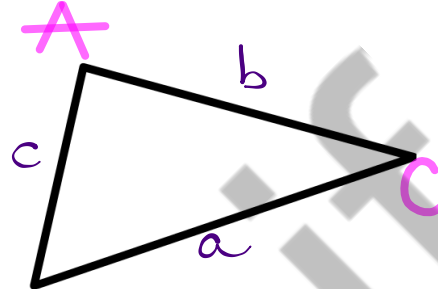


8.3 Sine and cosine laws pg. 241-242

When the triangle given is a non-right triangle, we cannot use the trigonometric ratios. We use the formula:

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



- Capital Letters are for Angles
- Small Letters are for sides
- Use 2 fractions at a time.

Example: How far is the fire from Tower A?

Step 1

$$180 - 37 - 82 = 61^\circ$$

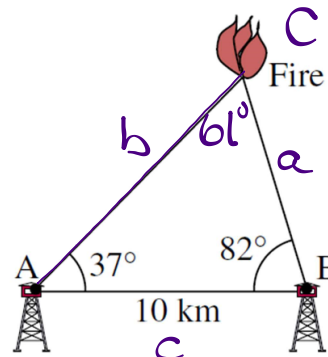
Step 2

$$\frac{\cancel{a}}{\sin 37^\circ} = \frac{b}{\sin 82^\circ} \Rightarrow \frac{10}{\sin 61^\circ}$$

$$b = 11.32 \text{ km}$$

Cross x & ÷

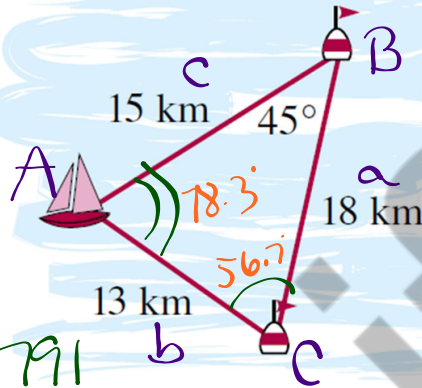
1 dec or 2 dec



Example: A yacht sails the three-leg course shown. Calculate the largest angle between the sides.

$$\frac{18}{\sin A} = \frac{13}{\sin 45} = \frac{15}{\sin C}$$

and $\sin A = 0.9791$
 $A = \sin^{-1} 0.9791$
 (78.3)

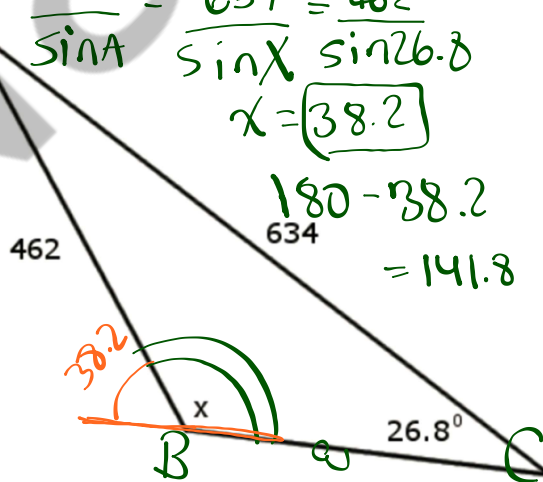


Example:
 Find the value of the missing **OBTUSE** angle

$$\frac{a}{\sin A} = \frac{634}{\sin X} = \frac{462}{\sin 26.8}$$

$$X = 38.2$$

$$180 - 38.2 = 141.8$$



marked x.

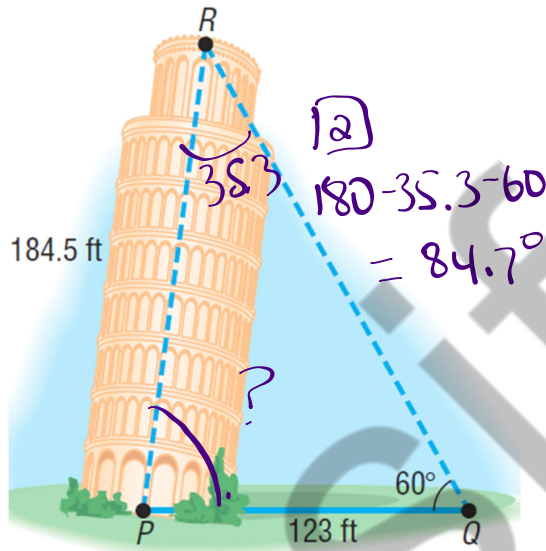
BELL WORK

At what angle is the PISA tower from the ground-up.

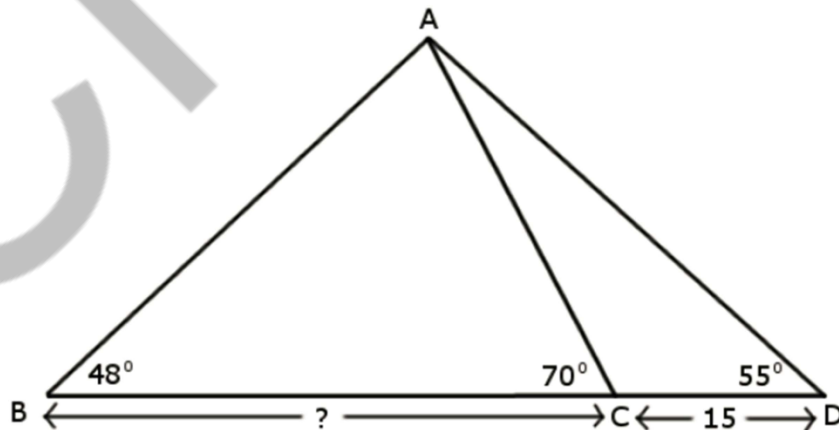
1

$$\frac{184.5}{\sin 60} = \frac{123}{\sin R}$$

$$R = 35.3$$

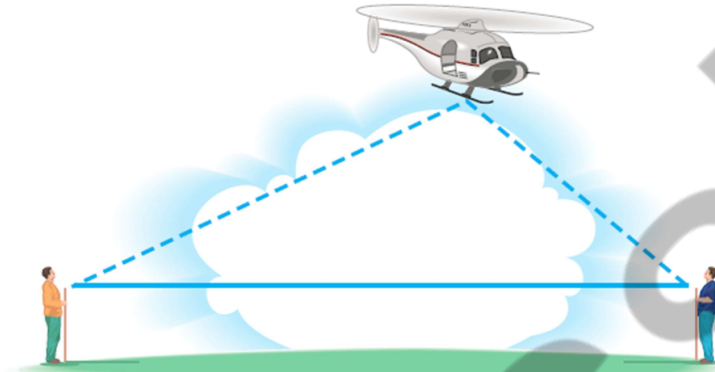


Bell Work: Find the missing value.



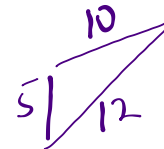
BELL WORK:

Finding the Height of a Helicopter Two observers simultaneously measure the angle of elevation of a helicopter. One angle is measured as 25° , the other as 40° (see the figure). If the observers are 100 feet apart and the helicopter lies over the line joining them, how high is the helicopter?



Cosine Law pg. 243-244

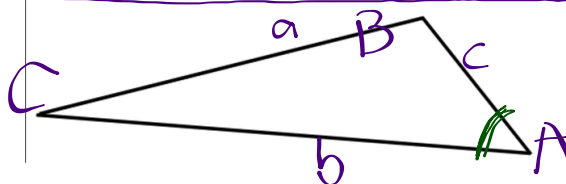
Use when you have SAS or SSS



We use the cosine law when SOHCAHTOA and SINE LAW do not help.

Either side length "a" will be missing or angle measurement "A" will be unknown.

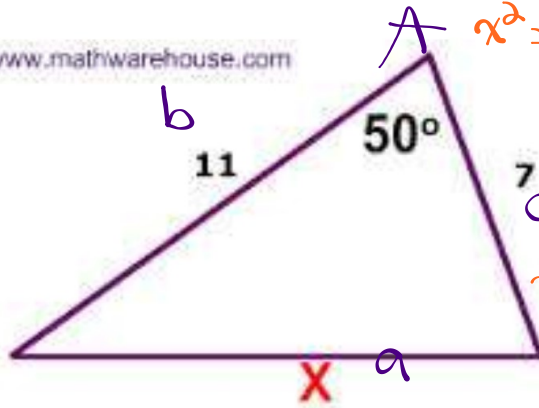
$$a^2 = b^2 + c^2 - 2bc \cos A$$



Case 1: Find the side x

Label the side across the angle given as: 'a'

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$$x^2 = 11^2 + 7^2 - 2(11)(7)\cos 50^\circ$$

$$x^2 = 121 + 49 - 154 \cos 50^\circ$$

Do not
Do this

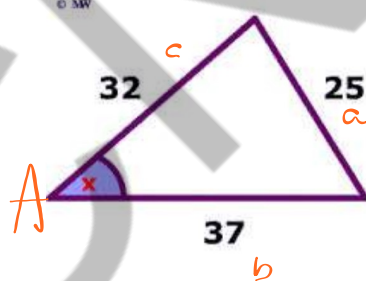
$$x^2 = 170 - 154 \cos 50^\circ$$

$$x^2 = 170 - 98.98$$

$$x = 8.4$$

Case 2: Find angle X

Label the unknown angle as: 'A'



$$25^2 = 37^2 + 32^2 - 2(37)(32)\cos A$$

$$625 = 2393 - 2368 \cos A$$

Do not
combine

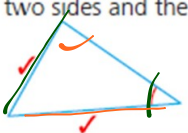
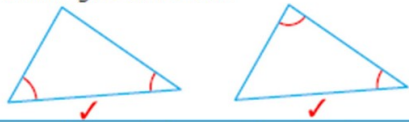
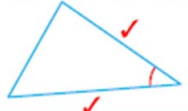
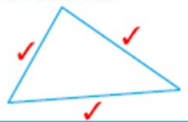
$$625 - 2393 = -2368 \cos A$$

$$\frac{-1768}{-2368} = \cos A$$

$$0.7466 = \cos A$$

$$\cos^{-1}(0.7466) = A$$

$$A = 41.7^\circ$$

Information Given	Measurement To Be Determined	Use
	angle	sine law
	side	sine law
 <p style="margin-left: 150px;">SAS</p>	side	cosine law
 <p style="margin-left: 150px;">SSS</p>	angle	cosine law

Find the measure of $\angle CED$ to the nearest degree.

Step 1 Find $m\overline{AC}$

$$\cos 18^\circ = \frac{4.5}{\overline{AC}} \Rightarrow \overline{AC} = 4.7\text{m}$$

Step 2 Find $m\overline{EC}$

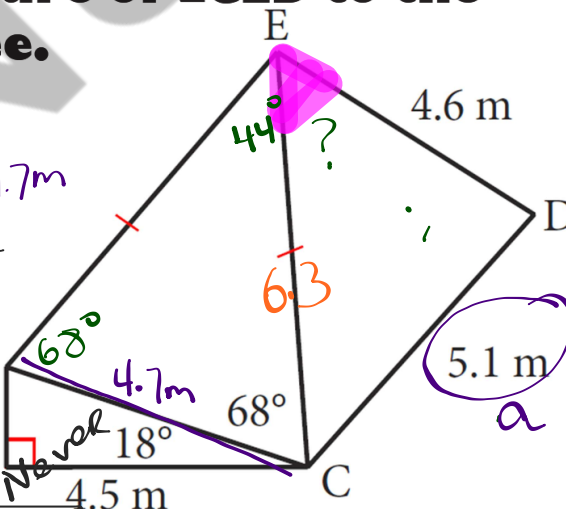
$$\overline{EC} = \frac{4.7}{\sin 68^\circ} \Rightarrow \overline{EC} = 6.3\text{m}$$

Step 3 Find $\angle DEC$

$$5.1^2 = 6.3^2 + 4.6^2 - 2(6.3)(4.6)\cos E$$

Note: Solving a triangle means finding all angles and sides.

$$\angle DEC = 53^\circ$$



CONCEPT SUMMARY		<i>Solving an Oblique Triangle</i>	
Given		Begin by Using	
two angles and any side		Law of Sines	
two sides and an angle opposite one of them		Law of Sines	
two sides and their included angle		Law of Cosines	
three sides		Law of Cosines	

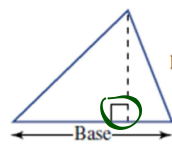
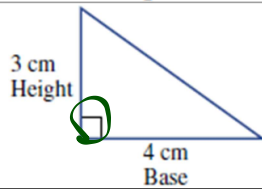
Homework p 241 #1-18

Sine p241 #2, 3, 8

Cosine p 243 # 10 a,d, 16, 17, 18

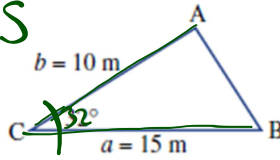
8.4 Area of a triangle pg. 247-249, pg.225

1:
General
Formula



$$A = \frac{b \times h}{2}$$

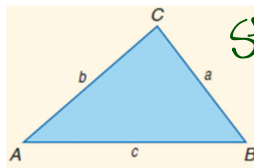
2: SAS
Trigonometric
Formula



$$A = \frac{a \times b \times \sin C}{2}$$

side side angle between 2 sides

3: Hero's
Law
SSS



$$A = \sqrt{p(p-a)(p-b)(p-c)}$$

where $p = \frac{a+b+c}{2}$

Step 2

Step 1

Calculate the area.

Herons

$$p = \frac{3+4+6}{2} = 6.5$$

3 km

6 km

$$A = \sqrt{6.5(6.5-3)(6.5-4)(6.5-6)}$$

$$= \sqrt{6.5(3.5)(2.5)(0.5)}$$

4 km

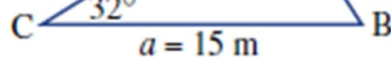
$$\sqrt{28.4} = 5.3$$

Square Root Last

TRIGONOMETRIC FORM

b = 10 m

$$A = \frac{15 \times 10 \times \sin 32}{2}$$



2

$$A = 39.7 \text{ m}^2$$

Homework p247 #1abc, 3, 4, p249 #8

Hints below: to look at only if help is needed.

Hint for number 3: Use formula 3 and then formula 2

Hint for number 4: Use formula 2 backwards.

End of chapter: OPTIONAL p 248 #1-8

Beginning of chapter: p225 **OPTIONAL**