

Law of Sine/Cosine Bearings

Headings and Bearings are ways of measuring the direction someone or something is heading. Typical problems include planes and boats. Directions are typically given in one of two ways.

1) Headings (from North): When a direction is given as an angle between 0° and 360° , the direction is considered at the angle, clockwise from North.

2) Bearings: are given as a direction in reference to North or South. You are told to rotate some angle toward the east or west from that. Angles are between 0° and 90° .

Notation for Bearings look like this.

N(angle)E – Starting at north rotate toward East

N(angle)W – Starting at north rotate toward West

S(angle)E – Starting at south rotate toward East

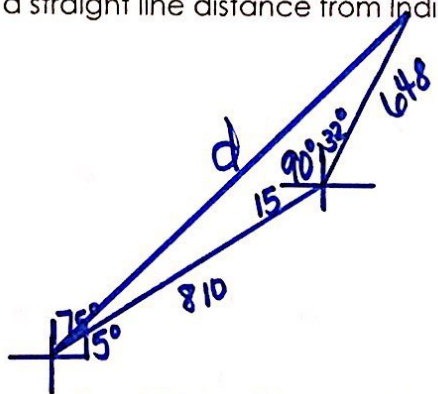
S(angle)W – Starting at south rotate toward West

Ex: $N25^\circ E$

" 25° East of North"

Examples:

1. A plane flies 810 miles from Indianapolis, IN to Cuyahoga Falls, OH with a bearing of $N 75^\circ E$. Then it flies 648 miles from Cuyahoga Falls to Niagara Falls, NY with a bearing of $N 32^\circ E$. What is a straight line distance from Indianapolis, IN to Niagara Falls, NY?



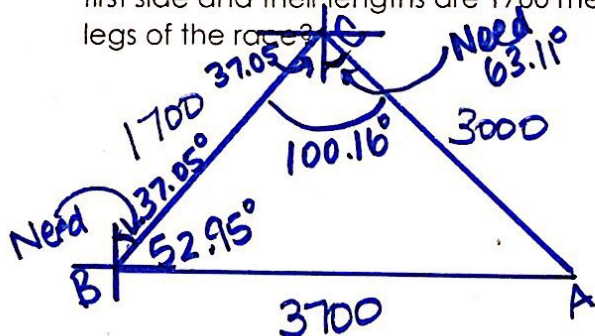
$$d^2 = 810^2 + 648^2 - 2(810)(648)\cos 137$$

$$\sqrt{d^2} = \sqrt{1843749.862}$$

$$d = 1357.85 \text{ mi}$$

$$90 + 32 + 15 = 137^\circ$$

2. A boat race along a triangular course marked by buoys A, B, and C. The race starts with the boats headed west for 3700 meters. The other two sides of the course lie to the north of the first side and their lengths are 1700 meters and 3000 meters. Find the bearings for the last two legs of the race?



$$3700^2 = 1700^2 + 3000^2 - 2(1700)(3000)\cos C$$

$$13690000 = 11890000 - 10200000\cos C$$

$$1800000 = -10200000\cos C$$

$$-0.1765 = \cos C$$

$$100.16^\circ = C$$

$$\frac{\sin 100.16}{3700} = \frac{\sin B}{3000}$$

$$B = 52.95^\circ$$

$$90 - 52.95 = 37.05^\circ$$

$$N37.05^\circ E$$

$$100.16 - 37.05 = 63.11^\circ$$

$$S63.11^\circ E$$