GENERAL APTITUDE

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Time & Distance

- ## Speed = Distance / Time

- ## Distance = Speed x Time

- Ram travels from A to B traveling distance of 10 km in 4 hrs. His speed is

- **10/4 = 2.5 km/hr**

- Ram moves from Pune to Satara at the same speed taking 1 day & 10 hrs. The distance between Pune & Satara is

- **(24+10) x 2.5 = 34 x 2.5 = 85 km**

- Ram now wants to reach back to Pune in 17 hours So he should travel back at a speed of

- **85/17 = 5 km/hr**

Time & Distance

- If the same distance is traveled at different speeds S1 & S2 then average speed is given by-

$$Sa = \frac{(2 \times S1 \times S2)}{(S1 + S2)}$$

If the same distance is traveled at different speeds S1 ,S2 & S3 then average speed is given by-

$$Sa = \frac{(3 \times S1 \times S2 \times S3)}{(S1S2 + S2S3 + S1S3)}$$

- **Imp : Convert every term to same units**

- **1 Km/hr = 5/18 m/s & 1 m/s = 18/5 km/hr**

- If a bowler has a run up of 100 m & he runs at a speed of 36 km/hr the time he takes to complete his runup is

- **36 x 5/18 m/s = 10m/s**

- **100m ÷10 m/s = 10 s**

Time & Distance

If different distance D1,D2 & D3 travelled is at different speeds S1 ,S2 & S3 then average speed is given by-

$$Sa = \frac{(D1 + D2 + D3)}{\left(\frac{D1}{S1} + \frac{D2}{S2} + \frac{D3}{S3}\right)}$$

- Q. A man covers 10kms at a speed of 5 km/hr, 30kms at a speed of 7 km/hr abd 20kms at a speed of 15 km/hr. Find out the average speed.

- $Sa = \dfrac{(10+ 30 + 20)}{\left(\frac{10}{5} + \frac{30}{7} + \frac{20}{15}\right)}$ = 7.77 km/hr

Time & Distance

- **Speed & distance are directly proportional.**

- **S α D**

- **Distance & Time are directly proportional.**

- **D α T**

- **Speed & time are inversely proportional.**

- **S α 1/T**

- **Relative speed** is **defined** as the **speed** of a moving object with respect to another. When two objects are moving in the same direction, **relative speed** is calculated as their difference and if objects are moving in opposite direction then calculate as their sum.

- **Relative speed = X-Y (same direction)**

- **Relative speed = X+Y (opposite direction)**

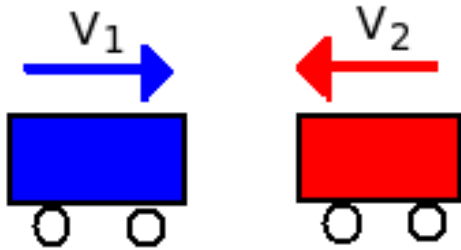# Relative Speed-

$$\text{Relative Speed} = V_1 - V_2$$
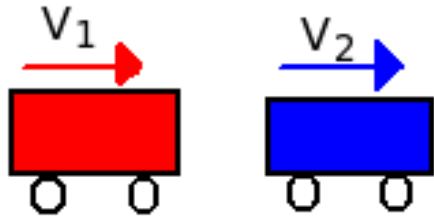
Objects Moving in Same direction

$$\text{Relative Speed} = V_1 + V_2$$

Objects Moving in Opposite Direction

Time & Distance

Q. A certain distance is covered by a car at a certain speed. If a motorcycle covers half the distance in double time, the ratio of the speed of the motorcycle to the car is

A. 4:1   B. 1:2   C. 1:4   D. 2:3

Soln:

- Let Car cover distance d in time t → Sc = d÷t

- Motorcycle covers dist d/2 in time 2t→ Sm = d/2÷2t

- → Sm = d/4t

- → Sm : Sc = d/t : d/4t = 1:4

- **Ans : C**

Time & Distance

Q. A car traveled 20% of the time at 30 km/hr, 50% of the time at 40 km/hr and rest of the journey at 50 km/hr. What is the average speed of the car over the whole journey?

A. 40 km/hr   B. 35 km/hr   C. 41 km/hr   D. 45 km/hr

Soln:

Avg Speed   = total dist / total time

Assume Journey   = T hr

Total Distance   = (0.2Tx30 + 0.5Tx40 + 0.3Tx50)

                   = 6T + 20T + 15T

                   = 41T

Average Speed   = 41T/T = 41 kmph

Ans: C

Time & Distance

Q. At 7:30 am two trains start from their respective stations A & B in opposite direction, 930 km apart at speeds of 60 km/hr & 90 km/hr respectively. At what time do they meet?

A.12:30 pm   B. 1:30 pm   C. 1:42 pm   D. 1:50 am

Soln:

- Time = Distance/ Speed
- Time = 930 km / (60+90)km/hr   (relative Speed adds up)
- Time = 6.20 hours = 6 hrs 12 min
- Time of meeting 1:42 pm

Ans: C

Time & Distance

Q. Two trains start from their respective stations A & B, 830 km apart at speeds of 100 km/hr & 60 km/hr at 6:00 am & 7:30 am respectively moving in opposite direction. At what distance from A do they meet?

A. 425 km   B. 525 km   C. 575 km   D. 625 km

- **Soln-**

DistanceA + DistanceB = Total Distance (At meeting pt)

S1xT1 + S2xT2   = 830

100 x T1 + 60 x (T1-1.5)   = 830

100T1 + 60T1 – 90   = 830 → 160T1 = 920 → T1 = 23/4 hrs

Distance from A = 100 x 23/4 = 575 km

- **Ans C**

Time & Distance

Q. A train starts from Mumbai towards Nagpur at 7:00 am with a speed of 60 kmph while another train starts from Mumbai in the same direction at 8:30 am at 80 kmph. At what distance from Mumbai do they meet?

A. 225 km   B. 300 km   C. 360 km   D. 400 km

Soln:

DistanceA   =   DistanceB   (At meeting pt)

$S_1 \times T_1$ = $S_2 \times T_2$

$60 \times T_1$ = $80 \times (T_1 - 1.5)$

$60T_1$ = $80T_1 - 120$ → $T_1 = 6$ hrs

D from Mumbai =   6x 60 = 360 km

Ans: C

Time & Distance

Q. Walking at a speed of 4/5 of the original speed a person reaches office 8 min late (8 mins more than normal time). Find the time required usually.

A.24 min   B. 30 min   C. 32 min   D. 44 min

Soln:

	Original	New
Speed	S	4S/5
Time	T	T+8

Speed x Time = Distance is constant

→ST   = 4S/5 x (T+8)

→T   = 4/5 x (T+8)

→5T/4 = T+8

→$\frac{5T}{4}$ - T =8

→ Normal Time T = 32 mins

   Ans: C

Time & Distance(Assignment)

Q. A boy starts from his house for college at a fixed time. If he walks at the rate of 5 kmph he is late by 7 mins. If he walks at 6 kmph he is 5 min early. Find College to home distance.

A. 5 km   B. 6 km   C. 7 km   D. 6.5 km

	Original	Case1	Case2
Speed	s	5	6
Time	t	t+7	t-5

Speed x Time = Distance is constant

→ st =   5 x (t+7)/60   =   6 x (t-5)/60

→   5t + 35   =   6t – 30

→   t   =   65 mins

→ Using Case 1 Distance = 5 x (65+7)/60 = 6 km

Ans B

Time & Distance(Assignment)

Q. One day a person travels to office at 5/6 of his usual speed. He takes t minutes more than normal time. What is his normal time?

A. 2t   B. 3t   C. 4t   D. 5t

Soln:

	Original	New
Speed	S	5S/6
Time	T	T+t

Speed x Time = Distance is constant

$\rightarrow$ST   = 5S/6 x (T+t)

$\rightarrow$T   = 5/6 x (T+t)

$\rightarrow$6T/5= T+t

$\rightarrow$T/5   = t $\rightarrow$ Normal Time T = 5t

Ans: D

Time & Distance(Assignment)

Q. A boy goes to school from home at a speed of 10km/hr and return back at 30km/hr. Find his average speed.

A. 15 km/hr   B. 14.5 km/hr   C. 10 km/hr   D. 20 km/hr

Ans: A

Time & Distance(Assignment)

Q. A man covers half of his journey at 6 km/h and the remaining half at 3 km/h. His average speed is-

A. 9 km/hr   B. 4.5 km/hr   C. 4 km/hr   D. 3 km/hr

Soln:

- Average speed$= \dfrac{2xy}{x+y} = \dfrac{2\text{ x }6\text{ x }3}{6+3} = \dfrac{36}{9} = 4$ km/hr

Ans: C

Time & Distance(Assignment)

Q. On a journey, across Delhi, a Taxi averages 30 kmph for 60% of the distance, 20 kmph for 20% of it and 10kmph for the remainder. The average speed for the whole journey is :

A. 20km/hr   B. 22.5 km/hr   C. 24.625km/hr   D. 25km/hr

Ans: A

Time & Distance(Assignment)

Q. A distance is covered by a cyclist at a certain speed. If a jogger covers half of the distance in double the time, the ratio of the speed of the jogger to that of the cyclist is :

A. 1 : 4   B. 4 : 1   C. 1 : 2   D. 2 : 1

Ans: A

Time & Distance(Assignment)

Q. Walking at a speed of 20% more than the original a person requires 6 min less than normal time. Find the time required usually

A.24 min   B. 30 min   C. 36 min   D. 44 min

- **Ans C**

Time & Distance(Assignment)

Q. Walking at a speed of 12 km/hr a person reaches 10 min late. But if he walks at 20 km/hr he reaches 14 min early. Find the distance.

A.9 km   B. 12 km   C. 14 km   D. 15 km

Ans: B

Time & Distance(Assignment)

Q. Two cars started simultaneously travelling toward each other from town A and town B 480km apart. It took first car travelling from town A to town B and car covered the distance in 8hrs and car from town B to town A covers distance in 12hrs. Find distance from town A when they meet?

A. 288km   B. 250km   C. 380km   D. 240km

Ans: A

- Speed of first car = Distance/ time = 480 /8 = 60km/hr

- Speed of second car = Distance/ time = 480 /12 = 40km/hr

- The cars will meet in = 480 / (60+40) = 4.8 hrs   (relative Speed adds up as travelling in opposite directions)

- Dist from A where they will meet = speed of car from A x time
                            = 60   x 4.8   = 288km

Time & Distance(Assignment)

Q. A car travels 1/3 of the distance on a straight road with a velocity of 10 km/h, next one-third with a velocity of 20 km/h and the last one-third with a velocity of 60 km/h. Then the average velocity of the car (in km/h) during the whole journey is-

A. 18km/hr   B. 24km/hr   C. 30km/hr   D. 20km/hr

Ans: A

$$\text{Time} = \frac{\text{Dist}}{\text{Speed}}$$

$$\text{Total Time} = \frac{1/3D}{10} + \frac{1/3D}{20} + \frac{1/3D}{60}$$

$$= \frac{D}{30} + \frac{D}{60} + \frac{D}{180}$$

$$= \frac{6D + 3D + 1D}{180}$$

$$= \frac{10D}{180} \text{ hrs}$$

$$\text{Avg velocity} = \frac{\text{Dist}}{\text{time}}$$

$$= \frac{D}{\frac{10D}{180}}$$

$$= \frac{180D}{10D}$$

$$= 18 \text{ km/hr}$$

Trains

- ## **Trains**
- Let S1 = speed of train,   S2 = Speed of Object

    L1 = length of the train, L2 = Length of the object.

      t = time taken by train to completely pass the object

Case A : Stationary object without considerable length

   L1   = S1x t

Trains

- ## Trains
- Let S1 = speed of train,   S2 = Speed of Object

     L1 = length of the train, L2 = Length of the object.

       t = time taken by train to completely pass the object

Case B : Stationary object with considerable length

   L1+L2 = S1x t

Trains

- ## <u>Trains</u>
- Let S1 = speed of train,   S2 = Speed of Object
      L1 = length of the train, L2 = Length of the object.
        t = time taken by train to completely pass the object

Case C : Moving object without considerable length
   L1 = (S1±S2) x t

Trains

- ## **Trains**
- Let S1 = speed of train,   S2 = Speed of Object

    L1 = length of the train, L2 = Length of the object.

    t = time taken by train to completely pass the object

Case D : Moving Object with considerable length

L1+L2 = (S1±S2) x t

Time & Distance

Q. Two trains of same length cross an electric pole in 12 sec & 20 sec respectively. Find in how much time do they cross each other while traveling in same direction?

A. 45 sec   B. 50 sec   C. 60 sec   D. 75 sec

Soln:

Case A : **L1   = S1x t** (Trains passing the pole)

L1   = S1 x 12 → S1 = L1/12

L1   = S2 x 20 → S2 = L1/20

Case B : **L1+L2 = (S1±S2) x t** (Train passing other train)

2L1   = (L1/12 –L1/20) x t

2   = (1/12 – 1/20) x t

2   = 1/30 x t   → t = 60 sec.

Ans: C

Time & Distance

Q. A train of length 600 mt crossed a man going in the same direction at 12 km/hr in 45 sec while the same train crossed another man coming from the opposite direction on a bike in 20 sec. Find the speed of the bike.

A. 24 km/hr   B. 36 km/hr   C. 40 km/hr   D. 48 km/hr

Soln:

12 km/hr = 12 x 5/18 = 10/3 m/s

Case A : **L1 = (St-Sm) x t** (Train passing man)

600   = (St-10/3) x 45

St   = 50/3 m/s

Case B : **L1 = (St+Sb) x t** (Train passing the bike)

600   = (50/3+Sb) x 20

Sb   = 40/3 m/s x 18/5 = 48 km/hr

Ans: D

Time & Distance

Q. A train of length 600 m crosses a man standing on a platform in 45 sec & the same train crosses the complete platform in 2 min. What is the length of the platform?

A. 500 m   B. 700 m   C. 900 m   D. 1000 m

- **Soln**:

- Case A : **L1   = S1x t** (Train passing the man)

-              600   = S1 x 45
               S1   = 600/45
                       = 40/3

- Case B : **L1+L2 = S1x t** (Train passing the platform)

- 600+L2   = 40/3 x 120

- L2   = 1600 -600

- L2   = 1000 m

- **Ans D**

Time & Distance(Assignment)

Q. Two trains of lengths 200 mt & 400 mt cross each other completely in 15 sec & 1.25 min respectively while going in opposite & same direction. Find the speed of the slower train.

A.24 m/s   B. 16 m/s   C. 40 m/s   D. 8 m/s

Soln:

Case A : **L1+L2 = (S1+S2) x t** (Trains passing opp direction)

200+400   = (S1+ S2) x 15

S1+S2 = 40 m/s ……(1)

Case B : **L1+L2 = (S1-S2) x t** (Trains passing same direction)

200+400   = (S1-S2) x 75

S1-S2   = 8 m/s …….(2)

2S1   = 48 → S1 = 24, S2=16

Ans: B

Time & Distance(Assignment)

Q. Person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?

A. 3.6   B. 7.2   C. 8.4   D. 10

Ans: B

Time & Distance(Assignment)

Q. An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in 1 2/3 hours, it must travel at a speed of:

A. 300 kmph   B. 360 kmph   C. 600 kmph   D. 720 kmph

Ans: D

Time & Distance(Assignment)

Q. The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 km in 4 hours, then the speed of the first train is:

A. 70 km/hr   B. 75 km/hr   C. 84 km/hr   D. 87.5 km/hr

Ans: D

Time & Distance(Assignment)

Q. A man on tour travels first 160 km at 64 km/hr and the next 160 km at 80 km/hr. The average speed for the first 320 km of the tour is:

A. 35.55 km/hr   B. 36 km/hr   C. 71.11 km/hr   D. 71 km/hr

Ans: C

Trains(Assignment)

Q. A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train ?

A. 120 metres   B. 180 metres   C. 324 metres   D. 150 metres

Ans : D

Trains(Assignment)

Q. A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going, in 10 seconds. The speed of the train is:

A. 45 km/hr   B. 50 km/hr   C. 54 km/hr   D. 55 km/hr

Ans: B

Time & Distance

- ## **Boats & Streams**
- If Speed of boat in still water = **x kmph**
- Speed of the stream = **y kmph** then

- Speed of the boat downstream **Sd = (x+y) kmph**
- Speed of the boat upstream   **Su = (x-y) kmph**

- Speed of Boat in still water **X = ½ (Sd + Su)**
- Speed of the stream   **Y = ½ (Sd – Su)**

Boats & Streams

Q. A boat goes 16 km upstream & returns back to original place in 6 hrs. If the speed of water is 2 kmph. Find the speed of boat in still water.

A. 3 kmph   B. 4 kmph   C. 6 kmph   D. 8 kmph

Soln

Let speed of boat = x, Speed of water y = 2

Case A : **Su = x-2**

Case B : **Sd = x+2**

Total time   = Tu   +   Td

6   = 16/(x -2) + 16/(x+2)

6(x-2)(x+2)   = 16(x+2) + 16(x-2)

6x^2 -24   = 16(2x)

6x^2 – 32x -24 =0

3x^2 -16x – 12 =0 → 3x^2 -18x + 2x -12 =0 → (3x+2)(x-6)=0

→ x= 6 kmph

   Ans: C

Boats & Streams

Q. A man notices that it takes him thrice the time to row up than to row down the same distance. Find the speed of the boat in still water if the speed of water is 5 kmph?

A. 8 kmph   B. 8.5 kmph   C. 10 kmph   D. 10.5 kmph

Soln

Td : Tu = 1 : 3 → Sd : Su = 3 : 1

Let speed of boat = x, Speed of water = 5

→Sd = x+5, Su = x-5

→Sd/Su   = (x+5)/(x-5)

→3/1   = (x+5)/(x-5)

→3(x-5)   = x+5

→3x-15   = x+5 → 2x =20 → x= 10 kmph.

Ans: C

Boats & Streams(Assignment)

Q. A person covers 200 m in 15 sec while going upstream & 5 km in 3 min while going downstream. Find the speed of boat in still water.

A. 44 m/s   B. 74 m/s   C. 74 km/hr   D. 80 km/hr

Ans: C

Boats & Streams(Assignment)

Q. A man rows at the rate of 12 kmph in still water. It takes him 4 hr 16 min to row to a place 24 km away & back. What is the speed of water?

A. 3 kmph   B. 2.5 kmph   C. 2 Kmph   D. 1.5 kmph

Ans : A

Boats & Streams(Assignment)

Q. A man notices that it takes him 5 times the time to row up than to row down the same distance. Find the speed of the boat in still water if the speed of water is 20 kmph?

A. 22 kmph   B. 25 kmph   C. 27 Kmph   D. 30 kmph

Ans: D

THANK YOU!