SNS COLLEGE OF TECHNOLOGY

Coimbatore–35
An Autonomous Institution

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16GE314 CAREER DEVELOPMENT PROGRAMME

II YEAR IV SEM

DEPARTMENT OF MECHANICAL ENGINEERING

TOPIC –Relative Speed

WHAT IS RELATIVE SPEED?

Let's start with the first question

RELATIVE SPEED

- We can define relative speed as the speed of a moving body with respect to another
- When two bodies are moving in the same direction, the relative speed is computed by their difference
- But when to bodies are moving in the opposite direction, the relative speed is calculated by adding the speed of both the bodies
- The difference between relative speed and relative velocity is that relative speed is the scalar quantity whereas relative velocity is the vector quantity.

How to calculate relative speed?

- Suppose two bodies are moving at a different speed in the same direction.
- Let the speed of 1st body be "x" km/hr
- And the speed of the 2nd body be "y" km/hr.
- So, their relative speed is = (x – y) km/hr [x > y]
- The time after which both the bodies meet = distance travelled / relative speed = d km/ (x – y) km/hr
- Suppose, time = t hrs.
- Then, the distance covered in 't' hours = relative speed * time
- = (x – y) km/hr * t hrs.

TRAIN PROBLEMS

- Train Problems form an interesting portion of the time-distance problems
- The Train Problems are a bit different than the regular problems on the motion of the objects
- This is due to the finite size of the trains
- As a result of the length of the trains, many interesting train problems originate

EXAMPLE

- Gita rows a boat at a speed of 15 kmph upstream and 20 kmph downstream. Find the Speed with which Gita rows the boat in still water and also find the Speed of the stream.

Solution:

- Given that upstream Speed = 15 kmph
- Downstream Speed = 20 kmph
- Speed of Gita in still water = x = ((a + b))/2= (20+15)/2 = 35/2
- Speed of stream =y = ((a – b))/2= (20-15)/2 = 5/2.

EXAMPLE

- The Speed of Narmada river is 5 kmph. A stationary body is placed in the river. Find the Time taken by the floating body to reach a stone which is 10 km downstream from the point where it is now?

Solution:

- Speed of body = Speed of river (as Speed of boy is 0) = 5 kmph
- Speed=Distance/Time.
- So, Time taken to reach 10 km = 10/5 = 2 hours.

EXAMPLES

✗ Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is:

✗ A) 2: 3 B) 3:2 C) 1:3 D) 3:1

SOLUTION

Answer: Let the speeds of the two trains be = x m/s and y m/s respectively. Then, the length of the first train = 27x meters, and length of the second train = 17y meters.

We can write:

(27x + 17y) / (x+ y)= 23

Or 27x + 17y = 23x + 23y, therefore we have: 4x = 6y

and (x/y) = (3/2). Hence the correct option here is B) 3:2

EXAMPLES

- Walking A train 360 m long is running at a speed of 45 km/hr. In what time will it pass a bridge 140 m long?
- A) 20 s B) 30 s C) 40 s D) 50 s

SOLUTION

Answer: We have already seen the formula for converting from km/hr to m/s: x km/hr =[x × (5/18)]m/s.

- Therefore, Speed =[45 x (5/18) m/sec = (25/2)m/sec.
- Thus the total distance to be covered = (360 + 140) m = 500 m. Also, we know that the formula for finding Time = (Distance/Speed)
- Hence, the required time = [(500 x 2)/25] sec = 40 sec.

EXAMPLES

A train running at certain speed crosses a stationary engine in 20 seconds. To find out the speed of the train. Which of the following information is necessary:

A. Only the length of the train

B. Only the length of the engine

C. Either the length of the train and the length of the engine

D. Both the length of the train and the length of the engine

SOLUTION

✗ Answer: D. Both the length of the train and the length of the engine

✗ Explanation: Since the sum of the lengths of the train and the length of the engine is needed, So both the lengths must be known.

PROBLEM

X A jogger running at 9 km/hr along side a railway track is 240 m ahead of the engine of a 120 m long train running at 45 km/hr in the same direction. In how much time will the train pass the jogger?

A. 12 secs

B. 18 secs

C. 36 secs

D. 72 secs

SOLUTION

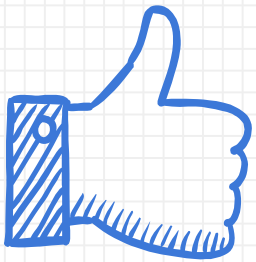
✗ Answer: C. 36 secs

Explanation: Speed of train relative to jogger = 45 - 9 = 36 km/hr.

= 36 * 5/18 = 10 m/sec

Distance to be covered = 240 + 120 = 360 m

Time taken = 360/10 = 36 secs



THANKS!

Any questions?

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