, total amount for the 5 instalments at the end of 5 month will be

$$\begin{aligned}
 & \text{Q/SI/Instalments} \\
 & \text{Rs.} \left[x + \left(x + \frac{18x \times 1}{1200} \right) + \left(x + \frac{18x \times 2}{1200} \right) \right. \\
 & \quad \left. + \left(x + \frac{18x \times 3}{1200} \right) + \left(x + \frac{18x \times 4}{1200} \right) \right] \\
 & = \left[5x + \frac{18x}{1200} (1+2+3+4) \right] \\
 & = 5x + \frac{180x}{1200} = \left(\frac{6180x}{1200} \right) \quad \dots \text{(ii)}
 \end{aligned}$$

from (i) and (ii), we get

$$\left(350 + \frac{1750 \times 18}{1200} \right) = \frac{6180x}{1200} \\
 x = 73.058$$

\Rightarrow Let each instalments be Rs. x

The amount to be paid instalments = 390200

The total value of all the three instalments is

$$\text{Rs.} \left[x \left(\frac{25}{26} \right) + x \left(\frac{25}{26} \right)^2 + x \left(\frac{25}{26} \right)^3 \right]$$

and this must be equal to Rs. 390200

$$\text{Hence, } x \times \frac{25}{26} \left[1 + \frac{25}{26} + \frac{625}{676} \right] = 390200$$

$$x = \text{Rs. } 140608$$

4. Rate of interest = 16% annum

Actual rate of interest = 4% per quarter

Principal of all three instalments

$$\begin{aligned}
 & = \left[17576 \left(\left(\frac{25}{26} \right) + \left(\frac{25}{26} \right)^2 + \left(\frac{25}{26} \right)^3 \right) \right] \\
 & = \frac{17576 \times 25 \times 1951}{26 \times 676} \\
 & = 48775
 \end{aligned}$$

Total amount paid = Rs. $17576 \times 3 = 52728$

Interest charged = $52728 - 48775 = 3953$

5. Rate of interest = $\frac{40/3}{2} \% = \frac{20}{3} \% \text{ half yearly}$

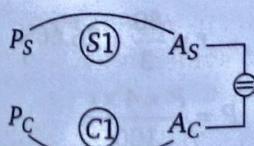
$$10815 = x \left[\frac{15}{16} + \left(\frac{15}{16} \right)^2 + \left(\frac{15}{16} \right)^3 \right]$$

$$x = 4096$$

$$P = 486680 \left[\frac{20}{23} + \left(\frac{20}{23} \right)^2 + \left(\frac{20}{23} \right)^3 \right]$$

$$\Rightarrow P = \left[486680 \times \frac{20}{23} \left(1 + \frac{20}{23} + \frac{400}{529} \right) \right]$$

$$P = 1111200$$



Obviously $P_S > P_C$, therefore percentage gain of P_C is greater than P_S .

48.

$$A_S = P + \frac{P \times 6 \times 6}{100} = P \left(\frac{136}{100} \right)$$

$$A_C = P \left(1 + \frac{6}{100} \right)^6 = P \left(\frac{106}{100} \right)^6$$

$$\therefore \frac{A_S}{A_C} = \frac{136}{100} \times \left(\frac{100}{106} \right)^6$$

49.



50. Difference between CI and SI for n^{th} year

$$= \frac{Pr}{100} \left[\left(1 + \frac{r}{100} \right)^{n-1} - 1 \right]$$

$$7280 = \frac{P \times 20}{100} [(1.2)^3 - 1]$$

$$\Rightarrow P = 50000$$

Alternatively:

Initially	I st year	II nd year	III rd year	IV th year
SI	10000	12000	14000	16000
CI	10000	12000	14400	17280

$$\text{CI for 4th year} = 17280 - 14400 = 3456$$

$$\text{SI for 4th year} = 2000$$

Difference between CI and SI = 1456 for Rs. 10000

So, the difference of Rs. 7280 is for Rs. 50000

$$51. \quad \frac{P \times 5 \times 9}{100 \times 12} - \frac{P \times 14 \times 3}{100 \times 12} = 10$$

$$\Rightarrow P = \text{Rs. } 4000$$

$$\text{Now, } \frac{4000}{100 \times 12} [5 \times 9 + 14 \times 3] = \text{Rs. } 290$$

52. Let the principal be x , then

$$\left(\frac{x}{7} \times 4 + \frac{x}{2} \times 5 + \frac{5x}{14} \times 6 \right) = 730$$

$$\Rightarrow x = 14000$$

Alternatively: Go through suitable options.

Choose any middlemost option so that if the chosen option is not correct, then you can determine that whether you have to increase or decrease the value of the choices given.

$$53. \quad \frac{P_1 \times 2 \times 7x}{100} = \frac{P_2 \times 2 \times 8x}{100}$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{8}{7}$$

$$54. \quad \frac{P \left[\left(1 + \frac{r}{100} \right)^3 - 1 \right]}{\frac{pr}{100}} = \frac{\left(1 + \frac{r}{100} \right)^3 - 1}{\frac{r}{100}} = 3.64$$

Now go through options and verify

$$\frac{\left(1 + \frac{20}{100}\right)^3 - 1}{\frac{20}{100}} = \frac{(1.2)^3 - 1}{0.2} = \frac{0.728}{0.2} = 3.64$$

Hence (c) is correct.

LEVEL (2)

1. CI for 2 years = Rs. 756

SI for 2 years = Rs. 720

It means the interest on the interest of the first year = Rs. 36
(= 756 - 720)

This implies that the rate of interest is 10%

$$\text{as } \frac{36}{360} \times 100 = 10\%$$

It means the principal for first year was Rs. 3600

$$\therefore \frac{P \times 10 \times 1}{100} = 360$$

$$\Rightarrow P = 3600$$

$$\text{Now, } \frac{P \times k \times k}{100} = \text{SI, where } r = t = k$$

$$\frac{3600 \times k^2}{100} = 900$$

$$\Rightarrow k = 5$$

$$2. 30000 (1 + 1.1 + (1.1)^2) - 30000 (1 + 1.1 + 1.2)$$

$$\Rightarrow \text{Rs. 300}$$

$$30000 \left(1 + \frac{10}{100}\right)^2 - \frac{30000 \times 10 \times 2}{100}$$

$$\Rightarrow \text{Rs. 300}$$

$$3. \text{ Interest received from Birbal} = \frac{Pr}{100}$$

$$\text{Interest received from Chanakya} = \frac{\left(2 \frac{Pr}{100}\right) \times \frac{r}{2}}{100}$$

$$= P \left(\frac{r}{100}\right)^2$$

$$4. 100 (1.3)^3 = 219.7$$

$$\Rightarrow \text{CI} = 119.7$$

$$\text{and } \text{SI} = \frac{100 \times 3 \times 30}{100} = 90$$

∴ CI is greater than SI by Rs. 29.7

$$\therefore \% \text{ increase} = \frac{29.7}{90} \times 100 = 33.00\%$$

5. The best way is to go through options

$$\frac{2200 \times 4 \times 3}{100} + \frac{1300 \times 6 \times 3}{100} = \text{Rs. 498}$$

Hence the presumed option is correct.

NOTE When we consider Rs. 2200 for 4%, then the rest amount i.e., Rs. 1300 = (3500 - 2200) will be considered automatically for 6%.

55.

$$\frac{8P}{5} = \frac{P \times r \times 32}{100}$$

$$r = 5\%$$

56.

$$\Rightarrow \frac{1500 \times 3}{100} (r_1 - r_2) = 18$$

$$r_1 - r_2 = 0.4$$

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Installments
Again

$$\frac{25P}{16} \times \frac{2 \times 25}{100} = \frac{25P}{32}$$

Therefore total amount of A after 4 years = $2P$

$$\text{and total amount of B after 4 years} = \frac{25P}{16} + \frac{25P}{32} = \frac{75P}{32}$$

$$\text{Therefore difference in amount} = \frac{75P}{32} - 2P = \frac{11P}{32} = 2750$$

$$P = 8000$$

⇒ Go through options

$$10. \text{ Go through options} \\ 1.8 + \frac{1.8 \times 6 \times 10}{100} = 1.6 + \frac{1.6 \times 8 \times 10}{100},$$

Hence (d) is correct.

$$\text{Alternatively: } P_1 + \frac{P_1 \times 6 \times 10}{100} = P_2 + \frac{P_2 \times 8 \times 10}{100}$$

$$\frac{P_1}{P_2} = \frac{9}{8}$$

11. Amount which is to be returned on completion of studies

$$= 600000 \times (1.08)^2$$

$$= 699840$$

But only half of 699840 is returned which is equal to Rs. 349920

∴ Amount which is returned after two years of completion of studies

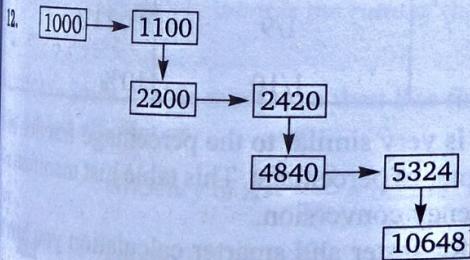
$$= 349920 \left(1 + \frac{10}{100}\right)^2$$

$$= 423403.2$$

Total amount returned

$$= 349920 + 423403.2 = 773323.2$$

= Rs. 7.73323 lakh



13. Note that, ultimately 8% interest is charged.

So the net value after 3 years = 125971.2

14. Total time = $25 + 5 = 30$ years

Again no. of time periods for cost increment = $\frac{30}{6} = 5$

and no. of time periods for rupee depreciation = $\frac{30}{5} = 6$

Now, the net value of the plot = $1000 \times (1.05)^5 \times (0.98)^6$

15.

≈ Rs. 1130

$$\frac{A}{B} = \frac{12 \times x}{3 \times y} = \frac{28}{15}$$

$$\Rightarrow \frac{A}{B} = \frac{7}{15}$$

16. We can find the profit of B but not investment.

17. We don't know the rate of interest.

18.

$$10500 = x \left[\frac{10}{11} + \left(\frac{10}{11} \right)^2 \right]$$

$$\Rightarrow x = 6050$$

19. Let the amount of investment with each one be Rs. 400, then

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$$[400 (1.1)^2] = [100 (1.1)^2] + \left[300 + \frac{300 \times r \times 2}{100} \right]$$

$$\Rightarrow r = 10.5\%$$

20. Best way is to go through options

$$1000 \times (1.2)^2 = 2488.32 \approx 2490$$

$$21. \text{ Amount earned by HDFC} = 1000000 + \frac{1000000 \times 10 \times 2}{100}$$

$$= 1200000$$

Amount earned by HUDCO = $1000000 (1.1)^3 = 1331000$

Net earning of HUDCO = $1331000 - 1200000 = 131000$

22. Interest paid by Ram Singh = Rs. 48000

Now go through option

$$48000 = \frac{100000}{100} [6 \times 4 + 4 \times 6]$$

$$48000 = 48000$$

Hence proved that option (b) is correct. It means Ram Singh availed the discount after 4 years of loaning.

23. Worth of hotel after 3 years = $1000000 (1.2)^3$

$$= 1728000$$

$$\text{Worth of car after 3 years} = 1600000 \left(\frac{3}{4}\right)^3$$

$$= \text{Rs. 6,75,000}$$

So, the difference in their worth (pertaining to hotel and car) is

$$= 1728000 - 675000 = 10,53,000$$

