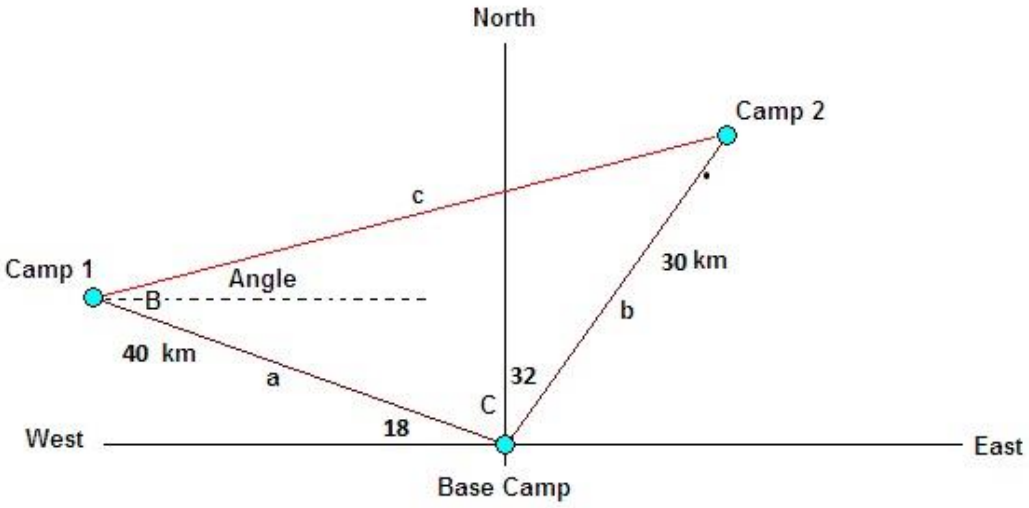
Answer on Question #46591-Physics-Mechanics-Kinematics-Dynamics

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 40 km away, 18° north of west, and the second team as 30 km away, 32° east of north. When the first team uses its GPS to check the position of the second team, what does the GPS give for the following?

(a) the second team's distance from the first team

(b) the second team's direction from the first team, measured relative to due east

Solution



c = distance from camp 1 to camp 2
Angle = angle of camp 2 from camp 1 with respect to east

a) You can use the law of cosines to determine the distance.

Distance from base camp to first team is $a = 40\ km.$

Distance from base camp to second team is $b = 30\ km.$

Angle at base camp between the teams is $C = 90 - 18 + 32 = 104°.$

$$c^2 = a^2 + b^2 - 2 \cdot a \cdot b \cdot \cos C = 40^2 + 30^2 - 2 \cdot 40 \cdot 30 \cdot \cos 104° = 3080.6.$$

$$c = 55.5\ km.$$

(b) If we calculate the angle at the first base camp using the triangle from above we can then get the angle as measured from due east of the second camp by subtracting 18 degrees from it.

$$\frac{sin(C)}{c} = \frac{sin(B)}{b} \rightarrow B = \sin^{-1}\left(\frac{b\ sin(C)}{c}\right) = \sin^{-1}\left(\frac{30 \cdot \sin 104°}{55.5}\right) = 31.6°.$$

So the angle as measured from due east of camp 2 from camp 1 will be $31.6 - 18 = 13.6°$ north of east.