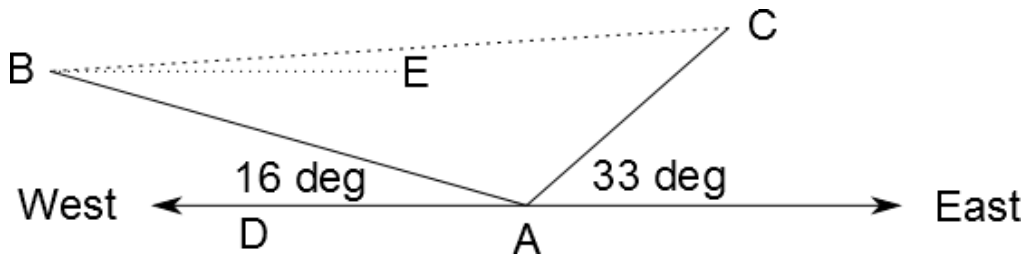
Answer on Question #38711

Physics – Mechanics | Kinematics | Dynamics

Question:

Two geological field teams are working in a remote area. A global positioning system (GPS) tracker at their base camp shows the location of the first team as 44 km away, 16° north of west, and the second team as 34 km away, 33° east of north. When the first team uses its GPS to check the position of the second team, what does it give for the second team's (a) distance from them and (b) direction, measured from due east?

Solution:



Here $AB = 44\ km$, $AC = 34$ km.

From plot,

$$\angle BAC = 180° - 16° - 33° = 131°.$$

Using the law of cosines for ΔABC one obtains

$$BC^2 = AB^2 + AC^2 - 2AB \cdot AC \cos 131°$$

$$BC = \sqrt{AB^2 + AC^2 - 2AB \cdot AC \cos 131°} = 71\ km.$$

Thus, the distance between teams equals $71\ km$.

$AD \parallel BE$ by building. Thus, angle $\angle ABE = \angle DAB = 16°$. One can determine $\angle ABC$ using the law of sines:

$$\frac{AC}{\sin \angle ABC} = \frac{BC}{\sin \angle BAC} \Rightarrow \angle ABC = \arcsin\left(\frac{AC}{BC} \sin \angle BAC\right) \approx 21°.$$

Thus,

$$\angle ABC = \angle ABC - \angle ABE = 5°.$$

Answer:

Distance between teams equals 71 km, direction, measured from due east equals 5°.