

Answer on Question #44125 – Math – Trigonometry

Two ships leave a port at the same time. The first ship sails on a course of 35 degrees at 15 knots while the second ship sails on a course of 125 degrees at 20 knots. Find after 2 hours (a) the distance between the ships, (b) the bearing from the first ship to the second ship, and (c) the bearing of the second ship to the first.

Solution:

#1

From the given headings we can say the angle between the courses of the two ships:

$$\alpha = 125^\circ - 35^\circ = 90^\circ$$

After $t = 2$ hours:

the 1st ship will have travelled distance

$$d_1 = v_1 \cdot t = 15 \text{ knots} \cdot 2 \text{ hours} = 30 \text{ hknots}$$

the 2nd ship will have travelled distance

$$d_2 = v_2 \cdot t = 20 \text{ knots} \cdot 2 \text{ hours} = 40 \text{ hknots}$$

We can use the law of cosines for a side/angle/side problem

$$a^2 = b^2 + c^2 - 2bc \cos \alpha$$

Assign the values as follows

a = distance between ships after 2 hours (side opposite angle α)

b = 30 hknots

c = 40 hknots

$\alpha = 90^\circ$

Thus,

$$a^2 = 30^2 + 40^2 - 2 \cdot 30 \cdot 40 \cdot \cos 90^\circ$$

$$a = \sqrt{30^2 + 40^2} = 50 \text{ hknots}$$

#2 and #3

Now we can get the bearings or the other angles of the triangle by using (arc)trig functions.

Bearing from the first ship to the second ship:

$$\beta = \arctan\left(\frac{c}{b}\right) = \arctan\left(\frac{40}{30}\right) = 53^\circ$$

The bearing of the second ship to the first.

$$\gamma = 90^\circ - \beta = 37^\circ$$

Answer:

a) distance between two ships after 2 hours: 50 hknots

b) 53°

c) 37°