Chapter - 12

Speed, Time and Distance

Time and Distance Quick Maths Formulas

→ **Speed = Distance / Time**
→ If the speed of a body is changed in the ratio a:b, then the ratio of the time taken changes in the ration b:a.
→ If a certain distance is covered at x km/hr and the same distance is covered at y km/hr, then the average speed during the whole journey is 2xy / (x+y) km/hr.
→ Required Distance = [(Product of two speeds) / (Difference of two speeds)] *Diff between arrival times.
→ Required Distance = Total Time Taken * [(Product of two speeds) / (Addition of two speeds)]
→ **Distance = (2*Time*S1*S2) / (S1 + S2)**
  Where S1 = Speed during first half and S2 = Speed during second half of journey.

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Foundation

Solutions

1. (c); Average speed $= \dfrac{50 + 40 + 90}{\dfrac{50}{25} + \dfrac{40}{20} + \dfrac{90}{15}}$

   $= \dfrac{180}{2 + 2 + 6} = \dfrac{180}{10} = 18 \text{ kmph}$

2. (c); Average speed $= \dfrac{\text{total distance}}{\text{total time}} = \dfrac{5 \times 6 + 4 \times 12}{6 + 12}$

   $= \dfrac{30 + 48}{18} = \dfrac{78}{18} = \dfrac{13}{3} = 4\dfrac{1}{3} \text{ km/hr}$

3. (b); Speed $= \dfrac{\text{distance}}{\text{time}} = \dfrac{10\dfrac{1}{5}}{3} = \dfrac{51}{5} \times \dfrac{1}{3} = \dfrac{17}{5} \text{ km/hr}$

   ∴ Required distance = speed × time

   $= \dfrac{17}{5} \times 5 = 17 \text{ km}$

4. (d); Speed of the train $= \dfrac{110}{3}$ m/sec.

   Required time $= \dfrac{(165 + 110)}{110} \times 3$

   $= \dfrac{275}{110} \times 3 = 7.5$ sec.

5. (d); (Length of the 1st train + Length of the tunnel)
   = speed × time

   $x + 700 = \dfrac{72 \times 5}{18} \times (1 \times 60)$

   $x + 700 = 20 \times 60$

   $x + 700 = 1200 \Rightarrow x = 1200 - 700$

   $x = 500$ metres.

6. (c); Speed of the train $= \dfrac{200 + 200}{20}$

   $= \dfrac{400}{20} = 20 \text{ m/sec} = 20 \times \dfrac{18}{5} \text{ km/hr}$

   = 72 km/hr

7. (b); Since the trains are moving in opposite direction

∴ Relative speed = speed of first train + speed of second train

Let speed of second train = x km/hr

∴ $(65 + x) \times \dfrac{5}{18} = \dfrac{125 + 125}{6}$, $(65 + x) \times \dfrac{5}{18} = \dfrac{250}{6}$

$(65 + x) = 150 \Rightarrow x = 150 - 65 \Rightarrow x = 85$ km/hr.

8. (c); Let usual time = t, distance = d, and speed = s

∴ $s = \dfrac{d}{t}$ ...(i)

and $\dfrac{3}{5}s = \dfrac{d}{t + 2\frac{1}{2}}$ ...(ii)

From equation (i) ÷ equation (ii)

$\dfrac{s}{\frac{3}{5}s} = \dfrac{\frac{d}{t}}{\frac{d}{t + \frac{5}{2}}} \Rightarrow \dfrac{5}{3} = \dfrac{t + \frac{5}{2}}{t} \Rightarrow 5t = 3t + \dfrac{15}{2}$

$2t = \dfrac{15}{2} \Rightarrow t = \dfrac{15}{4} = 3\dfrac{3}{4}$ hours

9. (c); At normal speed, Let usual time = t

∴ $s = \dfrac{d}{t}$ ...(i)

and $\dfrac{7}{11}s = \dfrac{d}{22}$ ...(ii)

From equation (i) ÷ equation (ii)

$\dfrac{s}{\frac{7}{11}s} = \dfrac{\frac{d}{t}}{\frac{d}{22}} \Rightarrow \dfrac{11}{7} = \dfrac{22}{t} \Rightarrow t = 14$ hours.

∴ saved time = (22 – 14) hrs = 8 hrs.

10. (c); Let required time = t hours;

∴ $s = \dfrac{d}{t}$ ...(i)

$\dfrac{3}{4}s = \dfrac{d}{(t + 2)}$ ...(ii)

$\dfrac{s}{\frac{3}{4}s} = \dfrac{\frac{d}{t}}{\frac{d}{(t + 2)}} \Rightarrow \dfrac{4}{3} = \dfrac{t + 2}{t}$

$4t = 3t + 6 \Rightarrow t = 6$ hours

11. (a); Average speed $= \dfrac{2xy}{x + y} = \dfrac{2 \times 12 \times 18}{(12 + 18)}$

$= \dfrac{72}{5} = 14\dfrac{2}{5}$ km/hr

12. (b); From the formula –

∴ Required ratio $= \sqrt{b} : \sqrt{a} = \sqrt{9} : \sqrt{4} = 3 : 2$

13. (b); Required ratio $= \sqrt{b} : \sqrt{a}$

$= \sqrt{25} : \sqrt{16} = 5 : 4$

14. (d); Let length of the platform = x m

∴ $120 \times \dfrac{5}{18} = \dfrac{320 + x}{24}$

$800 = 320 + x \Rightarrow x = 480$ m

∴ Speed of the man $= \dfrac{480}{4 \times 60} = \dfrac{120}{60} = 2.0$ m/sec.

15. (c); Average speed

$= \dfrac{39 + 25}{(45 + 35) \times \frac{1}{60}} = \dfrac{64 \times 60}{80} = 48$ km/hr

16. (b); Let length of the platform = x

∴ $108 \times \dfrac{5}{18} = \dfrac{(280 + x)}{12} \Rightarrow 360 = 280 + x$

x = 80 metres

∴ Speed of Boy $= \dfrac{80}{10} = 8$ m/sec

17. (b); Speed of the truck $= \dfrac{224}{4} = 56$ km/hr

∴ average speed of the bike $= \dfrac{56}{4} = 14$ km/hr

∴ Required distance = 14 × 7 = 98 km

18. (b); When person walks at 14 km/h

∴ $14 = \dfrac{d}{t}$ ...(i)

Now speed = 10 km/h

$10 = \dfrac{(d + 20)}{t}$ ...(ii)

∴ From eqn(i) ÷ eqn(ii)

$\dfrac{14}{10} = \dfrac{\frac{d}{t}}{\frac{(d + 20)}{t}}$

$\dfrac{14}{10} = \dfrac{d}{d + 20} \Rightarrow 14d + 280 = 10d \Rightarrow 4d = 280$

d = 70km

∴ Actual distance = 70 – 20 = 50 km

19. (a); Given adult fair = 102

$$\therefore \text{Child fair} = \frac{102}{3} = 34$$

Required fair $= 2(102) + 3(34) = 204 + 102 = 306$

20. (a); Average speed

$$= \frac{\text{total distance}}{\text{total time}} = \frac{75 + 25 + 50}{\dfrac{75}{25} + \dfrac{25}{5} + \dfrac{50}{25}}$$

$$= \frac{150}{3 + 5 + 2} = \frac{150}{10} = 15 \text{ km/hr}$$

21. (b); Speed $= \dfrac{\text{distance}}{\text{time}}$, $54 \times \dfrac{5}{18} = \dfrac{700 + 500}{t}$

$$t = \frac{1200}{15} \sec \Rightarrow t = 80 \sec.$$

22. (c); Running time $= \dfrac{1000}{50} = 20$ hrs.

No. of times that he will rest $= \dfrac{20}{3} \approx 6$

$\therefore$ Rest time $= 6 \times 20 = 120$ min $= 2$ hours

$\therefore$ Total time $= (20 + 2) = 22$ hrs.

23. (c); Time taken by car $= \dfrac{330}{55} = 6$ hrs.

$\therefore$ Average speed of bike $= \dfrac{(330 - 15)}{(6 - 1)} = \dfrac{315}{5}$

$$= 63 \text{ km/hr}$$

24. (a); distance $= 40 \times 9 = 360$ km

Required time $= \dfrac{360}{60} = 6$ hrs.

25. (c); Speed $= \dfrac{\text{distance}}{\text{time}} \Rightarrow 20 \times \dfrac{5}{18} = \dfrac{75}{t}$

$$t = \frac{75 \times 18}{100} = \frac{54}{4} = 13.5 \text{ seconds}$$

26. (a); Let Required time $= t$

$$144 \times \frac{5}{18} = \frac{100}{t} \Rightarrow t = 2.5 \text{ seconds}$$

27. (c); Speed $= \dfrac{\text{distance}}{\text{time}}$

Let length of the platform $= 2x$ m

$$\frac{60 \times 5}{18} = \frac{x + 2x}{32.4} \Rightarrow 3x = 1.8 \times 60 \times 5$$

$3x = 90 \times 6$

$x = 30 \times 6 = 180$ m

$\therefore$ Length of the platform $= 2x = 360$ m

28. (a); Speed $= \dfrac{\text{distance}}{\text{time}} \Rightarrow 66 \times \dfrac{5}{18} = \dfrac{d}{18}$

$d = 330$ m

29. (c); Speed of first train $(S_1) = \dfrac{120}{10} = 12$ m/sec.

Speed of second train $(S_2) = \dfrac{120}{15} = 8$ m/sec.

$\therefore$ Required time $= \dfrac{120 + 120}{(12 + 8)} = \dfrac{240}{20} = 12$ sec

30. (a); Average speed $= \dfrac{2xy}{x + y} = \dfrac{2 \times 70 \times 55}{125}$

$$= 61.6 \text{ km/hr}$$

31. (a); Let distance $= d$, time $= t$

$$\therefore 10 = \frac{d}{t + \dfrac{15}{60}} \qquad \dots(i)$$

$$12 = \frac{d}{t + \dfrac{5}{60}} \qquad \dots(ii)$$

From equation (i) ÷ equation (ii)

$$\frac{10}{12} = \frac{t + \dfrac{1}{12}}{t + \dfrac{1}{4}} \Rightarrow \frac{10}{12} = \frac{4 \times (12t + 1)}{12(4t + 1)} \Rightarrow t = \frac{3}{4} \text{hr}$$

$$d = 10 \times \left(\frac{3}{4} + \frac{15}{60} \right) = 10 \times \frac{60}{60} = 10 \text{km}$$

Shortcut:

Let distance $= d$

$$\frac{d}{10} - \frac{d}{12} = \frac{10}{60} \Rightarrow d = 10 \text{ km}$$

32. (a); Average speed $= \dfrac{2xy}{x + y} = \dfrac{2 \times 21 \times 24}{45}$

$$= \frac{112}{5} \text{ km / hr}$$

$\therefore$ Distance $= \dfrac{112}{5} \times 10$ km $= 224$ km

33. (d); Relative speed $= (3 + 3.5)$ km/hr $= 6.5$ km/hr

time $= 3$ hrs

$\therefore$ required distance $= (6.5 \times 3) = 19.5$ km

34. (c); Let length of the bridge = x

$$\therefore \text{speed} = \frac{\text{distance}}{\text{time}} \Rightarrow 15 = \frac{x}{5} \times 60$$

$$x = \frac{75}{60} \text{km} = \frac{5}{4} \text{km} = \frac{5}{4} \times 1000 \Rightarrow x = 1250 \text{ m}$$

35. (d); Speed in metres per second

$$= 180 \times \frac{5}{18} = 50 \text{ m/sec.}$$

36. (d); Speed $= \frac{\text{distance}}{\text{time}} \Rightarrow 60 \times \frac{5}{18} = \frac{d}{30} \Rightarrow d = 500 \text{ m}$

37. (c); Relative speed of the trains

$$= (50 - 30) = 20 \text{ km/hr} = 20 \times \frac{5}{18} \text{m/sec.}$$

$$\therefore \text{ length of the faster train} = 20 \times \frac{5}{18} \times 18 = 100 \text{ m}$$

38. (a); Let length of the train = l_1, length of platform = l_2

$$\therefore (25+5) \times \frac{5}{18} = \frac{l_1}{12} \Rightarrow \frac{150}{18} = \frac{l_1}{12} \Rightarrow l_1 = 100\text{m}$$

$$\therefore 25 \times \frac{5}{18} = \frac{100 + l_2}{18} \Rightarrow 100 + l_2 = 125 \Rightarrow l_2 = 25\text{m}$$

$$\therefore \text{Required length } (100 + 25) = 125 \text{ m}$$

39. (b); Time $= \frac{4}{5} \times \frac{1}{45}$ hrs

$$= \frac{4}{5} \times \frac{1}{45} \times 60 \times 60 \text{ sec} = 64 \text{ seconds}$$

40. (c); Speed of the train $= \frac{570 + 570}{15}$

$$= \frac{1140}{15} = 76 \text{ m/sec.}$$

Moderate

1. (b); By the given statements

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} \Rightarrow p - q = \frac{1}{r} \Rightarrow \frac{1}{r} = p - q$$

2. (a); Let distance = d

$$\frac{d}{2} + \frac{d}{3} = 5 \Rightarrow \frac{5d}{6} = 5 \Rightarrow d = 6 \text{ km}$$

3. (b); Let distance = d

$$\frac{d}{5} - \frac{d}{6} = \frac{25}{60}$$

$$\frac{d}{30} = \frac{25}{60} \Rightarrow d = 12.5 \text{ km}$$

4. (c); Let length of train = L

$$\therefore \text{speed} = \frac{L + 162}{18} \qquad \ldots \text{(i)}$$

$$\text{speed} = \frac{L + 120}{15} \qquad \ldots \text{(ii)}$$

From equation (i) and equation (ii)

$$\frac{L + 162}{18} = \frac{L + 120}{15}$$

$$5L + 810 = 6L + 720 \Rightarrow L = 90$$

5. (b); Relative speed of two train = (50 – 40)

$$= 10 \text{ kmph} = 10 \times \frac{5}{18} \text{ m/s}$$

$$\text{Required time} = \frac{120 + 80}{50} \times 18 = \frac{200}{50} \times 18 = 72 \text{ sec.}$$

6. (b); Let length of each train = x metres

$$\therefore \text{speed of first train} = \frac{x}{4} \text{ m/sec}$$

$$\text{speed of second train} = \frac{x}{5} \text{ m/sec}$$

$$\text{Relative speed} = \frac{x}{4} + \frac{x}{5} = \frac{9x}{20} \text{m/sec}$$

Time taken to cross each other
= time train to cover 2x metres

$$\text{at} \left(\frac{9x}{12}\right) \text{m/sec} = 2x \times \frac{20}{9x} = \frac{40}{9} \text{ sec.}$$

7. (c); Let the speed of the train = s km/hr

$$(s+3) \times \frac{5}{18} = \frac{240}{10} \Rightarrow 24 \times 18 = 5s + 15$$

$$432 = 5s + 15 \Rightarrow 5s = 417 \Rightarrow s = 83.4 \text{ km/hr}$$

8. (c); Let the time taken by train A when it meet = t
Let the time taken by train B when it meet = (t – 1)
60 × t + 75 (t – 1) = 330 ⇒ 60t + 75t – 75 = 330
135 t = 405 ⇒ t = 3 hr
∴ both train will meet at 11 A.M.

9. (b); Let they meet in t min.
5t + 10t = 1200
15t = 1200
t = 80 min

10. (b); Relative speed = (77 + 67) km/hr = 144 km/hr

$$= \frac{144 \times 5}{18} \text{ m/sec} = 8 \times 5 = 40 \text{ m/sec.}$$

$$\therefore \text{ Required time} = \frac{(160 + 140)}{40} = \frac{300}{40} = 7.5 \text{ sec.}$$

11. (d); Speed of first train $(S_1) = \dfrac{120}{10} = 12 \text{ m/sec}$

    Speed of second train $(S_2) = \dfrac{120}{15} = 8 \text{ m/sec}$

    ∴ Relative speed $= S_1 - S_2 = 4 \text{ m/sec}$

    ∴ Required time $= \dfrac{120 + 120}{4} = \dfrac{240}{4} = 60 \text{ sec}$

12. (a); Average speed $= \dfrac{\text{total distance}}{\text{total time}}$

    $= \dfrac{2000}{\dfrac{3000 + 8000 + 500 + 800}{400}}$

    $= \dfrac{2000 \times 400}{12300} = \dfrac{8000}{123} = 65\dfrac{5}{123} \text{ km/hr}$

13. (b); Let total distance $= d$ km

    ∴ average speed $= \dfrac{\text{total distance}}{\text{total time}}$

    $= \dfrac{d}{\dfrac{d}{3} \times \dfrac{1}{25} + \dfrac{d}{4} \times \dfrac{1}{30} + \dfrac{5d}{12} \times \dfrac{1}{50}}$

    $= \dfrac{1}{\dfrac{1}{75} + \dfrac{1}{120} + \dfrac{5}{600}} = \dfrac{1}{\dfrac{8 + 5 + 5}{600}}$

    $= \dfrac{600}{18} = \dfrac{300}{9} = \dfrac{100}{3} = 33\dfrac{1}{3} \text{ km/hr}$

14. (c); Let speed of A $= 3x$
    Let speed of B $= 4x$

    $3x \times t = 4x\left(t - \dfrac{30}{60}\right) \Rightarrow 3t = 4t - 2 \Rightarrow t = 2 \text{ hrs.}$

15. (c); In first two hours the distance covered by
    car $= 70 + 70 = 140$ km
    In the four hours distance covered by car
    $= 140 + 160 = 300$
    Remaining 45km is covered by car in

    $= \dfrac{45}{90} \text{ hr} = \dfrac{1}{2} \text{ hr}; \quad$ ∴ Total time $= 4\dfrac{1}{2} \text{ hrs.}$

16. (a); No. of stops that he rests $= \dfrac{150}{20} \approx 7$

    ∴ rest time $= 7 \times 10 = 70 \text{ min} = 1 \text{ hr } 10 \text{ min}$

    ∴ run time $= \dfrac{150}{15} = 10 \text{ hrs}$

    ∴ Total time $= 11 \text{ hr } 10 \text{ min}$

17. (a); Let speed of bike $= 15x$
    Speed of train $= 27x$

    ∴ speed of bus $= \dfrac{720}{9} = 80 \text{ km/hr}$

    $15x = \dfrac{3}{4}(80) \Rightarrow 15x = 60 \Rightarrow x = 4$

    Speed of train $= 108 \text{ km/hr}$
    ∴ Required distance $= (108 \times 7) \text{ km} = 756 \text{ km}$

18. (d); Distance $= \dfrac{44}{60} \times 50 \text{ km}$

    ∴ time when speed of bus increased by

    $5 \text{ km/hr} = \dfrac{44}{60} \times 50 \times \dfrac{1}{55} = \dfrac{4}{6} \text{ hrs} = \dfrac{4}{6} \times 60 \text{ min.}$

    $= 40 \text{ min}$

19. (b); Let speed of bus $= 2x$
    ∴ speed of train $= 3x$

    $\dfrac{75}{2x} - \dfrac{75}{3x} = \dfrac{12.5}{60} \Rightarrow \dfrac{125}{600} = \dfrac{75}{x}\left(\dfrac{1}{2} - \dfrac{1}{3}\right)$

    $= \dfrac{75}{x}\left(\dfrac{1}{6}\right) \Rightarrow \dfrac{125}{100} = \dfrac{75}{x}$

    $x = \dfrac{75 \times 100}{125} \Rightarrow x = 4 \times 15 \Rightarrow x = 60 \text{ km/hr}$

    ∴ speed of bus $= 2 \times 60 = 120 \text{ km/hr}$

20. (c); Length of platform $= 140$ m
    Let length of train $= x$ m

    $x + x \times \dfrac{40}{100} = 140 \Rightarrow x = 100 \text{ m}$

    Speed $= \dfrac{100}{10} = 10 \text{ m/sec.}$

21. (d); Let speed of train $= x$
    Let speed of car $= y$

    $\dfrac{120}{x} + \dfrac{480}{y} = 8 \text{ hours} \qquad \text{... (i)}$

    $\dfrac{200}{x} + \dfrac{400}{y} = 8\dfrac{1}{3} \qquad \text{... (ii)}$

    equation (i) $\times 5 -$ equation (ii) $\times 3$

    $\dfrac{600}{x} + \dfrac{2400}{y} = 40 \Rightarrow \dfrac{600}{x} + \dfrac{1200}{y} = 25$

    On subtracting (2) from (1)

    $\dfrac{1200}{y} = 15 \Rightarrow y = 80 \Rightarrow \dfrac{120}{x} + 6 = 8$

    $\dfrac{120}{x} = 2 \Rightarrow x = 60$

    ∴ Require ratio $= x : y = 60 : 80 = 6 : 8 = 3 : 4$

22. (c); Let Aditya takes t hours when he travel at 10 km/hr

$$\frac{d}{10} - \frac{d}{15} = 2 \implies \frac{d}{30} = 2 \implies d = 60 \text{ km}$$

$$\therefore \ t = \frac{60}{10} = 6 \text{ hr}$$

$$\therefore \text{ to reach A at 1 pm, speed} = \frac{60}{5} = 12 \text{ kmph}$$

23. (c); Let length of train = x m
∴ Let length of bridge = 3.5x m

$$\frac{x + 3.5x}{40} - \frac{x}{40} = 21 \implies x + 3.5x - x = 40 \times 21$$

$$3.5x = 840 \implies x = \frac{840}{35} \times 10$$

$$\therefore \text{ Length of bridge} = \frac{840}{7} \times 2 \times \frac{7}{2} = 840 \text{ m}$$

24. (a); Let speed of train A = x km/hr
then Let speed of train B = (x + 27) km/hr
∴ 16x + 16(x + 27) = 1872
16x + 16x = 1872 – 432
32x = 1440 ⟹ x = 45 km/hr

25. (d); Let length of train N = x

$$\therefore \text{ Let length of train M} = \frac{x}{2}$$

$$\therefore \text{ speed of train M} = \frac{x}{2 \times 25} = \frac{x}{50} \text{ m/s}$$

$$\text{Speed of train N} = \frac{x}{75} \text{ m/s}$$

$$\text{Required ratio} = \frac{x}{50} : \frac{x}{75} = \frac{1}{50} : \frac{1}{75} = 3 : 2$$

26. (a); Speed of truck $= \frac{396}{11} \times 2 = 36 \times 2 = 72 \text{ km/hr}$

$$\text{Speed of bike} = \frac{4}{3} \times 72 = 24 \times 4 = 96 \text{km/hr}$$

$$\text{Required time} = \frac{396 - 12}{96} = \frac{384}{96} = \frac{32}{8} = 4 \text{ hrs.}$$

27. (c); Ratio of their speed $= \sqrt{b} : \sqrt{a} = \sqrt{121} : \sqrt{81}$
= 11 : 9
Given A's speed = 44 km
∴ B's speed = 36 km/hr

28. (c); Let distance travelled by second train = d

$$\frac{d}{65} = \frac{d + 20}{85}$$

85d = 65d + 65×20
20d = 65×20,   d = 65 km
∴ Total distance = 65 + 65 + 20 = 150 km

29. (c); Let time taken by first train = t hrs
25t = 40(t – 6),   25t = 40t – 240
15t = 240,   t = 16 hrs
∴ Required distance = 16 × 25 = 400

30. (d); Distance = 240 × 5 = 1200 km

$$\therefore \text{ required speed} = \frac{1200}{5} \times 3 = 240 \times 3$$

= 720 km/hr

31. (d); Distance $= 3 \times \frac{5}{2} \text{ km} = 7.5 \text{ km}$

32. (c); $40 = \dfrac{d}{t + \dfrac{11}{60}}$ ... (i)

$$50 = \dfrac{d}{t + \dfrac{5}{60}} \qquad \text{... (ii)}$$

By (i) and (ii)

$$\frac{4}{5} = \frac{t + \dfrac{5}{60}}{t + \dfrac{11}{60}} \implies \frac{4}{5} = \frac{60(60t + 5)}{60(60t + 11)}$$

240t + 44 = 300t + 25 ⟹ 60t = 19

$$t = \frac{19}{60} \text{hr} \implies t = \frac{19}{60} \times 60 \text{ min} \implies t = 19 \text{ min}$$

33. (b); Let length of tunnel = L

$$\therefore 78 \times \frac{5}{18} = \frac{800 + L}{60} \implies 1300 = 800 + L \implies L = 500$$

34. (a); Distance travelled by A in first day $= 4 \times \frac{70}{5}$

= 56 km
∴ Required ratio = 42 : 56 = 6 : 8 = 3 : 4

35. (a); Relative speed = (11 – 10) km/hr = 1 km/hr

in 6 min., distance betwen both $= \frac{1 \times 5}{18} \times 6 \times 60$

= 100 m
∴ Required distance = (200 – 100) m = 100 m

36. (c); At 1 : 30 PM., distance covered by boy

$$= \frac{7}{2} \times 12 = 42 \text{ km}$$

Let speed of scooter = x km/hr

$$42 = x \times \left(\frac{7}{2} - \frac{5}{4}\right) \implies 42 = x \times \frac{14 - 5}{4}$$

$$42 = x \times \frac{9}{4} \implies x = \frac{42 \times 4}{9} \implies x = \frac{56}{3}$$

$$x = 18\frac{2}{3} \text{ km/hr}$$

37. (b); Let distance = x km

$$\therefore \frac{x}{2} - \frac{x}{3} = \frac{12}{60} \Rightarrow \frac{3x - 2x}{6} = \frac{1}{5} \Rightarrow x = \frac{6}{5} \text{ km}$$

38. (c); Let length of train = L

$$\therefore s = \frac{L}{10} \qquad \qquad ... (i)$$

$$s = \frac{L + 300}{25} \qquad \qquad ... (ii)$$

by equation (i) and equation (ii)

$$\frac{L}{10} = \frac{L + 300}{25} \Rightarrow 25L = 10L + 3000$$

$$15L = 3000 \Rightarrow L = 200 \text{ m} \Rightarrow s = 20 \text{ m/sec}$$

$$\therefore \text{Required time} = \frac{200 + 200}{20} = \frac{400}{20} = 20 \text{ seconds}$$

39. (a); Time taken by A = 252 = $2 \times 2 \times 3 \times 3 \times 7$
    Time taken by B = 308 = $2 \times 2 \times 7 \times 11$
    Time taken by C = 198 = $2 \times 3 \times 3 \times 11$
    $\therefore$ L.C.M = 2772 sec
    = 46 min 12 sec

40. (c); A win by B in 25 sec
    B win by C in 30 sec
    A win by C in 55 sec
    A win by C by 275 m

$$\text{Speed of A} = \frac{275}{55} = 5 \text{ m/s}$$

$$\text{Time taken to run a kilometre by A} = \frac{1000}{5} = 200$$

= 3 min 20 sec

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Time and Distance Aptitude- Speed Time and Distance Conversions

1 kilometer= 1000 meters = 0.6214 mile
1 mile= 1.609 kilometer
1 hour= 60 minutes= 60*60 seconds= 3600 seconds
1 mile = 1760 yards
1 yard = 3 feet
1 mile = 5280 feet

1 km / hour = 5 / 18 m / sec
1 m / sec = 18 / 5 km / hour = 3.6 km / hour
1 km/hr = 5/8 miles/hour
1 yard = 3 feet
1 mph = (1 x 1760) / (1 x 3600) = 22/45 yards/sec
1 mph = (1 x 5280) / (1 x 3600) = 22/15 ft/sec

Time and Distance Formula Tricks

Speed = Distance/Time
Time =Distance/Speed
Distance = (Speed × Time)
Average Speed= Total Distance / Total Time
1 km/hr = 5/18 m/sec
1 m/sec = 18/5 km/hr
If the Speed of the two trains is S1 and S2 respectively and lengths are L1 and L2, then, While moving in the opposite direction 1)Relative speed = S1+S2. Time taken = [(L1 + L2)/(S1+S2)]

If the Speed of the two trains is S1 and S2 respectively and lengths are L1 and L2, then, While moving in the same direction 1)Relative speed = S1-S2. Time taken = [(L1 + L2)/(S1-S2)]

If the train passes an electric pole or a man, Speed = Length of the Train / Time

If two trains of lengths L1 and L2 cross each other at speeds of S1 and S2, respectively, in time t, the equation is given as S1+S2 = (L1+L2)/t.