Lesson 4: Calculating the Measure of an Angle in Right Triangles

Friday, August 31, 2018   2:27 AM

Trigonometry Lesson #4:
Calculating the Measure of an Angle in Right Triangles

Review

(Pg.85)

In Lesson #2 we learned how to determine the measure of an angle, when given a trigonometric ratio for the angle. For review, complete the following example.

Determine, to the nearest degree, the acute angle for which **＊ use inverse trig functions**

a) $\sin x° = 0.45$

b) $\cos y° = 0.1624$

c) $\tan z° = 5.2$

$x° = \sin^{-1}(0.45)$
$x° = 27°$

$y° = \cos^{-1}(0.1624)$
$y° = 81°$

$z° = 79°$

**Calculating the Measure of an Angle**

In order to use the trigonometric ratios to determine the measure of an angle in a right triangle, we need to know the lengths of two of the sides of the triangle.
Complete the following work for the diagram shown.
Relative to the angle $a°$, 16 is the length of the ADJACENT side and 34 is the length of the _____.
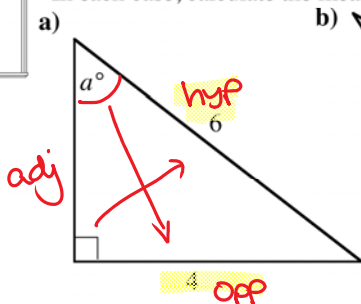
The trigonometric ratio which involves the ADJACENT and the _____ is the _____ ratio.

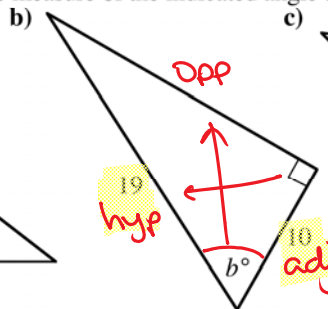_____ $a° = \dfrac{16}{34}$, so $a° = $ _____ to the nearest degree.

SOH CAH TOA
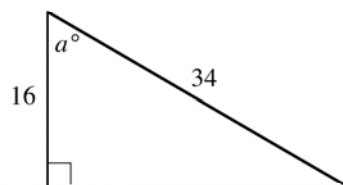
Class Ex. #1 In each case, calculate the measure of the indicated angle to the nearest degree.

a) $a°$ hyp 6 adj 4 opp

$\sin a° = \dfrac{4}{6}$

$a° = \sin^{-1}\left(\dfrac{4}{6}\right)$

$a° = 42°$

b) opp 19 hyp 10 adj $b°$

$\cos b° = \dfrac{10}{19}$

$b° = \cos^{-1}\left(\dfrac{10}{19}\right)$

$b° = 58°$

c) 29 hyp $c°$ 21 opp 20 adj

$4 ÷ 6 = \sin^{-1}$

$\tan c° = \dfrac{21}{20}$

$c° = \tan^{-1}\left(\dfrac{21}{20}\right)$

$c° = 46°$
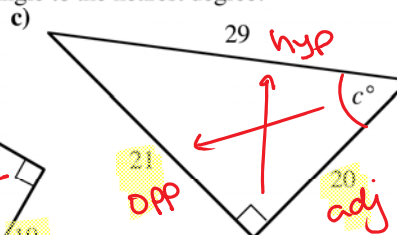
Complete Assignment Questions #1 - #5

Angle of Elevation, Angle of Depression

- The **angle of elevation** is measured upwards from the horizontal. The sketch at the right illustrates the angle of elevation of the helicopter from the boat.

  line of sight

  angle of elevation of the helicopter from the boat
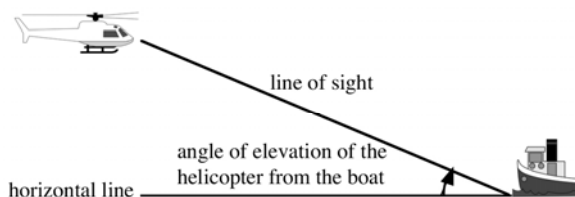
  horizontal line

- The **angle of depression** is measured downwards from the horizontal. The sketch at the right illustrates the angle of depression of the boat from the helicopter.

  horizontal line

  angle of depression of the boat from the helicopter

  line of sight

  horizontal line

  angle of depression

  line of sight

  angle of elevation
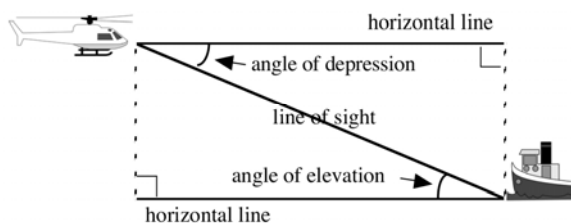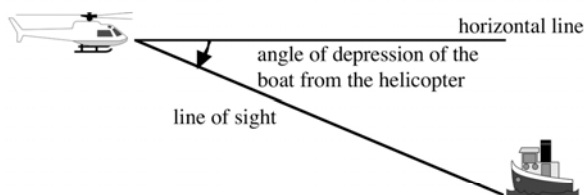
  horizontal line

- Note that angles of elevation and angles of depression are determined from the horizontal and NOT from the vertical.

- The sketch above shows that: angle of elevation of the helicopter from the boat = angle of depression of the boat from the helicopter
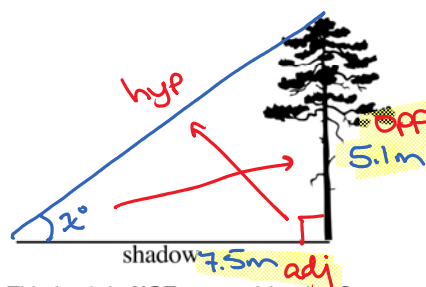

Class Ex. #2

A tree 5.1 m tall casts a shadow 7.5 m long. Calculate the angle of elevation of the sun to the nearest tenth of a degree.
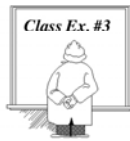
$$\tan x° = \frac{5.1}{7.5}$$

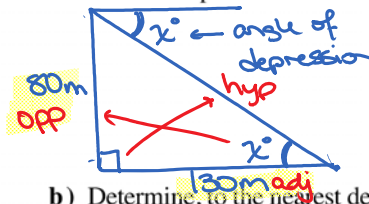$$x° = \tan^{-1}\left(\frac{5.1}{7.5}\right)$$

$$x° = 34.2°$$

hyp

opp

5.1m

$x°$

shadow 7.5m

adj

Class Ex. #3

A boat is 130 m from the base of a cliff. The cliff is 80 m high.

a) Draw a diagram to represent this scenario and mark the angle of depression of the boat from the top of the cliff.

$x°$ ← angle of depression

80m OPP

hyp

$x°$

130m adj

b) Determine, to the nearest degree, the angle of depression of the boat from the top of the cliff.

$$\tan x° = \frac{80}{130}$$

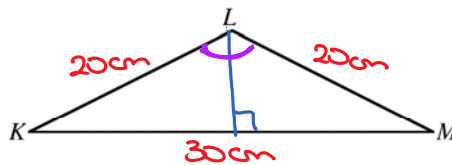$$x° = \tan^{-1}\left(\frac{80}{130}\right)$$

$$x° = 32°$$

Isosceles Triangles

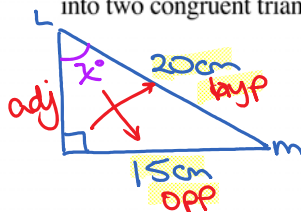**Class Ex. #4**

Consider isosceles triangle *KLM* in which *KL* = 20 cm, *LM* = 20 cm, and *KM* = 30 cm.

L

20cm   20cm

K ————30cm———— *M*

a) Why can't we use SOHCAHTOA in triangle *KLM* to determine the measure of angle *KLM*?

ΔKLM is not a right triangle

b) Determine, to the nearest degree, the measure of angle *KLM* by splitting triangle *KLM* into two congruent triangles.

L

$x°$ 20cm

adj   hyp

m

15cm OPP

$$\sin x° = \frac{15}{20}$$

$$x° = \sin^{-1}\left(\frac{15}{20}\right)$$

$$x° = 48.5903...$$

∠KLM = 2 × 48.5903...

= 97°

Complete Assignment Questions #6 - #14