

GRADE 10 ESSENTIAL
UNIT E – TRIGONOMETRY
SOLVING TRIANGLE FOR MISSING SIDE GIVEN AN ANGLE

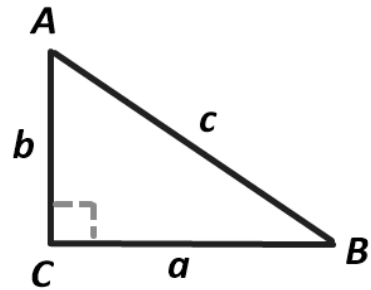
Name: _____

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1. Recall why we study triangles.

Every shape can be made up of triangles, and every triangle can be made up of 'right' triangles.

A right triangle has a 90° corner.

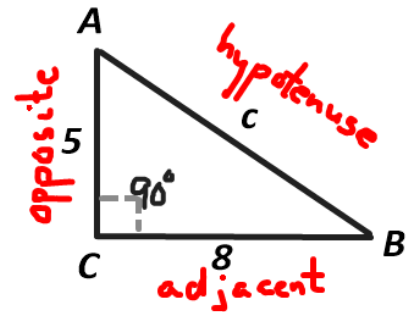


2. There are six possible measurements of a triangle, the three sides and the three corners. They are all closely related. If you know three of the measurements you can figure out all the rest. (except for one instance)

Solving for an angle given two sides

3. Recall how we found an *unknown angle* of a right triangle if given two sides.

Ancient tables tell us that every right triangle that has a 5 for every 8 ratio (for example) of its sides are similar and have the same corner angles.



Corner B of this triangle has an angle measure of: $\angle B = \tan^{-1} (5/8) \cong 32^\circ$

SOLVE FOR A MISSING SIDE GIVEN AN ANGLE AND ANOTHER SIDE

4. To solve for a missing side given an angle and a missing side we follow the same steps as before:

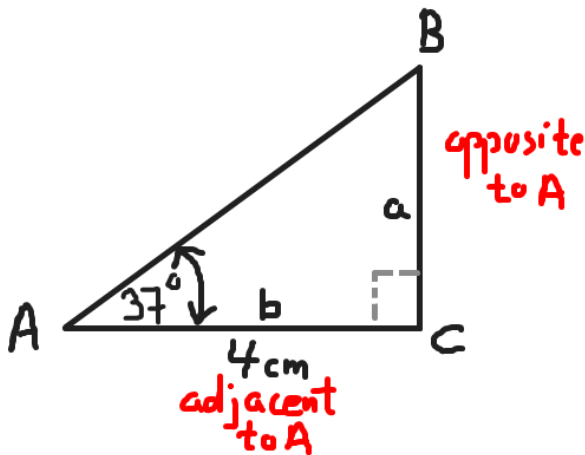
Identify the Given Corner, Label Triangle Sides, Select a Trig Formula, Plug in the Numbers, Solve

SOH CAH TOA

MrF

4.

Example: Determine Length 'a':



- $\angle A$ is the given angle measure
- 'a' is the side we want to know, the *opposite* to $\angle A$
- 'b' is a given side; the *adjacent* to the given angle
- Plugging into the *tangent* trig ratio

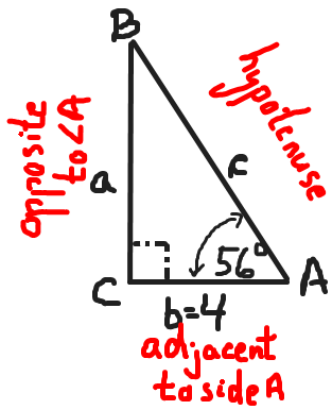
$$\tan(37^\circ) = \frac{a}{4}$$

- then juggle to isolate side 'a'

$$4 * \tan(37) = a;$$

$$a = 3.01 \text{ cm}$$

5. Example 2: Determine length of side c.



- Given $\angle A = 56^\circ$ and side $b = 4$
- Label sides
- Want the hypotenuse, given the adjacent; use the trigonometric ratio:

$$\cos A = \text{Adj/Hyp}$$

- Plug in the numbers

$$\cos 56^\circ = \frac{4}{c}$$

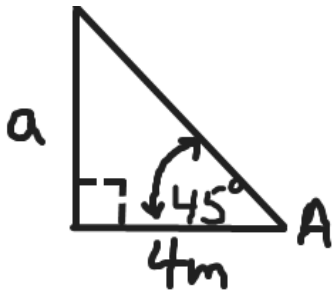
$$\cos 56^\circ = \frac{4}{c}$$

$$c = \frac{4}{\cos 56^\circ}$$

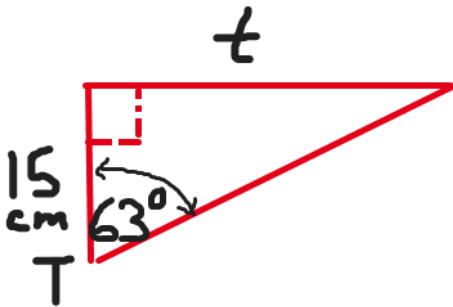
$$c = 4 / \cos(56) \quad 7.15$$

Side c is 7.15 units long.

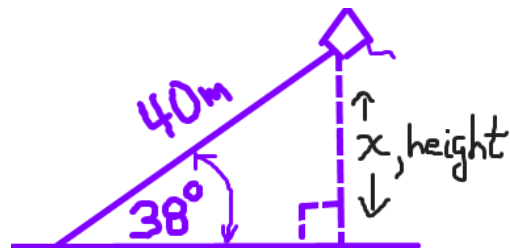
6. Determine length a



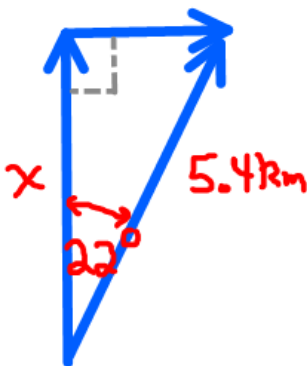
7. Determine length of side ' t '



8. You are out flying a kite with family. The string is 40 metres long, your phone shows an angle of 38° of 'elevation'. Determine the height, x , of the kite.



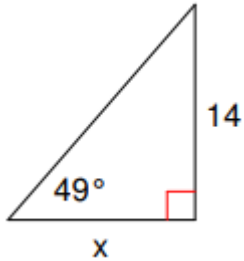
'height' means straight up, shortest distance, perpendicular to the level ground



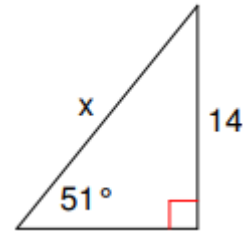
9. Jeff's GPS on his phone says it is 5.4 km at an angle of 22° on a compass to his friend's house. But that is a straight-line direct distance. Determine how far Jeff must walk north, length x , before he turns right (east) to get to his friend's house.

10. Solve the following triangles for the indicated side, x :
 (show your work of course following the proper method) (recall also that the hypotenuse is the longest side!) (These triangles are conveniently drawn almost properly to scale so your eyeball should give a close answer too!)

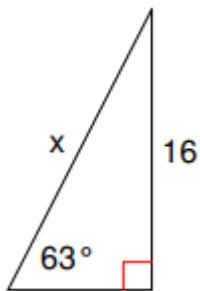
a.



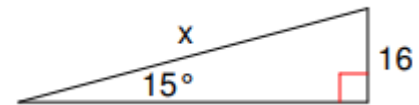
b.



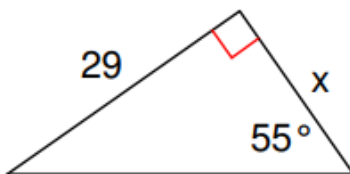
c.



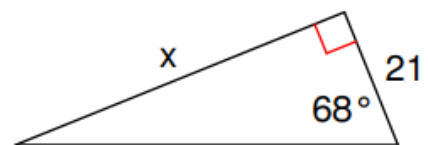
d.



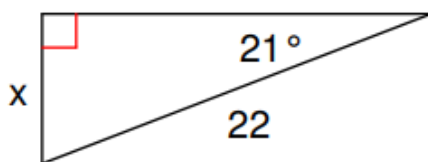
e.



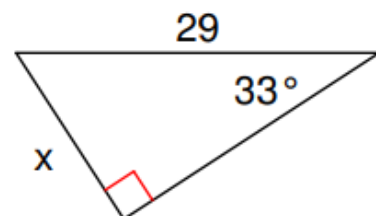
f.



g.



h.



ANSWERS

$$6. \tan (45) = a/4 ; a = 4.00$$

$$7. \tan (63) = t/15 ; t = 29.44$$

$$8. \sin 38 = x / 40 ; x = 24.63 \text{ metres high}$$

$$9. \cos 22^\circ = x / 5.4 ; x = 5.01 \text{ km}$$

$$10. \begin{array}{llll} \text{a. } 12.17 & \text{b. } 18.01 & \text{c. } 17.96 & \text{d. } 61.82 \\ \text{e. } 20.31 & \text{f. } 51.98 & \text{g. } 7.88 & \text{h. } 15.79 \end{array}$$