Numerical Ability

(1) Conventional Method
(2) Improvised Method
(3) Substitution Method.

(a) Framing equation
(b) Ratios & proportions
(c) Percentages
(d) Averages

Simple Equations

Q1) In a zoo there are rabbits and peacocks, where heads are counted there are 90 & when legs are counted there are 224. find the no. of rabbits & peacocks?

Sol: $r + p = 90$ — (1)

$4r + 2p = 224$ — (2)

Conventional Method

$4r + 2p = 180$ → 2 × (1)

$2r = 44$

$r = 22$

$p = 90 - 22$ from (1)

$p = 68$

$4r + 2p = 224$ — (2)

No. of rabbits = x

No. of peacocks = $90 - x$

$\because 4(x) + 2(90 - x) = 224$

$\therefore x = 24$ ⇒ No. of rabbits

$\because$ No. of peacocks = $90 - 24$

$= 68$

224
180
44
90
46
68

Improvised Method.

If all are peacocks then the no. of legs = 180

180
-224
44 remains

if increase of 2 legs ⟶ 1 rabbit

then increase of 44 legs ⟶ x rabbits

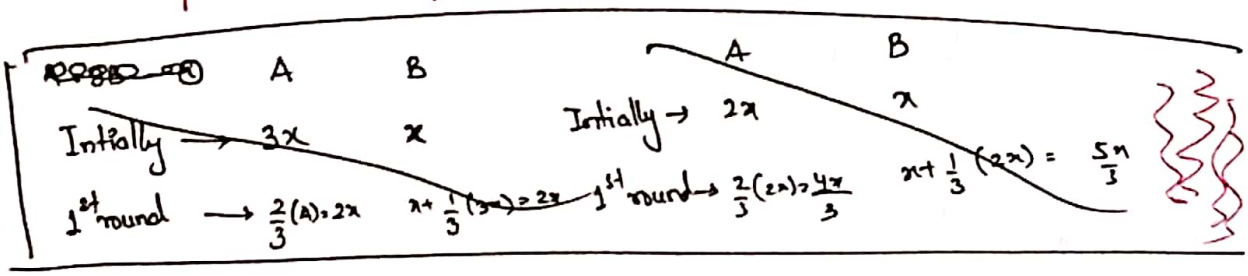
$2x = 44$

$x = 44$ rabbit

peacock = 68

Q2) If A has twice the money than B. In 1st round B wins 1/3 of A's money. What part of B's money should A win back. In the second round so that both of them have equal money?

Sol:



	A	B
Initially →	30	15
1st round →	$\frac{2}{3}(30) = 20$	$15 + \frac{1}{3}(30) = 25$
at the end of 2nd round →	20 + 2.5	25 − 2.5 = 22.5

∴ What fraction A should win from B to be equal.

$\frac{2.5}{25}$ (or) $\frac{1}{10}$ //

Q3 A pond can be completely filled with rain water in 40 days, each day the quantity of water gets doubled from the previous day. What is the time taken to fill 1/4 of the pond?

Sol:

at 40th day → full

39th day → $\frac{1}{2}$ full

38th day → $\frac{1}{4}$ full

Q In a certain party, there was a bowl of rice for every 2 guest, a bowl of soup for every 3 guests and a bowl of meat for every 4 guests. If in all there were 65 bowls of food. Find the no of guests in the party.

Sol:

Rice bowl → R

Soup bowl → S

Meat bowl → M

$R + S + M = 65$

~~Total guest = 2R or 3S or 4M~~

$R + \frac{2}{3}R + \frac{R}{2} = 65$

$13R = 390$

$R = 30$

Total guest = 2R (or) 3S (or) 4M.

i.e., $2R = 3S = 4M$

∴ Total guest = 2R

$= \frac{60}{2}$

Q In a class there a certain no. of students, if [illegible] then, to accomodate all of them one bench has to be borrowed from the next class. If 7 students sit on each bench, then after accomadating all of them there is still space for 5 students. Find the no of students in the class?

Sol: Let, no. of benches in class = x.

then no. of students in class = $6(x+1)$

~~d~~ ~~no. of students~~ $7x - 5 = 6(x+1)$ [from second statement]

No. of benches $\therefore x = 11$

No of students = $6(11+1)$

$= 72$

Q Ramesh is standing in a Row, $\frac{3}{5}$ of the people on his left side is samesas $\frac{4}{7}$ of the ppl on his right side, find the minimum no. of people standing in the row.

Sol. x Ramesh y

$\frac{3}{5}(x) = \frac{4}{7}(y)$

$\frac{x}{y} = \frac{20}{21}$

Least value possible for x & y = 20 & 21

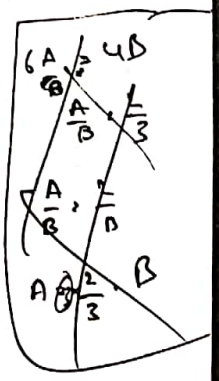
$\Rightarrow 20 + 1 + 21$

$\Rightarrow 42$

if minimum is not given then options should be of form: $(41m+1)$

Pg 3 (23) A = 6 hr, B = 4 hr

Let, no. of pages in book = 12 [12 is divisible by 6 & 4]



A's speed to read one page = ~~2 hours~~ 2 pages/hour

B's speed to read one page = 3 pages/hour

Let the situation arise after x hours

now, remain of A's pages = 2 (remaining of B's page)

$12 - 2x = 2(12 - 3x)$

$\therefore x = 3$ hrs

Pg5

(35) Let, cycling speed = x km/h

walking speed = y km/h

Case(i) : 19 km in 2 hours

(ii) : 26 km in 2 hour

[Speed = distance × time]

Case(i) $x\left[\frac{1}{4}\times 2h\right] + y\left[\frac{3}{4}\times 2\right] = 19$

$x\left(\frac{1}{2}\right) + y\left(\frac{3}{2}\right) = 19 \quad -(1)$

Case(ii) $x\left(\frac{1}{2}\times 2\right) + y\left(\frac{1}{2}\times 2\right) = 26$

$x + y = 26 \quad -(2)$

$(1) \Rightarrow \quad x + 3y = 38$

$\underline{x + y = 26}$

$2y = 12$

$y = 6$

∴ Walking speed = 6 km/h

→ Ratios :-

- A ratio is comparitions between 2 or more similar quantities.

  Ex: Ratio of ages B & S = 9 : 1

  Ratio of income of A & B = 1 : 4 (or) $\frac{1}{4}$ (or) 0.25

- Ratio alone will never give original values.
- A ratio should always be written in the least or minimum terms.
- Multiplying or dividing all the terms of the ratio with same number, the ratio does not change.
- Inverse ratio of $A : B = \frac{1}{A} : \frac{1}{B}$ (or) $B : A$
- Inverse ratio of $A : B : C = \frac{1}{A} : \frac{1}{B} : \frac{1}{C}$ = BC : AC : AB

Q Divide 2300 among a, b and c in the ratio 15 : 21 : 10 ?

Sol: Total = 2300 — 15 : 21 : 10

A's share = $\frac{15}{46} \times 2300 = 750$

B's share = $\frac{21}{46} \times 2300 = 1050$

C's share = $\frac{10}{46} \times 2300 = 500$

$15x + 21x + 10x = 2300$

$46x = 2300$

$x = \frac{2300}{46} = 50$

$\therefore$ 750 : 1050 : 500

Q Divide 4700 b/w a, b, c in the ratio $\frac{1}{3} : \frac{1}{4} : \frac{1}{5}$

Sol: Total = 4700, $\frac{1}{3} : \frac{1}{4} : \frac{1}{5}$

A's share = $\frac{1}{3}$

• Take the LCM of Denominators : 3 × 4 × 5 = 60

• Multiply it to the ratios :

$= \frac{1}{3} \times 60 : \frac{1}{4} \times 60 : \frac{1}{5} \times 60$

$= 20 : 15 : 12$

A's share = $\frac{20}{47} \times 4700 = 2000$

B's share = 1500

C's share = 1200

$\frac{2}{3} : \frac{3}{4} : \frac{1}{2} \Rightarrow 8 : 9 : 6$

$\frac{1}{(\frac{3}{2})} : \frac{1}{(\frac{4}{3})} : \frac{1}{2}$

$2 \times 4 \times 2 : 3 \times 3 \times 2 : 1 \times 3 \times 4$

$8 : 9 : 6$

Q A certain sum of money is divided among a, b and c in such a way that 2 times the share of A = 3 times the share of B which inturn is same as 4 times the share of C find the ration in which the money is divided.

Sol: $2A = 3B = 4C = k$

Then $A = \frac{k}{2}$, $B = \frac{k}{3}$, $C = \frac{k}{4}$

$\therefore$ A : B : C = $\frac{k}{2} : \frac{k}{3} : \frac{k}{4} = \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ (00

$= 12 : 8 : 6$

$= 6 : 4 : 3$

A : B : C

6 : 4 : 3

Q If $a:b = 4:5$, $b:c = 8:7$ find $a:b:c$?

Sol: $a:b$: $8(4:5) = 32:40$ ||ly $b:c$: $5(8:7) = 40:35$

$a:b:c = 32:40:35$

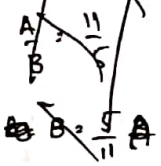
(or)

a	b	c
4	5	
	8	7

$\Rightarrow$ a b c = 32 40 35

Q The ratio of income of A and B = 11:5; if A gets 2100 more than B, find their respective incomes?

Sol: A : B = 11 : 5 ; A = B + 2100



Diff of Both = 11 − 5 = 6 parts

2100 = 6 parts

∴ 1 part = Rs 350

Hence, A's = 11 × 350 = 3850

B's = 5 × 350 = 1750

Q A sum is divided among p, q and r in such a way that for each rupee 'p' gets, q gets '45 paise' and r get '30 paise'. If the share of q is Rs 27. What is the total amount.

Sol: 1 : (45) : (30) $\Rightarrow$ 100 : 45 : 30

1 : $\frac{45}{100}$: $\frac{30}{100}$: $\Rightarrow$ 20 : 9 : 6

$9x = 27$

$x = \frac{27}{9} = 3$

$20x3 : 9x3 : 6x3$

= 60 : 27 : 18

= 105

If Q's share is 9, then total amount = 35

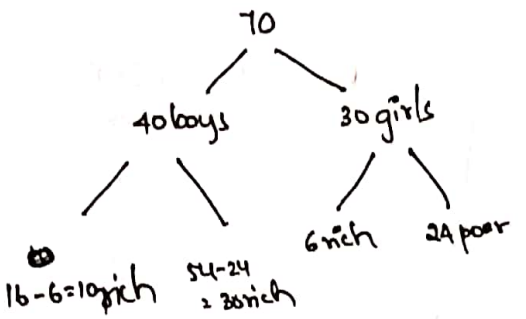
if Q's share is 27, then total

= 35 × 3

= 105

Q In a class of 70 students, thier ratio of Boys : Girls = 4:3, among the girls the ratio of rich and poor = 1:4, if ratio of rich and poor among students = 8:27, find the ratio of rich and poor boy in the class.

Sol:



70 sty
16 rich
54 poor

27 × 2 = 54

1:3 is the ratio of rich and poor in boys in class

Pg 61

Q1 A:B = 8:15 ; B:C = 5:8, C:D = 4:5, then A:D

Sol:

A	B	C	D
8	15		
	5	8	
		4	5

A:D = 4:15

$\frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} = \frac{8}{15} \times \frac{5}{8} \times \frac{4}{5}$

$\frac{A}{D} = \frac{4}{15}$

if we need A:B:C:D ⇒ $N_1 \times N_2 \times N_3 : D_1 \times N_2 \times N_3 : D_1 \times D_2 \times N_3 : D_1 \times D_2 \times D_3$

$\frac{8\,(N_1)}{15\,(D_1)} : \frac{5\,(N_2)}{8\,(D_2)} : \frac{4\,(N_3)}{5\,(D_3)}$ = 160 : 300 : 480 : 600

(or)

= 16 : 30 : 48 : 60 ⇒ 8 : 15 : 24 : 30

Q2 M:F = 7:4 ; M = 84, then total members = ?

7x + 4x = T, but 7x = 84

x = 84/7 = 12

7(12) + 4(12) = T

84 + 48 = T

∴ Total members = 132

7 parts = 84

then 11 parts = ?

$\frac{84}{7} \times 11 = 132$

Q3 P : Q : R = 2 : 3 : 5 ; P + R = 400 + Q , then R = ?

Sol: P + R = 7 parts
Q = 3 parts
4 parts → 400
1 part → 100
R = 5 parts → 500

$7x = 400 + 3x$
$4x = 400$
$x = 100$
$\therefore R = 5x = 500$

Q4 M : P : B = 5 : 7 : 8, $M^+ : P^+ : B^+ = \frac{2}{5} : \frac{1}{2} : \frac{1}{3}$

= 12 : 15 : 10

Note: When data is given only in ratios or in percentages, we solve the problem by making assumptions

Sol: Let no. seats initially → 5, 7 & 8 respectively.

Then ratio after the increase = 5 + 40% : 7 + 50% : 8 + 75%

= 7 : 10.5 : 14 × 2

= 14 : 21 : 28

= 2 : 3 : 4

2pm to 8:30pm
@408

Pg 61

(6) Ratio of sharing money (A, B, & C) : $\frac{2}{3} : 1 : 4$

$= \frac{2}{3} \times 3 : 1 \times 3 : 4 \times 3$

$= 2 : 3 : 12$

A's share $= \frac{2}{17} \times 510 = 60$

B's share $= \frac{3}{17} \times 510 = 90$

C's share $= \frac{12}{17} \times 510 = 360$

let A = x

$x = \frac{2}{3}B$

$B = \frac{3x}{2}$

$B = \frac{1}{2}C$

$C = 6x$

$x + \frac{2}{3}x + 6x = 510$

$3x + 2x + 18x = 1530$

$23x = 1530$

(7) 2430 $\Rightarrow$ A : B : C

-5
-10
-15

2400 $\Rightarrow$ 3 : 4 : 5

$3k+4k+5k = 2400$

$k = 200$

new B's $4k = 800$

original B's share $= 800+10 = 810$

$3K+4K+5K = 2400$

$12K = 2400$

$K = 200$

$\times 4$

800

810

(10) Out of remaining 16 lit :- milk $= \frac{5}{8} \times 16 = 10$ lit

water $= \frac{3}{8} \times 16 = 6$ lit

Now, 4 lit of milk is added

Then new ratio $= 14 : 6$ (or)

$7 : 3$

$8x = 20$

$x = \frac{20}{8} = 2.5$

12 : 5 → 7 : 5 = 20

14 : 5

16 : 5

(11) Quantity of tin in new alloy $= \left(\frac{2}{5} \times 60\right) + \left(\frac{1}{5} \times 100\right) = 24 + 20$

$= 44$ kg

(13) Let 1gm of each alloy has mixed

Then, gold in new alloy $= \left(\frac{2}{5} \times 1\text{gm}\right) + \left(\frac{3}{10} \times 1\right)$

$= \frac{4+3}{10} = \frac{7}{10}$ gm

Copper in new alloy $= \left(\frac{3}{5} \times 1\right) + \left(\frac{7}{10} \times 1\right)$

$= \frac{6+7}{10} = \frac{13}{10}$

$\therefore$ Ratio of gold and copper $= \frac{7}{10} : \frac{13}{10} \Rightarrow 7 : 13$

53

A = B+7

B = C+8

x + x+7 + x-8 = 53

3x - 1 = 53

$x = \frac{53+1}{3}$

(15) 25p : 10p : 5p

1 : 2 : 3 $\Rightarrow$ 30

$x + 2x + 3x = 30$

$6x = 30$

$x = \frac{30}{6} = 5$

Then value of the coins in Rs $= x\left(\frac{1}{4}\right) + 2x\left(\frac{1}{10}\right) + 3x\left(\frac{1}{20}\right)$

i.e $\Rightarrow \frac{x}{4} + \frac{x}{5} + \frac{3x}{20} = 30$

$\therefore x = 50$

No. of 5p coin $= 3x$ or 150

10p coin $= 100$

25p coin $= \frac{50}{2}$

Proportions :

- Equality of two ratios is called proportions.

Eg: $3 : 4 = 9 : 12$ (is as)

3, 4, 9 & 12 are in proportions

if $a : b = c : d$, then

(i) a, b, c & d are in proportional.

(ii) It is denoted as $a : b :: c : d$

(iii) a, b, c & d are called 1st, 2nd, 3rd and 4th proportional group.

(iv) Product of extremes = Product of means

$$a \times d = b \times c$$

Q Find the 4th proportional to 3, 5, 12?

Sol: $3 : 5 :: 12 : x \Rightarrow x = 5 \times 4 = 20$

$3 \times x = 5 \times 12$

$x = \frac{60}{3}, \frac{20}{2}$

Pg61

(5) Let their present salary is $2x$ and $3x$ resp.

Then new salaries are $(2x+4000)$ and $(3x+4000)$ respectively.

Ratio of new salaries = $(2x+4000) : (3x+4000)$

i.e $= 40 : 57 = (2x+4000) : (3x+4000)$

$40 \times (3x+4000) = 57 \times (2x+4000)$

$6x = 68000$

(or)

$3x = 34000$

$\therefore$ present value of sum = $5x = \$34000$

(9) 60 lit : 2 : 1

Initially → milk = $\frac{2}{3} \times 60 = 40$ lit

water = $\frac{1}{3} \times 60 = 20$ lit

Let x more lit of water is added.

Then, new ratio of M & W = $40 : 20 + x$

i.e $= 1 : 2 = 40 : 20 + x$

$\Rightarrow 1 \times (20 + x) = 2 \times 40$

$x = 60$

Pg 67

(3) 6yr ago K: 6x, S: 5x

Present age ⇒ K = 6x+6, S = 5x+6

After 4 years ⇒ K = 6x+10, S = 5x+10

i.e ⇒ 6x+10 : 5x+10 = 11 : 10

10 × (6x+10) = 11 × (5x+10)

x = 2

then present age of Sagar = 5x+6 = 10+6 = 16 yrs.

(5) P. Age A = 5x, B = 3x

if: 5x−4 : 3x+4

i.e 5x−4 : 3x+4 = 1 : 1

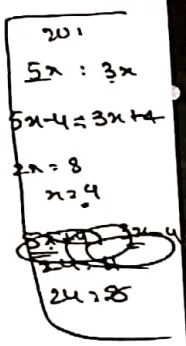
5x − 4 = 3x + 4

x = 4

Then 5x+4 : 3x−4 = 5(4)+4 : 3(4)−4

24 : 8

⇒ 8 : 1



(6) A : B = 3x : 1x

P. Age : B = x yrs, A = 3x yrs

(3x+5) = 2(x+5)

x = 5 yrs

P. Age : B = 5 years, A = 15 years

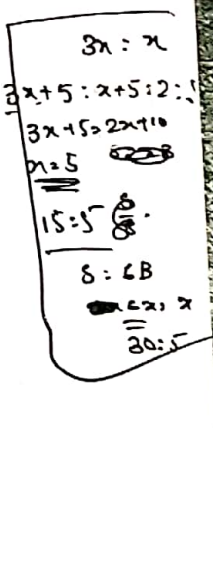
let it be y years ago

15 − y = 6(5 − y)

15 − y = 30 − 6y

5y = 15

y = 3 years



Percentages:

- 18% ⇒ $\frac{18}{100}$ ⇒ 0.18

(i) 35% of 280 ⇒ $\frac{35}{100} \times 280 \Rightarrow 98$

(ii) In an exam, my score is 28 out of max 80 marks. What is my %?

$\frac{28}{80} \times 100 = 35\%$

(iii) 84 is what percent of 60?

$\frac{x}{100} \times 60 = 84 \Rightarrow \frac{84 \times 100}{60} = 140\%$

(iv) 96 is what % more than 80?

$$\text{more \%} = \frac{(96-80)}{80} \times 100 = \frac{16}{80} \times 100$$
$$= 20\%$$

> More % (or) increase %
> $$= \frac{\text{diff}}{\text{smaller no.}} \times 100$$

(v) 64 is what % less than 192?

$$\text{less \%} = \frac{(192-64)}{192} \times 100$$
$$= \frac{128}{192} \times 100 = 66\frac{2}{3}\% \Rightarrow 66.66\%$$

> Less % (or) decrease %
> $$= \frac{|\text{diff}|}{\text{larger no}} \times 100$$

(vi) Original salary = Rs 2800, if increased by 25%, then new salary = ?

$2800 \times (1.25) = 3500$
(or) 2800 + 25% of 2800

$$1.00 + 0.25 = 1.25$$

(vii) Original salary = Rs 4800, if decreased by 20%, then new salary = ?

$4800\,(0.8) = 3840$
(or)
4800 − 20% of 4800

$$1.00 - 0.20 = 0.80$$

(viii) New salary = 7320 ₹ after an inc of 22%, then original salary = ?

$$x = \frac{7320}{(1.22)} = 6000$$
(or)

$$1.00 + 0.22 = 1.22 \qquad x \cdot (1.22) = 7320$$

New Salary = Original + inc
$7320 = x + 22\%$ of x
$7320 = x + \frac{22x}{100} \Rightarrow x = 6000$

(ix) New Salary = 4800, after dec of 40%, original salary = ?

$$x = \frac{4800}{0.6} = 8000$$
(or)
$4800 = x - 40\%$ of x
$4800 = x - \frac{40}{100}x \Rightarrow x = 8000$

(x) 35% of a no. is 140, what is 65% of the same no.?

$35\% \longrightarrow 140$

$65\% \longrightarrow x$

$x * 35\% = \frac{140 \times 65}{100}$

$x = \frac{140 \times 65 \times 100}{100 \times 35}$

$65\% \longrightarrow x = 260$

Successive Percentage Increase:

(Q1) A number 60 is increased successively by 25%, 20% & 30%. Find the new no.

Sol: $60 + 25\% \text{ of } 60 = 75$

$75 + 20\% \text{ of } 75 = 90$

$90 + 30\% \text{ of } 90 = 117$

New no $= (1.25)(1.2)(1.3) \times 60$

$= 117$

Q Find the single effective percentage increase in the previous problem?

Let original be 100; then $100 \times 1.25 \times 1.2 \times 1.3 = 195$

Single effective increase % $= (195 - 100)$

$= 95\%$

(or)

Single Effective increase % $= \left(x + y + \frac{xy}{100}\right)\%$ [x, y are two successive %]

if $x = 25, y = 20$

$= (20 + 25 + 5)\%$ or 50%

if $x = 50, y = 30$

$= (50 + 30 + 15)\%$ (or) 95%

Successive Percentage Decrease / Discount :-

Q A no. 80 is decreased successively by 10%, 25% and 20% & find new no.?

Sol: $80 - (10\% \text{ of } 80) = 72$

$72 - (25\% \text{ of } 72) = 54$

$54 - (20\% \text{ of } 54) = 43.2$

New no. $= (80 \times (0.9) \times (0.75) \times (0.8))$

$= \underline{43.2}$

Q Find the single effective percentage decrease in the previous problem.

Let 100 be original

$100 \times 0.9 \times 0.75 \times 0.8 = 54$

$\therefore$ Single effective decrease % $= (100 - 54)\%$

$= \underline{46\%}$

(or)

Single effective decrease % $= \left(x + y - \frac{xy}{100}\right)\%$ [x, y are % given]

if $x = 10\%$, $y = 25\%$

$= (10 + 25 - 2.5) = \underline{32.5\%}$

if $x = 32.5\%$, $y = 20\%$

$= (32.5 + 20 - 6.5) = \underline{46\%}$

$\therefore \underline{46\%}$

Pg 80

(13) $S_1 = 1000 \times (0.8)(0.9)$

$= 720$

$S_2 = 1000 (0.85)(0.85)$

$= 722.5$

$\therefore S_2 - S_1 = \underline{2.5}$

(or)

$S_1 = (20 + 10 - 2)\% = 28\%$ $\quad S_2 = (15 + 15 - 2.25) = 27.75\%$

$S_2 - S_2 = 28 - 27.75\% = 0.25\%$

Pg 82

(25) Flight delayed = 75% of total flights

Flight on time = 25% of total flight

75% = 1200

25% = ? (x)

$x = \frac{1200 \times 25}{75}$ (400)

$x = 400$

(24) Total marks = 150 + 150 + 180 = 480

Marks req to pass = 35% of 480 = 168

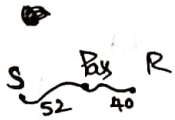
i.e 62 + 35 + x = 168

$x = 71$

(23) • Diff (52 + 40) = 23% of max marks

i.e 92 = 0.23 × max marks

max marks = $\frac{92}{0.23}$ = 400



• pass marks = Suresh score + 52 marks

= (22% of 400) + 52

pass marks = 140

• % required to pass the exam = $\frac{140}{400} \times 100$ = 35%

(22) ~~60% male, 40% female = 100~~ let guest invited = 100

60 male, 40 female

No. of guest attended = 80% = 80 ppl

40 female, 40 male

∴ male : female = 40 : 40

= 1 : 1

(21)

	Population	×Gfl
Country X →	300	1% of 300 = 3
Country Y →	100	2% of 100 = 2
	400	5

$\Rightarrow \frac{5}{400} \times 100 = 1.25$

(20) Let total no. of people be 100
- 50% not infected
- 50% infected
  - 30% show symptoms
  - 70% no symptoms

Always $\Rightarrow (100 \times 0.5) \times 0.7 = 35\%$

$50 \times 0.3 = 15\%$

remaining : $50 - 15 = 35\%$

(19) $x + y = 0.95$; $x(\text{Rs } 0.9) + y(1.2) = 0.9$

$x + y = 0.95$ ... (1) ; $0.9x + (1.2)y = 0.9$ ... (2)

(1) × 0.9 : $0.9x + 0.9y = 0.855$; $0.9x + 1.2y = 0.9$

$0.3y = 0.045$

$y = \frac{0.045}{0.3} = \frac{0.15}{0.05}$

$x = 0.95 - 0.15$

price of tea = $x = 0.80$

Let, original % of tea = Rs x /kg

Then, original % of sugar = $(95 - x)$ kg

$0.9x + 1.2(95 - x) = 90$

$\therefore x = 0.8$

(18) Let the paint purchased = x kgs

Then paint used = 85% of x [remaining 15% is wastage.]

i.e 25 kg = 85% of x

$x = 29.41$ kgs

Then no. of cans purchased = $\frac{29.41}{2}$ (or) 15 cans

∴ Cost of pain purchased = Rs $(15 \times .16)$

= Rs 240

(17) Fail in 1st subject = 40% of TS.

Fail in 2nd subject = 10% of (60% of TS) = 6% of TS

Pass in first 2 subjects = 100% − (40% + 6%)

= 54% of TS

Fail in the remaining subjects = 25% of (54% of TS) = 13.5% of TS.

∴ Total fail = 40% + 6% + 13.5% = 59.5% of TS

Total passed = 100 − 59.5 = 40.5% of TS

difference = 19% of TS

$$\frac{19}{100} \times TS = 570$$

$$TS = \frac{570}{0.19} = 3000$$

(16) Let max marks in 3 papers = 100, 200 & 200 = 500

50% 60% 65%

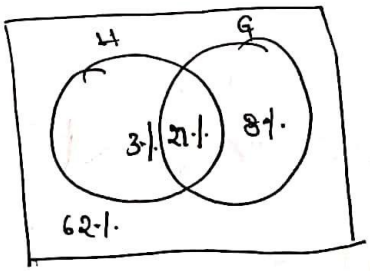
Then marks scored by student → 50, 120, 130 ⇒ 300

Overall % scored = $\frac{300}{500} \times 100 = 60\%$

(14) No. of students passed = 62% of the applicants

$$248 = 62\% \text{ of } x$$

$$x = \frac{248}{0.62} = 400$$



(11) $(x \times (1.1)) \cdot (1.08) \cdot (0.9) = 26730$

$\therefore x = 25000$

let no of bushes = x

let no of bushes after 3 years = z

$26730 = x \times 1.1 \times 1.08 \times 0.9$

$x = 25000$

(8) let original salary = x

Then after expenditure = $x \cdot (0.9) \cdot (0.85) \cdot (0.9)$

$$x = \frac{1377}{(0.9)(0.85)(0.9)} \Rightarrow 2000$$

(6) Total applicants (x) — 5% ineligible
— 95% eligible — 85% belong to Gen
— 15% belong to other

Other category students eligible = 15% of (90% of x) | ~~$x \cdot (0.95) \cdot (0.15)$~~

i.e $4275 = x \cdot (0.95) \cdot (0.15)$

$$x = \frac{4275}{(0.95)(0.15)}$$

$$x = 30000$$

(5) Candi A → 30% of Total votes

Candi B → 60% of (70% of TV) ⇒ 42% of TV

Did not Vote → ~~28%~~ (100% − 30% − 42%) = 28% of Total Votes

Diff of Candi A − DNV = 30 − 28 = 2%

i.e = 2% = 1200

100% = ? (x)

$$x = \frac{1200 \times 100}{2} = 60000$$

(4) ~~DNV = 10% of TV~~

~~Invalid = 10% of (90% of TV)~~ =

Let voters in the list (x) — 10% DNV
— 90% voted — 10% invalid
— 90% valid — 54% winner
— 46% loser } 8%

~~Total votes given to winner = $x \cdot (0.9) \cdot (0.9) \cdot (0.54)$~~

Majority = $x \times (0.9) \times (0.9) \times (0.08)$

$$\frac{1620}{0.9 \times 0.9 \times 0.08} = x$$

$$x = 25000$$

(1) diff = 1% = 80

100% = ?

$x = \frac{80 \times 100}{1}$

$x = 8000$

(9) Household decs by 20% · other increase by 70%

Overall dec by 25%.

but overall should be less than 20% as increase in 70% will decrease the overall below 20%.

PROFIT & LOSS :-

- If no discount is given, then Marked Price and Selling Price both are same.
- Discount is always given on Marked Price.

$$\text{discount \%} = \left(\frac{\text{discount}}{\text{Marked Price}} \times 100\right)$$

- Profit or Loss is always calculated on Cost Price.
  - If Profit, then $\text{Sell Price} = \text{Cost Price} + \text{Profit}$
  - If Loss, then $\text{Selling Price} = \text{Cost Price} - \text{Loss}$

Q1 CP = 480, SP = 600, Profit % = ?

$$\text{Profit \%} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$$

$$= \frac{120}{480} \times 100$$

$$= 25\%$$

SP = CP + Profit

Profit = 600 − 480

= 120

Q2 CP = 650, SP = 450, what is loss %.

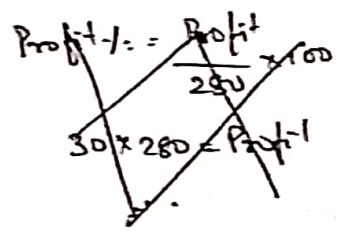
$$\text{loss \%} = \frac{200}{650} \times 100 = 30.5\%$$

$$\left[\text{loss \%} = \frac{\text{loss}}{CP} \times 100\right]$$

loss = CP − SP

loss = 200

(3) CP = 280 Rs , Profit = 30 %.



$= 280 \cdot (1 \cdot 3)$

$\Rightarrow \underline{364}$

SP = CP + Profit

= 280 + 30 % of 280

= 364

4) CP = 360 , the loss = 15 % , S.P = ?

$SP = 360 \cdot (0 \cdot 85)$

$= \underline{306}$

SP = CP − loss

= 360 − 15 % of 360

= 360 − 54

= 306

(5) SP = 420, Profit = 40 % , CP = ?

$CP = \frac{420}{1 \cdot 4} = \underline{300}$

SP = CP + profit

$420 = x + (40 \% \text{ of } x)$

$x = 300$

(6) SP = 340 , loss = 32 % , CP = ?

$CP = \frac{340}{0 \cdot 68} = \underline{500}$

Q An article is marked as 40 % above the cost price , then at a certain % of discount is offered . If the profit made is 12 % , then discount % offered on the article ?

Sol: Let CP = 100 SP = 112 Rs

then MP = 140

SP = CP + (Profit % of CP)

= 100 + 12

SP = 112

discount given = MP − SP

= 140 − 112

$\Rightarrow 28$

$\text{Discount \%} = \frac{28}{140} \times 100 = \underline{20 \%}$

Q A trader marks up the price of a product by 50%. If the discount is increased from 10% to 20%, his profit comes down by Rs 105. What is the cost price of the product?

Sol: 10% of MP = 105
∴ MP = 1050

MP = 150% of CP (Mark up by 50%)
1050 = 150 CP
CP = Rs 700

Q Cost of 21 articles = Selling price of 18 articles. Find the gain / loss %?

Sol: Let, CP of each article = Re 1

CP of 18 Article = Rs 18
SP of 18 Artic = (CP of 21) = Rs 21
Profit = 21 - 18
= 3
Profit % = $\frac{3}{18} \times 100 = 16\frac{2}{3}\% = 16.66\%$

Pg 83
(2) 1st case :- No. of pieces accepted = (95% of 2000) or 1900
Revenue received = Rs 25 × 1900
= Rs 4750 ⟶ Profit
∴ this investment = $\frac{4750}{1.25}$ = Rs 38000 ⟶ this much

2nd case: No. of pieces accepted = 2000 (0.5) = 1000
Revenue received = Rs 25 × 1000 = 25000
= Rs 25000

∴ loss made ⇒ Rs 38000 − Rs 25000
= Rs. 13000 ⟶ loss

if loss % = $\frac{13000}{38000} \times 100$

(3) Let CP of the article = Rs x

Now, Profit % in 1st case = loss % in 2nd case

$$\frac{1920-x}{x} \times 100 = \frac{x-1280}{x} \times 100$$

$$1920 - x = x - 1280$$

$$2x = 3200$$

$$x = 1600 = \text{Cost Price}$$

Also, only if Profit % = loss %

$$CP = \frac{1920 + 1280}{2}$$

$$= \text{Rs } 1600$$

New Selling Price = 1600 + 25% of 1600

= 1600 + 400

= 2000

(4) Let Cost Price of second variety = Rs x/kg

Now, SP of mix = Rs 177

Profit = 18%

$\therefore$ CP of mix = $\frac{177}{118}$ × Costs 150

Cost of the mixture per kg = $\frac{\text{Total cost of mix}}{\text{no of kgs mixed.}}$

$$\text{Rs } 150 = \frac{(\text{Rs } 200 \times 2\text{ kg}) + (\text{Rs } x + 3\text{ kg})}{5\text{ kg}}$$

$$150 = \frac{400 + 3x}{5}$$

$$750 - 400 = 3x$$

$$x = \frac{350}{3}$$

$$= 116.66$$

(7) As change of SP = 108 brough a total change of 22.5%.

$\therefore$ 22.5% = 108

loss => 12.5% = ? (x)

$$x = \frac{108}{22.5} \times 12.5 = 60$$

22.5 = Rs 108

100% = ? (x)

$$x = \frac{108 \times 100}{22.5} = \text{Rs } 480$$

(CP)

1st SP : 87.5% of CP

2nd SP : 110% of CP

diff :- 22.5% of CP.

$108 = 22.5\% \text{ of } x$

$x = Rs\ 480$

then loss - 12.5% of CP

$= \frac{12.5}{100} \times 480$

$= Rs\ 60$

(8) MP = 1400 ; Price Paid = $(1400 \times 0.8) \times 0.9$

$\Rightarrow 1008$ for briefcase.

Effective discount = (20 + 10 - 2)

= 28%.

(9) SP of A clock = SP of B clock

120% of (A's CP) = 93.75% of (B's CP)

$\frac{A's\ CP}{B's\ CP} = \frac{75}{120} = \frac{5}{8}$

A's CP $= \frac{5}{13} \times 650 = 250$

B's CP $= \frac{8}{13} \times 650 = 400$

$\therefore$ CP of A = 250 & CP of B = 400

Averages :-

Average = $\frac{\text{Sum of the terms in the group}}{\text{No of terms in the group.}}$

Sum = Avg × No. of terms

No. of terms = $\frac{\text{Sum}}{\text{Average}}$

Note : • Average always lies between the highest value and the lowest value.

• Whatever change is found in each of the values, we find a similar change also in the average. (+, −, *, ÷).

- For a series of AP :-

  if odd no. of elements => Avg = middle element

  if even no. of elements => Avg = avg of middle two elements

- for AP series :

  Avg of the series = Avg of 1st and last terms

WEIGHTED AVERAGE :-

- When two or more than a group are combined then the resulting average is called weighted average.

Q1 In a class average weight of boys & girls is 90 kg and 60 kg respectively. Find the average weight of the class.

Sol: Data insufficient. The no. of boys & girls not specified

Note: • To calculate weighted average, along with the average of each group, we also require no. of elements of each group.

Q2 from Q1, if then no of boys and girls = 30 & 20 respectively. Find the avg weight of the class.

Sol: Average weight of class = $\frac{\text{(Sum of the weights of stds)}}{\text{No of students}}$

Total/Sum = (Avg × Total no)$_B$ + ( )$_G$ ⇒ $\frac{3900}{50} = 78$ kg

= (90 × 30) + (60 × 20)

= 2700 + 1200

= 3900

Q3 from Q2, if no. of boys and girls in the ratio, 3:5, what is the avg weight of the class :-

Sol: Let no. of boys and girls = 3 and 5 respectively.

Avg weight of class = $\frac{90\times3+60\times5}{3+5}$

$= \frac{270+300}{8} = \frac{570}{8} = 71.25$ kg

∴ Avg weight of class = 71.25 kg

Pg 65

(1) Avg age of family = $\frac{67\times2+35\times2+6\times3}{7} = 31\frac{5}{7}$

(2) Avg = $\frac{5\times510+25\times240}{30}$ = 285

(3) Let, avg exp/person = Rs x

Now, exp of 9th person = Rs $(x+20)$

Total exp of 9 persons = $x\times9$

i.e $(30\times8)+x+20 = 9x$

x = Rs 32.5

Total exp of 9 person = 9×32.5

= 292.5 Rs

(4) Total runs scored in 40 innings = $50\times40 = 2000$

Total runs scored in 38 innings = $48\times30 = 1824$

176 (Difference) [Highest & lowest is not there]

∴ $H+L = 176$ —①

$H-L = 172$ —②

$2H = 348$

$H = 174$ runs ∴ Highest = 174 runs.

$L = 176-174$

$L = 2$ runs

2pm to 5:30p DS
6pm-8:30pm NA
@204

(5) $(1^{st}+2^{nd}+3^{rd}+4^{th})$ day temp $= 58 \times 4 = 232^\circ$ — (1)

(6) also same $(2^{nd}+3^{rd}+4^{th}+5^{th})$ day temp $= 60 \times 4 = 240^\circ$ — (2)

(1) − (2) $\Rightarrow$ $5^{th} - 1^{st} = 8^\circ$ — (3)

Given $1^{st} : 5^{th} = 7 : 8$ diff = 1 part

but from (3) & 1 part $\rightarrow 8^\circ$

8 parts $\rightarrow$? (x)

$x = 8 \times 8$

$5^{th} = x = \underline{64^\circ}$

(7) Age of the teacher = Sum of the age including Teacher − Sum of ages excluding Teache

(8) also same $= 18 \times 37 - 17 \times 36$

$= \underline{54 \text{ yrs}}$

(11) Avg age of the team = $\underline{x}$ yrs

Then, sum of ages of 11 player = $11 \times x$

i.e $26 + 29 + [(x-1) \times 9] = 11x$

$\Rightarrow x = \underline{23 \text{ yrs}}$

(12) Increase in total weight of the class $= (54 \times 5) - (48 \times 5) \Rightarrow 30$ kgs

Increase in Avg weight of class $= \frac{\text{Increase in total weight}}{\text{No of students}} = \frac{30}{45} = \frac{2}{3}$ kgs

$\therefore$ New Avg weight of class $= 52 + \frac{2}{3} =$

$= 52.\frac{2}{3}$ kgs

(d) None of these.

(13) $A+B+C = 84\times3 \Rightarrow 252$ kg — ①

$A+B+C+D = 80\times4 \Rightarrow 320$ kg — ②

∴ weight of $D = 320-252 = 68$ kgs

Then, weight of $E = 68+3 \Rightarrow 71$ kgs

$B+C+D+E = 79\times4 \Rightarrow 316$ kg — ③

③ − ② ⇒ $A-E = 4$ kgs

$A = 4+71$

$A = 75$ kgs

(14) $(x)+(x+2)+(x+4)+(x+6)+(x+8) = 425$

$5x+20 = 425$

$x = 81$

∴ 81, 83, 85, 87, .. 95, 97, 99, 101, 103 (find avg)

Avg of first five no. $= \frac{425}{5} = 85$

i.e 3rd no = 85 [odd length sequence]

Avg of last terms = 10th terms (8 − 12)

$= (85+14)$

$= 99$

(15) also same

∴ The avg of last 5 number sequence = 99

Sum of last 5 terms = 99×5

$= 495$

MIXTURE & ALLIGATION:

Pg 77

(Q1) Let two varieties mixed by 2kg & 3kgs respectively.

Then price of mixture per kg = $\frac{\text{Total cost of mix}}{\text{No. of kgs mixed}} = \frac{(15\times2)+(20\times3)}{2+3}$

$= \frac{30+60}{5} = \frac{90}{5} = ₹18$ kg

∴ ₹18 per kg.

⑥ Let, price of 2nd variety = ₹ Rs x/kg

let 2 varieties mixed be 8Kg & 7Kgs

Then, Price of mixture per kg = $\frac{\text{Total cost of mix}}{\text{No. of Kgs mixed}}$

$$\Rightarrow 10 = \frac{(9.3 \times 8) + (x \times 7)}{8+7}$$

$$x = ₹10.8$$

⑦ Quantity of milk in final mix = $x\left(1 - \frac{y}{x}\right)^n$

where x = Intial Quantity

y = No. of liters replaced on each occassion

n = no. of iterations

⑧ from above: $40\left(1 - \frac{4}{40}\right)^3$

$= 40 \cdot (0.9)^3 = 40 \cdot (0.729)$

$\Rightarrow$ 29.16 liters

Quantity of water = 40 − 29.16

$\Rightarrow$ 10.84 lits

⑨ same as ⑧

% of milk in final mix = $\left(\frac{x-y}{x}\right)^n$

% of milk in final mix = $\left(\frac{40-4}{40}\right)^3 = 72.9\%$

if the quantity of milk replaced is not constant, then,

Quantity of milk in final mix = $x \cdot \left(1 - \frac{y_1}{x}\right) \cdot \left(1 - \frac{y_2}{x}\right) \left(1 - \frac{y_3}{x}\right)$

% of milk in final mix = $\left(1-\frac{y_1}{x}\right)\left(1-\frac{y_2}{x}\right)\left(1-\frac{y_3}{x}\right)$ %.

(10) % of wine in final mix = $\left(\frac{x-y}{x}\right)^n$

i.e $\frac{16}{81} = \left(\frac{x-8}{x}\right)^4$

$\sqrt[4]{16x^4} = \sqrt[4]{81(x-8)^4}$

$2x = 3(x-8)$

$2x = 3x - 24$

$x = 24$

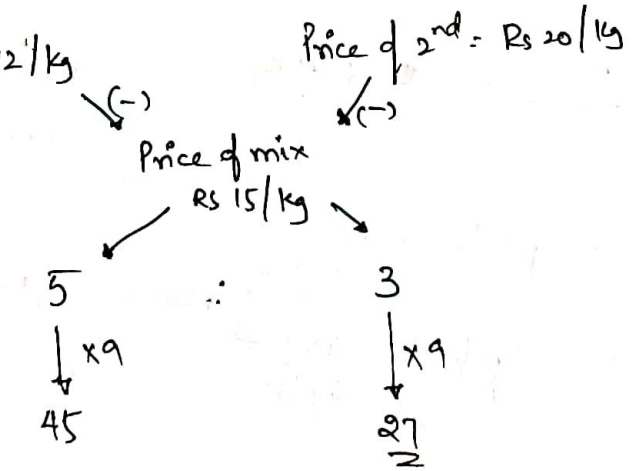
$\therefore$ x = Original quantity of wine = 24 liters.

Alligation:

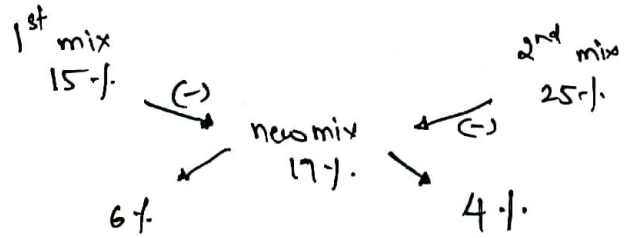
- It is a rule connecting prices and quantities.

Q A traders sells two variety of sugar costing ₹ 12/kg and ₹ 20/kg. In what ratio these two varieties should be mixed. Such that the price of mixture ₹ 15/kg.

Sol:



If:



Pg 77

Take Spirit Content (take any one content)

③

	S	W
A	5	2
B	7	6

A mix $\frac{5}{7}$ (-) → new mix ← (-) B mix $\frac{7}{13}$

$\frac{8}{13}$

$\frac{1}{13}$: $\frac{9}{13}$

④ also same

$\Rightarrow 7:9$

∴ To get the new mix we get by taking 7:9 ratio.

⑤ (Take milk content only)

1st mix 75% (-) → new mix 62.5% ← (-) 2nd mix 50%

$\left(\frac{75+50}{2}\right)$ = 12.5%

12.5% : 12.5%

$\Rightarrow 1:1$

∴ To get 12 liters of milk.

6 liters milk, 6 liters of H_2O.

② SP of mix = Rs 9.24/kg

Profit % = 10%

CP of mix = $\frac{9.24}{1.1}$ or Rs 8.4/kg

CP 1st 9 (-) → CP of mix 8.4 ← (-) CP 2nd 7

1.4 : 0.6

or 7:3

As 2nd variety taken = 21 = 3×9

then 1st variety taken = 7×9 = 63 kgs

} Common factor.

:- TIME & WORK :

Note: • Unless specified, total work is always considered as 1 unit.

• Men & days are always in inverse variation, when work is constant.

for ex: 18 men → 24 days then days men 2 : 1, days 1 : 2, 24 : 48

∴ 9 men → ? (48)

Unitary Method:

1) A alone → 12 days then A & B together will be :-

B alone → 24 day

Sol: (A+B)'s work for 1 day $= \left(\frac{1}{12} + \frac{1}{24}\right) = \frac{1}{8}$

∴ They together take 8 days to complete the work.

$$(A+B)\text{'s time} = \frac{xy}{x+y}$$

2) A alone → 10 days

B alone → 15 days then, A+B+C = ?

C alone → 20 days

$(A+B+C)$'s 1 day work $= \left(\frac{1}{10} + \frac{1}{15} + \frac{1}{20}\right)$

$= \frac{13}{60}$

∴ They together take $\frac{60}{13}$ or $4\frac{8}{13}$ days.

$$(A+B+C)\text{'s time} = \frac{xyz}{xy+yz+zx}$$

(3) A+B → 10 days then (i) A+B+C → ?

B+C → 12 days (ii) A → ?, B → ?, C → ?

C+A → 15 days

8b) (i) $[(A+B)+(B+C)+(C+A)]$'s 1 day work

$= \left(\frac{1}{10}+\frac{1}{12}+\frac{1}{15}\right)$ or $\frac{1}{4}$

i.e $2(A+B+C)$'s 1 day work $= \frac{1}{4}$

$(A+B+C)$'s 1 day work $= \frac{1}{8}$

$\therefore$ 8 days to complete the work.

(ii) A's 1 day work $= \frac{1}{8} - \frac{1}{12} \Rightarrow \frac{1}{24}$ Total − (B+C)

$\therefore$ 24 days to complete by A alone

B's 1 day work $= \frac{1}{8} - \frac{1}{15} = \frac{7}{120}$

$\therefore$ B alone $\longrightarrow \frac{120}{7}$ (or) $17\frac{1}{7}$ days

C's 1 day work $= \frac{1}{8} - \frac{1}{10} = \frac{2}{80} = \frac{1}{40}$ $\frac{10-8}{80}$

$\therefore$ C alone $\longrightarrow$ 40 days.

$(A+B+C)$'s time $= \dfrac{2xyz}{xy+yz+zx}$ x, y, z is a combination of workes

Note:

- Efficiency and time are always in inverse variation.

  If ratio of efficiency of 2 men $= a:b$

  Then, ratio of time taken by them $= b:a$

- The wages earned by workers should always be divided in the ratio of their efficiency (or) proportionately to the work done.

Pg 70

(10) Ratio of time taken (A & B) = 10 : 15
= 2 : 3

∴ Ratio of their efficiency = 3 : 2

A's share = $\frac{3}{5} \times 225$ = Rs 135

B's share = $\frac{2}{5} \times 225$ = Rs 90

A's daily wage will be:
$\frac{225}{10}$, 22.5

B's daily wage will be
$\frac{225}{15} = \frac{15}{1}$

~~(9) A's daily~~

Q A & B undertake a piece of work for Rs 960, A alone can do it in 12 days B alone can do it in 16 days. With help of expert the completed the work together 4 days find the share of expert?

Sol: A's contribution in 4 days = $\frac{4}{12}$ or $\frac{1}{3}$ → A's share = $\frac{1}{3} \times 960$ = Rs 320

B's contribution in 4 days = $\frac{4}{16}$ or $\frac{1}{4}$ → B's share = $\frac{1}{4} \times 960$ = Rs 240

∴ Experts share = 960 − (320 + 240) (560)

= Rs 400

Pg 70

(9) Ration efficiency (1st & 2nd) = 3 : 1

∴ Ratio of time taken by them = 1 : 3

time diff = 2 parts

80 day → 2 parts

(x) ? ← 1 parts

x = 40 days

1st tailor alone = 1 part or 40 days

2nd tailor alone = 3 parts or 120 days

together = $\frac{40 \times 120}{40 + 120} = \frac{40 \times 120}{160} = 30$ days

8:45am to 1pm
CD
@308

(15) A complete work = 9 days B's one day work = $\frac{1}{12}$

A's one day work = $\frac{1}{9}$

Work done in 1st 2 days or 1 set of work $\frac{9+12}{21}$

$= \left(\frac{1}{9} + \frac{1}{12}\right) = \frac{7}{36}$

work in 5 sets or 10 days $= 5 \times \frac{7}{36} = \frac{35}{36}$

work remaining $= 1 - \frac{35}{36} = \frac{1}{36}$

A's works on 11th day and takes $1/4^{th}$ of the day to complete the remaining time.

$\therefore$ Total time taken $= 10\frac{1}{4}$ days $\Rightarrow$ $\overbrace{10}^{\text{both}} + \overbrace{\frac{1}{4}}^{A}$ $\left[\frac{1}{\left(\frac{1}{9}\right)} \times \frac{1}{36} = \frac{1}{4}\right]$

if B was working on 11th day, then,

total time take $= 10 + \frac{1}{3}$ days $= 10\frac{1}{3}$ day $\left[\frac{1}{\left(\frac{1}{12}\right)} \times \frac{1}{36} = \frac{1}{3}\right]$

Q A and B can do a piece of work in 10 days & 15 days. If they work together on alternate days, one on each day. What is the time taken to complete the work?

Sol. A's one day work $= \frac{1}{10}$ B's one day work $= \frac{1}{15}$

Work done on first 2 days $= \frac{1}{10} + \frac{1}{15} = \left(\frac{1}{6}\right)$ sets

$\therefore$ work is completed in 6 sets or 12 days.

Pg 69

(6) let total time taken $= x$ days

- A's contribution $= \frac{x}{15}$; B's contribution $= \frac{2}{10}$

$\frac{x}{15} + \frac{2}{10} = 1$ $x = 12$ days

$\frac{2x+6}{30} = 1$

$2x = 24$ $x = 12$ days

Q A alone starts the works and after 2 days B joins him. A leaves the works 3 days before its completion find the time taken to complete the work?

Sol: let, total time taken = x days

A's contribution = $\frac{x-3}{15}$, B's contribution = $\frac{x-2}{10}$

$\therefore \frac{x-3}{15} + \frac{x-2}{10} = 1$

$\frac{2x-6+3x-6}{30} = 1$

$5x = 42$

Total time = $x = 8.4 (or) 8\frac{2}{5}$ days.

(4) P alone → 96 hrs [8×12 = 96]

Q alone → 80 hrs [10×8 = 80]

(P+Q)'s 1 days work = $\frac{1}{96} \times 8 + \frac{1}{80} \times 8$

$= \left(\frac{1}{12} + \frac{1}{10}\right)$ or $\frac{11}{60}$

$\therefore$ They together take $\frac{60}{11}$ or $5\frac{5}{11}$ days.

(12) Q alone → 300 hrs [12×25 = 300]

R alone → 600 hr [12×50 = 600]

Ratio of work done (Q & R) = $\frac{1}{300} \times 12 \times 5 : \frac{1}{600} \times 18 \times 7$

$= 60 : 63$

$\Rightarrow 20 : 21$

(11) 5 skilled → 20 days

8 semi-skilled → 25 days

10 unskilled → 30 days

$\therefore$ 1 skilled → 100 days

1 semi → 200 days

1 unskilled → 300 days

work by the team 1 days $= \left(\frac{2}{100} + \frac{6}{200} + \frac{5}{300}\right)$ or $\frac{1}{15}$

$\therefore$ the team takes 15 days to complete the work.

(2) $(P+Q+R)$'s in 1 hour $= \frac{216}{4}$ or 54 pages

I: The sum should be 54.

@ & (d) are eliminated.

II: R's work = Q's work i.e P-Q = R-Q

(b) 15, 17, 22

17 - 15 = 2 pages 22 - 17 = 5 pages

P Q R

(c) 15, 18, 21

18 - 15 = 3 pages ; 21 - 18 = 3 pages

III's: 5 (R's work) = 7 (B's work)

5 (21) = 105 pages

7 (18) = 105 pages

(5) Let B+C → x day

then A alone → x days

(B+C) one day = A's one day → $\frac{1}{x}$ day

(A+B+C) in 1 day = $\frac{1}{10} + \frac{1}{50} = \frac{6}{50}$

$\frac{1}{x} + \frac{1}{x} = \frac{6}{50}$

$x = \frac{100}{6}$ days

B's 1 day work = $\frac{1}{10} - \frac{6}{100} = \frac{1}{25}$

$\therefore$ B alone = 25 days

Second Phase : Direct formula

$$\frac{M_1 \cdot D_1 \cdot H_1}{W_1} = \frac{M_2 \cdot D_2 \cdot H_2}{W_2}$$

Q: 30 men → 20 days

25 men → double the work → ? day

$$\frac{30 \times 20 \times 1}{1} = \frac{25 \times D_2 \times 1}{2}$$

$D_2 = 48$ days.

~~Pg~~ Pg71

(17)

(19) is same

56 days

30 days | 26 days

$$\frac{104 \times 38 \times 8}{\left(\frac{2}{5}\right)} = \frac{(104+x) \times 26 \times 8}{\left(\frac{3}{5}\right)}$$

$1040 = (104 + x) \times 13$

$1040 - 6$

$x = 56$ men

(20) 1 machine → 1 toy → 7 mins

100 machine → 100 toys

The time for each machine to create toy will not change.

∴ 7 mins only.

(OR)

$$\frac{M_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2}$$

$$\frac{1 \times 1 \times 7}{7} = \frac{100 \times 1 \times x}{100}$$

$x = 7$ mins //

(16) $1M = 2W$ — (1)

$1C = \frac{1}{3}W$ — (2) or $W = 3C$

$1M = 2W = 6C$ — (3)

No of men employed $= \frac{6}{13} \times 39 \Rightarrow 18$

No. of women employed $= \frac{5}{13} \times 39 \Rightarrow 15$

No. of children employed $= \frac{2}{13} \times 39 \Rightarrow 6$

$(18M + 15W + 6C) =$ Rs 1113/day

$(108C + 45C + 6C) = 1113$/day

$\therefore$ Each child $= \frac{1113}{159} = ₹7$/day

$\therefore$ Each child will be paid by Rs 7/day.

(14) $(4M + 6W)$ in 8 days $= (3M + 7W)$ in 10 days.

$\hookrightarrow (32M + 48W)$ in 1 day $= (30M + 70W)$ in 1 day [Make days equal]

$2M = 22W$

$1M = 11W$

$(4M + 6W)$ in 8 days.

$44W + 6W \longrightarrow 8$ days

$10\ W \longrightarrow ?\ (x)$ $\quad \frac{50 \times 8}{10}$ $\quad$ [$\downarrow M$ $\uparrow$ time]

$x = 40$ days

(13) $(1200m + 500w)$ in 2 weeks $=$ $(900$ men $+ 250w)$ in 3 week

$\hookrightarrow (2400M + 1000M)$ in 1 week $= (2700m + 750W)$ in 1 week

$300m = 250W$

(1200 m + 300 w) ⇒ 1200 m + 600 m ⇒ 1800 m in 2 weeks

(x) ⇒ in 1 week

x = 3600.

time ↓ 2:1 than m ↑ 1:2

2:1 week 1800 : x men

∴ no. of men = 3600

PIPES

Pg 72

③ Let the 3rd pipe alone take x min.

(A+B+C) in 1min = $\frac{1}{50}$

$\frac{1}{60}$ $\frac{1}{75}$ $\frac{-1}{x}$

∴ pipe filling the tank is positive

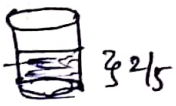
pipe emptying the tank is negative.

$\frac{1}{60} + \frac{1}{75} + \left(\frac{-1}{x}\right) = \frac{1}{50}$

$\frac{1}{x} = \frac{1}{60} + \frac{1}{75} - \frac{1}{50}$

x = 100 min

① (A+B) in 1min = $\frac{1}{10} + \left(\frac{-1}{6}\right) = \frac{-1}{15}$



It takes 15 mins to empty a full tank.

∴ $\frac{2}{5} \times$ (15)

= 6 min to empty

- If positive, it means it is full.
- If negative, it means it is empty

(4) (A+B) in 1 min $\left(\frac{1}{5}+\frac{1}{20}\right) = \frac{1}{4}$

∴ they together take 4 hr to fill the tank.

Let, leak alone take x hrs.

(A+B+C) in 1 hr $= \frac{1}{4.5}$ or $\frac{2}{9}$

$\frac{1}{4} + \left(\frac{-1}{x}\right) = \frac{2}{9}$

$\frac{1}{4} - \frac{2}{9}$

$\frac{9-8}{36} = \frac{1}{36}$

$x = 36$ hrs

4.5 : because after leakage it takes 30 min more to be full

(7) Let it take x more min after closing 1st pipe.

A's contribution $= \frac{3}{12}$, B's contribution $= \frac{3+x}{15}$

$\frac{3}{12} + \frac{3+x}{15} = 1$

$x = 8$ min 15 sec

(10) let waste pipe alone take x mins

(A+B+C) in 1 min $= \frac{1}{15}$

$\frac{1}{20} + \frac{1}{24} + \left(\frac{-1}{x}\right) = \frac{1}{15}$

$\therefore x = 40$ min

In 1 min, waste pipe empties 3 gallon

in 40 min ⟶ 120 gallon

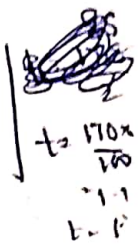
∴ Capacity of tank = 120 gallon.

-: TIME & DISTANCE :-

$T = \frac{D}{S}$ $\quad S = \frac{D}{T}$ $\quad D = S \times T$

- Speed and Time are always in inverse variation, when distance is constant.

Q: A man covers a distance of 170 km in 2 hrs partly at 100 km/hr and partly at 50 km/hr. Find the time spent at a speed of 100 km/hr?



Sol: Let time spent on 100 km/hr = x hrs

$D_1 + D_2 = 170$ kms

$100x + 50(2-x) = 170$

$x = 1\frac{2}{5}$ hrs or $1\frac{2}{5}$ hr or 1 hr 24 min

Q: Walking at a speed of 5 km/hr a man misses the bus by 4 mins. If he walks at 6 km/hr he reached the bus stand 6 mins early. Find the distance walked to reach the bus stand.

Sol: Let, distance = d km/hr

Then, $T_1 - T_2 = 10$ mins or $\frac{1}{6}$ hrs.

$\frac{d}{5} - \frac{d}{6} = \frac{1}{6}$

$d = \underline{5 \text{ km}}$

Q Walking at $\frac{3}{4}$ of his usually. A man reaches his office 12 min late. Find the us. Find the usual time to reach the office.

Sol: New speed = $\frac{3}{4}$ of speed.

∴ new time taken = $\frac{4}{3}$ of usual time

$= UT + \frac{1}{3}UT$

Clearly, additional time taken = $\frac{1}{3}UT$

i.e 12 min = $\frac{1}{3}UT$

$UT = 36$ min

- Average Speed:

Q A man travels from A to B at a speed of 90 Km/hr, and from B to C at 60 km/hr. Find his average speed for entire journey.

Sol: Insufficient Data

$$\text{Avg Speed} = \frac{\text{Total dist travelled}}{\text{total time taken}}$$

As total dist, or total time is not give.

Q If the time taken from A to B is 3 hr and B to C is 4 hrs. Find avg speed?

Sol: $$\text{Avg. speed} = \frac{D_1 + D_2}{T_1 + T_2} = \frac{(90\times3) + (60\times4)}{7} = \frac{510}{7}$$

Avg. speed = 72.84 (or) $72\frac{6}{7}$ Km/hr.

Note: • If the distance travelled is both cases is same, then avg. speed

$$\text{avg speed} = \frac{2AB}{A+B}$$; where A & B are two speed

Q. If B is midpoint of AC.

Sol. $\frac{2\times90\times60}{90+60} = 72$ Km/hr.

Note: If the time spent is same in both the cases then avg speed:

$$\text{avg speed} = \frac{A+B}{2}$$ where A & B are two speed

Eg: Q If time taken from A to B & B to C 3 hrs.

Sol: avg speed = $\frac{90+60}{2}$, 75 km/hr.

Note: If the ratio of two distances is m:n and the two speeds are x km/hr & y km/hr respectively, then

$$\text{avg speed} = \frac{(m+n)xy}{my+nx}$$

Q If distance AB & BC = 3:2.

Sol. Avg speed = $\frac{(3+2)\ 90\times60}{3\times60 + 2\times90}$ =

- Conversions

Km/hr ⟶ m/sec : x Km/hr = $x \times \frac{5}{18}$ m/s

m/sec ⟶ Km/hr : 25 m/sec = $25 \times \frac{18}{5}$ ⇒ 90 Km/hr

Speed = km/hr, dist = km, time = hrs

Speed = m/sec, dist = meters, time = secs

Pg 74

(2) Cyclist → dist = 1 Km, time = 1 hr

Jogger ⟶ dist = $\frac{1}{2}$ km, time = 2 hrs.

Ratio of their speeds (J & C) = $\frac{D_1}{T_1} : \frac{D_2}{T_2}$

$\frac{\frac{1}{2}}{2} : \frac{1}{1}$ ⇒ $\frac{1}{4} : \frac{1}{1}$ ⇒ 1:4

(3) Phase I: $D = S \times T$

$= 80 \times 2\frac{1}{4}$ (2.25)

$= 180$ km.

Phase II: $D = 350 - 180 = 170$ km

$T = \frac{D}{S} = \frac{170}{60}$ or $\frac{5}{6}$ hrs. or 2 hrs 50 min

total time taken: 2 hrs 15 min
+ 2 hrs 50 min
5 hrs 5 min

∴ 10:25 am she reached by this time.

(4) Let, speed of return = x km/hr

the speed onward = $(1.25)x$ km/hr

Avg speed = $\frac{\text{total dist}}{\text{total time}} = \frac{400+400}{8\text{hr}+8\text{hr}} = \frac{800}{16} = 50$ Km/hr

Avg speed = 50 Km/hr

$\frac{2ab}{a+b} = 50$

$\frac{x \cdot (1.25)x}{2.25x} = 25$

$x = \frac{25 \times 9}{5}$

$x = 45$ Km/hr

Speed onward = 1.25×45 Km/hr

$= 56.25$ Km/hr

(5) Avg Speed = $\frac{\text{total dist}}{\text{total time}} = \frac{D_1+D_2+D_3}{T_1+T_2+T_3} = \frac{(50\times1)+(48\times2)+(52\times3)}{1+2+3} = \frac{151}{3}$

$= 50\frac{1}{3}$

SD + 96 + 156. 451 / 3902 / 47

(7) Let original speed = x km/hr

new speed = $x+10$ km/hr

(8) is same

now, $T_1 - T_2 = 2$ hrs

$$\frac{715}{x} - \frac{715}{(x+10)} = 2$$

$x = 55$ Km/hr

(8) $T_2 - T_1 = \frac{1}{2}$ hr. ; dist = d kms

(9) Let distance = d km

then $T_1 - T_2 = 4$ hrs

$$\frac{d}{20} - \frac{d}{30} = 4\text{hr}$$

$d = 240$ km

RELATIVE SPEED:

- Speed of one moving body when observed from another moving body is called Relative speed.

- RS in opposite = Sum of speeds
- RS in same direction = Difference of speeds.

Note: • Whenever two objects are moving simultaneously, in same or opp directions, we should always calculate with relative speed.

Pg 75

(11) 1st train 8.00 am 60 Km/hr → A — 330 km — B ← 2nd train 9:00 am 75 km/hr

(12) is same

- When 2nd train starts, the distance btw two trains = 270 km [330 − 60]

Time taken to meet each other = $\frac{D}{S} = \frac{D}{RS}$

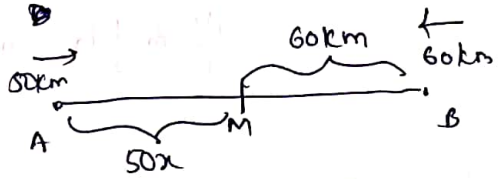
$$= \frac{270}{60+75} = \frac{270}{135}$$

$= 2$ hrs

Count 2 hrs starting from 9am = 11 a.m

(13) Let they meet each other = x hrs

(14) is same



additional dist. by B = 120

$60x - 50 = 120$

$x = 12$ hrs

Distance (AB) = $60x + 50x$

= 1320 km

(or)

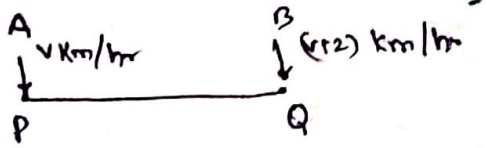
Dist (AB) = RS × T

= (60+50) × 12

= 1320 km

Note: The distance reduced by 2 persons together to meet each other in same direction or opposite direction is equal to the intial distance between the 2 persons.

(15)



dist. reduced in opp direc = dist reduced in same direction

$rs_1 \times T_1 = rs_2 \times T_2$

$[(V+2)+V] \times \frac{72}{60} = [(V+2)-V] \times 6$

$V_A = 4$ km/hr

$V_B = V_A + 2$

$= 6$ km/hr

(16) **Stoppage time /hr = $\frac{\text{diff in speed}}{\text{speed without stops}}$**

$= \frac{14}{42}$ or $\frac{1}{3}$ hr = 20 min

- I LIKE TRAINS :

- Distance travelled by train to cross pole = length of train
- Distance travelled by train to cross platform = length of train + length of platform
- Distance travelled by trains to meet in same direction or opposite direction = length of train 1 + length of train 2.
- Distance of train to cross a moving person : = length of train

(17) Speed of train = 132 km/hr

Distance travelled by train = $l_p + l_t$

$= 165 + 110$

$d = 275$ m

$t = \frac{275}{\text{Speed}}$

Speed $= 132 \times \frac{5}{18}$

$= 36.6$

time $= \frac{275}{36.6} = 7.5$ sec

(18) Speed of the train = 72 m in 45 sec

$= 18$ m/sec

Dist. travelled to cross 1st station = length of platform + train = $S \times T$

$272 + x = 18 \times 23$

$x = 142$ m

Length of the train = 142 m

(19) Length of train = 150 m (Distance)

Speed = 95 km/hr

person moving in same direction = 5 km/hr

time $= \frac{\text{Dist}}{RS} = \frac{150}{(95-5)} = \frac{150}{90}$

$= \frac{5}{3 \times \frac{5}{18}} = \frac{5}{3} \times \frac{18}{5}$

$= 6$ secs

(20) Length of the train = distance travelled to cross the man

$= rs \times t$

$= (54-9) \cdot \frac{5}{18} \times 14$

length of train = 175 mts

dist. travell to cross the platform = S×T

$= 54 \times \frac{5}{18} \times 25$

length of platform + 175 = 375

length of platform = 375 − 175

= 200

INSERTING MISSING CHARACTER

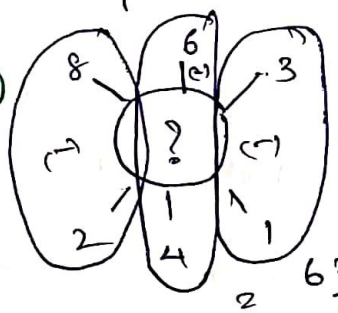
Pg 32

① $(12+13)^2 \div 625 = ?$

② $3^2 + 6^2 + 5^2 + 4^2 = 86$

③ $\frac{89+16}{7} = 15$

④



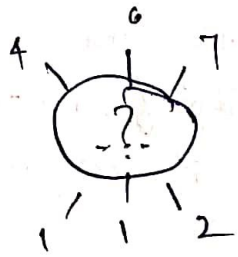
8 − 2 = 6

6 − 4 = 2

3 − 1 = 2

622

⑤



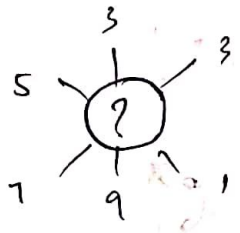
4 × 2 = 8

7 × 1 = 7

6 × 1 = 6

678

⑥



? : 7 − 5

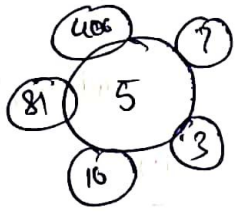
262

⑧ ?

⑨ $? = (1)^2 + (5)^2$

$= 26$

⑨



$(3 \times 5) + 1 = 16$

$(16 \times 5) + 1 = 81$

$(406 + 5) + 1 = ?$ 2031

⑪ $(13 \times 4) - (23 + 28)$

$= 1$

⑯ ⑫ ⑬ ?

⑭ $(15-5) \times (6+2) = 80$

$(13-11) \times (16+8)$

$= 48$

⑮ $(6)^2 + (3)^2 - ((4)^2 + (2)^2) = 25$

$(4)^2 + (x)^2 - ((1)^2 + (5)^2) = -12$

$x = 2$

(17) $x_2C_3^6 \; x_9C_2^{18} \; x_5C_5^{15}$

$x_2C_8^4 \; x_{27}C_3^9 \; x_3C_9^x$

(18, 19) ?

$x * 5 = 9$

$x = 3$

(20)

4C	2B	3A
28A	?	45B
7C	5A	15B

$2 \times 5 = 10$ 'C' is missing in 2nd row

$\therefore ? = 10C$

(8) $67 - 16 - 42 = 9$

6:30 am to 1pm

NA

@30s

(13) $(3 \times 4) + (5 \times 5)$

$\Rightarrow 37$

(18) $(6)^2 + (7)^2 + (3)^2 = 94$

(19) $4 + 1 - x = 4$

$5 - x = 4$

$x = 1$

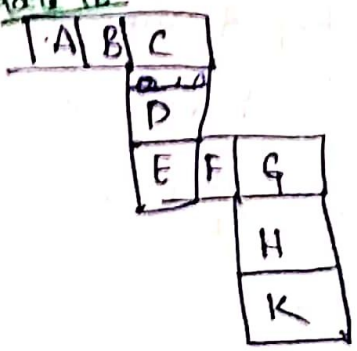
(12) $(48 + 184) - (34 + 56)$

$= 142$

(16) ~~$(18 \times 4) - (8 \times 4 \; 8 \times 4)$~~

$(7 \times 5) + (6 \times 9) = 89$

Q: Gate 18 :



A to K = 1 to 9

$A + B + C = C + D + E = E + F + G = G + H + K = 13$

then what is the number represented by E.

$C + D + E$ ~~$= E + F + G = 13$~~

3 9 1 | 1 8 4

~~A B C~~ 8

3 9 1

8

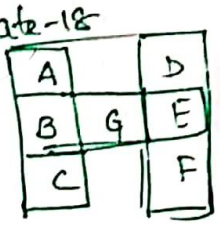
(4) 7 2

6

5

$E = 4$

Q Gate-18



$A \times B \times C = B \times G \times E = D \times E \times F$

A to G = 1 to 9

Which number is not represented ~~by~~

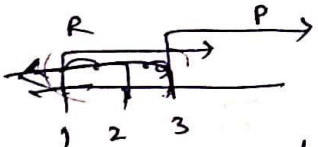
(a) A (b) ~~5~~ (c) 6 (d) 9

Since, if '5' is in A to G, then other * does not give multiple of 5. But since we can not repeat 5, it is not gonna be represented.

Analytical Reasoning *** :-

Pg 5

(39) According to P → S ≥ 3 cars
According to Q → S < 3 cars
According to R → S ≥ 1 car



Since one is correct and two other are false.

(c) 3 ; P is true, R is true ✗

(b) 1 ; Q is true, R is true ✗

(c) 0 ; Q is true, P is false, R is false ✓

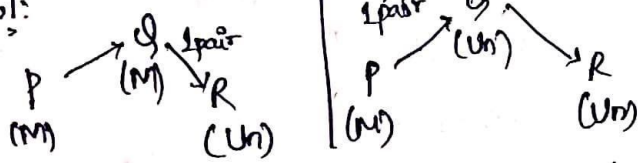
(40)

(b) Check P's drink and s'age

Q P is looking at Q, Q is looking at R. P is married and R is unmarried. How many pair of ppl we get, where a married person is looking at an unmarried person.

@ 0 (b) 1 (c) 2 (d) cannot be determined.

Sol:



∴ for each set we are getting only 1 pair.

∴ 1 pair

Pg 40 (30)

S > L > P

(d) P is youngest of them

(31) C > T > E

(b) false

(32) P < M should be definitely true :-

@ R > M, R > P — No comparision b/w M & P

(b) M > S < P

(c) Q < M < F = P; M < P ✗ false

(d) P = A < R < M

P < R < M; P < M true

(33) P → Q, R → S, S ~ P, Q → R

P → Q → R → S

(i) is true
(ii) is false

@ (i) only

(34) T >(1) M >(2) S
P >(1) S

T >(1) M >(1) P >(1) S

∴ Pradeep is older among them.

S = M + B + 2
T = M + 3
P = S + 1
T > M > P > S

(35) Riaz > Som
Shiv > Ansu

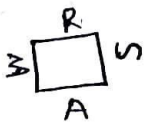
(i) true (b) false

@ Only (i) is true.

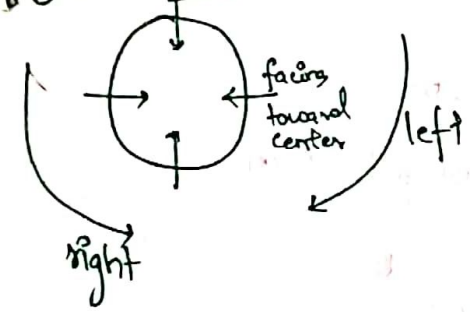
S < R
Sh > A
R > S
Sh > An

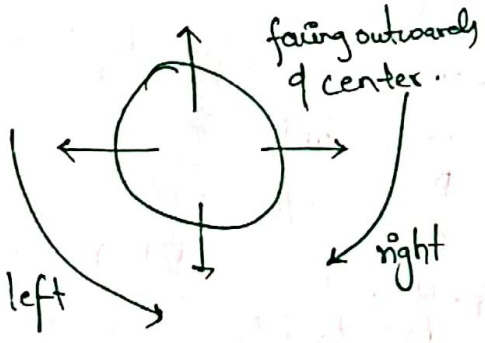
(26)

(c) Srinivas & Murli

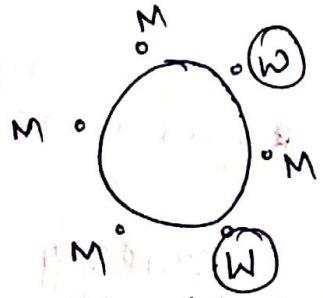


• Seating problem :-





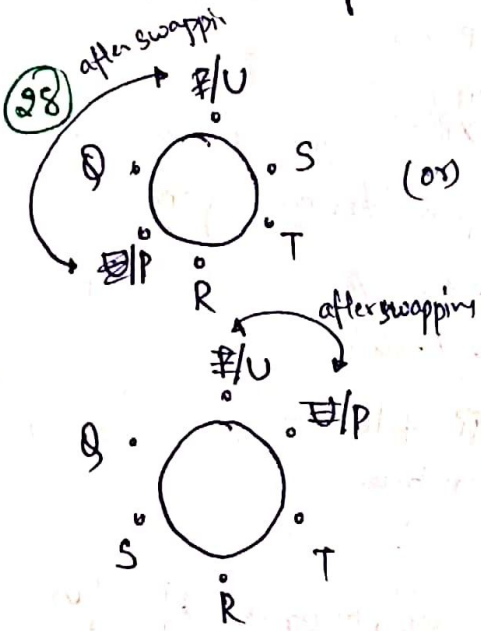
(27)



this satisfies all the conditions.

∴ No. of women = 2

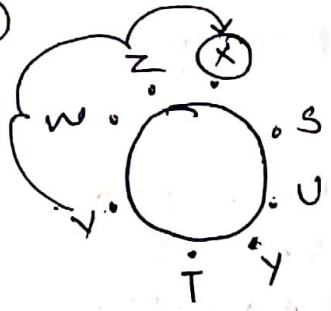
(28)



∴ T is immediate left of P or

P is immediate right of Q

(29)



Third left of V = X

Notes:

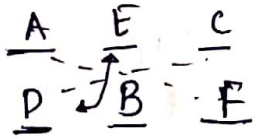
(i) While facing North → our left is left, our right is right

(ii) while facing South → our left is right, our right is left.

(iii) While facing East → upward direction is left and downward direction is left.

(iv) While facing West → upward is right, downward is left.

Pg 37 01 to 05



① (d) A and F

② (d) E

③ (a) A and E

④ (c) DBF

⑤ A D C (a) C and A
E B F

06 to 10

B ② G (d) none of these

E ⑦ BA (a)

G ⑧ G (c)

F

D ⑨ CF (d)

C

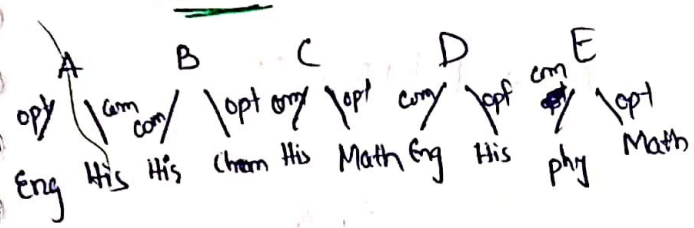
A ⑩ (d) all are required

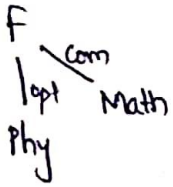
11 to 15

Psy — Phi Eco Sci Eng Social Mech
× Mon Tue

(11) @ Psychology
(12) © Economic
(13) (d) None of these
(14) @ one
(15) ~~[illegible]~~ (d) Economics

21 to 24





(21) @ History
(22) (d) D
(23) (d) None of these
(24) © E

(25) X Z V W Y

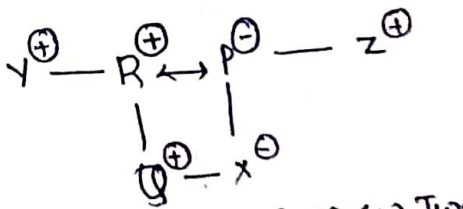
Middle building = V

BLOOD RELATIONS

- $A^{+} \leftrightarrow B^{-}$ (married couple)
  male female
- A^{+} —— B^{+} [single line means same generation]
  (Son) (Son)
  Brothers
- A^{+} —— B^{-}
  Brother-Sister
- A^{-} —— B^{-}
  Sis-Sis
- A^{+} Father [this line mean two generation]
  |
  B^{+} Son
- A^{+} Father
  |
  B^{-} Daughter
- A^{-} Mother
  |
  B^{+} Son
- A^{-} Mother
  |
  B^{-} Daughter [Ity for other level]

Pg 21

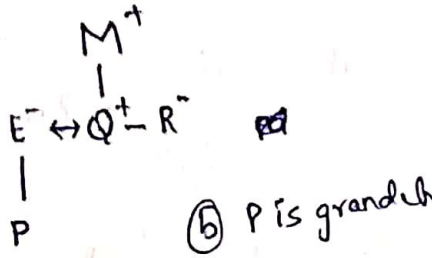
(9)



(i)(b) Z (ii) @ R (iii) (b) Two

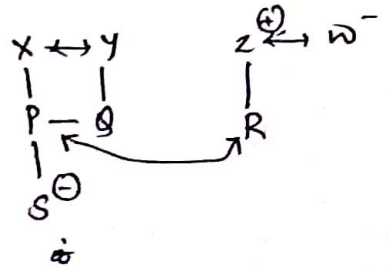
(iv)(c) Brother (v)(d) R & Y (vi)(b) Two

(10)



(b) P is grandchild of M

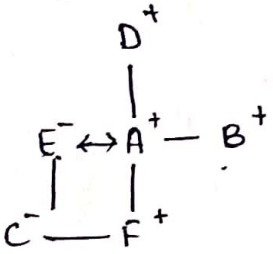
(11)



P and R should be married to satisfy the statements.

Ans: (b)

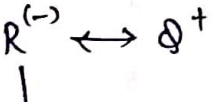
(8)



(i)(d) E (ii)(c) A (iii)(d) 4 (iv)(c) Son

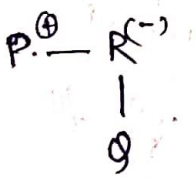
(v) (a) ABF

(17)

(i) P+R-Q : 

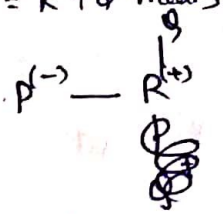
@ Q is father of P

(ii) P×R ÷ Q means



(c) P is uncle of Q

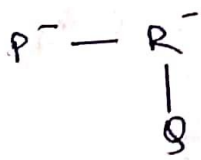
(iii) P = R + Q means



(b) P is daughter of Q

~~(a) P is aunt of Q~~

(iv) P = R ÷ Q means:



(a) P is aunt of Q.

(Q1) @ Cousin

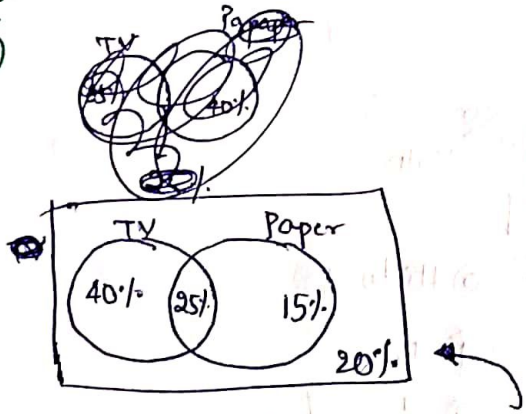
(Q2) Brother (d) None of these

(Q3) @ Daughter

VENN DIAGRAM

Pg 18

(10)



Neither watch TV or read newspaper = 20%

= 100% - (40+25+15)

= 20%

(12)

50 — 10000

27 → x

x = ?

atleast 2 papers = exactly 2 + exactly 3

= (12+5+8) + (2)

= 27

Ans = $\frac{27}{50} \times 10000 \Rightarrow 5400$

Pg 18/(12) extension

Q How many expected to read atmost 2 papers?

Sol: Atmost 2 papers = not reading any paper + reading only 1 paper + reading only exactly 2 papers.

$\Rightarrow (10) + (2+4+6) + (12+8+5)$

$= 48$ [total - 3 paper]

Ans $\frac{48}{50} \times 10,000 = 9600$

Q How many are expected to read atleast one paper?

Sol: 8000 ; Atleast 1 = 50 - 10 = 40

$\frac{40}{50} \times 10,000 = 8000$

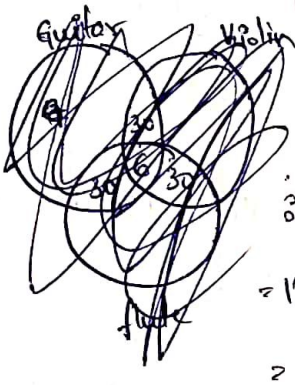
Pg 19

(13) 120 muscians,

6 — 3 instrument

30 - 2 instrument

40 - Guitar

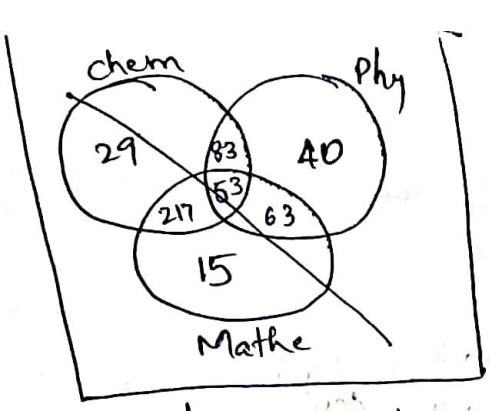


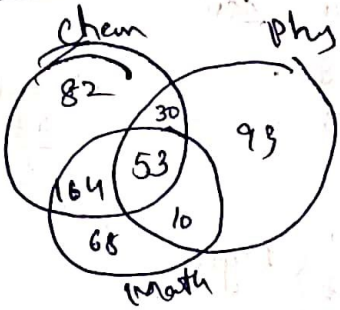
∴ Remaining

$= 120 - (6 + 30 + 40)$

$= 120 - 84$

$= 44$ (violin alone or flute alone)





Q How many registered for chem & phy but not maths:-

Sol: ⇒ 30

Q How many student registered for any two subjects:-

Sol: any 2 :- 2 or more

$(30+10+164) + (53)$

$= 257$

Q How many have registered for any 2 & only 2?

Sol: any 2 and only 2 : exactly 2

$30+10+164 = 204$

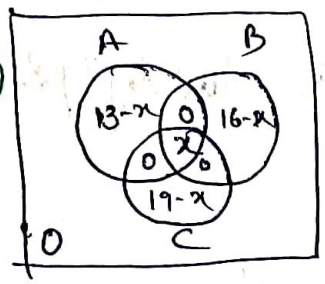
(14) $n(A \cup B \cup C)$

$= n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) + n(A \cap B \cap C)$

$500 = 329 + 186 + 295 - 83 - 97 - 63 + x$

$x = 53$

(11)



$13 - x + 16 - x + 19 - x + x = 40$

$x = 4$

LOGICAL PUZZLES

Q1 Find the last digit or units digit of $(2^{50} \times 3^{48})$

Sol: $2^1 \to 2$, $2^2 \to 4$, $2^3 \to 8$, $2^4 \to 6$ } 1 cycle

$2^5 \to 2$, $2^6 \to 4$, $2^7 \to 8$, $2^8 \to 6$ } 1 cycle

$4 \overline{)50} (12$ cycle

48

2

we take 2nd remainder

$\therefore$ last digit of $2^{50} = 4$

$3^1 \to 3$, $3^2 \to 9$, $3^3 \to 7$, $3^4 \to 1$, $3^5 \to 3$, $3^6 \to 9$, $3^7 \to 7$, $3^8 \to 1$

$4 \overline{)48} (12$

48

0

$\therefore$ last digit of $3^{48} = 1$

$2^{50} \times 3^{48}$

$\downarrow \quad \downarrow$

$4 \times 1 = 4$

Q Find the last digit or units digit of $(2^{17} \times 3^{13})$

$4 \overline{)19} (4$ cycle

16

3

we take 3rd no.

$4 \overline{)13} (3$ cycle

12

1

$\therefore$ last digit of $3^{13} = 3$

$\therefore 2^{17} \times 3^{13}$

$\downarrow \quad \downarrow$

$8 \times 3 = 24$

Q Find the last digit of $(3749)^{153}$

Sol: $(3749)^{153} = 9^{153}$ is same as

$9^1 \to 9$, $9^2 \to 1$ } cycle

$9^3 \to 9$

$9^4 \to 1$

when power is odd $= 9$

even $= 1$

$\therefore (3749)^{153} \approx 9$

Pg 1

(6) $(2171)^7 + (2172)^9 + (2173)^{11} + (2174)^{13}$

$(1)^7 + (2)^9 + (3)^{11} + (4)^{13}$

$1 + 9 + 7 + 4 = 14$

$= 4$

(7) $(211)^{870} + (146)^{127} \times 3^{424}$

$(1)^{870} + (6)^{127} \times 3^{424}$

$1 + 6 * 1 = 7$

(2) $(47x \times 729 \times 345 \times 343) = 5$

x can be 1, 3, 5, 7, 9

Q Find the number of zeros at the end of the product 100!.

Sol:

$5 \overline{)100}$ — 20 — 0 remainder

$5 \overline{)20}$ — 4 — 0 remainder

Add the quotients to get no. of zeros

$= 20 + 4$

$= 24$ zeros

Q How many zeros at the end of product 175! :-

So,

5 | 175
5 | 35 ← 0 remainder
5 | 7 ← 0 remainder
1 ← 2 remain

Add all quotients = 7+35+1
= 43 zeros

Pg ①

Q. $16 \times 22 \times 15 \times 50 \times 66 \times 115 \times 18 \times 90$

No. of zeros at the end :-

$(2)^4 \times (2\times11) \times (3\times5) \times (5\times5\times2) \times (5\times13) \times (5\times23) \times (2\times3\times3) \times (2\times3\times3\times5)$

2's count = 8 , 5's count = 6

Take the least of 2 values

∴ No. of zeros = 6

(11) Let no. of glasses broke = x

No. of glass delivered safely = 100 − x

$3(100-x) - 9(x) = 240$

$300 - 3x - 9x = 240$

$12x = 60$

$x = 5$

(29) Let no of plates = x,

then no. of oranges = x(1)+1

no. of mangoes = 2(x+1)

= 2(x−1)

Diff of mangoes & oranges

$= 2[x(2)] - [x(1)+1]$

$3 = 2[x-1] - x(1) + 1$

$x = 6$

(36) Let the no. of chocolates be 'x'. or verify by options.

Let x = 124

Ajit = $\frac{1}{2}(124) - 1 \Rightarrow 61$ 124 − 61 = 63

B = $\frac{1}{3}(63) - 2 = 19$ 63 − 19 = 44

C = $\frac{1}{4}(44) - 3 = 8$ then 44 − 8 = 36

∴ 124 chocolates

(31)

20 trucks 15 cars | 20 m fuel 15 m car
10 m 5 m

1 cycle, it takes 30 m distance or 5 m

3 sec → 1 cycle

3600 sec → ?

? = 720

Ans 720 × 2 ⇒ 1440 vechiles

(33) volume = $\frac{1}{3}\pi r^2 h$

new volume = $\frac{1}{3}\pi(1.5r)^2 h$

$= 2.25\left(\frac{1}{3}\pi r^2 h\right)$

Diff or increase from original

= 2.25 − 1 = 1.25 or 125%.

Q if radius is increased by 20%. height decby 10%

original volume = $\frac{1}{3}\pi r^2 h$

new volume = $\frac{1}{3}\pi (1.2r)^2 (0.9h)$

$= 1.296 \times \frac{1}{3}\pi r^2 h$

∴ Total increase in volum

$= 1.296 - 1$

$= 0.296$ or

29.6 %

Z

6:am : 8:30am
DS
9am 1pm
CD
@ 308

if I take 3-digit no: 628
then 6-digit = 628628

$= (6+8+2) - (2+6+8)$

$= 0$ ∴ it is divisble by 11.

(2) 72

(i) 7+2 = 9 ✓

(ii) 72 - 45 = 27 ✓

(3) least no. exactly divisible by 20, 42 & 76

= LCM of (20, 42, 76).

2 | 20, 42, 76
2 | 10, 21, 38
5, 21, 19

$= 2 \times 2 \times 5 \times 21 \times 19$

$= 7980$

this gives reminder as 0

So, required no: 7980 + 7

= 7987

Any multiple of LCM of divisors + common remider

i.e = $(7980 \times m) + 7$

will satisfy the given condition.

Q What is the greatest 5-digit no satisfying the above condition.

Sol:

7980) 99999 (12
7980
19199
15960
4230

99999
(-) 4230
95760
+7
95767

NUMBER SYSTEM :-

Pg 57

(1) 715?423 divide by 3. Then ? = ?

(7+1+5+x+4+2+3) divisble by 3

(22+x) is divisible by 3

∴ x = 2 is the smallest value for x.

(5) Divisibility rule for 11:

- The difference bbo sum of digits at odd places and sum of digits at even place should be either '0' or a no. divisible by 11.

(19) Least no. divisible by 12, 18, 36 & 45

= LCM of (12, 18, 36 & 45)

(20) is same.

2	12, 18, 36, 45
5	6, 9, 18, 45
3	6, 9, 18, 9
2	2, 3, 6, 3
3	2, 3, 3, 3
	1, 1, 1, 1

2×5×3×2×3×2

= 180

Required no = 180 - common difference

Common difference: 12 - 8 = 4, 18 - 14 = 4, 36 - 32 = 4, 45 - 41 = 4

∴ 180 - 4

Required = 176 is the least divisible

Other no. that satisfy.

• Any multiple of (LCM of Divisors) - common difference.

(180 × m) - 4

180) 999 (5
900
99

999
-99
900
-4
∴ 896 is largest 3-digit no. divisible by 12, 18, 36, 45

Note: Product of any two number = Product of their HCF × LCM

Ex: a = 21 & 15

product of 21×15 = 315

(2) LCM of 21×15 = 105

HCF of 21×15 = 3

Product of LCM × HCF

= 105 × 3

= 315

∴ same

(18) Product of 2 no. = LCM × HCF

480 × x = 4800 × 160

x = 1600

(15) Answer = LCM of their timings

= LCM (36, 45, 72, 81, 108)

3	36, 45, 72, 81, 108
3	12, 15, 24, 27, 36
2	4, 5, 8, 9, 12
2	2, 5, 4, 9, 6
3	1, 5, 2, 9, 3
	1, 5, 2, 3, 1

LCM = 3×3×2×2×3×5×2×3

= 3240 sec all five will ring together after or 54 mins

54 mins.

(16) LCM of 48, 72, 108

3	48, 72, 108
2	16, 24, 36
2	8, 12, 18
2	4, 6, 9
2	2, 3, 9
3	1, 3, 9
	1, 1, 3

LCM = 3×2×2×2×2×3×3

= 16×27

= 432 secs or 7 min 12 sec

60) 432 (7
12

∴ 8:27:12 h

(17) LCM of their timing to complete 1 round.

Distance = 11 km

$S = \frac{D}{t}$

$t = \frac{D}{S} = \frac{11}{4}, \frac{11}{5.5}, \frac{11}{8}$

i.e LCM of $\frac{11}{4}, \frac{11}{5.5}, \frac{11}{8}$

LCM of $\frac{11}{4}, \frac{2}{1}, \frac{11}{8}$

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

$= \frac{22}{(1)} = 22$ hrs

∴ They will meet again after 22 hours.

(29) 1 to 100, are having 3 factors.

Note: Only squares of prime numbers will have exactly 3 factors.

$2^2 = 4 \Rightarrow 1, 2, 4$

$3^2 = 9 \Rightarrow 1, 3, 9$

$5^2 = 25 \Rightarrow 1, 5, 25$

$7^2 = 49 \Rightarrow 1, 7, 49$

$11^2 = 121$ ✗

∴ 1 to 100 → 4, 9, 25, 49.

(39) LCM of $(3, 5, 7, 9, 11) = 3 \times 3 \times 5 \times 7 \times 11$

3465 — common diff

3465 →

⇒ 3464

(13) $T_1 = 408$ Kg, $T_2 = 468$ Kg, $T_3 = 516$ Kg

The size of the box should be the largest divisor of 408, 468 and 516 Kg.

HCF (408 ; 468 , 516)

= 12 Kgs

(or)

Select any two

408) 468 (1
408
60) 408 (6
360
48) 60 (1
48
12) 48 (4
48
x

(24) Maximum no. of students in each room = the largest divisor of 60, 84, 108

i.e HCF of 60, 84, 108

= 12

No. of rooms required = $\frac{60 + 84 + 108}{12}$

$= 5 + 7 + 9$

$= 21$

DATA INTERPRETATIONS

- More % or increas %.

$$= \frac{\text{diff}}{\text{Small No}} \times 100$$

- dec % or less % $= \frac{\text{diff}}{\text{larger No}} \times 100$

Pg 87

(1) (a) Cars: 248 → 280

inc % $= \frac{32}{248} \times 100$

(b) 72 → 81

inc % $= \frac{9}{72} \times 100$

(c) 210 → 241

incr % $= \frac{31}{210} \times 100$

(d) 79 → 93

incr % $= \frac{14}{79} \times 100$

(as)

take reverse division, and the quotient which has least value will be more and vv.

Option (d).

(2) Total vechicles sold in 1994,

107 + 112 + 266 + 235 + 442 = 1162

(a) $\frac{442}{1162} \times 100 =$

(b) $\frac{336}{855} \times 100 =$

(c) $\frac{153}{\quad} \times 100$

(d) $\frac{210}{\quad} \times 100$

(3) Heavy vechiles sold in 1993 = 81

Total sold in 1992 = 1013

81 is what % of 1013?

Sol: $\frac{81}{1013} \times 100 \Rightarrow$ 8 %

(4) 1994 :- 1993 → 1994

81 → 107

inc % $= \frac{107-81}{81} \times 100 = 32\ \%$.

∴ Inc % of heavy vechile in 1995 is also 32 %.

Then Heavy vechile sold in 1995

: 107 + 32 % of 107

= 141

But the value should be in: 141000

(5)

(a) 1993 : $\frac{93}{411} \times 100 < 25\ \%$

(b) 1990: $\frac{60}{336} \times 100 < 25\ \%$

(c) 1994: $\frac{64}{340} \times 100 < 25\ \%$

1994: $\frac{112}{442} \times 100 \approx 25\ \%$.

Q What is the growth rate of the 2-wheelers during the given period:

Intial = 340

Final = 442

Growth rate (increase %) = $\frac{102}{340} \times 100$

= 30%

Q What is the average growth rate of the 2-wheeler during the given period.

Sol: Avg. Growth Rate

= growth rate or incr %

no. of possible increases ← (n-1)

= $\frac{30\%}{5-1}$ = 7.5%

Q In which year the sale of jeeps increase by Max % over it previous year

Sol: 1991: $\frac{19}{153} \times 100$ ✗

1992: $\frac{38}{172} \times 100$ ✓

1993: $\frac{31}{810} \times 100$ ✗

1994: there is decrease. so ✗.

∴ Highest increase in % by 1992.

Pg 98

Q46). U's marks:

English = (64% of 50) or 32

Maths = (83% of 100) = 83

Science = (60% of 150) = 90

Hindi = (88% of 50) = 44

Social = (70% of 75) = 52.5

301.5

Overall % scored = $\frac{301.5}{425} \times 100$

Q What are avg % of mark scored by the student in Scicne subject.

Sol: Avg marks % :

$= \frac{80\% + 60\% + 88\% + 68\% + 64\% + 70\%}{6}$

$= \frac{432\%}{6} = 72\%$

Q What are the avg marks scored in science subject.

Sol:

Avg marks scored = 72% of (Total Marks 150)

= 108

Q62 Pg 106

Revenue from sale of Elegance

= no. of pieces sold × Price / Pieces

= (27+25+29+21) × Rs 48 [making approx]

for sale of Smooth:

= (20+19+22+18) × 63

(or)

from the given data, we can say Executives have been more

PIE CHART

(a) 54°

$\Rightarrow \frac{54^\circ}{360^\circ} \times 100 = 15\%$

(b) 20%.

$\Rightarrow 20\% \text{ of } 360 \Rightarrow \frac{20}{100} \times 360$

$= 72^\circ$

Pg 94

(30) Rakesh Children education

= 12% of 15000

$= \frac{12 \times 1500}{100}$

= 1800

Sohan Children education

= 8% of 18000

= 1440

Sohan spends (1800 − 1440) = 360 less than Rakesh.

∴ Rs. 360 less

(31) Rakesh = 38% of 15000

$\frac{1500 \times 3}{4500}$ = 5700

$\frac{300 \times 3}{900}$ Sohan = 33% of 18000

= 5940

∴ Sohan ate more by 240 more

(32)

Ratio of expenditure of CE = 12% of 15000 : 8% of 18000

$\frac{2}{5}$ 12% of 15000 : 8% of $\frac{18000}{6}$

⇒ 10 : 8

(or) ⇒ 5 : 4

(33) 19% of 360° = $\frac{19 \times 360}{100}$

72° (20%) − 3.6° (1%)

68.4° = 68.4°

Q Expenditure of Sohan on Food is what % more than that of house.

Sol: Food = Rs 33

House = Rs 27

More % = $\frac{6}{27} \times 100 = 22.2\%$

Q Money spent by Rakesh on food is what % more or less when compared to money spent by Sohan on house?

$\frac{1800 \times 8}{1440}$

6

Sol: Rakesh on food = 38% of 15000
= 5700

Sohan on House = 27% of 18000
= 4860

More % = $\frac{5700-4860}{4860} \times 100$

= $\frac{840}{486} \times 10$

= 17.2%

17 Sept.
9-1pm
PAA @308

Pg 92 Q21:24

21) (c)

22) $\frac{10\%}{360} \Rightarrow 36°$ (b)

23) 6% = Rs 16440
13% = ? (x)

$x = \frac{16440}{6} \times 13$

(c) = Rs 35620 crore

24) Defence expenditure (96-97)
= Rs 29,498 crore

(97-98) = Rs 35620 crore

inc % = 21%

but Ans: (b)

BAR GRAPH :-

Pg 118

Q74

(i) Beds (C_2) = 20 - 12 ⇒ 8
tables (C_3) = 13 - 5 ⇒ 8
∴ True

(ii) Total no of chair = 2 + 10 + 5 + 2 + 4
= 23

Total no of Tables = 7 + 2 + 8 + 3 + 10
= 30

chairs < # table
∴ True

(c) Both (i) & (ii) true.

Pg 105

Q60

growth rate (or) increase % = $\frac{35}{20} \times 100$

Overall increase % = 175%

Average % growth = $\frac{\text{growth rate (or) inc \%}}{n-1}$

= $\frac{175\%}{5-1}$ = (or) 43.75%

43.75% ≈ 40

Q54

Total production of company A (in 6 years)
= 30 + 35 + 35 + 40 + 45 + 55
= 240 thousands

Color TV (in 6 years) = 75% of 240
= 180 thousands

(c) = 1.8 lacs

Q50 Installed Capacity: Required amount only

Large plant: When produced more than required

Small plant: " " less than required

Total production (large plant) = 160 + 190 + 230 + 190
= 770 tonnes

Total production (small plant) = 150 + 160 + 120 + 100 + 120
= 650

Diff = 770 − 650 = 120 tonnes.

Question: Highest production of any company is what % more (or) less when compared to avg production of the company.

Sol: ~~Total production~~

Average production = $\frac{770+650}{9} \Rightarrow \frac{1420}{9} \Rightarrow 158$

Highest production = 230

~~230 is what~~ more % = $\frac{230-158}{158} \times 100$

$= \frac{72}{158} \times 100$

=

Pg 90 Q13 : 15

13) ~~a)~~ 2000 : $\frac{35.80}{18.30}$ (or) = 1.95

~~X~~ (b) 2002 : $\frac{48.6}{27.0} = 1.8$

~~X~~ (c) 2001 : $\frac{40.90}{21.10} = 1.$

(d) 2004 : $\frac{66.9}{40.60} = 1.$

14) a) 2001 : 35.80 → 40.9

inc % = $\frac{5.1}{35.8} \times 100$

b) 2004 : 59.5 → 66.9

inc % = $\frac{7.4}{59.5} \times 100$

c) 2002 : 40.9 → 48.6

inc %

d) 2003 : 48.6 → 59.5

inc % =

15) (a) Increase

Q16 : 20

16) (a) @ 11758

17) 2004 - 05 = 5445

~~2005 - 06 = 5~~

2006 - 07 = 5813

inc % = $\frac{368}{5445} \times 100 = 6.8$ (d)

18) Required Ratio = 5315 : 2956

= 1.8

@ 18 : 13 = 1.4 ×

(b) 9 : 5 = 1.8

19) let the prices be Rs 5, Rs 3 & Rs 2 respectively

Total volume of production (2003-04)

= (2956 × 5) + (5315 × 3) + (3487 × 2)

=

Total volume of production (2004 - 05)

= (3137 × 5) + (5445 × 3) + (3432 × 2)

=

Inc %

(B) = 3

20) # of persons employed = $\frac{\text{Total Production}}{\text{Production per Person}}$

$= \frac{3302\times10^6}{1500} + \frac{5813\times10^6}{3000} + \frac{3389\times10^6}{5600}$

= 47 lakhs

LINE GRAPH

Pg 96 Q39 : 42

39) Domestic Sales (93-94) = Rs 1600 Cr

Export (93-94) = Rs 900 Cr

Diff = Rs 700 Cr (d)

40) (c) 94-95

41) @ 300 CROHE

42) $\frac{1000}{3200} \times 100 \approx 30\%$

Pg 105 Q59

Q What is the rainfall experienced during 16th hour to 18 hour?

0-15 hr = 200 mm

0-18 hr = 300 mm

⇒ 16th to 18th = 100 mm

original Problem solution:

Volume of water that falls on roof

= area of the roof × depth of the rainfall

= 50 sq.m² × 0.3 m

= 15 m³ (or) 15000 lts

∴ water collected in the tank

= 50% of 15000

= 7500 lts

Pg 108 Q66

Let the investments be Rs 800 & Rs 900 in 2006.

Ratio of interest paid = 6% of 800 : 4% of 900

= 48 : 36

(d) = 4 : 3

Q72

(i) Growth stops after 150 mins at 37°C

Growth stops after 140 mins at 25°C

∴ True

(ii) Curd formation at 37°C = 85 min

Curd formation at 25°C = 122 min

∴ 2(85) ≠ 122)

∴ False

@ Only (i) is true.

Q13

(i) Summer = 10.5 - 1.5 = 9.0

Winter = 8 - 0.2 = 7.8

Summer ≠ winter

∴ false

(ii) 10th, 11th, 12th, 14th

∴ True

(B) Only (ii) is true

Q68 (c) Down-up-down

Q69 (b) P to R

575m ~~-~~ 440m ⇒ 135m

Q70

(c) R, S, T

NUMERICAL ABILITY :-

Pg 54 Q13

ALRYX, EPVZB, ITZDF, OYEIK

+4 +4 +6

(d) OYEIK

Q14

QLWZB BHKM WCGJ MSVX

+6 +5+2 +6 +3+2 +6 +4+3 +6 +3 +2

(c) WCGJ

Q15 (d) NVBD

Pg 51

Q26 AD, CG, FK, JP, O

+2 +3 +4 +5

+3 +4 +5 +6

(c) OV

Q27 IG, 11K, 13M, _____

prime no., corresponding letter

(b) 17Q

Q29 A, CD, GHJ, _____, UVWXY

B EF JKLM

(c) MNOP

Q30 B, FH, LNP, _____

+2 +2+2 +2+2+2

CDE IJK

+3 +3 +3

(c) TVXZ

Q31 BC, FGH, LMNO, _____

DE IJK PQRS

b) TUVWX

Q32 KM5, ID8, GS11, EV14, ?

+2 +2 +2

+3 +3 +3

C Y 17

Q20 81, 54, 36, 24, ____

(81×2) ÷ 3 = 54

(54×2) ÷ 3 = 36

(36×2) ÷ 3 = 24

(24×2) ÷ 3 = 16

Q21 12 35 81 173 357 ?

(12×2) + 11 = 35

(357×2) + 11 = 725