1c

Average speed = $\left(\frac{2xy}{x+y}\right)$ kmph $= \left(\frac{2 \times 30 \times 70}{30+70}\right)$ kmph

2d

Sol: Let the required distance be x km

difference in the time of 2 speeds $= 15 \text{ min} = \frac{1}{4}$ hr

$\therefore \frac{x}{3} - \frac{x}{4} = \frac{1}{4}$ (or) $4x - 3x = 3$ (or) $x = 3$ km

3a

Sol: Let the total distance be x km.

$\frac{\frac{x}{2}}{45} + \frac{\frac{x}{2}}{30} = \frac{13}{3}$ (or) $\frac{x}{90} + \frac{x}{60} = \frac{13}{3}$

(or) $4x + 6x = \frac{13}{3} \times 360$

(or) $x = 156$

4c

usual time = 54 min

5d

$\frac{x}{12} - \frac{x}{13} = \frac{13}{60}$ (or) $13x - 12x = \frac{12 \times 13 \times 13}{60}$ (or) $x = 33.8$

6d

Sol: Time = 9 hrs, speed = 54 kmph

$\therefore$ Distance = Speed × Time = (54 × 9) km

distance = 486 km , new time = 6 hrs

New speed = $\frac{\text{Distance}}{\text{Time}} = \frac{486}{6} = 81$ kmph

$\therefore$ Increase in speed = 27 kmph

7a

Sol: Time $= \frac{40}{60}$ hr $= \frac{2}{3}$ hr, speed = 54 kmph

$\therefore$ Distance $= 54 \times \frac{2}{3} = 36$ km

Now, distance = 36 km , time $= \frac{30}{60}$ hr $= \frac{1}{2}$

New speed = 36 × 2 = 72 kmph.

8d

Sol: Speed is $18 \times \frac{5}{18}$ m/sec = 5 m/sec

Distance covered in 6 min = 5 × 6 × 60 = 1800 m

9d

Sol: Let the total distance be x

$$\frac{\frac{2}{3}x}{4}+\frac{\frac{1}{3}x}{5}=\frac{7}{5} \text{ (or) } \frac{x}{6}+\frac{x}{15}=\frac{7}{5}$$

(or) $5x + 2x = 42$ (or) $x = 6$ km

10d

Sol: Let the total distance be x km.

$$\frac{\frac{x}{2}}{30}+\frac{\frac{x}{2}}{20}=\frac{25}{2} \text{ (or) } \frac{x}{60}+\frac{x}{40}=\frac{25}{2}$$

$$\text{(or) } 2x + 3x = \frac{120 \times 25}{2}; \quad x = 300$$

11c

Difference in timing = 30 min = $\frac{1}{2}$ hrs

$$\therefore \frac{x}{2}-\frac{x}{3}=\frac{1}{2} \text{ (or) } 3x - 2x = 3 \text{ (or) } x = 3$$

12a

Sol: Let the distance be x km

Difference in timing = 10 min = $\frac{1}{6}$

$$\therefore \frac{x}{3}-\frac{x}{4}=\frac{1}{6} \text{ (or) } 4x - 3x = 2 \text{ (or) } 2 \text{ km}$$

13c

Sol: Let the correct time to complete the journey be x

Distance covered in x + 10 min at 30 kmph

= distance covered in (x + 4) min at 40 kmph

$$\therefore \frac{x+10}{60} \times 30 = \frac{x+4}{60} \times 40 = 3(x + 10) = 4(x + 4)$$

(or) $3x + 30 = 4x + 16$; (or) $x = 14$

14d

Time taken to cover 7 km = $\frac{7}{42} \times 60 = 10$ min

15a

Sol: To be 0.5 km apart, they take 1 hr.

To be 7.5 km apart they take $\left(\frac{1}{0.5} \times 7.5\right) = 15$ hrs

16c

To be (20 + 12) km apart, they take 1hr.

To be 64 km apart, they take $\left(\frac{1}{32} \times 64\right) = 2$

17a

$\frac{x}{20} = \frac{x+60}{30}$ or $3x = 2x + 120$ or $x = 120$

$\therefore$ Distance between A and B = x+x+60 = 84

18c

$\therefore 30x = 60\left(x - \frac{1}{2}\right)$ (or) $30x = 60x - 30$

(or) x = 1 hr $\therefore$ 2 p.m.

19d

$6x - 5x = \frac{20}{60} = \frac{1}{3}$

Time taken by A = 6x hrs = $6 \times \frac{1}{3} = 2$

20a

$x \times \frac{10}{60} + 2x \times \frac{10}{60} + x \times \frac{10}{60} = 30$; $x = 45$

21a

$\left(\frac{2xy}{x+y}\right)$ kmph = $\left(\frac{2 \times 20 \times 30}{30 + 20}\right) = 24$

22c

$\frac{x}{60} + \frac{x}{80} = 12$

(or) $6x + 8x = 12 \times 480$ (or) $= 411.42$

23d

time taken = $\left(\frac{2000}{500} + \frac{800}{400} + \frac{400}{200}\right)$ hrs = 8

speed = $\frac{3200}{8} = 400$ km/hr

24c

Let the required distance be x km

$\frac{x}{4} + \frac{x}{3} = 6$ (or) $3x + 4x = 72$ (or) $x = 10.29$

25a

the length of journey be x

$\frac{x}{20} - \frac{x}{30} = 5$ (or) x = 300 l

26c

(A + B)'s one day's work = $\frac{1}{x} + \frac{1}{2x} = \frac{3}{2x}$

$\therefore$ A and B jointly take $\frac{1}{\frac{3}{2x}} = \frac{2x}{3}$ number of days

$\therefore \frac{2x}{3} = 6 \Rightarrow x = 9$ days ; $\therefore 2x = 18$ days.

27d

$\frac{1920}{10 \times 16} = 12$ men

28c

$\frac{300}{25} = 12$ men

29a

16 persons can complete a job in 12 days. Hence 32 women can complete a job in 12 days as 64 children can complete a job in 12 days.
Thus 32 women and 64 children together would take $\frac{12}{2} = 6$ days to complete the job.

30c

Sol: Work done by 45 people in 30 days is half the total. Now to complete the remaining half in 15 days (45 –30 = 15) the contractor must have 90 people. Thus he must employ (90 – 45) = 45 people

31d

Sol: 2 men ≡ 5 women; 2 women ≡ 5 children
Thus 100 children = 40 women = 16 men
Hence, 16 men would take 10 days to complete the job
$\therefore$ 1 man would take (10 × 16) = 160 days to complete

32b

Sol: We have (no. of workers × no. of days) = constant. Thus we get 20 × 45 = 900 Man-days. Now in order to complete the task in 30 days, (900 ÷ 30) = 30 workers will be required in all. Hence 10 more workers will be required (30 – 20 = 10)

33d

Time = $\frac{1}{\left(\frac{1}{4} + \frac{1}{6}\right)} = \frac{1}{\frac{5}{12}} = \frac{12}{5} = 2.4$

34a

Sol: Total work = 8 × 36 = 288 men-days. Now in 10 days 8 men would complete $(8 \times 10 \times \frac{1}{288})$ portion of the work.

Thus the remaining portion would be $[(288 - 80) \div 288] = (13 \div 18)$

Now after removing 4 men, the remaining work would be completed by only 4 men.

Required number of days = $\frac{\text{remaining work}}{\text{1 day's work}} = \frac{13 \div 18}{4 \div 288} = 52$

35c

Sol: Work done by A and B in 30 days = $\left(\frac{1}{40} \times 30\right) = \frac{3}{4}$

Remaining work = $1 - \frac{3}{4} = \frac{1}{4}$

$\frac{1}{4}$ work is done by A in 30 days

36d

Sol: (A+B)'s 5 day's work + (B + C)'s 2 day's work + C's 11 days work = 1

$\frac{5}{12} + \frac{2}{16}$ + C's 11 day's work = 1; C's 11 day's work = $\frac{11}{24}$

C's 1 day's work = $\frac{1}{24}$; C alone can finish in 24 days.

37a

Sol: Work done by B = $1 - \frac{5}{6} = \frac{1}{6}$

$(A + C) : B = \frac{5}{6} : \frac{1}{6} = 5 : 1$

Total share is 6 and the amount is Rs. 600

B's share = Rs. $\left(600 \times \frac{1}{6}\right)$ = Rs. 100

38a

Sol: Time taken by Raju alone = $\frac{2}{3} \times 4 = \frac{8}{3}$ day

Their 1 day's work = $\frac{1}{4} + \frac{1}{6} + \frac{3}{8} = \frac{19}{24}$

Three together can finish the work = $\frac{24}{19} = 1\frac{5}{19}$

39d

Sol: The rate of filling the tank = $\frac{1}{20}$ per min

The rate of emptying the tank = $\frac{1}{40}$ per min

Effective rate of filling = (1) – (2) = $\frac{1}{40}$ per min

Thus tank will be full in 40 min.

40a

Sol: Rate of filling of pipe 1 = $\frac{1}{24}$ per min

Rate of filling of pipe 2 = $\frac{1}{40}$ per min

$\therefore$ Combined rate of filling = $\frac{1}{24} + \frac{1}{40} = \frac{8}{120} = \frac{1}{15}$

The tank get filled in 15 min.

41b

Sol: The rate of filling of the tank = $\frac{1}{10}$ per hr

Rate of emptying the tank = $\frac{1}{20}$ per hr

Boat taps are got open, the effective rate of filling

= $\frac{1}{20}$ per hr

It would take 20 hrs to fill the tank.

42a

Sol: The rate of filling of the Cistern without leak = $\frac{1}{7}$ per hr

The rate of filling of the same with the leak = $\frac{1}{8}$ per hr

rate of leakage is given as

= $\frac{1}{7} - \frac{1}{8} = \frac{1}{56}$ per hr. $\therefore$ 56 hours.

43d

Sol: Net part filled in 1 hr = $\left(\frac{1}{2}+\frac{1}{3}-\frac{1}{4}\right) = \frac{7}{12}$

$\therefore$ Tank will be full in $\frac{12}{7} = 1\frac{5}{7}$ hrs

44d

Sol: Let B be closed after x min

Part filled by (A+B) in x min and part filled by A in (15 – x) min = 1

$\therefore x\left(\frac{1}{20}+\frac{1}{25}\right) + (15-x)\left(\frac{1}{20}\right) = 1$

or $\frac{9x}{100} + \frac{15}{20} - \frac{x}{20} = 1$

(or) $\frac{x}{25} = \frac{1}{4}$ (or) $x = 6\frac{1}{4}$

45b

Part filled by (A + B + C) in 1 min = $\left(\frac{1}{15}+\frac{1}{12}+\frac{1}{10}\right) = \frac{15}{60} = \frac{1}{4}$

I the three pipes together will fill the tank in 4 min.

46c

Sol: Net part filled in 1 hr = $\left(\frac{1}{4}+\frac{1}{8}-\frac{1}{10}\right) = \frac{11}{40}$

$\therefore$ The tank will be full in $\frac{40}{11}$ hrs (or) $3\frac{7}{11}$

47d

Sol: Work done by the leak in 1 hr = $\left(\frac{1}{8}-\frac{1}{9}\right) = \frac{1}{72}$

∴ leak will empty the full Cistern in 72 min.

48d

: Work done by leak in 1 hr = $\left(\frac{2}{5}-\frac{2}{9}\right) = \frac{8}{45}$

leak will empty the tank in $5\frac{5}{8}$ hrs

49b

Sol: Part filled in 5 min = $5\left(\frac{1}{30}+\frac{1}{60}\right) = \frac{1}{4}$

Remaining Part = $1 - \frac{1}{4} = \frac{3}{4}$

Part filled by a tap in 1 min = $\frac{1}{60}$

$\frac{1}{60} : \frac{3}{4} :: 1 : x$ (or) $x = \frac{3}{4} \times 1 \times 60$; (or) $x = 45$

The remaining part will be filled in 45 min.

50d

Sol: Work done by inlet in 1 hr = $\frac{1}{5} - \frac{1}{6} = \frac{1}{30}$

Time to fill by the inlet pipe = 30 hr.

∴ In 30 hrs it can fill (30×60) 3 lit. = 5,400 lit.