1. (c) Proportion of the volume of the tank filled by both the pipes in 4 min $= 4\left(\frac{1}{15}+\frac{1}{10}\right) = \frac{2}{3}$ rd of the tank.

Volume of the tank filled by all the pipes working together $= \frac{1}{15}+\frac{1}{10}-\frac{1}{5} = \frac{-1}{30}$

i.e., $\frac{1}{30}$ tank is emptied in 1 min.

$\therefore$ $\frac{2}{3}$ rd of the tank can be emptied in $\frac{2\times 30}{3} = 20$ min

2. (d) Since, flow of waste pipe = flow of filling pipe.
$\Rightarrow$ Filled part in one min = emptied part in one min.
$\therefore$ After opening the waste pipe for 2 min, cistern will be full in $(5 + 2) = 7$ min.

3. (c) $(A + B)$'s 1 hour's work $= \left(\frac{1}{12}+\frac{1}{15}\right) = \frac{9}{60} = \frac{3}{20}$

$(A + C)$'s 1 hour's work $= \left(\frac{1}{12}+\frac{1}{20}\right) = \frac{8}{60} = \frac{2}{15}$

Part filled in 2 hrs $= \left(\frac{3}{20}+\frac{2}{15}\right) = \frac{17}{60}$

Part filled in 6 hrs $= \left(3\times\frac{17}{60}\right) = \frac{17}{20}$

Remaining part $= \left(1-\frac{17}{20}\right) = \frac{3}{20}$

Now, it is the turn of A and B and $\frac{3}{20}$ part is filled by A and B in 1 hour.

$\therefore$ Total time taken to fill the tank $= (6 + 1)$ hrs $= 7$ hrs.

4. (b) Thus, by our extended formula, number of required days

$$= \frac{1}{\frac{1}{44\times 1}+\frac{1}{44\times 2}+\frac{1}{44\times 3}} = \frac{44\times 1\times 2\times 3}{6+3+2} = 24 \text{ days}$$

5. (c) Let the work be finished in x days.
Then, A's x day's work + B's $(x - 1)$ day's work + C's $(x - 2)$ day's work = 1

or, $\frac{x}{8}+\frac{x-1}{16}+\frac{x-2}{24} = 1$

or, $\frac{6x+3x-3+2x-4}{48} = 1$

or, $11x = 55$

$\therefore$ $x = 5$ days

6. (b) Let B be closed after x minutes. Then, part filled by $(A + B)$ in x min. + part filled by A in $(18 - x)$ min = 1.

$\therefore$ $x\left(\frac{1}{24}+\frac{1}{32}\right)+(18-x)\times\frac{1}{24} = 1$

or, $\frac{7x}{96}+\frac{18-x}{24} = 1$ or, $7x + 4(18 - x) = 96$

or, $3x = 24$ $\therefore$ $x = 8$.

So, B should be closed after 8 min.

Direct Formula:

Pipe B should be closed after $\left(1-\frac{18}{24}\right)\times 32 = 8$ min.

7. (a) Let the number of men originally employed be x.
$9x = 15(x - 6)$
or $x = 15$

8. **(c)** In 8 days, Anil does $=\frac{1}{3}$rd work.

$\therefore$ in 1 day, he does $=\frac{1}{24}$th work.

$\therefore$ Rakesh's one day's work = 60% of $\frac{1}{24}=\frac{1}{40}$th work.

Remaining work $=1-\frac{1}{3}=\frac{2}{3}$

(Anil and Rakesh)'s one day's work

$=\frac{1}{24}+\frac{1}{40}=\frac{1}{15}$th work

Now, $\frac{1}{15}$th work is done by them in one day.

$\therefore$ $\frac{2}{3}$rd work is done by them in $15\times\frac{2}{3}=10$ days

9. **(b)** A's one day's work $=\frac{1}{8}$th work

B's one day's work $=\frac{1}{3}$rd work

$\therefore$ A's 4 day's work $=4\times\frac{1}{8}=\frac{1}{2}$nd work

$\therefore$ In next two days, total wall $=\frac{1}{2}+2\left(\frac{1}{8}\right)-2\left(\frac{1}{3}\right)$

$=\frac{1}{12}$th wall

Remaining wall $=1-\frac{1}{12}=\frac{11}{12}$th

Now, $\frac{1}{8}$th wall is built up by A in one day.

$\therefore$ $\frac{11}{12}$th wall is built up by A in $8\times\frac{11}{12}=7\frac{1}{3}$ days.

10. **(a)** Work done by the waste pipe in 1 minutes

$=\frac{1}{20}-\left(\frac{1}{12}+\frac{1}{15}\right)=-\frac{1}{10}$ [–ve sign means emptying]

$\therefore$ Waste pipe will empty the full cistern in 10 minutes.

11. **(a)** Let the filling capacity of pump be x m^3/min.
Then, emptying capacity of pump = $(x+10)$ m^3 /min.

$\therefore$ $\frac{2400}{x}-\frac{2400}{x+10}=8$

$\Rightarrow x^2+10x-3000=0$

$\Rightarrow (x-50)(x+60)=0 \Rightarrow x=50$ m^3/min.

12. **(c)** Suppose pipe A alone takes x hours to fill the tank.

Then, pipes B and C will take $\frac{x}{2}$ and $\frac{x}{4}$ hours respectively to fill the tank.

$\therefore \frac{1}{x}+\frac{2}{x}+\frac{4}{x}=\frac{1}{5}\Rightarrow\frac{7}{x}=\frac{1}{5}\Rightarrow x=35$ hrs.

13. **(a)** Part filled in 10 hours $=10\left(\frac{1}{15}+\frac{1}{20}-\frac{1}{25}\right)=\frac{23}{30}$.

Remaining part $=\left(1-\frac{23}{30}\right)=\frac{7}{30}$.

$(A+B)$'s 1 hour's work $=\left(\frac{1}{15}+\frac{1}{20}\right)=\frac{7}{60}$.

$\frac{7}{60}:\frac{7}{30}::1:x$ or $x=\left(\frac{7}{30}\times1\times\frac{60}{7}\right)=2$ hours.

$\therefore$ The tank will be full in (10 + 2) hrs = 12 hrs.

14. **(c)** **Method I.** Considering one day's work:

$4m+6w=\frac{1}{8}$ .....(1)

$3m+7w=\frac{1}{10}$ ....(2)

(1) × 3 – (2) × 4 gives

$18w-28w=\frac{3}{8}-\frac{4}{10}$ or, $10w=\frac{1}{40}$

$\therefore$ 10 women can do the work in 40 days.

Method II. We find that

$8(4m+6w)=10(3m+7w)$

or, $2m=22w$

$\therefore$ $4m=44w$

$\therefore$ 4 men + 6 women = 50 women do in 8 days

$\therefore$ 10 women do in $\frac{8\times50}{10}=40$ days

15. **(b)** $A+B$ can do the work in 5 days $=5\left[\frac{1}{25}+\frac{1}{20}\right]$

$=\frac{5\times45}{25\times20}=\frac{9}{20}$

Rest of the work $=1-\frac{9}{20}=\frac{11}{20}$

B will do the rest of the work in $20\times\frac{11}{20}=11$ days.

16. **(c)** Let the capacity of tank be x litres

In one hour tank empties $=\frac{1}{8}$ of x $=\frac{x}{8}$ litre

In one hour, tap admits 6 litres
after opening tap tank is emptied in 12 hours.

So in one hour tank empties by $\frac{1}{12}$ of $x=\frac{x}{12}$ litres.

Therefore equation becomes $6-\frac{x}{8}=-\frac{x}{12}$

$$6=\frac{x}{8}-\frac{x}{12}=\frac{4x}{96}=\frac{x}{24}$$

$\therefore \quad x = 144$ litres

17. (b) Let work done by A in one day be a, similarly, for B, b and for C, c

So, $3a = 1$, $4b = 1$, $6c = 1$ [Total work be 1 unit]

So, Total work done by the 3 Machines in one day

$$=\frac{1}{3}+\frac{1}{4}+\frac{1}{6}=\frac{3}{4}$$

Therefore, time taken to complete the work is

$$\frac{1}{3/4}=\frac{4}{3} \text{ days.}$$

18. (b) Suppose large pump takes t hours to fill a tank

$\therefore$ 1 hour work of large pump fills $=\frac{1}{t}$ part

1 hour work of each small pump fills $=\frac{1}{t}\times\frac{2}{3}$

1 hour work of all 4 pumps fill $=\frac{1}{t}+3\times\frac{2}{3t}=\frac{3}{t}$

Therefore, $\frac{3}{t}$ part is filled by all 4 pumps in 1 hour

$\therefore$ Whole tank would be filled in $1\times\frac{t}{3}=\frac{t}{3}h$ this is 1/3 of the time taken by large pump i.e., t hour

19. (b) A's one day's work $=\frac{1}{15}$th work.

B's one day's work $=\frac{1}{10}$th work.

$(A + B)$'s one day's work $=\frac{1}{15}+\frac{1}{10}=\frac{1}{6}$th work.

Let A left after x days.

$\therefore$ $(A + B)$'s x days' work $=\frac{x}{6}$th work.

Remaining work $=1-\frac{x}{6}=\frac{6-x}{6}$th work.

Now, in 5 days, work done by $B=\frac{6-x}{6}$th work.

$\therefore$ In 1 day work done by $B=\frac{6-x}{30}$th work

and $\frac{6-x}{30}=\frac{1}{10}$

$\therefore x = 3$ days

20. (b) Given 12 men $\equiv$ 15 women $\equiv$ 18 boys

$\therefore$ 1 Man $\equiv$ 1.5 boys, 1 woman = 6/5 boys.

Now, $5W + 6B = 12B$.

Required answer is calculated as follows :

Total no. of boys reqd. = 18 × [(15/16) × (8/9)]

= 15 boys

The number of boys already present = 12.

Hence, 3 boys more required.

But 3 boys = 2 men.

So, 2 men are required.

21. (c)

	Men	Women	Children
Work	3	2	1
Numbers	20	30	36

Ratio of wages = (3 × 20) : (2 × 20) : (1 × 36) = 5 : 5 : 3

Total wages of men $=\frac{5}{13}\times 780 = ₹\ 300$

$\therefore$ Wages of a man = ₹ 15

Similarly, wages of woman = ₹ 10

and wages of child = ₹ 5

Total waves of 15 men, 21 women and 30 children

$= 15 \times 15 + 21 \times 10 + 30 \times 5 = 585$

Total wages for 2 weeks = ₹ 1170

22. (a) If x complete a work in x days. y will do the same task in $3x$ days.

$3x - x = 40$

$\Rightarrow \quad x = 20$

y will finish the task in 60 days

$(x + y)$'s 1 days work

$$=\frac{1}{20}+\frac{1}{60}=\frac{1}{15}$$

Both of them will complete the work in 15 days.

23. (b) Let the inlets be A, B, C and D.

$A + B + C = 8.33\ \%$

$B + C + D = 6.66\%$

$A + D = 5\%$

Thus $2A + 2B + 2C + 2D = 20\%$

and $A + B + C + D = 10\%$

$\rightarrow$ 10 minutes would be required to fill the tank completely.

24. (b) The 32 minutes extra represents the extra time taken by the pipes due to the leak.

Normal time for the pipes $\rightarrow n \times (1/14 + 1/16)$ $= 1 \rightarrow n = 112/15 = 7$ hrs 28 minutes.

Thus, with 32 minutes extra, the pipes would take 8 hours to fill the tank.

Thus, $8(1/14 + 1/16) - 8 \times (1/L) = 1 \rightarrow 8/L$

$= 8(15/112) - 1$

$1/L = 15/112 - 1/8$

$= 1/112.$

Thus, $L = 112$ hours.

25. (d) Let x = Number of days it rained in the morning and had clear afternoons.

y = Number of days it rained in the afternoon and had clear mornings.

z = Number of days it rained in the morning or afternoon

So according to question, $x + y = 7$

$x + z = 5$

$y + z = 6$

Adding all three equations, $x + y + z = 9$

So, $d = 9$ days

26. (a) Given 6 BSF ≡ 10 CRPF ⇒ 4 BSF + 9 CRPF

$= 4 + (9 \times 6/10)$ BSF $= \frac{94}{10}$ BSF

Now work = 6 × 2 BSF days = $\frac{94}{10} \times X$ BSF days

We have $6 \times 2 \equiv \frac{94}{10} \times X \Rightarrow X = 1.27$ days

27. (b) Let the required number of working hours/day = x

More pumps, less working hrs per day (Indirect)

Less days, more working hrs per day (Indirect)

$$\left.\begin{matrix}\text{Pumps} & 4:3\\ \text{Days} & 1:2\end{matrix}\right\} :: 8:x$$

$\therefore 4 \times 1 \times x = 3 \times 2 \times 8$

$\Rightarrow x = \frac{3 \times 2 \times 8}{4} = 12$

28. (b) Go through option

$140 \times 4 = (140 + 120 + 100 + \ldots + 20)$

$560 = 560$

Alternatively: Let n be the initial number of worker then

$n \times 4 = n + (n-20) + (n-40) + \ldots + (n-120)$

$4n = 7n - 420$

$\Rightarrow 3n = 420$

$\Rightarrow n = 140$ workers

29. (b) Ratio of number of men, women and children

$= \frac{18}{6} : \frac{10}{5} : \frac{12}{3} = 3x : 2x : 4x$

$\therefore (3x + 2x + 4x) = 18$

$\therefore x = 2$

Therefore, number of women = 4

Share of all women = $\frac{10}{40} \times 4000 = ₹\ 1000$

$(\because 18 + 10 + 12 = 40)$

$\therefore$ Share of each woman = $\frac{1000}{4}$ ₹ 250

30. (c) Raju = 10%, Vicky = 8.33% and Tinku = 6.66%. Hence, total work for a day if all three work = 25%. In 2 days they will complete, 50% work. On the third day onwards Raju doesn't work. The rate of work will become 15%. Also, since Vicky leaves 3 days before the actual completion of the work, Tinku works alone for the last 3 days (and must have done the last 6.66 × 3 = 20% work alone). This would mean that Vicky leaves after 80% work is done. Thus, Vicky and Tinku must be doing 30% work together over two days.
Hence, total time required = 2 days (all three) + 2 days (Vicky and Tinku) + 3 days (Tinku alone).

31. (a) Time taken by B = $10 \times \frac{100}{125} = 8$ days

Required answer = $\frac{8 \times 10}{18} = 4\frac{4}{9}$ days

Alternatively :

Reqd. days = $10 \div (1 + 1.25) = \frac{10}{2.25} = \frac{40}{9} = 4\frac{4}{9}$

32. (d) $(A + B)$ 1 day's work = $\frac{1}{20}$ ...(1)

$(B + C)$ 1 day's work = $\frac{1}{30}$ ...(2)

$(C + A)$ 1 day's work = $\frac{1}{40}$ ...(3)

Adding eqs. (1), (2) and (3)

$2(A + B + C) = \frac{1}{20} + \frac{1}{30} + \frac{1}{40}$

$2(A + B + C) = \frac{6 + 4 + 3}{120}$

$\Rightarrow (A + B + C)$ 1 day work together $= \frac{13}{240}$

A' Alone 1 day's work = $(A + B + C)$ 1 day's work – $(B + C)$ 1 day's work

$A = \frac{13}{240} - \frac{1}{30} \Rightarrow \frac{13 - 8}{240} = \frac{5}{240}$

Number of days taken by $A = \frac{240}{5}$ days

C ' Alone 1 day's work = $(A + B + C)$ 1 day's work – $(A + B)$ 1' day's work

$\Rightarrow \frac{13}{240} - \frac{1}{20} \Rightarrow \frac{13 - 12}{240} = \frac{1}{240}$

Number of days taken by $C = \frac{240}{1}$ days

Required Ratio $\frac{240}{5} : \frac{240}{1} \Rightarrow 1 : 5$

33. (a) 1M = 2W

(8M + 4W) × (6 days – 2 days) = (4M + 8W) × x days

$[M_1D_1 = M_2D_2]$

$\Rightarrow (8 \times 2W + 4W) \times (6 - 2)$ days $= (4 \times 2W + 8W) \times x$ days

$\Rightarrow (16 + 4)W \times 4$ days $= 16W \times x$ days

$\Rightarrow x = \frac{20 \times 4}{16} = 5$ days

34. (d) $(x + y)$'s 6 days' work = $\left(\frac{1}{30} \times 6\right) = \frac{1}{5}$.

Remaining work = $\left(1 - \frac{1}{5}\right) = \frac{4}{5}$

Now, $\frac{4}{5}$ work is done by y in 32 days.

Whole work will be done by y in $\left(32 \times \frac{5}{4}\right) = 40$ days.

35. (c) (A + B)'s 1 day's work $= \frac{1}{10}$; C's 1day's work $= \frac{1}{50}$

(A + B + C)'s 1 day's work $= \left(\frac{1}{10} + \frac{1}{50}\right) = \frac{6}{10} = \frac{3}{25}$ ...(1)

Also, A's 1 day's work = (B + C)'s 1 day's work ...(2)

From (1) and (2), we get : 2 × (A's 1 day's work) $= \frac{3}{25}$

$\Rightarrow$ A's 1 day's work $= \frac{3}{50}$

$\therefore$ B's 1 day's work $= \left(\frac{1}{10} - \frac{3}{50}\right) = \frac{2}{50} = \frac{1}{25}$

So, B alone could do the work in 25 days.

36. (c) A's 1 day's work $= \frac{1}{10}$ and B's 1 day's work $= \frac{1}{15}$

$\therefore$ (A + B)'s 1 day's work $= \left(\frac{1}{10} + \frac{1}{15}\right) = \frac{1}{6}$

So both together will finish the work in 6 days.

37. (b) Let the required number of days be x.

Then, more men, more km (Direct proportion)

more days, more km (Direct proportion)

men

$$\left.\begin{matrix} \text{Men} & 12 & : & 28 \\ \text{Days} & 7 & : & x \end{matrix}\right\} :: 1.5 : 12$$

$\therefore$ $12 \times 7 \times 12 = 28 \times x \times 1.5$

$$x = \frac{12 \times 7 \times 12}{28 \times 1.5} = 24$$

38. (c) (A + B + C)'s 1 day's work $= \left(\frac{1}{40}\right)^{th}$ part of whole work

(A + B + C)'s 16 days work $= \frac{16}{40} = \frac{2}{5}$ of whole work

(B + C) completes remaining work in 40 days (B + C) completes $\left(\frac{3}{5}\right)^{th}$ part of work in 40 days.

(B + C) completes whole work in $\frac{40 \times 5}{3} = \frac{200}{3}$ days.

$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{40}$

$\frac{1}{A} + \frac{3}{200} = \frac{1}{40}$

$\frac{1}{A} = \frac{1}{40} - \frac{1}{200} = \frac{4}{200}$

$\frac{1}{A} = \frac{1}{100}$

A alone can complete whole work in 100 days.

39. (c) $\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{6}$

(A + B + C) can do $\frac{2}{6} = \frac{1}{3}$ part of work in 2 days.

Remaining work = $1 - \frac{1}{3} = \frac{2}{3}$

In one hour (A + B) can do $\frac{2}{3 \times 7}$ part of work

$\frac{1}{C} = \frac{1}{6} - \left(\frac{1}{B} + \frac{1}{C}\right)$

$\frac{1}{C} = \frac{1}{6} - \frac{2}{21} = \frac{3}{42}$

C = 14 hours

40. (c) Let Pratibha can finish the work in x days then, Sonia can finish the same work in 3x days

According to question

3x – x = 60

2x = 60 $\Rightarrow$ x = 30

Pratibha and Sonia can individually complete the work in 30 days and 90 days respectively.

41. (c) Let 10 men left the work after 10 days.

Then, M × D = M × x + (M – 10) (70 – x)

40 × 60 = 40x + 30 (70 – x)

$\Rightarrow$ 2400 = 2100 + 10x $\Rightarrow$10x = 300 $\Rightarrow$ x = 10 days