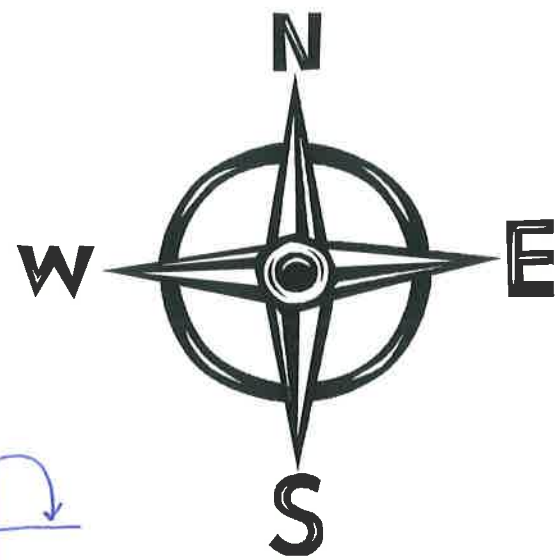
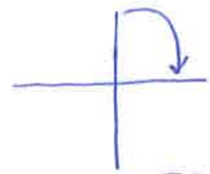
Pre-Calculus (A)
Section 4.8 (Bearings) Notes

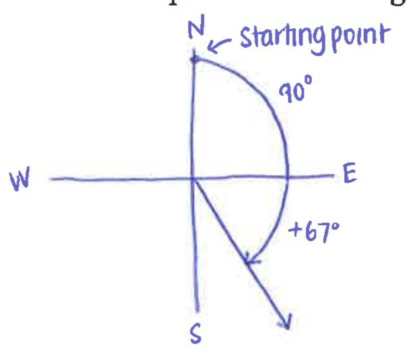
There are two standard methods for writing bearings:



(1) When an object in motion, like a ship or an airplane, has its *bearing* or *course* given, it is given in terms of direction (north, south, east or west) and the single angle given is **always measured clockwise from north**.

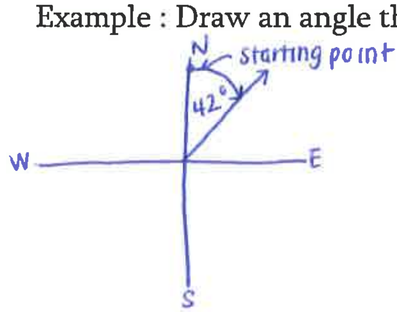


Example : Draw an angle to approximate a bearing of 157°. ← no direction given assume from North/clockwise

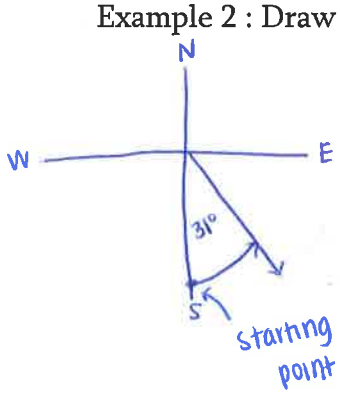


(2) The other system starts with a north or south line and uses an acute angle to show direction. The angle given is **measured from the second direction to the first**.

Example : Draw an angle that shows a bearing of N 42° E ← an angle 42° East of north
↑start



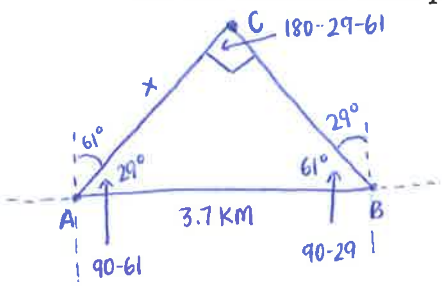
Example 2 : Draw an angle that shows a bearing of S 31° E. ← an angle 31° east of south
↑start



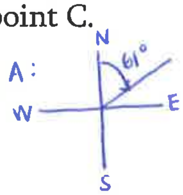
Applications of Bearings :

from N clockwise

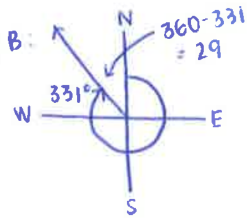
1. Radar Stations A and B are on an east-west line, 3.7 km apart. Station A detects a plane at C, on a bearing of 61°. Station B simultaneously detects the same plane on a bearing of 331°. ← From N clockwise
Find the distance from point A to point C.

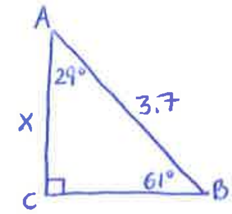


Bearing A:



Bearing B:





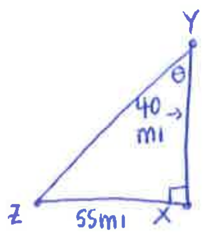
$\sin 61 = \frac{X}{3.7}$

$X = 3.7 \sin 61$

$X = 3.2$ $\boxed{AC = 3.2\text{ km}}$

2. City X is 40 miles due south of City Y, and City Z is 55 miles due west of City X. What is the bearing of City Z from City Y? (nearest tenth of a degree)

↑ from city Y looking at city Z



$\tan\theta = \frac{55}{40}$

$\theta = \tan^{-1}\left(\frac{55}{40}\right)$

$\theta = 54°$

Bearing: ∠Y is made by starting S and swinging W

⇒ 54° West of South

so $\boxed{S\ 54°\ W}$

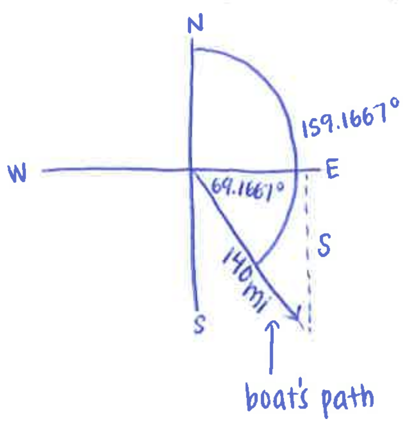
3. A boat sails for 4 hours at 35 miles per hour in a direction 159° 10'. How far south has it sailed? (nearest mile)

↳ 4 hrs × 35 mph = 140 miles

→ North clockwise

↳ $\frac{10\text{ min}}{1} \cdot \frac{1\text{ deg}}{60\text{ min}} = 0.1667$

159.1667°



$\sin 69.1667 = \frac{S}{140}$

$S = 140 \sin 69.1667$

$S = 130.8$

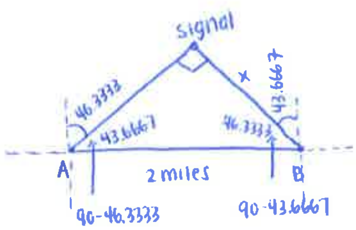
$\boxed{S \approx 131\text{ miles south}}$

$\frac{20\text{mph}}{1} \cdot \frac{1\text{deg}}{60\text{ min}} = .3333$ $\frac{40\text{mph}}{1} \cdot \frac{1\text{deg}}{60\text{ min}} = .6667$

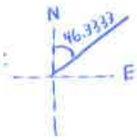
4. Radio direction finders are set up at points A and B, which are 2 miles apart on an east-west line. From A it is found that the bearing of the signal from a radio transmitter is N 46° 20' E, while B, the bearing of the same signal is N 43° 40' W. Find the distance of the transmitter from B.

46.3333° East of north

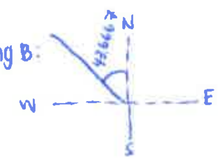
43.6667° west of north

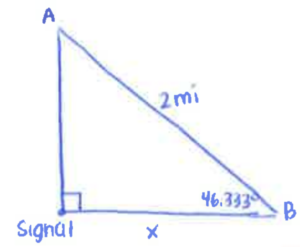


Bearing A:



Bearing B:





$\frac{\cos 46.3333}{1} = \frac{x}{2}$

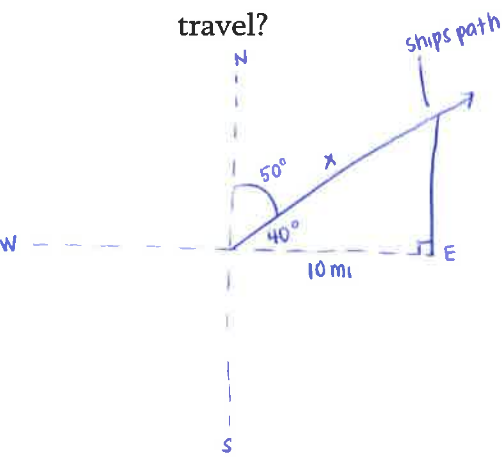
$x = 2\cos 46.3333$

$x \approx 1.38$

The transmitter is 1.38 mi from point B

50° east of north

5. A ship travels on a N 50° E course. The ship travels until it is due north of a port which is 10 nautical miles due east of the port from which the ship originated. How far did the ship travel?



$\frac{\cos 40}{1} = \frac{10}{x}$

$10 = x \cdot \cos 40$

$x = \frac{10}{\cos 40}$

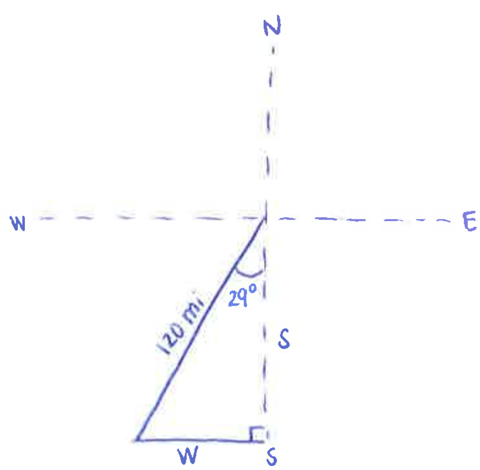
$x \approx 13.1$

The ship traveled about 13.1 miles

29° west of south

6. A ship leaves port at noon and has a bearing of S 29° W. The ship sails at 20 knots. How many nautical miles south and how many nautical miles west will the ship have traveled by 6:00 P.M.?

noon → 6pm : 6 hours × 20 knots = 120 miles



$\frac{\cos 29}{1} = \frac{S}{120}$ $\frac{\sin 29}{1} = \frac{W}{120}$

$S = 120\cos 29$ $W = 120\sin 29$

$S = 104.95$ $W = 58.17$

$S \approx 105$ $W \approx 58.2$

The ship traveled 105 mi South and 58.2 mi West