1. (d) When A covers 200 metres, B covers

$$200\times\frac{22}{25}=176\text{m}$$

So, B is $(200 - 176) = 24$ m far away from the end point when A reaches in.

2. (b) Let the required distance be x km.

Difference in the times taken at two speeds

$$= 12 \text{ min} = \frac{1}{5}\text{hr}.$$

$$\therefore \frac{x}{5}-\frac{x}{6}=\frac{1}{5} \Leftrightarrow 6x-5x=6 \Leftrightarrow x=6$$

Hence, the required distance is 6 km.

3. (c) Total distance travelled in 12 hours = (35 + 37 + 39 + ... upto 12 terms).

This is an A.P. with first term, $a = 35$, number of terms, $n = 12$, common difference. $d = 2$.

$$\therefore \text{ Required distance} = \frac{12}{2}[2\times 35+(12-1)\times 2]$$

$$= 6(70 + 22) = 552 \text{ km}.$$

4. (b) Let the speed of the train and the car be x km/h and y km/h, respectively.

Now, $\frac{120}{x}+\frac{480}{y}=8$ ...(1)

and $\frac{200}{x}+\frac{400}{y}=\frac{25}{3}$ ...(2)

From (1), $120y + 480x = 8xy$ and ...(3)

From (2), $200y+400x=\frac{25}{3}xy$ ...(4)

From (3) and (4),

$$\frac{120y+480x}{8}=\frac{3(200y+400x)}{25}$$

or $15y + 60x = 24y + 48x$

or $12x = 9y$ or $\frac{x}{y}=\frac{3}{4}$ or $x : y = 3 : 4$

5. (c) Remaining distance = 3 km and Remaining time

$$=\left(\frac{1}{3}\times 45\right) \text{ min} = 15 \text{ min} = \frac{1}{4} \text{ hour}.$$

$\therefore$ Required speed = (3 × 4) km/hr = 12 km/hr.

6. (a) Let the whole distance travelled be x km and the average speed of the car for the whole journey be y km/hr.

Then, $\frac{(x/3)}{40}+\frac{(x/3)}{20}+\frac{(x/3)}{60}=\frac{x}{y}$

$$\Leftrightarrow \frac{x}{30}+\frac{x}{60}+\frac{x}{180}=\frac{x}{y}$$

$$\Leftrightarrow \frac{1}{18}y=1$$

$$\Leftrightarrow y = 18 \text{ km/hr}.$$

7. (a) Speed of first train = 50 km/hr.

Speed of second train = $\frac{400}{7}$ km/hr.

At 8:00 AM distance between two trains is 100 kms.

Relative velocity

$$=50+\frac{400}{7}=\frac{350+400}{7}=\frac{750}{7}\text{km/h}$$

Time taken $=\frac{100\times 7}{750}\times 60=56\text{ min}$. Hence, the two trains meet each other at 8:56 AM.

8. (b) Let the speed of the stream be x km/hr and distance travelled be S km. Then,

$$\frac{S}{12+x}=6 \text{ and } \frac{S}{12-x}=9$$

$$\Rightarrow \frac{12-x}{12+x}=\frac{6}{9} \Rightarrow 108-9x=72+6x$$

$$\Rightarrow 15x=36 \Rightarrow x=\frac{36}{15}=2.4 \text{ km/hr}.$$

9. (a) If the rate of the stream is x, then $2(4.5 - x) = 4.5 + x$

$\Rightarrow 9 - 2x = 4.5 + x \Rightarrow 3x = 4.5 \Rightarrow x = 1.5$ km/hr

10. (b) Distance covered = 187.5m, Time = 9 secs

Relative speed = $\frac{187.5}{9}\times\frac{3600}{1000}$ = 75 km/hr

As the trains are travelling in opposite directions, speed of goods train = 75 – 50 = 25 km/hr.

11. (d) Relative speed of both trains = 60 + 90 = 150 km / h

Total distance = 1.10 + 0.9 = 2 km

$$\therefore \text{ Required time } = \frac{2\times 60\times 60}{150}=48 \text{ seconds}.$$

12. (c) Let the speed of the train be x km/hr and that of the car be y km/hr.

Then, $\frac{120}{x}+\frac{480}{y}=8$ or $\frac{1}{x}+\frac{4}{y}=\frac{1}{15}$ ...(1)

And, $\frac{200}{x}+\frac{400}{y}=\frac{25}{3}$ or $\frac{1}{x}+\frac{2}{y}=\frac{1}{24}$ ...(2)

Solving (1) and (2), we get $x = 60$ and $y = 80$.

$\therefore$ Ratio of speeds = 60 : 80 = 3 : 4.

13. (c) Suppose they meet x hrs after 8 a.m. Then,

(Distance moved by first in x hrs) + [Distance moved by second in $(x - 1)$ hrs] = 330

$\therefore$ $60x + 75(x - 1) = 330$

$\Rightarrow x = 3$

So, they meet at (8 + 3), i.e. 11 a.m.

14. (a) Total journey = 180 km

$\frac{1}{3}$rd of journey $=\frac{180}{3}=60$ km.

If usual speed be x kmph, then

$$\frac{60}{\frac{3x}{4}}-\frac{60}{x}=\frac{1}{2}$$

$$\Rightarrow \frac{80}{x}-\frac{60}{x}=\frac{1}{2}$$

$$\Rightarrow \frac{80}{x}-\frac{60}{x}=\frac{1}{2}$$

$\Rightarrow x = 40$ kmph

15. (a) If the rowing speed in still water be x kmph, and the distance be y km, then

$$\frac{y}{x-2}=6$$

$\Rightarrow y = 6(x-2)$ ...(1)

and, $\frac{y}{x+2}=4$

$\Rightarrow y = 4(x+2)$ ...(2)

$\Rightarrow 6(x-2) = 4(x+2)$

$\Rightarrow x = 10$ kmph

16. (a) d = product of speed $\left[\frac{\text{difference of time}}{\text{difference of speed}}\right]$

$d=\frac{4\times 5}{60}\left[\frac{10-(-5)}{5-4}\right]$ [Here, –ve sign indicates before the schedule time]

$\Rightarrow d = 5$ km

17. (a) Let the distance be x km. Let speed of train be y km/h. Then by question, we have

$\frac{x}{y+4}=\frac{x}{y}-\frac{30}{60}$ ...(1)

and $\frac{x}{y-2}=\frac{x}{y}+\frac{20}{60}$ ...(2)

On solving (1) and (2), we get $x = 3y$

Put $x = 3y$ in (1) we get

$$\frac{3y}{y+4}=3-\frac{1}{2}\Rightarrow y=20$$

Hence, distance = 20 × 3 = 60 km.

18. (a) Let each side of the square be x km and let the average speed of the plane around the field be y km/h. Then,

$$\frac{x}{200}+\frac{x}{400}+\frac{x}{600}+\frac{x}{800}=\frac{4x}{y}$$

$$\Rightarrow \frac{25x}{2400}=\frac{4x}{y}\Rightarrow y=\left(\frac{2400\times 4}{25}\right)=384.$$

$\therefore$ Average speed = 384 km/h.

19. (c) Here, distance to be covered by the thief and by the owner is same.

Let after 2 : 30 p. m., owner catches the thief in t hrs.

Then, $60\times t=75\left(t-\frac{1}{2}\right)\Rightarrow t=\frac{5}{2}$ hrs

So, the thief is overtaken at 5 p.m.

20. (c) Let the speed of the cars be x km/h and y km/h, respectively.

Their relative speeds when they are moving in same direction = $(x - y)$ km/h.

Their relative speeds when they are in opposite directions = $(x + y)$ km/h.

Now, $\frac{70}{x+y}=1$ or $x+y=70$ ...(1)

and $\frac{70}{(x-y)}=7$ or $x-y=10$ ...(2)

Solving (1) and (2), we have

$x = 40$ km/h and $y = 30$ km/h.

21. (b) Volume of water flowed in an hour

= 2000 × 40 × 3 cubic metre = 240000 cubic metre

$\therefore$ volume of water flowed in 1 minute

$=\frac{240000}{60}=4000$ cubic metre = 40,00,000 litre

22. (c) Initial distance = 25 dog leaps.

Per minute → dog makes 5 dog leaps

Per minute → Cat makes 6 cat leaps = 3 dog leaps.

Relative speed = 2 dog leaps/minutes.

An initial distance of 25 dog leaps would get covered in 12.5 minutes.

23. **(a)** Form the equations first and then use the options.

24. **(b)**

	Ram	:	Sham
Speed	7	:	4
Time	4	:	7
Distance	4	:	7

Now, $7x - 4x = 300$

Means $x = 100$

Therefore, the winning post is $7 \times 100 = 700$ m away from the starting point

25. **(d)** The watch gains (5 + 10) = 15 min in 30 hours (12 Noon to 6 PM next day). This means that it will show the correct time when it gains 5 min in 10 hours or at 10 PM on Monday.

26. **(b)** The train needs to travel 15 minutes extra @35 kmph. Hence, it is behind by 8.75 kms. The rate of losing distance is 5 kmph. Hence, the train must have travelled for 8.75/5 = 1 hour 45 minutes. @40 kmph → 70 km.

Alternatively, you can also see that 12.5% drop in speed results in 14.28% increase in time. Hence, total time required is 105 minutes @ 40 kmph → 70 kilometers.

Alterntively, solve through options.

27. **(c)** Let the distance between the school and the home be x km.

Then, $\frac{x}{8} - \frac{2.5}{60} = \frac{x}{10} + \frac{5}{60}$ or $\frac{x}{8} - \frac{x}{10} = \frac{5}{60} + \frac{2.5}{60}$

or $\frac{2x}{80} = \frac{7.5}{60}$ or $x = \frac{7.5 \times 80}{2 \times 60} = 5$ km

28. **(b)** Relative speed of rockets

$= (42000 + 18000) = 60000$ mile/h

It means both of them together cover a distance of 60000 miles between themselves in 60 minutes or 1000 miles in 1 minute.

Hence, they should be 1000 miles apart, 1 minute before impact.

29. **(c)** Let the speed of the train be x m/sec. Then,

Distance travelled by the train in 10 min. = Distance travelled by sound in 30 sec.

$\Leftrightarrow x \times 10 \times 60 = 330 \times 30$

$\Leftrightarrow x = 16.5$.

$\therefore$ Speed of the train $= 16.5$ m/sec $= \left(16.5 \times \frac{18}{5}\right)$ km/hr

$= 59.4$ km/hr

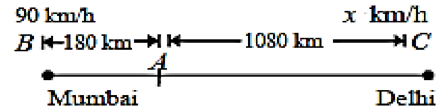
30. **(c)** Let the speed of train C be x km/h.

At 9 p.m. the train A will have covered a distance of 180 km.

For trains A and B relative speed $= (90 - 60) = 30$ km/h

Distance between them = 180 km

Time after which they meet $= \frac{180}{30} = 6$ hrs



For trains A and C relative speeds $= (60 + x)$ km/h

Distance between them = 1080 km.

Time after which they meet $= \frac{1080}{(60 + x)}$ hrs

As the time of meeting of all the three trains is the same, we have $\frac{1080}{(60 + x)} = 6$

or $x = 120$ km/h

31. **(b)** Time taken by the boat during downstream journey $= \frac{50}{60} = \frac{5}{6}$ h

Time taken by the boat in upstream journey $= \frac{5}{4}$ h

Average speed $= \frac{2 \times 50}{\frac{5}{6} + \frac{5}{4}} = \frac{100 \times 24}{50} = 48$ mph

32. **(c)** Let the distance be x km. Then,

(Time taken to walk x km) + (Time taken to ride x km)

$= \frac{23}{4}$ hrs.

$\Rightarrow$ (Time taken to walk $2x$ km) + (Time taken to ride $2x$ km) $= \frac{23}{2}$ hrs.

But, time taken to ride $2x$ km $= \frac{15}{4}$ hrs.

$\therefore$ Time taken to walk $2x$ km $= \left(\frac{23}{2} - \frac{15}{4}\right)$ hrs $= \frac{31}{4}$ hrs

= 7 hrs 45 min.

33. **(a)** Let the speed of the boatman be x km/hr and that of stream by y km/hr. Then

$\frac{12}{x + y} = \frac{4}{x - y}$

$\Rightarrow$ $12x - 12y = 4x + 4y$

$\Rightarrow$ $8x = 16y \Rightarrow x = 2y$

Now $\frac{45}{x+y} + \frac{45}{x-y} = 20$

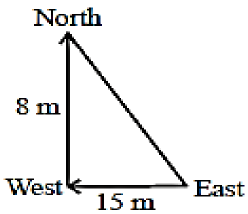
$\Rightarrow 45 + 135 = 60\,y \Rightarrow 180 = 60y \Rightarrow y = 3$km/hr.

34. **(c)** Required distance

$= \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225}$

$= \sqrt{289} = 17$ m



35. **(b)** Let the Speed of faster train be x and speed of slower train be y.

Now, when both the train move in same direction their relative speed $= x - y$

Now, total distance covered = 130 + 110 = 240

Now, distance = speed × time

$\therefore 240 = (x - y) \times 60$ ($\because$ 1min = 60sec)

$\Rightarrow x - y = 4$ ...(1)

When the trains move in opposite direction then their relative speed $= x + y$

$\therefore 240 = (x + y) \times 3$

$\Rightarrow 80 = x + y$ ...(2)

on solving eqs (1) and (2), we get $x = 42$ m/sec and $y = 38$ m/sec

36. **(d)** Let v_m = velocity of man = 48 m/min

Let v_c = velocity of current

then t_1 = time taken to travel 200 m against the current.

i.e., $t_1 = \frac{200}{v_m - v_c}$ ....(1)

and t_2 time taken to travel 200 m with the current

i.e., $t_2 = \frac{200}{v_m + v_c}$ ....(2)

Given : $t_1 - t_2 = 10$ min

$\therefore \frac{200}{v_m - v_c} - \frac{200}{v_m + v_c} = 10$

$\Rightarrow v_m^2 - v_c^2 = 40v_c \Rightarrow v_c^2 + 40v_c - (48)^2 = 0$

$\Rightarrow v_c = 32, -72$

Hence, speed of the current = 32 ($\because v_c \neq -72$).

37. **(d)** Let speed of current = v.m/min

$\frac{200}{48 - v} - \frac{200}{48 + v} = 10$

$20\,(48 + v) - 20\,(48 - v) = 48^2 - v^2$

$40\,v = 48^2 - v^2$

$v^2 + 40v - 2304 = 0$

$v = 32$ m/min.

38. **(c)** We know that, the relation in time taken with two different modes of transport is

$t_{\text{walk both}} + t_{\text{ride both}} = 2\,(t_{\text{walk}} + t_{\text{ride}})$

$\frac{31}{4} + t_{\text{ride both}} = 2 \times \frac{25}{4}$

$\Rightarrow t_{\text{ride both}} = \frac{25}{2} - \frac{31}{4} = \frac{19}{4} = 4\frac{3}{4}$ hrs

39. **(d)** Time difference between 8 am and 2 pm = 6 hrs.

Angle traced by the hour hand in 6 hours

$= \left(\frac{360}{12} \times 6\right)^{\circ} = 180^{\circ}$

40. **(a)** The dog loses 1/3rd of his normal time from the meeting point. (Thus normal time = 35 × 3 = 105 minutes)

If the meeting occurred 24 km further, the dog loses 25 minutes.

This means that the normal time for the new distance would be 75 minutes. Thus, normally the dog would cover this distance of 24 km in 30 minutes.

Thus, normal speed = 48 km/hr.

41. **(b)** When *A* covers 1000 m, *B* covers 960 m.

Similarly, when *B* covers 1000 m, *C* covers 975 m.

$\therefore$ When *B* covers 960 m, *C* covers $\frac{975}{1000} \times 960 = 936$ m.

Thus, *A* can give a start to *C* by a distance

= (1000 – 936) m = 64 m.

42. **(a)** In 2 minutes, he ascends = 1 metre

$\therefore$ 10 metres, he ascends in 20 minutes.

$\therefore$ He reaches the top in 21st minute.

43. (d) $\frac{40}{(B-S)}+\frac{55}{(B+S)}=13$

$\frac{30}{(B-S)}+\frac{44}{(B+S)}=10$

On solving these, we get $B = 8$ km/h, $S = 5$ km/h

$\therefore$ speed of Mallah in still water = 8 km/h

44. (c) Note here the length of the train in which passenger is travelling is not considered since we are concerned with the passenger instead of train. So, the length of the bridge will be directly proportional to the time taken by the passenger respectively.

$t \rightarrow$ Time

$l \rightarrow$ Length of bridge

Therefore, $\frac{t_1}{t_2}=\frac{l_1}{l_2}$

$\frac{7}{4}=\frac{280}{2}$

$\Rightarrow \quad x = 160$ m

45. (c) Speed of tiger = 40 m/min

Speed of deer = 20 m/min

Relative speed = 40 – 20 = 20 m/min

Difference in distances = 50 × 8 = 400 m

$\therefore$ Time taken in overtaking (or catching) $=\frac{400}{20}=20$ min

$\therefore$ Distance travelled in 20 min = 20 × 40 = 800 m

46. (d) $(6 - x) = (8 - 1.5x)$

$\Rightarrow \quad x = 4$ cm

So, it will take 4 hours to burn in such a way that they remain equal in length.

47. (c) The speeds of two persons is 108 km/h and 75 km/h. The first person covers 1080 km in 10 hours and thus he makes 12 rounds. Thus, he will pass over another person 12 times in any one of the direction.

48. (c) Angle between two hands at 3 : 10 am

= (90 + 5) – 60 = 35°

So, the required angle = 70°, after 3:10 am

Total time required to make 70° angle when minute-hand is ahead of hour-hand.

$=\frac{90+70}{11/2}=\frac{320}{11}$ min

So at 3h $\frac{320}{11}$ min the required angle will be formed.

49. (d) $(n + 1)$ times in n days.

50. (c) If you start at 12 noon, you would reach at 4 : 30 PM. You would be able to meet the train which left Mumbai at 8 AM, 9 AM, 10 AM, 11 AM, 12 Noon, 1 PM, 2 PM, 3 PM and 4 PM – a total of 9 trains.

51. (b) In 36 hours, there would be a gap of 8 minutes. The two watches would show the same time when the gap would be exactly 12 hours or 720 minutes.

The no. of 36 hour time frames required to create this gap = 720/8 = 90.

Total time= 90 × 36 = 3240 hours. Since this is divisible by 24, the watches would show 12 noon.

52. (c) The net time loss is 1/3% of 168 hours.

53. (d) Perimeter $=4\times\sqrt{160000}=1600$ m

$\text{Time}=\frac{\text{Distance}}{\text{Speed}}=\frac{1600\times5\times60}{5000}=96$ min

54. (b) Circumference $=\frac{44}{7}\times35=220$ cm

Distance travelled in 1 minute $=\frac{33000}{60}=550$ m

Required no. of revolutions $=\frac{550\times100}{220}=250$

55. (d) Distance covered by the aeroplane in 9 h

= 9 × 756 = 6804 km

Speed of helicopter $=\frac{2\times6804}{48}=283.5$ km/h

$\therefore$ Distance covered by helicopter in 18 h

= 283.5 × 18 = 5103 km

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

$=\frac{6+6+6+6}{\frac{6}{25}+\frac{6}{50}+\frac{6}{75}+\frac{6}{150}}\Rightarrow\frac{24}{6\left[\frac{1}{25}+\frac{1}{50}+\frac{1}{75}+\frac{1}{150}\right]}$

$=\frac{24\times300}{6\times24}\Rightarrow 50$ km/hr

57. (b) Radian covered in one second $=2\times\frac{22}{7}\times3.5$

Time required to covered 55 radian $=\frac{55}{2\times\frac{22}{7}\times3.5}=2.5$

58. (b) D = S × T

$60=S\times\left(\frac{45}{60}\right)$ hr

$S=\frac{60\times60}{45}\Rightarrow 80$ km/hr

Now, new speed = 80 – 15 = 65 km/hr.

$\therefore$ Time $= \frac{\text{Distance}}{\text{Speed}} = \frac{60}{65}$ hr.

or $\frac{60}{65} \times 60 \text{ min} = 55.38 \text{min}$.

Hence, time to taken by car to travel same distance is 55.38 min.

59. (b) Let speed of the second train = x km/hr.

Relative speed of trains = $(50 + x)$ km/hr.

Distance travelled by trains = (100 + 120) = 220 metres

Distance = Speed × Time

$$\left(\frac{220}{1000}\right)\text{km} = (50 + x)\text{ km/hr.} \times \left(\frac{6}{3600}\right)\text{hr}$$

$$50 + x = \frac{220 \times 3600}{1000 \times 6}$$

$50 + x = 132$

$x = 132 - 50 = 82$ km/hr

60. (c) Let T be the speed of train and C be the speed of car.

$$\frac{120}{T} + \frac{480}{C} = 8 \Rightarrow \frac{1}{T} + \frac{4}{C} = \frac{1}{15} \quad ...(1)$$

$$\frac{200}{T} + \frac{400}{C} = 8 + \frac{20}{60} \Rightarrow \frac{1}{T} + \frac{2}{C} = \frac{1}{24} \quad ...(2)$$

Subtracting (2) from (1)

$$\frac{2}{C}(2-1) = \frac{1}{15} - \frac{1}{24}$$

$$\frac{2}{C} = \frac{1}{40} \Rightarrow C = 80$$

$$\frac{1}{T} = \frac{1}{15} - \frac{4}{80}$$

$$\frac{1}{T} = \frac{1}{60} \Rightarrow T = 60$$

Required ratio = 60 : 80 = 3 : 4

61. (c) Let correct time to cover journey be t hours

$$70\left(t + \frac{12}{60}\right) = 80\left(t + \frac{3}{60}\right)$$

70t + 14 = 80t+ 4

10t = 10

t = 1 hour

62. (c) Let total distance be d.

time taken for 60% distance $= \frac{0.6d}{40} = \frac{3d}{200}$h

time taken for 20% distance $= \frac{0.2d}{30} = \frac{d}{150}$h

time taken for remaining 20% distance

$$= \frac{0.2d}{10} = \frac{d}{50}\text{h}$$

$$\text{average speed} = \frac{d}{\frac{3d}{200} + \frac{d}{150} + \frac{d}{50}}$$

$$= \frac{200 \times 150 \times 50}{22500 + 10000 + 30000} = \frac{200 \times 150 \times 50}{62500}$$

= 24 kmph