

## Relative velocities – Practice

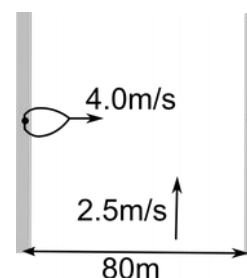
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1. A river, 80 meters wide, flows at 2.5 m/s towards the North ( $0^\circ$ ). A motorboat travels at 4.0 m/s.

(a) The motor boat heads East ( $90^\circ$ ).

Calculate:

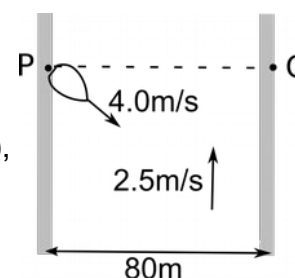
- (i) the resultant speed and bearing of the motorboat, ( $4.7 \text{ m/s}$ ,  $58^\circ$ )
- (ii) the time taken for the boat to travel from one side to the other, ( $20 \text{ s}$ )
- (iii) the distance downstream that the boat reaches the opposite side. ( $50 \text{ m}$ )



(b) The motorboat wants to travel directly across the river from point P to point Q.

Calculate:

- (i) the bearing at which the boat must head (point towards), ( $129^\circ$ )
- (ii) the speed at which the boat travels from P to Q, ( $3.1 \text{ m/s}$ )
- (iii) the time taken to travel from P to Q. ( $25.6 \text{ s}$ )



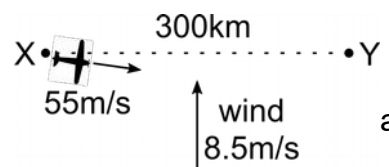
2. Plane A flies with a velocity of 900 km/hr at a bearing of  $240^\circ$ . Plane B flies with a velocity of 500 km/hr at a bearing of  $160^\circ$ .

Calculate the velocity of A relative to B. ( $950 \text{ km/hr}$  at  $271^\circ$ )

(hints: you can keep velocities in km/hr; draw a triangle representing  $v_A - v_B$ )

3. A light aircraft flies at 55 m/s in still air. It needs to fly from point X to point Y, a distance of 300 km due East (bearing  $90^\circ$ )

The wind is blowing from South to North (bearing  $0^\circ$ ) at speed of 8.5 m/s.



Calculate

- (a) the bearing that the aircraft must head in order to travel from X to Y. ( $99^\circ$ )
- (b) the speed of the plane relative to the ground. ( $54.3 \text{ m/s}$ )
- (c) the time taken to travel from X to Y. ( $92 \text{ minutes}$ )

4. An aircraft, flying at a steady air speed  $A$ , takes 2 hours to travel 600 km against a head wind, speed  $W$ . The return trip take 1hr 40 mins.

(hint: work in km and hours)

- (a) Write distance = speed x time equations, in terms of  $A$  and  $W$ , for the outward and return journeys.
- (b) Solve the equations to find the airspeed and windspeed. ( $330 \text{ km/hr}$ ,  $30 \text{ km/hr}$ )