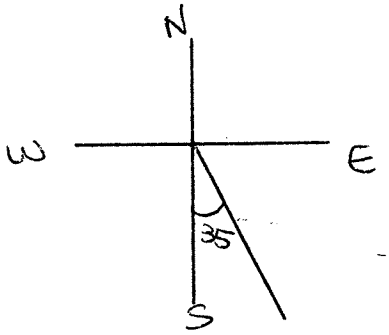
Geometry (H)
Section 8.7 – More Application Problems using Trig

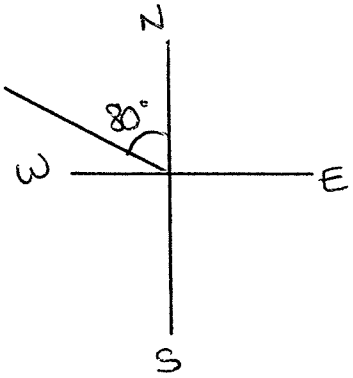
In surveying and navigations, directions are generally given in terms of **bearings**. A bearing measures the acute angle a path or line of sight makes with a fixed north-south line.

For example:

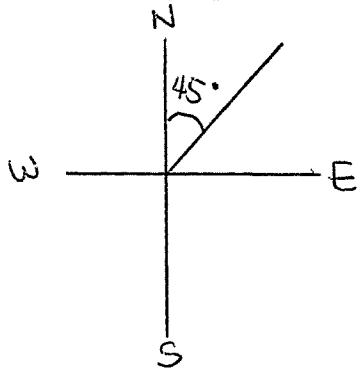
1. S 35° E



2. N 80° W

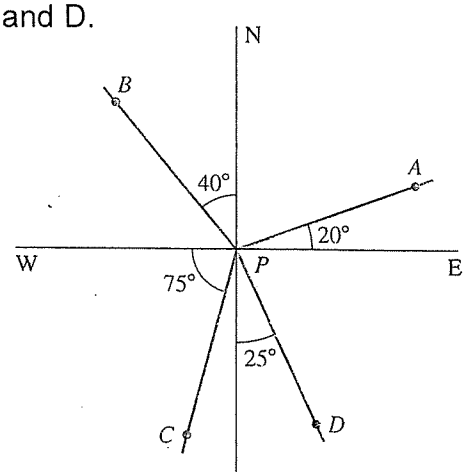


3. N 45° E



Let's look at a couple examples …

1. Find the bearing from P to each of the points, A, B, C and D.



(A) N 70° E

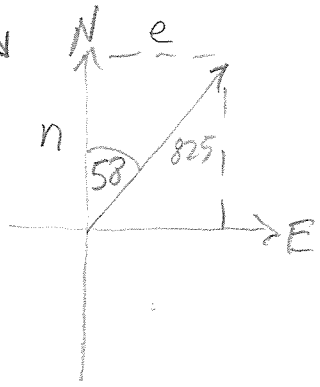
(B) N 40° W

(C) S 15° W

(D) S 25° E

Tell: * only distance on labels

2. An airplane flying at 550 miles per hour has a bearing of N 58° E. After flying 1.5 hours, how far north and how far east has the plane traveled from its point of departure?



$1.5 \times 550 = 825$

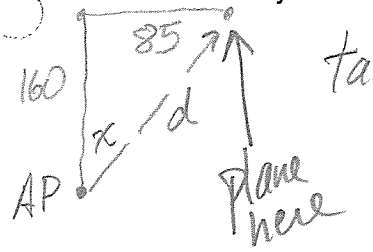
$\cos 58 = \frac{n}{825}$

$437.2 \approx n$ miles north

$\sin 58 = \frac{e}{825}$

$e \approx 699.6$ miles east

3. A plane is 160 miles north and 85 miles east of an airport. If the pilot wants to fly directly to the airport, what bearing should be taken? What distance must be traveled?



$\tan x = \frac{85}{160}$

$x = 28$

S 28° W

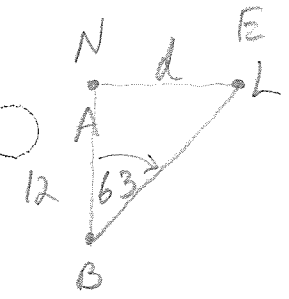
$a^2 + b^2 = c^2$

$160^2 + 85^2 = d^2$

$32825 = d^2$

$d \approx 181.2$ miles

✓ 4. Ship A is due west of a lighthouse. Ship B is 12 km south of ship A. From ship B the bearing to the light house is N 63° E. How far is ship A from the lighthouse?

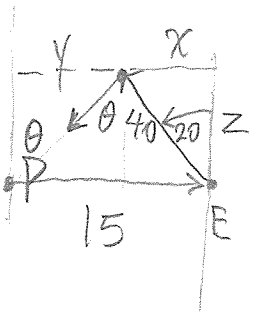


$\tan 63 = \frac{d}{12}$

$d \approx 23.5513$ ✓

Ship A is ≈ 23.6 Km east of the LH.

✓ 5. A ship leaves port and travels due east for 15 miles, then changes course to N 20° W and travels 40 more miles. Find the bearing to the port of departure.



① $\sin 20 = \frac{x}{40}$

$x \approx 13.6808$ ✓

$y \approx 1.3192$

② $\cos 20 = \frac{z}{40}$

$z \approx 37.5877$ ✓

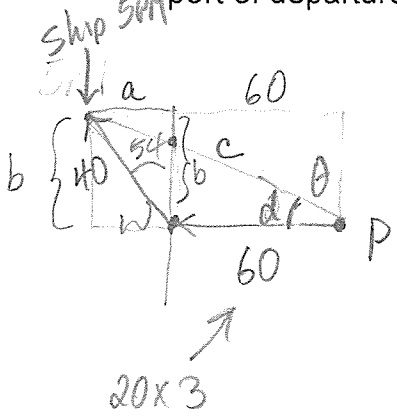
③ $\tan \theta = \frac{1.3192}{37.5877}$

$\theta = 2.01$ ✓

④ Answer:

S 2° W

6. A ship leaves port at noon and heads due west at 20 knots (nautical miles). At 3 p.m. the ship changes course to N 54° W. Find the ship's bearing and distance from the port of departure at 5 p.m.



① $\sin 54 = \frac{a}{40}$

$a \approx 32.3607$

② $\cos 54 = \frac{b}{40}$

$b \approx 23.5114$

③ distance

(a+60) →

$92.3607^2 + 23.5114^2 = c^2$

$9083.2848 = c^2$

$95.3063 \approx c$

$95.3 \approx c$

nautical miles

④ $\sin d = \frac{23.5114}{95.3063}$

$d \approx 14.2819$

$14° \approx d$

⑤ $90 - 14 = 76°$

N 76° W