Leaving Cert Applied Mathematics Grinds - Week VIII

Topic: Relative Velocity

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Leaving Cert
Applied
Mathematics
Grinds

Week 8:
Relative
Velocity

Sound & Visual Check

"I am now talking…."

"If you **cannot** hear me or see my screen please say "Cannot hear/see you" on the chat.

"If some of you can't hear me, please restart your computer and join the class again."

Leaving Cert Applied Mathematics Grinds

Week 8: Relative Velocity

Lesson Overview:

By the end of this lesson you should:

- **Understand** what is meant by relative velocity
- **Understand** how we can use the SUVAT equations along with relative velocity equations to solve problems in different reference frames.
- **Know** the key formulas for relative velocity
- **Know** how to apply vectors to relative velocity problems
- **Have** a better understanding of how to solve relative velocity question in an exam format

The SUVAT equations

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

A swimmer is caught in a current which is flowing Southwards at 1 m/s. If the resultant velocity of the swimmer is 2 m/s in a South East Direction, find the speed of the swimmer relative to the current, correct to 2 decimal places.

An aircraft flew due East from P to Q at u_1 km/hr. Wind speed from the South West was v km/hr. On the return journey from Q to P, due west, the aircrafts speed was u_2 km/hr. the wind velocity remains unchanged. If the speed of the aircraft in still air was x km/hr, and x is greater than v, show that

- $u_1 - u_2 = v\sqrt{2}$
- $u_1 u_2 = x^2 - v^2$

To a cyclist travelling North at 7 m/s the wind appears to blow from the North West. To a pedestrian walking due West at 1 m/s the same wind appears to come from the South West. Find the magnitude and direction of the true velocity of the wind.

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A speedboat is travelling at 20 m/s. A trawler is travelling East at 4 m/s. To an observer on the trawler, the speedboat appears to be travelling in a South Easterly direction. Find the velocity of the speed boat in terms of the $\hat{i}$ and $\hat{j}$ components.

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A girl wishes to swim across a river which is 60 m wide. The river flows with speed 2 m/s. The boat can travel at 1 m/s in still water. The girl wishes to land on the opposite side which is 120 m downstream. Find the two directions in which the girl can steer the boat. Find the two times taken to cross.

The driver of a speedboat travelling in a straight line at 20 m/s wishes to intercept a yacht travelling at 5 m/s in a direction 50 degrees North of East. Initially, the speedboat is positioned 5 km South East of the yacht.

1. the direction the speedboat must take in order to intercept the yacht.
2. how long the journey takes.

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A man wishes to row a boat across a river to reach a point that is 25 m downstream from his starting point. The man can row the boat at 3.2 m/s in still water. The river is 45 m wide and flows uniformly at 3.6 m/s.

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2. the respective crossing times

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Next Weeks Lesson:
Leaving Cert Applied Mathematics Grinds - Week IX

Topic: Relative Velocity and Exam Questions

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