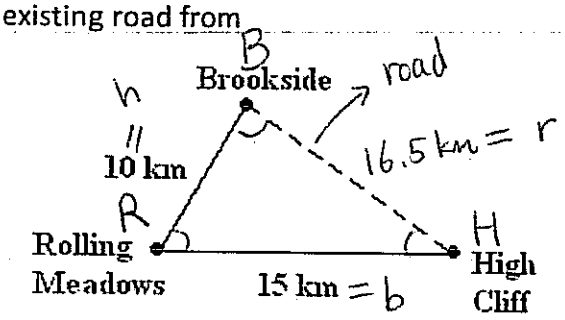
To Find an Angle Using the Cosine Law:

Example 2 A third road is planned that will directly connect Brookside and High Cliff, which are 16.5 km apart. Find the angle, to the nearest tenth of a degree, between the new road and the existing road from



a) Rolling Meadows to Brookside → $\angle B = ?$

$b^2 = r^2 + h^2 - 2rh\cos B$

$15^2 = (16.5)^2 + 10^2 - 2(16.5)(10)\cos B$

$225 = 272.25 + 100 - 330\cos B$

$225 - 272.25 - 100 = -330\cos B$

$-147.25 = -330\cos B$

$\frac{-147.25}{-330} = \cos B$

$\frac{0.4462}{\cos} = \frac{\cos B}{\cos}$

$\cos^{-1} 0.4462 = B$

$\therefore B = 63.5^\circ$

$\therefore$ The angle between RM and new road is 63.5°

b) Rolling Meadows to High Cliff → $\angle H = ?$

$h^2 = r^2 + b^2 - 2rb\cos H$

$10^2 = 16.5^2 + 15^2 - 2(16.5)(15)\cos H$

$100 = 272.25 + 225 - 495\cos H$

$100 - 272.25 - 225 = -495\cos H$

$\frac{-397.25}{-495} = \frac{-495\cos H}{-495}$

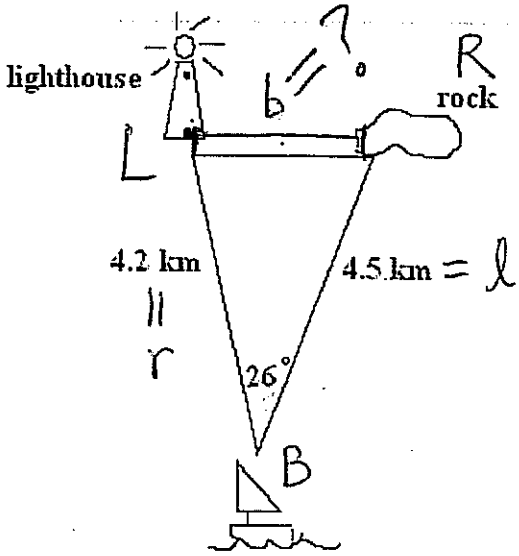
$\frac{0.8025}{\cos} = \frac{\cos H}{\cos}$

$\cos^{-1} 0.8025 = H$

$36.6^\circ = H$

$\therefore$ The angle between RM and High Cliff is 36.6° to new road

Example 3 A boat is sailing north through a narrow strait. Through one particularly narrow section, a lighthouse marks the western shoreline, while a buoy indicates a rock hazard directly east of the lighthouse, as shown. What is the width of the strait, to the nearest tenth of a kilometre?



$b^2 = l^2 + r^2 - 2lr \cos B$

$b^2 = 4.5^2 + 4.2^2 - 2(4.5)(4.2)\cos 26°$

$b^2 = 20.25 + 17.64 - 37.8 \cos 26°$

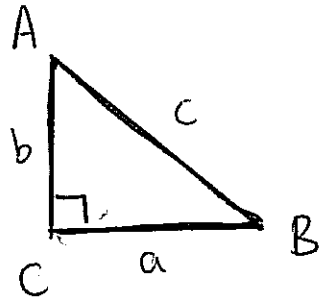
$b^2 = 37.89 - 37.8 \times 0.898794$

$b^2 = 37.89 - 33.974$

$\sqrt{b^2} = \sqrt{3.916}$

$b = 1.98$ km

What happens if the contained angle is 90°?



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

$\cos 90° = 0$

$\therefore c^2 = a^2 + b^2$

Homework: Worksheet

April 15

Unit test on Monday April 20

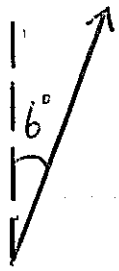
MPM2D
Ms. Kueh

Compass Points

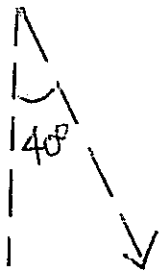
N30°W means that you face North, then turn 30° to the West.

Draw the angles below:

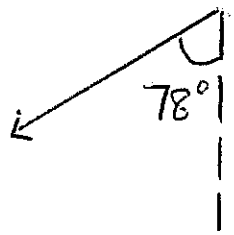
N6°E



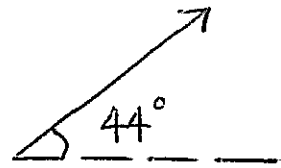
S40°E



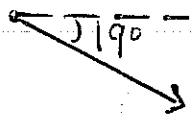
S78°W



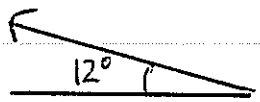
E44°N



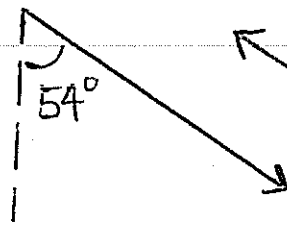
E19°S



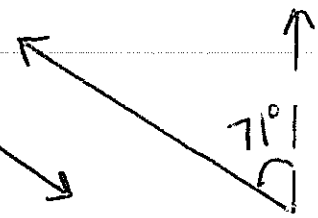
W12°N



S54°E

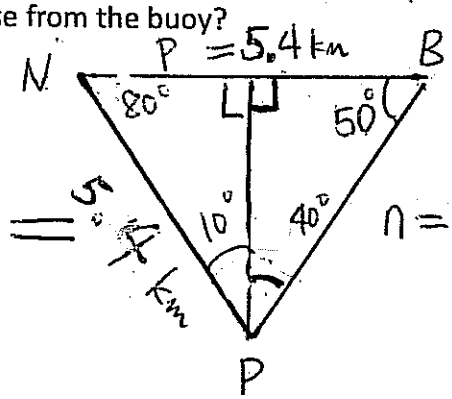


N71°W



Example 1

The Nautilus is sailing due east toward a buoy, while the Porpoise approaches the buoy heading N40°E. If the Nautilus is 5.4 km from the buoy and the Porpoise is 5.4 km from the Nautilus, how far is the Porpoise from the buoy?



$\angle B = 180 - 40 - 90 = 50°$

$\frac{n}{\sin N} = \frac{b}{\sin B}$

$\frac{n}{\sin 80°} = \frac{5.4}{\sin 50°}$

$\angle N = 180 - 90 - 10$

$= 80°$

$n = \frac{5.4}{\sin 50°} \times \sin 80°$

$n = 6.94 \text{ km}$