**Introduction:**

The problem on Speed and distance chapter are some time become very complex and need to be solved with the help of equations. If you understand the depth of this chapter, then it is easy for you to solve the questions. This chapter is closely related to physics and its concepts are also used to solve problems like motion in a straight line, circular motion, relative motion etc. In SSC 2 to 4 questions are asked regularly in prelims exam.

Important concepts:

1. Motion:

The rate at which distance is covered during the motion is called speed. Speed is measured in distance per unit time.

The unit of speed are- metre/sec, km/hr, km/min, metre/min, etc.

The basic formula to calculate Distance= Speed × Time

1. Conversion of Unit:

1 kmph or 1km/hr

= 100m/60×60sec

= 5m/18sec= 5/18 m/s

So, to convert km/hr into m/s, we multiply by 5/18 and similarily to convert m/s into km/hr we divide by 5/18.

1. When one of the term is constant in distance, speed or time then the proportionality is:

S×T=D

When speed is constant, time is directly proportional to distance. So the proportionality follow is-

t1/t2=d1/d2

Same when time is constant speed is directly proportional to distance.

s1/s2=d1/d2

But in case, when distance is constant, speed is inversely proportional to time.

s∝ 1/t

s1t1=s2t2

1. Average speed:

Average speed formula= Total covered distance/ Total time taken

It is the ratio of total covered distance to the total time taken.

If a person travel somewhere p1, p2, p3,p4…..pn distance in time q1, q2, q3, q4….qn with different speeds r1, r2, r3, ….rn. then its average speed is-

Average speed=

**Note:**

We know according to average that when two different speed (r1 and r2) covered the same distance, then average speed=

If we want to calculate the average speed with three different speed that covered same distance, then formula of average speed=

Questions related to article:

Q1: Govind travel from Allahabad to Bareilly at a speed of 15km/hr, from Bareilly to Chandausi at 30 km/hr, and from chandausi to Dehradun at 40 km/hr. If the distance travelled is same in all cases then find the average speed of govind?

Answer:

Suppose the distance travelled is 120 km.

Now, Average speed= Total distance/total time

=240/15= 16 km/hr

Q2: Ravindra want to go delhi so he divided the distance of his journey into 3 parts 20 km, 25km, 45 km. He travelled these distances with different speeds of 5 km/h, 10 km/h, 15 km/h. Find its average speed of total journey?

Answer:

Average speed= Total speed/ total time

=

=90/9.5 = 900/95 km/hr

Q3: In a competition, rahul is running with a speed of 50 km/hr. if he runs at a speed of 40km/hr then, find the percentage decrease in its speed?

Answer:

Required increase in percentage

=50-40/50100

=10/50100= 20%

Q5: The distance from Prayagraj to Mughal sarai Junction is 1176 km. This distance is covered by a superfast train in 5 hours less than a express train while the average speed of express train is 70 km/hr less than that of the superfast train. Find the time taken by express train?

Answer:

Assume, the speed of express train= x km/hr

Speed of superfast train= (x+70) km/hr

We know that,

Distance=

1176=

on solving x=98 km/hr

**Q6:** Duranto express with a speed of 105 km/hr starts from Prayagraj at 7:00 AM and reached Orissa. There it stopped for 45 minutes. While returning from Orissa Duranto speed reduced by 20% and it reaches Prayagraj at 5:12 PM on the same day. Find the distance travelled between Prayagraj to Orissa?

**Solution :**

Let, D be the distance between prayagraj to Orissa

Total time of journey including stoppage time at Prayagraj= 10 hours 12 minutes

Total time of journey excluding stoppage time at Prayagraj = 9 hours 27 minutes

9 hrs 27 minutes= 9.45 hours

Reduced speed = 80/100 of 105 = 84 km/hr

From the question:

(D/105) + (D/84) = 9.45

Taking LCM of 105, 84 we get,

(4D + 5D)/420 = 9.45

9D = 9.45 × 420

D = 9.45 × 420/9

D = 441 km

**Q7: If an E-ricksaw increases its speed by 20 kmph, then, 3 hours less time will be taken by him to cover the distance between P and Q and if the E-ricksaw reduce the speed by 20 kmph, then 4.5 hours more will be taken to cover the same distance. Calculate the distance between P and Q?**

**Explanation:**

Let, the distance between P and Q = x

Initial Speed of E-ricksaw = y

When he take 3 hr less time,

= 3

On taking LCM from denominator, we get

= 3-------1

When he takes 4.5 hrs more,

– = 4.5

On taking LCM of denominator, we get

= 4.5--------2

From eq.1 and 2 we get,

3y2 + 60y = 4.5y2 – 90y

3y + 60 = 4.5y – 90

1.5y = 150

y = 100 km/hr

Now, put y=100 in Eq. 1 we get,

= 3

x = 1800 km

Q8: A distance is covered at a certain speed in a certain time. If the double of this distance is covered in four times the speed in same time, then the ratio of the two speeds is:  
**Solution:**

Scenario. 1: let Distance D , Speed S1 ,

Then, Time 

Scenario.2: let Distance 2D , Speed S2 ,

Then, Time

Speed for scenario 2,

S2=S1/2

Hence, ratio of the speed

=S1 : S2/2

=1:1/2= 2:1

Q9: A special train depart from Mysore travelling at a speed of 25 kmph at 9 am and another mail train depart at 2 pm by travelling at a speed of 35 kmph depart in the same direction. They together travel how much distance?

**Answer:** 

**Solution:** To travel together,the special train has started early and travel 5 hrs. so the distance is 25 x 5 km and the second train gains a speed of (35 - 25) or 10 km per hour**.**

The second train gain the time= or 12 ½ hrs.

The required distance from Mysore= 12 ½ 35= 437 ½ km.

**Q10: Avanish travelled on scooter from Tamilnadu to Coimbatore at the speed of (x + 10) kmph and returned from Coimbatore to Tamilnadu at the speed of (x – 10) kmph. The distance between these two cities is 600 km and total time taken is 25 hrs for whole journey. If x be the usual speed, then find the value of x.**

**Explanation:**

Let Usual speed = x

=25

Taking 25 common from LHS,

25= 25

Taking LCM of denominator, we get;

24(x – 10) + 24(x + 10) = (x2 – 100)

24x – 240 + 24x + 240 = x2 – 100

x2 – 48x – 100 = 0

on factorise we get,

x2 – 50x + 2x – 100 = 0

x(x – 50) + 2(x – 50) = 0

(x + 2)(x – 50) = 0

x = -2, 50(negative value neglected)

**Q11: Tanya come from the school at 5 pm travelling at the speed of 75% of her usual speed and after 40 minutes she stop at a confectionary shop and bought some choclates, then travel towards home. If the time taken by Tanya to reach the school is 1 hour at the usual speed, then find the distance travelled by Tanya between confectionary shop and home is approximately what percent of the distance between school and home?**

**Answer: B**

**Explanation:**

Suppose, the speed be x km/hr

Complete distance between school and Home = x × 1 hr = x km

75% of the original speed = x × =

With new speed the distance covered in 40 minutes = ×

= × =

Now, the distance between confectionary shop and home = x – =

Required percentage = × 100

= × 100 = 50%

Q12: How much time a mail train and an express train take to cross each other travelling in both the direction, if, given that one train is 180m long and another is 270 long. Both these trains run at a speed of 46 kmph and 54 kmph (take both the train is in motion)?

**Answer**: 202.5 & 16.2 sec

**Solution:**

When train move/motion in same direction, their relative speed

Distance need to be covered

Time taken

When train move/motion in opposite directions, then relative speed

Distance need to be covered

Time

Q13: A fruitseller sell fruits on cycle by travelling on cycle. He travels the first 1/4 distance at 10km/hr ,the second 1/4 distance at 20km/hr, the third 1/4 distance at 30km/hr and the last 1/4 distance at 40km /hr. Find the average velocity of the cycle?

**Answer**: 19

**Solution:**

**Let total distance= 80 km**

**He travelled ¼ km each, it means he travelled for 20 km each part.**

Q14: A book is writtern by Mr Modi in which he takes 5 hours to type 5 pages while Amit shah also writing the same book in which he takes 4 hours to type 80 pages. find the time taken by both of them working together on another computer to type an consignment of 150 pages.

**Answer**: 5

**Solution:**

In 1 hr Mr Modi type no. of pages= 50/5=10

In 1 hr Amit Shah type no. of pages= 80/4=20

For 150 pages they both take,

T= 5 hrs

A tourist bus was taken from UP to Haridwar. The family goes from point UP to Haridwar in 12 hours, while returning from Haridwar the tourist bus driver increases the speed of bus by 20%. If the total distance between UP and Haridwar is 300 km, then find Average speed to travel from UP to Haridwar?

Solution:

The speed of tourist bus, from UP to Haridwar = 300/12 = 25 km/h

The speed of tourist bus, from Haridwar to UP = 25 × (120/100) = 30 km/h

Average speed of the total journey = (Total distance)/(Total time taken)

Average speed =

Average speed