Answer & Solutions

Level-I

1. (a) Let a distance x be covered in time t.

$$\text{Required ratio} = \frac{\frac{x/2}{2t}}{\frac{x}{t}} = \frac{1}{4} = 1:4$$

2. (c) Let the distance travelled during both upward and downward journey be x km.

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

$$= \frac{x+x}{\frac{x}{16}+\frac{x}{28}} = \frac{2}{\frac{28+16}{28\times16}}$$

$$= \frac{2\times28\times16}{44} = 20.36 \text{ km/h}$$

3. (b) $\text{Distance} = \left(1100\times\frac{11}{5}\right)$ feet = 2420 feet.

4. (a) Time required = (2 hrs 30 min – 50 min) = 1hr 40 min

$= 1\frac{2}{3}$ hrs

$\therefore$ Required speed $= \left(50\times\frac{3}{5}\right)$ km/hr = 30 km/hr.

Original speed $= \left(50\times\frac{2}{5}\right)$ km/hr = 20 km/hr.

$\therefore$ Difference in speed = (30 – 20) km/hr = 10 km/hr.

5. (c) When time is constant the distance covered by A and B will be in the ratio of their speeds, respectively.

6. (b) Let the distance travelled be x km.
Then, the correct time at a speed of 30 km/h

$= \frac{x}{30}-\frac{10}{60}$ and

the correct time at a speed of 42 km/h $= \frac{x}{42}+\frac{10}{60}$

Now, $\frac{x}{30}-\frac{10}{60} = \frac{x}{42}+\frac{10}{60}$

or $\frac{x}{30}-\frac{x}{42} = \frac{2}{6}$ or $\frac{12x}{1260} = \frac{2}{6}$ or $x = 35$ km

7. (c) Relative speed of the trains = (40 + 20) = 60 m/s
Distance = (120 + 120) = 240 m

Time taken by trains to cross each other completely

$= \frac{240}{60} = 4$ s

$\therefore$ Larger the no. of cogs (tooth of wheel) of wheel, lesser will be that no. of revolution made by it.

8. (c) Let the speed of trains be x km/h and y km/h, respectively.
When the trains cross each other, time taken by both the trains will be equal.

i.e. $\frac{110}{x} = \frac{90}{y} \Rightarrow \frac{x}{y} = \frac{110}{90} \Rightarrow x:y = 11:9$

9. (b) Required distance $= \frac{S_1S_2}{(S_1 \sim S_2)}\times$ Time difference

$= \frac{8\times5}{3}\times\frac{3}{2} = 20$km

10. (b) Let the total distance be x km. Then,

$\frac{\frac{1}{2}x}{21}+\frac{\frac{1}{2}x}{24} = 10 \Rightarrow \frac{x}{21}+\frac{x}{24} = 20$

$\Rightarrow 15x = 168 \times 20 \Rightarrow x = \left(\frac{168\times20}{15}\right) = 224$ km.

11. (b) Speed of the train = 132 km/h $= \frac{132\times5}{18}$ m/s

Distance = (110 + 165) = 275 m
Time required to cross the railway platform

$= \frac{275\times18}{132\times5} = 7.5$ s

12. (b) Let the total distance be $3x$ km.

Then, $\frac{x}{3}+\frac{x}{4}+\frac{x}{5} = \frac{47}{60} \Leftrightarrow \frac{47x}{60} = \frac{47}{60} \Leftrightarrow x = 1.$

$\therefore$ Total distance = (3 × 1) km = 3 km.

13. (c) $\frac{x}{9}-\frac{x}{10} = \frac{20}{60}$

or, $\frac{10x-9x}{90} = \frac{20}{60}$

$\therefore x = 30$ km

14. (c) Let the normal speed = x km/h
Then, the new speed = $(x + 5)$ km/h.

Now, $\frac{300}{x}-2 = \frac{300}{(x+5)}$ or $\frac{300}{x}-\frac{300}{(x+5)} = 2$

Checking with options, we see that $x = 25$ km/h.

15. **(c)** Distance between Chauhan and the gun
$= 3.32 \times 1000 = 3320$ m
Time taken = 10 s
$\Rightarrow$ Speed $= \frac{3320}{10} = 332\,\text{m/s}$

16. **(a)** Since A and B move in the same direction along the circle, so they will first meet each other when there is a difference of one round between the two.
Relative speed of A and $B = (6 - 1) = 5$ rounds per hour.
Time taken to complete one round at this speed $= \frac{1}{5}$ hr = 12 min.
$\therefore$ They meet at 7:42 a.m.

17. **(c)** Average speed $= \frac{\text{Total distance covered}}{\text{Total time taken}}$
$$= \frac{2\times200}{\frac{200}{40}+\frac{200}{20}} = \frac{2\times40\times20}{40+20}$$
$$= \frac{2\times40\times20}{60} = \frac{80}{3} = 26.67 \text{ km/h.}$$

18. **(a)** Let the length of each train be x metres.
Then, the total distance covered $= (x + x) = 2x$ m
Relative speed $= (46 - 36) = 10$ km/h $= \frac{10\times5}{18}\,\text{m/s}$
Now, $36 = \frac{2x\times18}{50}$
or $x = 50$ m

19. **(c)** After 5 minutes (before meeting), the top runner covers 2 rounds i.e., 400 m and the last runner covers 1 round *i.e.,* 200 m.
$\therefore$ Top runner covers 800 m race in 10 minutes.

20. **(b)** Due to stoppges the train travels
(45 – 36) = 9 km less in an hour than it could have travelled without stoppages.
Thus train stops per hour for $\frac{9}{45}\times60 = 12$ min.

21. **(b)** Distance travelled by the train in 1 hour
$= 2\times\frac{22}{7}\times2.1\times75\times60\,\text{m.} = \frac{132\times450}{1000} = 59.4$ km
i.e. speed of the train = 59.4 km/h.

22. **(d)** First train's speed is 45km/hr.
$\left(\text{Using speed} = \frac{\text{Distance}}{\text{Time}}\right)$
Second train's speed is 60km/hr.
Difference in the distance covered by these trains in 1 hr. is 15 km.

23. **(c)** Speed of speed-boat = 16 – 3 = 13 km/hr.
$\therefore$ Speed of boat against the current = 13 – 3
= 10 km/hr.

24. **(d)** Let the usual speed be x km/hr, then
$$\frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$$
$\Rightarrow x = 750$ km/hr

25. **(a)** Relative velocity = 20 + 30 = 50 m/s.
Distance = 2.5 kms. = 2500 m.
t = 2500/50 = 50 s.

26. **(c)** Relative speed = 90 + 60 = 150 km/hr.
Total distance to be covered = 300 + 200 = 500 m
Time required $= \frac{500}{150\times1000}\times3600 = 12$ sec.

27. **(d)** Required distance between A and B
$$= \frac{3\left((9)^2-(3)^2\right)}{2(9)} = \frac{3(81-9)}{18} = \frac{72}{6} = 12\,\text{km.}$$

28. **(d)** Total distance covered = 2 × 91 km = 182 km
Time taken = 20 hours
$\therefore$ Average speed $= \frac{182}{20} = 9.1\,\text{km/h}$
Let the speed of flow of the river = x km/hr
then, $\frac{10^2-x^2}{10} = 9.1 \Rightarrow 100-91 = x^2 \Rightarrow x = \pm3$
Hence, rate of flow of the river = 3 km/h

29. **(d)** Relative speed = 5.5 – 5 = 0.5 km/h.
Required time $= \frac{8.5}{0.5} = 17$ h

30. **(d)** x (speed of boat in standing water) = 9 km/hr
speed of stream = 1.5 km.h
Total time taken by him $= \frac{105}{10.5}+\frac{105}{7.5}$
= 10 + 14 = 24 h

31. **(a)** Given, distances are 2500 km, 1200 km and 500 km.
Given, speeds are 500 km/h, 400 km/h and 250 km/h
$\therefore$ Total time $= \frac{2500}{500}+\frac{1200}{400}+\frac{500}{250}$
$= 5 + 3 + 2 = 10$ hr.
$\therefore$ Average speed $= \frac{\text{Total distance}}{\text{Total time}}$
$$= \frac{2500+1200+500}{10} = \frac{4200}{10}$$
= 420 km/hr

32. **(d)** Let the distance between each pole be x m.
Then, the distance up to 12th pole = 11 x m
Speed $= \frac{11x}{24}$ m/s

Time taken to covers the total distance of $19x$

$= \frac{19x \times 24}{11x} = 41.45\,s$

33. (a) Let the length of the journey $= x$ km.

$\therefore$ Journey rides by horse cart $= x\left(1 - \frac{1}{2} - \frac{1}{3}\right)$

$= \frac{1}{6}x$ km.

Then, total time taken to complete journey $= \frac{31}{5}$ hr

$\Rightarrow t_1 + t_2 + t_3 = \frac{31}{5}$

$\Rightarrow \frac{x}{2} \times \frac{1}{4} + \frac{x}{3} \times \frac{1}{12} + \frac{x}{6 \times 9} = \frac{31}{5}$

$\Rightarrow x = \frac{31}{5} \times \frac{216}{37} = 36.2\text{km} \approx 36\text{km}$

34. (d) Required difference $= \frac{180}{3} - \frac{180}{4} = 15$ km

35. (c) Let the husband and the wife meet after x minutes. 4500 metres are covered by Pradeep in 60 minutes.

In x minutes, he will cover $\frac{4500}{60}x$ metres.

Similarly,

In x minutes, his wife will cover $\frac{3750}{60}x$ m.

Now, $\frac{4500}{60}x + \frac{3750}{60}x = 726$

$\Rightarrow x = \frac{726 \times 60}{8250} = 5.28\,\text{min}$

36. (a) Let speed of the boat in still water be x km/h and speed of the current be y km/h.
Then, upstream speed $= (x - y)$ km/h
and downstream speed $= (x + y)$ km/h

Now, $\frac{24}{(x-y)} + \frac{28}{(x+y)} = 6$ ...(1)

and $\frac{30}{(x-y)} + \frac{21}{(x+y)} = \frac{13}{2}$ ...(2)

Solving (1) and (2), we have
$x = 10$ km/h and $y = 4$ km/h

37. (c) The train that leaves at 6 am would be 75 km ahead of the other train when it starts. Also, the relative speed being 36 kmph, the distance from Mumbai would be (75/36) × 136 = 283.33 km

38. (a) The train can cover (200 + 350) m distane in five seconds which means the speed of the train is 110 m/s. Relative speed of man and trian is 114 m/s. To cover the distance of 100 metre, it will take less than one second.

39. (a) The clock gains 15 min in 24 hours.
Therefore, in 16 hours, it will gain 10 minutes.
Hence, the time shown by the clock will be 4.10 am.

40. (b) Average speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \frac{80}{\frac{60}{40} + \frac{20}{20}} = \frac{80}{2.5} = 32\,\text{km/h}$

41. (d) Total distance = 250 × 2 = 500 km

Total time $= 5\frac{1}{2}\text{hrs} + 4\frac{2}{3}\text{hrs} = 10\frac{1}{6}\text{hrs}$

Average speed $= \frac{\text{Total distance}}{\text{Total time}} = \frac{500}{10\frac{1}{6}} = \frac{3000}{61}\text{hrs}$

= 49.18 hours ≈ 50 hours (approx.)

42. (c) Their relative speeds = (4.5 + 3.75) = 8.25 km/h

Distance = 726 metres $= \frac{726}{1000} = 0.726\,\text{km}$

Required time $= \frac{0.726}{8.25} \times 60 = 5.28$ min

43. (d) Since they are moving in opposite direction, therefore their relative speed will be 4 + 3 = 7 km/hr.

Time $= \frac{d}{s} = \frac{17.5}{7} = 2.5\text{hrs.}$

(where d is distance and s is speed).
$\therefore$ They should meet at 12.30 PM.

44. (c) Speed on return trip = 150% of 40 = 60 kmph.

$\therefore$ Average speed $= \left(\frac{2 \times 40 \times 60}{40 + 60}\right)$ km/hr

$= \left(\frac{4800}{100}\right)$ km/hr = 48 km/hr.

45. (a) Average speed $= \frac{2 \times V_1 \times V_2}{V_1 + V_2} = \frac{2 \times 40 \times 60}{40 + 60}$

= 48 km/h

46. (c) The speeds of the two cyclists are different Hence, when one of the cyclist has covered one round more than the other cyclist, only then they will meet at the starting point.
$\therefore$ Time when the two cyclists will meet
= 300 m × (difference in speeds)
= 300 × (8 – 7) sec = 300 seconds.

47. (c) Let the correct time to complete the journey be x min.

Distance covered in (x + 11) min. at 40 kmph
= Distance covered in (x + 5) min. at 50 kmph

$\therefore \frac{(x+11)}{60} \times 40 = \frac{(x+5)}{60} \times 50 \Leftrightarrow x = 19$ min.

48. **(a)** Let x be the total distance.
$\therefore$ According to the question,

Distance covered by him on foot = $\frac{1}{3} x \times \frac{1}{4} = \frac{x}{12}$

But given he travels on foot = 2 km

$\therefore \frac{x}{12} = 2 \Rightarrow x = 24$ km.

49. **(d)** Let speed of car = x km / hr
Let speed of pedestrian = y = 2km / hr
$\therefore$ Relative speed = (x – 2) km / hr
$\therefore$ According to the question,

$(x-2) \times \frac{6}{60} = 0.6 \Rightarrow x-2 = 6 \Rightarrow x = 8$ km / h

50. **(b)** Let the original time be T hours and original speed be x km/h

$$\frac{1500}{x} = T \quad \ldots(1)$$

$$\frac{1500}{x+250} = T - \frac{30}{60} \quad \ldots(2)$$

Solving equations (1) and (2), we get
Speed of plane = x = 750 or – 1000 (not possible)
$\therefore$ x = 750 km/h

51. **(c)** Suppose they meet x hours after 14.30 hrs.
Then, $60x = 80(x-2)$ or $x = 8$.
$\therefore$ Required distance = (60 × 8) = 480 km.

52. **(c)** Total time taken

$= \left(\frac{9}{9+6} + \frac{9}{9-6}\right)$ hour

$= \left(\frac{3}{5} + 3\right)$ hours $= 3\frac{3}{5}$ hours

53. **(a)** Distance to be covered by the thief and by the owner is same.
Let after time 't', owner catches the thief.

$\therefore 40 \times t = 50\left(t - \frac{1}{2}\right)$

$\Rightarrow 10t = 25 \Rightarrow t = \frac{5}{2}$ hr $= 2\frac{1}{2}$ hr

54. **(b)** Rest time = Number of rest × Time for each rest
= 4 × 5 = 20 minutes
Total time to cover 5 km

$= \left(\frac{5}{10} \times 60\right)$ minutes + 20 minutes = 50 minutes.

55. **(c)** Assume that the distance is 120 km. Hence, 30 km is covered @ 25 kmph, 40@30 kmph and so on. Then average speed is 120/total time

56. **(c)** Time taken to cross a pole = $\frac{50}{1000} \times \frac{1}{45}$ hr

$\therefore$ No. of counts = $\frac{4 \times 1000 \times 45}{50}$ = 80 × 45 = 3600.

57. **(a)** Average speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \frac{400 \times 4 \times 9}{88+96+89+87} = \frac{400 \times 4 \times 9}{360}$

= 40 metres /minutes

58. **(b)** Time = $\frac{\text{Distance advanced}}{\text{Relative speed}}$

$2 = \frac{2 \times x}{(30-x)}$

$\Rightarrow x = 15$ km/h

59. **(c)** Average speed of truck = 368/8 = 46 km/hr
Average speed of car = 46 + 18 = 64 km/hr
Distance travelled by car = 368 + 16 = 384 km
Time taken by car = 384/64 = 6 hrs.

60. **(b)** Let the usual speed of the aeroplane be x km/h.

Then, $\frac{1500}{x} - \frac{1}{2} = \frac{1500}{(x+250)}$

$\frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2} \Rightarrow \frac{1500x + 3750000 - 1500x}{x(x+250)} = \frac{1}{2}$

$\Rightarrow 750000 = x^2 + 250x$ or $x^2 + 250x - 750000 = 0$

$\Rightarrow x^2 + 1000x - 750x - 75000 = 0$

$\Rightarrow (x + 1000)(x - 750) = 0 \Rightarrow x = 750, -1000$

Speed cannot be negative
We get x = 750 km/h

61. **(c)** To walk both ways, duration = 55 minutes

$\therefore$ To walk one way, duration = $\frac{55}{2}$ minutes

To walk one way + To ride one way = 37 minutes

$\therefore$ To ride both ways $= 2 \times \frac{19}{2}$ = 19 minutes

62. **(b)** Let total distance be 100 km.

Total time = $\frac{50}{50} + \frac{40}{40} + \frac{10}{20} = 1 + 1 + \frac{1}{2} = \frac{5}{2}$ hours

$\therefore$ Average speed = $\frac{100 \times 2}{5}$ = 40 kmph

63. **(b)** Speed of train = 36 kmph

$= \left(36 \times \frac{5}{18}\right)$ m/sec. = 10 m/sec.

Required time = $\frac{\text{length of train + Bridge}}{\text{Speed of train}}$

$= \frac{270+180}{10}$ = 45 seconds

64. (d) Let original time taken by student be x hours.

$$\frac{5}{2}\times\left(x+\frac{6}{60}\right)=3\times\left(x-\frac{10}{60}\right)$$

$$5x+\frac{1}{2}=6x-1$$

$$x=\frac{3}{2}\text{hours}$$

$$\therefore \text{ distance of school}=\frac{5}{2}\times\left(\frac{3}{2}+\frac{1}{10}\right)=4\text{km}$$

65. (b) Total distance = (100 + 50) m = 150 m

$$\text{Speed of the train}=\frac{150\times3600}{1000\times10}=54\text{ km/hr}$$

66. (c) Let the required distnace be *x* km.
Difference in the times taken at two speeds

$$=8\text{ min }=\frac{8}{60}\text{ hr }=\frac{2}{15}\text{ hr}$$

$$\therefore \frac{x}{5}-\frac{x}{6}=\frac{2}{15}$$

$$\frac{6x-5x}{30}=\frac{2}{15}$$

$$x=\frac{2}{15}\times30=4$$

Hence, the required distance is 4 km.

67. (d) Relative speed

$$=(45+54)=99\text{km / hr}=\frac{99\times5}{18}\text{m / sec}$$

Distance covered in crossing each other
= (108+112) = 220m

$$\text{Required time}=\frac{220}{99}\times\frac{18}{5}=8\text{sec}$$

68. (a) Let speed of train = x km/hr
Distance travelled by train
= Relative speed of train × Time

$$100\text{ m}=(x+5)\text{ km/hr}\times\frac{36}{5}\text{ seconds}$$

$$\frac{100}{1000}\text{km}=(x+5)\times\left(\frac{36}{5}\times\frac{1}{3600}\right)\text{hrs}$$

$$\Rightarrow x+5=50$$

$$\therefore x=45\text{ km/hr}$$

69. (a) Distance covered in 4.5 h = 80 × 4.5 = 360 km

$$\text{Speed}=\frac{360}{4\text{h}}\text{km}=90\text{ km/h}$$

70. (d) Total distance covered by horse in $2\frac{1}{2}$ seconds

$$=66\times\frac{5}{2}=165\text{m}$$

$$\text{Radius of the field}=\frac{165}{2\pi}=\frac{165\times7}{2\times22}=26.25\text{m}$$

71. (c) Side of square park = $\sqrt{25}$km = 5 km
Perimeter of park = 4 × 5 = 20 km

$$\text{Time taken}=\frac{20\text{km}}{3\text{km / h}}=6\text{ hours 40 minutes}$$

72. (a) $\text{Speed of bicycle}=\frac{\text{Distance}}{\text{Time}}$

$$=\frac{192}{8}=24\text{ metre/second}$$

$$\therefore \text{ Speed of man}=24\times\frac{3}{4}$$

= 18 metre/second

$$\therefore \text{ Required time}=\frac{\text{Distance}}{\text{Speed}}$$

$$=\frac{54}{18}=3\text{ seconds}$$

73. (b) $\text{Speed of bus}=\frac{\text{Distance}}{\text{Time}}$

$$=\frac{572}{13}=44\text{ kmph}$$

74. (c) V be the speed of train

$$V+9=\frac{210}{6\times1000}\times3600$$

$$V+9=126$$

$$V=117\text{ km/h}$$