GENERAL APTITUDE

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Todays topics

1. Time, Speed & Distance
2. Trains, Boats & Streams
3. Surds and Indices
4. Problems on Ages
5. Cyclicity & Remainders

Time & Distance

- **Speed = Distance / Time**
- **Distance = Speed x Time**
- **Time = Distance / Speed**

- **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 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-

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

Time & Distance

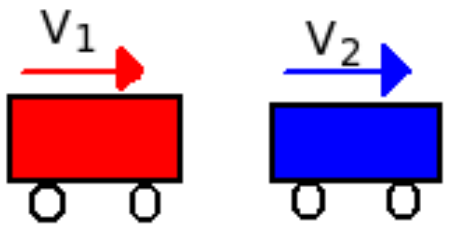
If different distance D1,D2 & D3 travelled is at different speeds S1 ,S2 & S3 then average speed is given by-

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

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)**

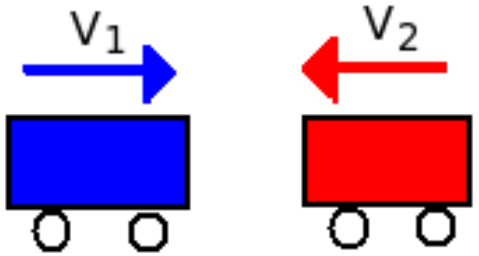
Relative Speed-



Objects Moving in Same direction

Relative Speed = $V_1 - V_2$

Relative Speed = $V_2 - V_1$



Objects Moving in Opposite Direction

Relative Speed = $V_1 + V_2$

Distance, Speed & Time

Q1. If a train run at 40 km/hr, it reaches its destination late by 11 mins, but if it runs at 50km/hr, it is late by 5 mins only. The correct time(in mins) for the train to complete its journey is

A. 10mins

B. 12mins

C. 19mins

D. 8 mins

Ans: C

Distance, Speed & Time

Q2. By walking at 3/4th of his usual speed, a man reaches office 20 minutes later than usual. What is his usual time?

A. 10 mins

B. 12 mins

C. 19 mins

D. 60 mins

Ans: D

Distance, Speed & Time

Q3. A person travels 285 km in 6 hrs in two stages. In the first part of the journey, he travels by bus at the speed of 40 km per hr. In the second part of the journey, he travels by train at the speed of 55 km per hr. How much distance did he travel by train?

A. 165 km

B. 145 km

C. 205 km

D. 185 km

E. 180 Km

Ans: A

Distance, Speed & Time

- Late/early
- Early/late

(+) timings

- Late/late
- Early/early

(-) timings

$$D = \frac{\Delta t \times s1 \times s2}{|s1 - s2|}$$

Distance, Speed & Time

Q4. A boy walking at a speed of 20km/hr reaches his school 30mins late. Next time he increases the speed by 4km/hr but still he is late by 10mins.Find the distance of his school from his house?

A. 30km

B. 40km

C. 50km

D. 9km

Ans: B

Distance, Speed & Time

Q7. If A travels to his school from his house at the speed of 6 km/h, then he reaches the school 9 minutes late. If he travels at the speed of 8 km/h, he reaches the school 8 minutes earlier than school time. The distance of his school from his house is:

A. 4.3 km

B. 3.4 km

C. 6.8 km

D. 6.4 km

Ans: C

Distance, Speed & Time

Q5. Kartik left for the city A from City B at 5:20am.He traveled at a speed of 80km/hr for 4hrs 15mins.After that, the speed was reduced to 60km/hr.If the distance between two cities is 350km,at what time did Kartik reach city A?

A. 9:20am

B. 9:25am

C. 9:35am

D. 9:45am

Ans: D

Distance, Speed & Time

Q6. A man walking at a speed of 10km/hr. After every kilometer he takes a rest of 5mins.How much time will he take to cover a distance of 5km?

A. 60mins

B. 50mins

C. 40mins

D. 70mins

Ans: B

Distance, Speed & Time

Q8. The ratio between the speeds of a bike and a scooter is 4:5, respectively. Also, a car covered a distance of 540 km in 6 hours. The speed of the bike is half the speed of the car. How much distance will the scooter cover in 8 hours?

A. 500 km

B. 450 km

C. 680 km

D. 700 km

Ans: B

Distance, Speed & Time

Q9. 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

Ans: C

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

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

Case A : Stationary object without considerable length

L1 = S1x t

= 60x5/18 x 9

=150m

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

Q. A train of length 600 m running at a speed of 48km/hr 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**:
- Convert 48km/hr into m/sec
- Case B : **L1+L2 = S1x t** (Train passing the platform)
- 600+L2 = 40/3 x 120
- L2 = 1600 -600
- L2 = 1000 m
- **Ans D**

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 C : Moving object without considerable length

L1 = (S1±S2) x t

Time & Distance

Q. A train of length 600m running at a speed of 60km/hr crossed a 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:

60 km/hr = 60 x 5/18 = 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

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

Trains

Q. Two trains of lengths 100 m and 200 m respectively running in opposite directions at a speed of 60 km/hr and 30 km/hr respectively. In what time will they cross each other?

A. 16 sec B. 10 sec C. 12 sec D. 14 sec

Soln:

When two trains crosses each other in opposite direction then their Distance & Relative Speeds get added.

L1 + L2 = (S1 + S2) x t

100 + 200 = (60+ 30) x t

300m = 90 km/hr x t but 90km/hr = 25m/sec

300 = 25 x t

t = 12 sec

Ans: C

Trains

Q10. Two trains running in opposite directions cross a man standing on the platform in 270 seconds and 170 seconds respectively and they cross each other in 230 seconds. The ratio of their speeds is:

A. 1 : 3

B. 3 : 2

C. 3 : 4

D. 2 : 3

Ans: B

Trains

Q11. A train 150 m long passes a cyclist, moving at 8 km/hr in the same direction as the train, in 12 seconds. What is the speed of the train?

A. 50 km/hr

B. 53 km/hr

C. 60 km/hr

D. 65 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

Q12. A boat running downstream covers a distance of 20 km in 1.5 hours, while for covering the same distance upstream, it takes 5 hours. What is the speed of the boat in still water?

A. 5.3 km/hr

B. 7.2 km/hr

C. 8.7 km/hr

D. 10.1 km/hr

Ans: C

Boats & Streams

Q13. A boat can travel with a speed of 17 km/hr in still water. If the speed of the stream is 5 km/hr, find the time taken by the boat to go 88 km downstream.

A. 3.25 hours

B. 3.75 hours

C. 4.00 hours

D. 4.50 hours

Ans: C

Boats & Streams

Q14. In one hour, a boat goes 33 km/hr along the stream and 15 km/hr against the stream. The speed of the boat in still water (in km/hr) is:

A. 22 kmph

B. 25 kmph

C. 24 kmph

D. 23 kmph

Ans: C

Ages

Q15. Father is aged three times more than his son sachin. After 8 years, he would be two and a half times of sachin's age. After further 8 years, how many times would he be of sachin's age?

A. 2 times

B. 2 1/2 times

C. 2 3/4 times

D. 3 times

Ans: A

Ages

Q16. 20 years ago, age of father was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is

A. 11:2

B. 10:1

C. 11:5

D. 9:2

Ans : C

Ages

Q17. One year ago, the ratio of Honey and Piyush ages was 2: 3 respectively. After five years from now, this ratio becomes 4: 5. How old is Piyush now?

A. 5 years

B. 25 years

C. 10 years

D. 15 years

Ans: C

Indices & Surds

Q20. Simplify $\left(\frac{343}{1024 \times 8 \times 4}\right)^{1/3} \times (256)^{1/2}$

A. 7/16

B. 7/4

C. 49/2

D. 7/2

Ans: D

Cyclicity & Remainders

Number	Cyclicity	Power Cycle
1	1	1
2	4	2, 4, 8, 6
3	4	3, 9, 7, 1
4	2	4, 6
5	1	5
6	1	6
7	4	7, 9, 3, 1
8	4	8, 4, 2, 6
9	2	9, 1
10	1	0

Cyclicity & Remainders

Q. Find the last digit of 13^{59}

A. 5 B. 6 C. 7 D. 3

Solution :

No of digits in the base does not make a difference

Last digit of the base decides cyclicity.

Cyclicity of 3 is : 3, 9, 7, 1 (4)

59/4 = 14 remainder 3

= 3^3 = 27

So last digit is 7

Ans : C

Cyclicity and Remainder

Q18. Find the remainder, when (15^23+23^23) is divided by 19

A. 4

B. 15

C. 0

D. 18

Ans: C

Cyclicity and Remainder

Q19. When 2^256 is divided by 17, the remainder would be ?

A. 1

B. 16

C. 14

D. None of these

Ans: A

Cyclicity and Remainder

Q. When 7^84 is divided by 342, the remainder would be ?

A. 1

B. 341

C. 49

D. None of these

Ans: A

Surds and Indices

Rules of Indices: -

i. $a^n * a^m = a^{m+n}$

ii. $\frac{a^m}{a^n} = a^{m-n}$

iii. $(a^n)^m = a^{mn}$

iv. $(ab)^n = a^n * b^n$

v. $(\frac{a}{b})^n = \frac{a^n}{b^n}$

vi. $a^0 = 1$ (where a $\neq 0$)

vii. $a^{-n} = \frac{1}{a^n}$

Rules of Surds: -

i. $\sqrt[n]{a} = a^{\frac{1}{n}}$

ii. $\sqrt[n]{ab} = a^{\frac{1}{n}} * b^{\frac{1}{n}}$

iii. $\sqrt[n]{\frac{a}{b}} = \frac{a^{\frac{1}{n}}}{b^{\frac{1}{n}}}$

iv. $(\sqrt[n]{a})^n = a$

v. $(\sqrt[n]{a})^m = a^{\frac{m}{n}}$


THANK
YOU!