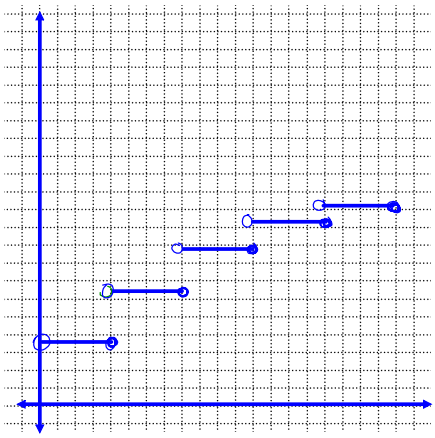
Warm - up

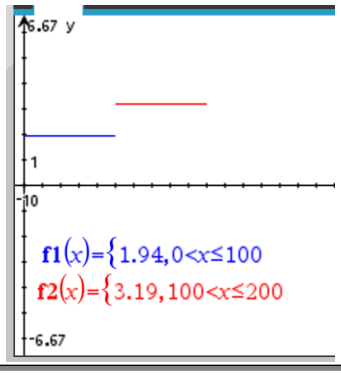
Sketch and find Domain and Range

Prices for sending packages at a post office are in the chart

mass

~~Weight~~ of Package	Price ($)
Up to 100g	1.94
Over 100g to 200g	3.19
Over 200g to 300g	4.44
Over 300g up to 400g	5.09
Over 400g up to 500g	5.47





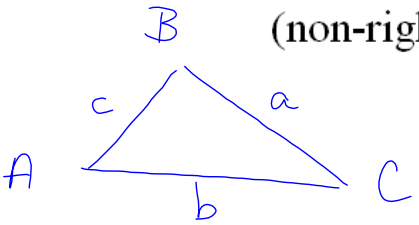
On the TI-Nspire

Sine Law
Cosine Law

Learning Goal
- **use sine law properly**
- **use cosine law properly**

Sine Law

It is used to solve **Oblique Triangles**
(non-right triangles)

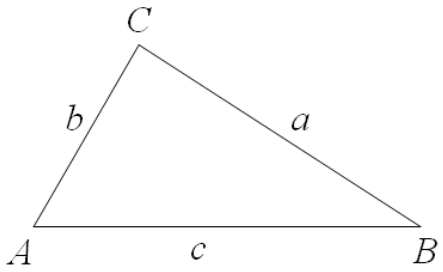


It is used when you are given

- two angles and one side (ASA)
- two sides and one angle (SSA)

Note: angles and sides need to be across from each other

The Sine Law

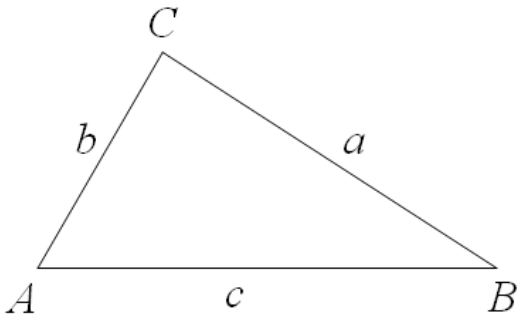


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$ ← side

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$ ← angle

Note: Sides and angles with the same name need to be opposite to each other.

The Cosine Law



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

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$b^2 = a^2 + c^2 - 2ac\cos B$$

The Cosine Law is used for situations involving **SAS** as well as **SSS**.

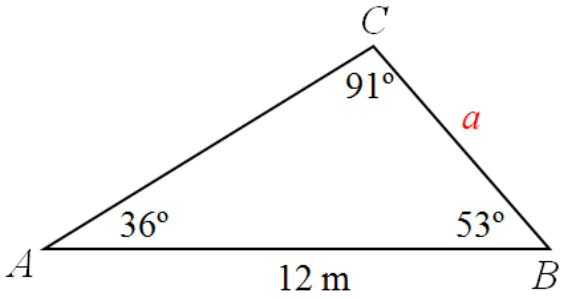
You are given 2 sides and the contained angle and you wish to find the third side **or** three side and you need to find one of the angles.

On the Boards...

Example 1: Determine the length of side a.

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$



Steps

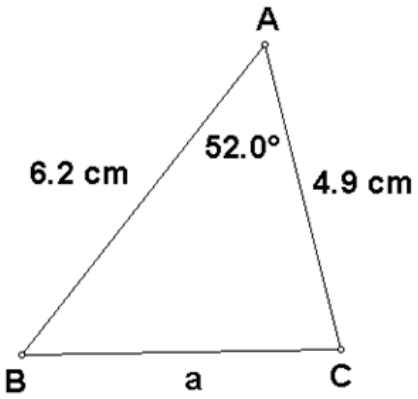
1. Choose the correct ratio
2. Set it up
3. Solve

$$\frac{a}{\sin 36^\circ} = \frac{12}{\sin 91^\circ}$$

$$a = \frac{12}{\sin 91^\circ}(\sin 36^\circ)$$

$$a \doteq 7$$

Find a.



$a^2 = b^2 + c^2 - 2bc\cos A$

$a^2 = 4.9^2 + 6.2^2 - 2(4.9)(6.2)\cos 52°$

$a^2 = 25.04$

$a \doteq 5$

In ΔPQR, q=100cm, p=45cm, ∠Q=70° ,

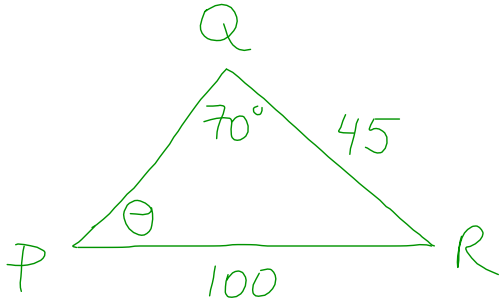
Determine the measure of ∠P.

Draw a diagram

Choose formula

Sub in numbers

Solve



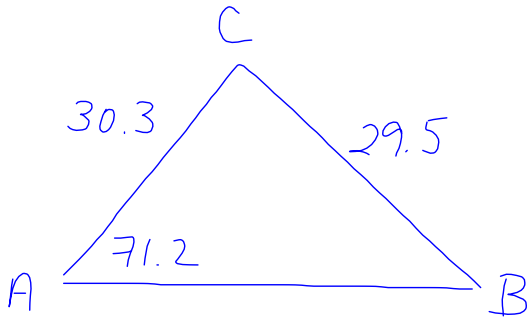
$\frac{\sin P}{45} = \frac{\sin 70°}{100}$

$\sin P = 0.42$

$P = 25°$

c) ΔABC where $\angle A = 71.2°$, $a = 29.5cm$ and $b = 30.3cm$

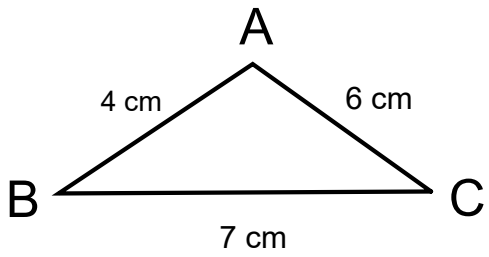
Find $\angle B$



$$\frac{\sin B}{30.3} = \frac{\sin 71.2°}{29.5}$$

$$\sin B = 0.97$$

$$B = 76°$$



Find angle A.

$$a^2 = b^2 + c^2 - 2bc\cos A$$

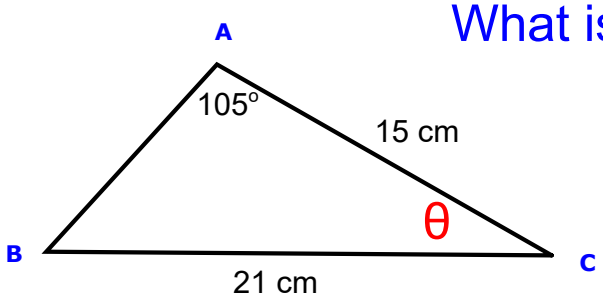
$$7^2 = 6^2 + 4^2 - 2(6)(4)\cos A$$

$$49 = 36 + 16 - 48\cos A$$

$$-3 = -48\cos A$$

$$0.0625 = \cos A$$

$$86° = A$$



What is the problem here?

Can't use cosine law

Find $\angle B$

$$\frac{\sin 105^\circ}{21} = \frac{\sin B}{15}$$

$$0.6899 = \sin B$$

$$44^\circ = B$$

Find θ

$$\theta = 180^\circ - 105^\circ - 44^\circ$$

$$\theta = 31^\circ$$

Seatwork

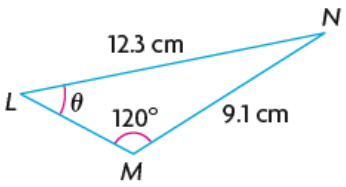
pg 318 # 4a, 5ad, 7, 8, 12, 13

pg 326 # 4ab, 6, 7

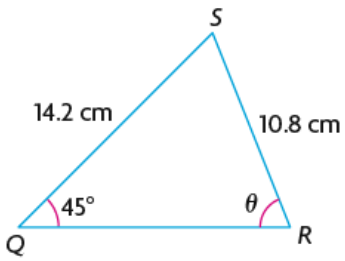
pg 318

4. Determine the measure of angle θ to the nearest degree.

a)



b)



5. K Where appropriate, sketch all possible triangles, given each set of information. Label all side lengths to the nearest tenth of a centimetre and all angles to the nearest degree.

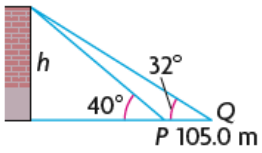
a) $a = 7.2$ mm, $b = 9.3$ mm, $\angle A = 35°$

b) $a = 7.3$ m, $b = 14.6$ m, $\angle A = 30°$

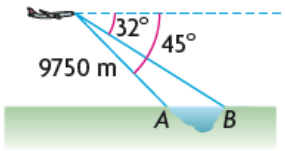
c) $a = 1.3$ cm, $b = 2.8$ cm, $\angle A = 33°$

d) $c = 22.2$ cm, $\angle A = 75°$, $\angle B = 43°$

7. A A building of height h is observed from two points, P and Q, that are 105.0 m apart as shown. The angles of elevation at P and Q are 40° and 32°, respectively. Calculate the height, h, to the nearest tenth of a metre.



8. A surveyor in an airplane observes that the angle of depression to two points on the opposite shores of a lake are 32° and 45°, respectively, as shown. What is the width of the lake, to the nearest metre, at those two points?



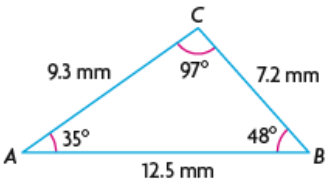
12. The Huqiu Tower in China was built in 961 CE. When the tower was first built, its height was 47 m. Since then it has tilted 2.8°, so it is called China's Leaning Tower. There is a specific point on the ground where you can be equidistant from both the top and the bottom of the tower. How far is this point from the base of the tower? Round your answer to the nearest metre.

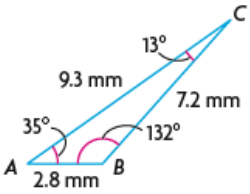
13. Your neighbour claims that his lot is triangular, with one side 430 m long and the adjacent side 110 m long. The angle opposite one of these sides is 35°. Determine the other side length of this lot to the nearest metre and the interior angles to the nearest degree.

Answers

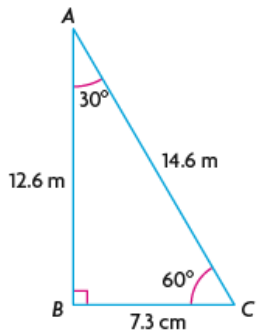
4. a) 40° b) 68° or 23°

5. a)



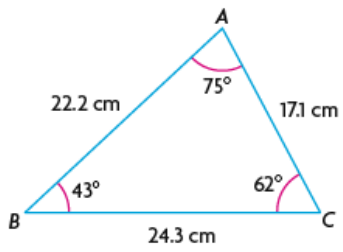


b)



c) no triangle exists

d)



7. 257.0 m **8.** 7499 m

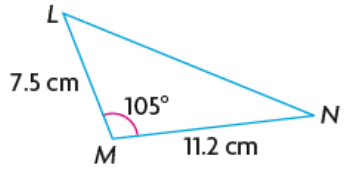
12. 481 m

13. (35° opposite 430 m side) 515 m, 8°, and 137°

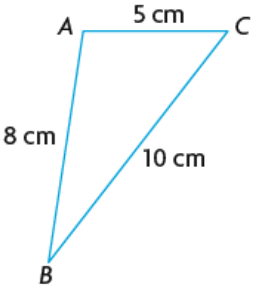
pg 326

4. K Calculate each unknown angle to the nearest degree and each unknown length to the nearest tenth of a centimetre.

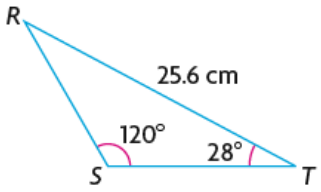
a)



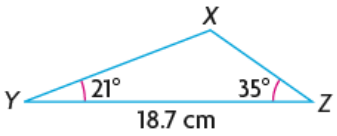
c)

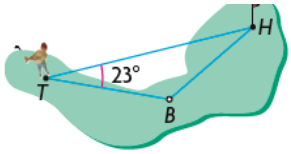


b)



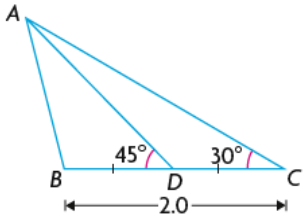
d)





6. While golfing, Sahar hits a tee shot from T toward a hole at H, but the ball veers 23° and lands at B. The scorecard says that H is 270 m from T. If Sahar walks 160 m to the ball (B), how far, to the nearest metre, is the ball from the hole?

7. Given $\triangle ABC$ at the right, $BC = 2.0$ and D is the midpoint of BC. Determine AB, to the nearest tenth, if $\angle ADB = 45°$ and $\angle ACB = 30°$.

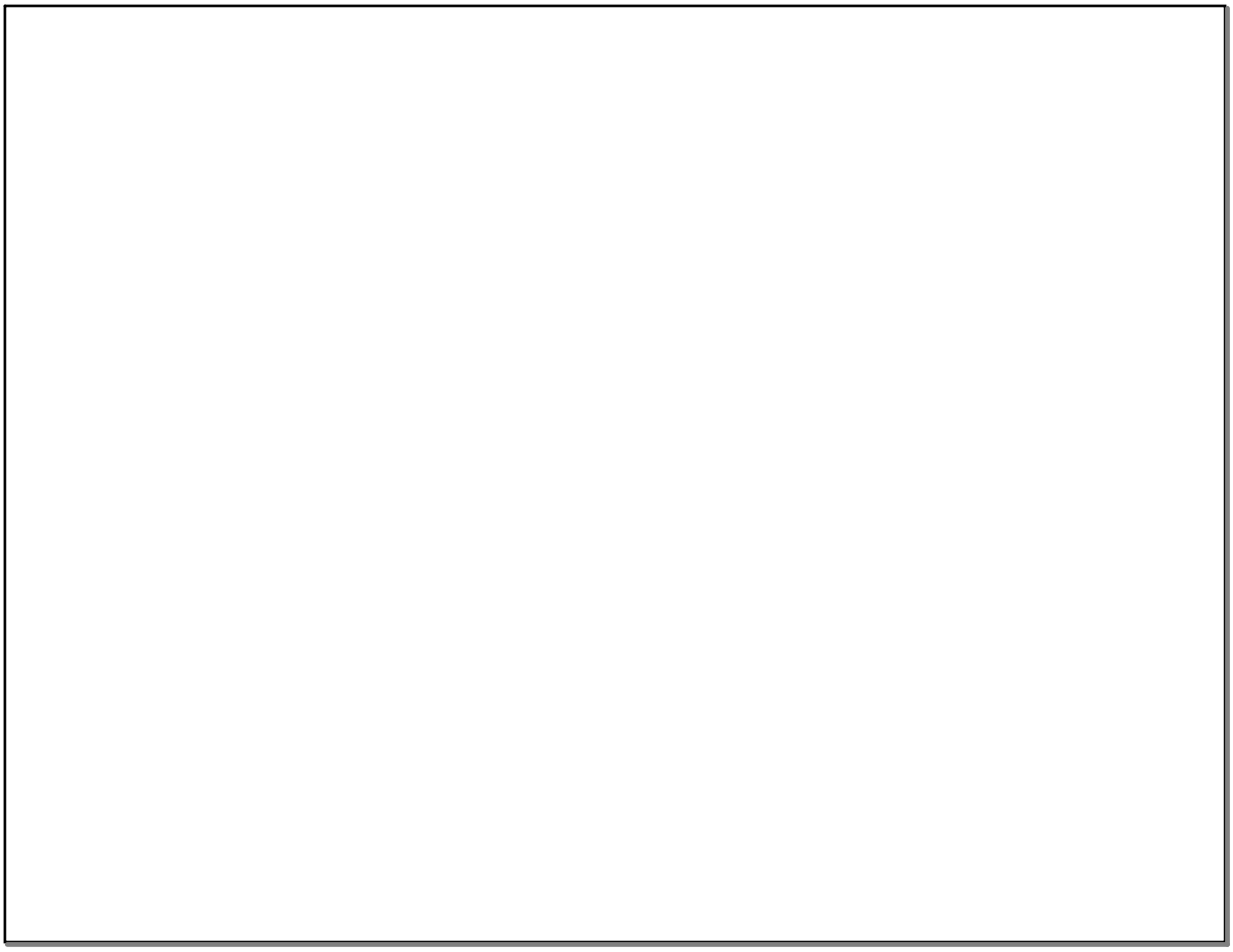


8. Two forest fire towers, A and B, are 20.3 km apart. From tower A, the bearing of tower B is 70°. The ranger in each tower observes a fire and radios the bearing of the fire from the tower. The bearing from tower A is 25° and from tower B is 345°. How far, to the nearest tenth of a kilometre, is the fire from each tower?

Answers

4. a) $m \doteq 15.0$ cm, $\angle L \doteq 46°$, $\angle N \doteq 29°$
b) $\angle R = 32°$, $t \doteq 13.9$ cm, $r \doteq 15.7$ cm
c) $\angle A \doteq 98°$, $\angle B \doteq 30°$, $\angle C \doteq 52°$
d) $\angle X = 124°$, $y \doteq 8.1$ cm, $z \doteq 12.9$ cm

5. 11°

6. 138 m

7. 1.4