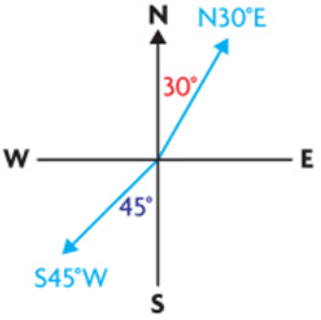
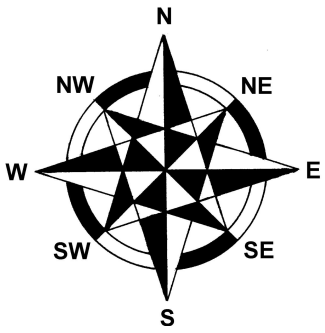
MORE APPLICATIONS... Bearings

NOTE:

Communication | *Tip*

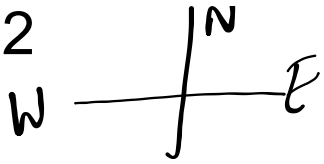
Directions are often stated in terms of north and south on a compass. For example, N30°E means travelling in a direction 30° east of north. S45°W means travelling in a direction 45° west of south.



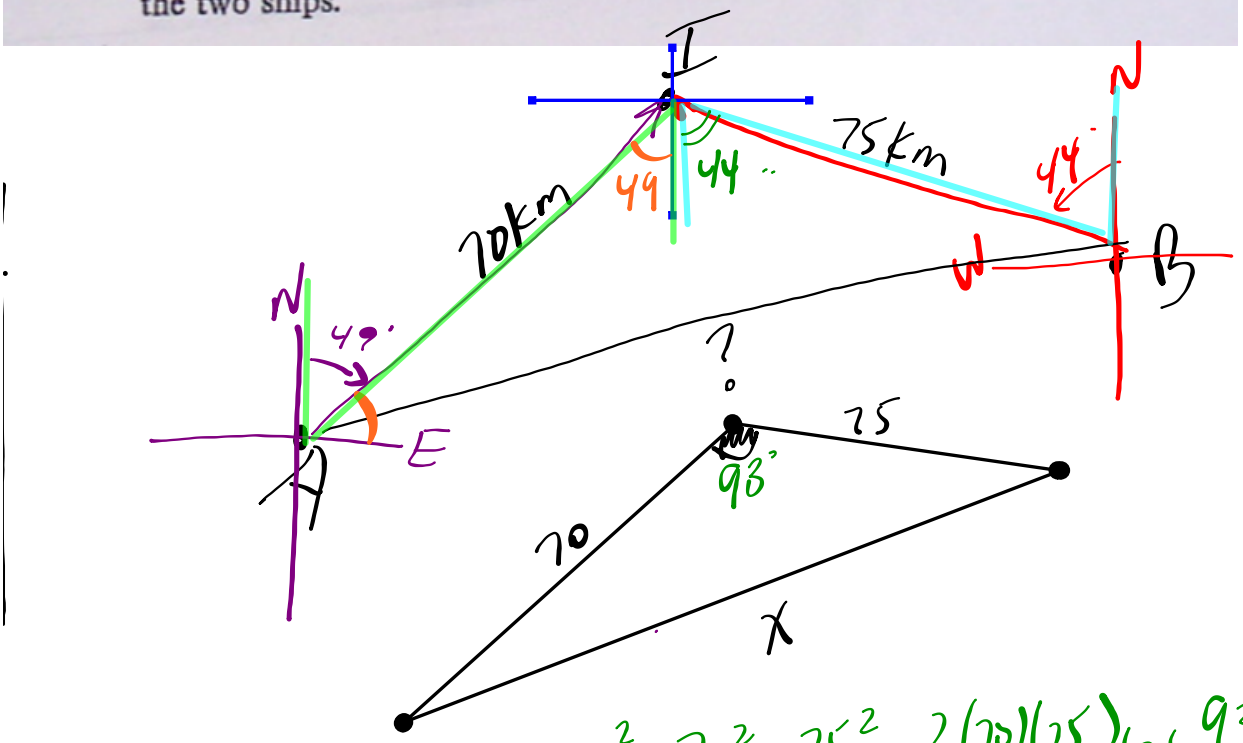


Booklet Questions... 10.12: #11, 12

QUESTIONS???



12 Two ships take separate bearings on the same island. From ship A, the island is N49°E and from ship B it is N44°W. If ship A and ship B are respectively 70 km and 75 km from the island, find the distance between the two ships.



$x^2 = 70^2 + 75^2 - 2(70)(75)\cos 93°$

$x^2 =$ 70²+75²-2*70*75*cos(93) = 11074.52754

$x =$ √(Ans) = 105.2355812

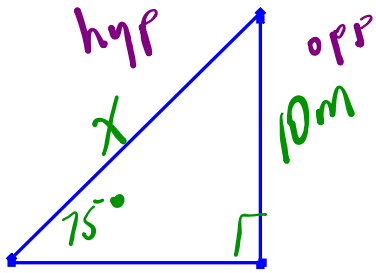
$x = 105.2\text{ km}$

7 For purposes of safety, the suggested angle of elevation a ladder makes with the ground is 75°.

(a) What should be the length of the ladder to reach 10 m up a wall?

(b) If the base of a ladder is 1.5 m from the wall, how far up the wall will the ladder reach?

$\frac{x}{\sin 90^\circ} = \frac{10}{\sin 75^\circ}$

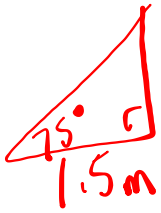


a) $\frac{x \sin 75^\circ}{\sin 75} = \frac{10}{x \sin 75}$

$x = \frac{10}{\sin 75^\circ}$

$x = 10.4\text{m}$

b)



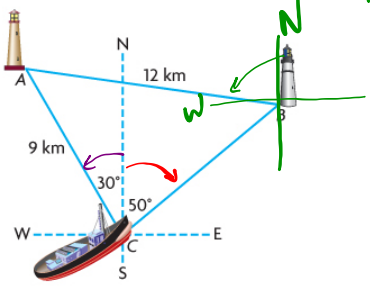
$1.5 \tan 75^\circ = \frac{x}{1.5}$

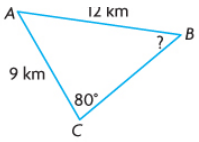
$5.6\text{m} = x$

Applications: Bearings

Ex #1:(p. 122) **Using reasoning to determine the measure of an angle**

The captain of a small boat is delivering supplies to two lighthouses, as shown. His compass indicates that the lighthouse to his left is located at N30°W and the lighthouse to his right is located at N50°E. Determine the compass direction he must follow when he leaves lighthouse *B* for lighthouse *A*.





I drew a diagram. I labelled the sides of the triangle I knew and the angle I wanted to determine.

$$\frac{\sin B}{AC} = \frac{\sin C}{AB}$$

I knew *AC*, *AB*, and $\angle C$, and I wanted to determine $\angle B$. So I used the sine law that includes these four quantities.

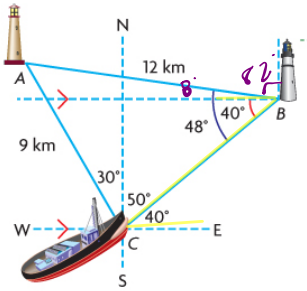
I used the proportion with sin *B* and sin *C* in the numerators so the unknown would be in the numerator.

$$\frac{\sin B}{9} = \frac{\sin 80°}{12}$$
$$9\left(\frac{\sin B}{9}\right) = 9\left(\frac{\sin 80°}{12}\right)$$
$$\sin B = 9\left(\frac{\sin 80°}{12}\right)$$
$$\sin B = 0.7386...$$
$$\angle B = \sin^{-1}(0.7386...)$$
$$\angle B = 47.612...°$$

I substituted the given information and then solved for sin *B*.

The measure of $\angle B$ is 48°.

The answer seems reasonable. $\angle B$ must be less than 80°, because 9 km is less than 12 km.



I drew a diagram and marked the angles I knew. I knew east-west lines are all parallel, so the alternate interior angle at *B* must be 40°.

The captain must head N82°W from lighthouse *B*.

The line segment from lighthouse *B* to lighthouse *A* makes an 8° angle with west-east. I subtracted this from 90° to determine the direction west of north.

NOTE:

Communication Tip

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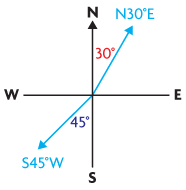
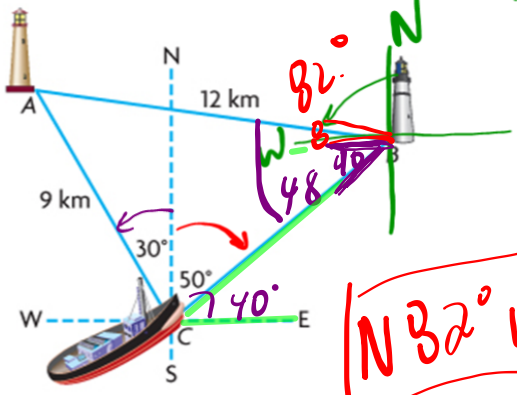
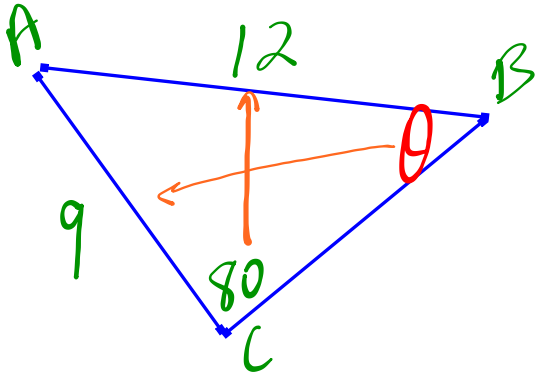


Compass Rose Animation



N W

N 32° W



$$\frac{9\sin\theta}{9} = \frac{9\sin 80^\circ}{12}$$

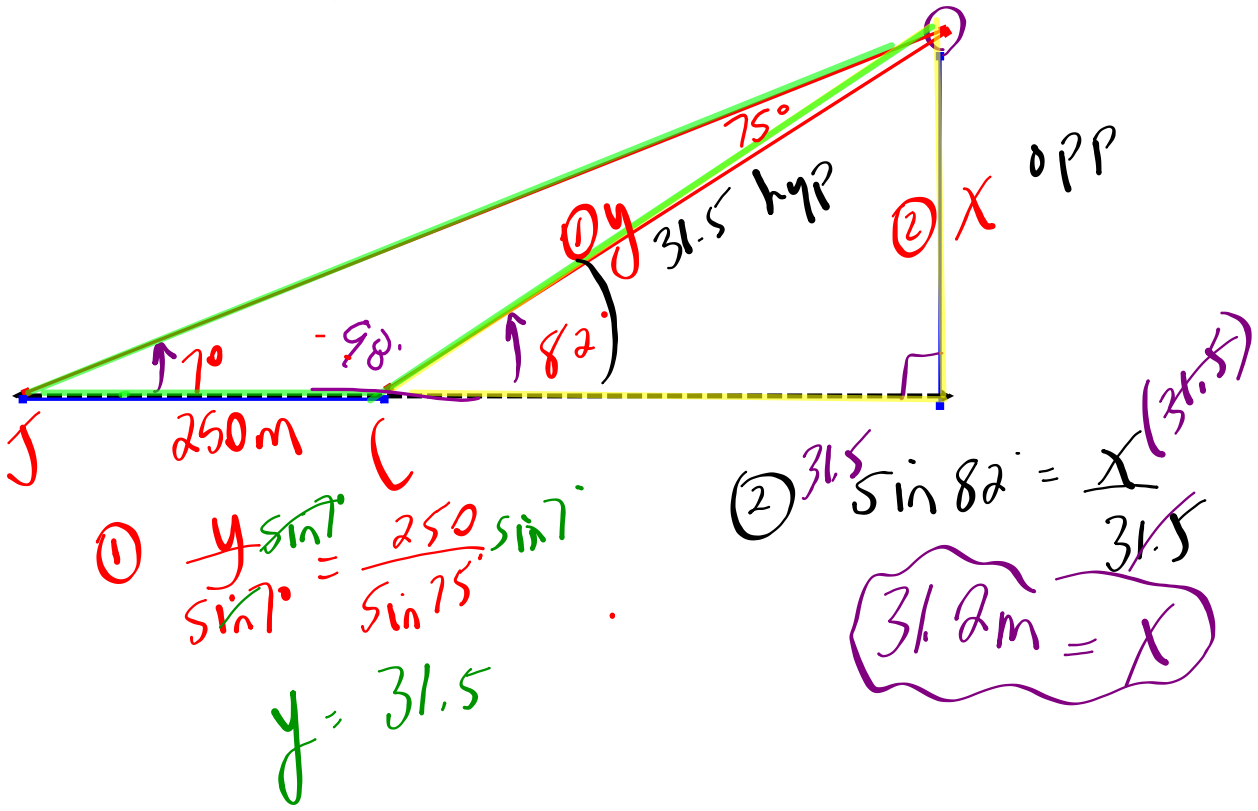
$$\sin^{-1}\sin\theta = \sin^{-1}(0.7386)$$

$$\theta = 48^\circ$$

EX #2: Solving an application question...

(p. 166)

Colleen and Juan observed a tethered balloon advertising the opening of a new fitness centre. They were 250 m apart, joined by a line that passed directly below the balloon, and were on the same side of the balloon. Juan observed the balloon at an angle of elevation of 7° while Colleen observed the balloon at an angle of elevation of 82°. Determine the height of the balloon to the nearest metre.



① $\frac{y \sin 7^\circ}{\sin 7^\circ} = \frac{250 \sin 7^\circ}{\sin 75^\circ}$

$y = 31.5$

② $31.5 \sin 82^\circ = \frac{x}{31.5}$ (31.5)

$31.2\text{m} = x$

HOMEWORK: More Applications/Word Problems

Page 154 #5, 6, 9, 10, 11 (bearings - see example from Friday)
Page 172 #9, 10, 12, 13, 14