Answer on Question #38912, Physics, Mechanics | Kinematics | Dynamics

The velocity of a boat is 20 km/h in a direction 50 degree north of east. The wind velocity is 5 km/h from the west. The resultant velocity of the boat can be represented by the side of a triangle in which two velocities are the other side. Determine the resultant velocity of the boat.

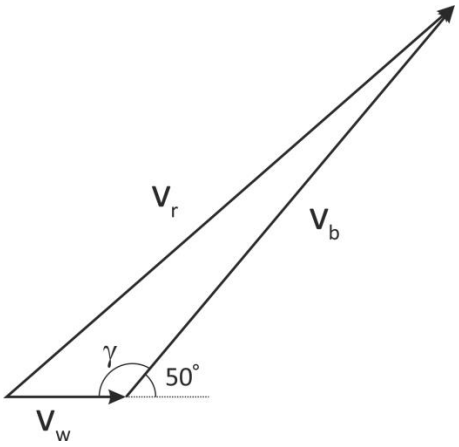
Solution:

We introduce the following notations:

v_b = 20 km/h (velocity of a boat),

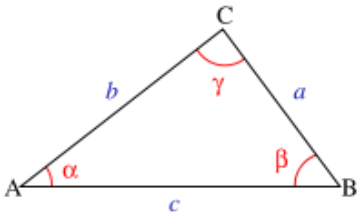
v_w = 5 km/h (wind velocity),

γ = 180°-50°=130° (angle between the direction from the west and north-east direction).



I give the formula for the Law of Cosines and use it to find the missing side length of a triangle.

$$c^2 = a^2 + b^2 - 2ab\cos\gamma$$



In our notations the resultant velocity of the boat v_r is:

$$v_r^2 = v_b^2 + v_w^2 - 2v_b v_w \cos\gamma$$

$$v_r^2 = 20^2 + 5^2 - 2 \cdot 20 \cdot 5 \cdot \cos(130°) = 400 + 25 + 128.56 = 553.56$$

$$v_r = \sqrt{553.56} = 23.5 \text{ km/h}$$

Answer: 23.5 km/h.