Trigonometric Ratios

*** Must have calculator in DEGREE mode ***

HYPOTENUSE

OPPOSITE

Reference angle

θ

Theta

ADJACENT
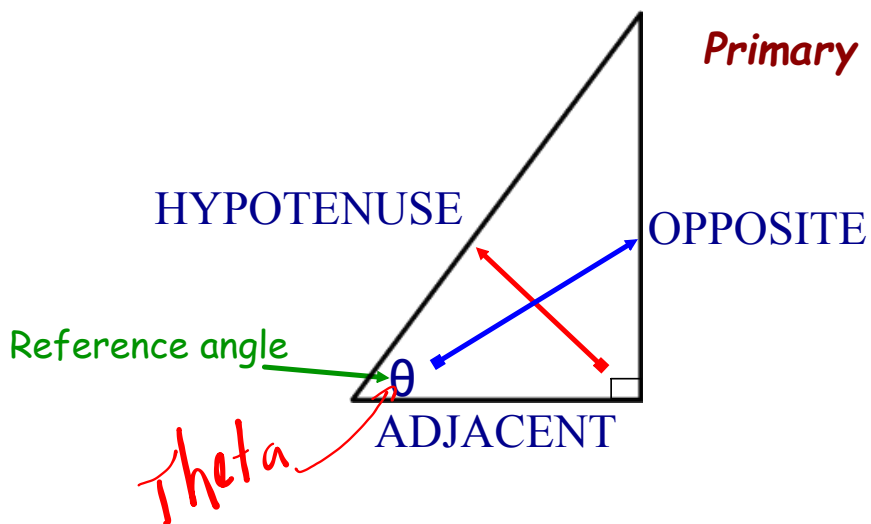
Primary Trigonometric Ratios

$$\sin\theta = \frac{opp}{hyp}$$

$$\cos\theta = \frac{adj}{hyp}$$

$$\tan\theta = \frac{opp}{adj}$$

Memory Aid: "SOH CAH TOA"

EXAMPLE - Finding an unknown side   SOH CAH TOA

hyp
12.8 cm
44°
sin
x

$$12.8 \cdot \cos 44° = \frac{x (12.8)}{12.8}$$

$$9.21 cm = x$$

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8 opp
23°
y hyp

$$y \cdot \frac{\sin 23°}{\sin 23°} = \frac{8 \cdot y}{y \sin 23°}$$

switch →

$$y = \frac{8}{\sin 23°}$$

EXAMPLE - Finding an unknown angle

18.1 m   opp
adj
14.3 m   θ

$$\tan^{-1} \tan \theta = \left(\frac{18.1}{14.3}\right)$$

$$\tan^{-1}\left(\frac{18.1}{14.3}\right)$$

$$\theta = 52°$$

EXAMPLE - Solve the triangle (find ALL sides and angles)

x²   5 - 12 - 13
adj   M   15 - 36 - 39
15 mm   a
  67°   23°
A   hyp   G
  39 mm

$$a^2 = 39^2 - 15^2$$

$$\sqrt{a^2} = \sqrt{1296}$$

$$a = 36$$

$$\cos A = \frac{15}{39}$$

$$\cos^{-1}\left(\frac{15}{39}\right)$$

$$\angle A = 67°$$

$$\angle G = 23°$$

L   b   17.2 y opp   I
  35°   55   adj
$\angle B = 55°$ i hyp   10.25
    B

$$\tan 55° = \frac{b}{10.25}$$

$$14.64 = b$$
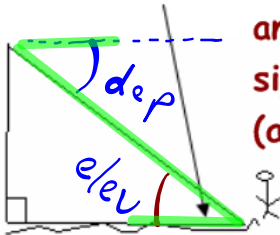
$$\cos 55° = \frac{10.25}{i}$$

$$i = \frac{10.25}{\cos 55°}$$

$$i = 17.87$$

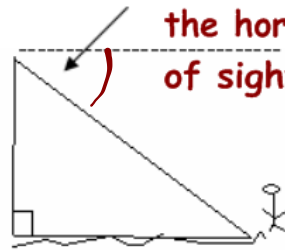# Applications of Right Angle Trigonometry

ANGLE OF ELEVATION/DEPRESSION

Angle of elevation – is the angle between the ground and the line of sight.
(angle of inclination)

Always from the GROUND up

Angle of Depression – is the angle between the horizon and the line of sight.

Always outside the triangle

$\angle$ of elev = $\angle$ of depression

Example 1:

Two trees are 100m apart. From a point on <u>midway</u> between them, the angles of elevation to their tops are 8° and 13°. How much taller is one tree than <u>the other</u>?
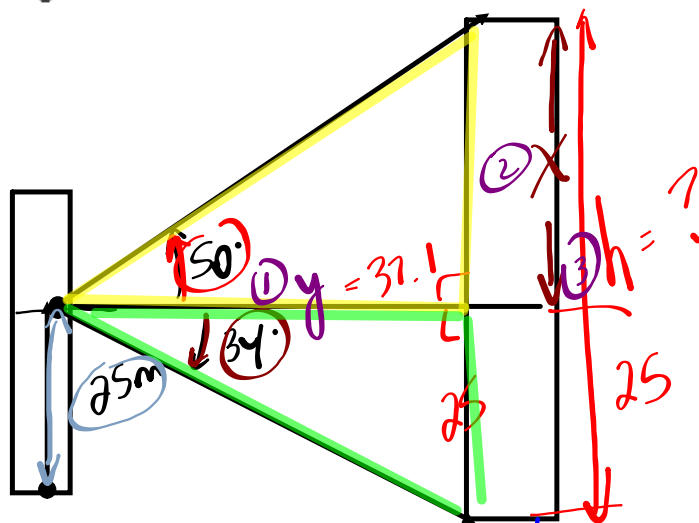

① $\tan 13° = \dfrac{x^{(50)}}{50}$

$11.5 = x$

② $\tan 8° = \dfrac{y}{50}^{(50)}$

$7.0 = y$

③ Taller $= 11.5 - 7$

$= 4.5 m$

Example 2:

The 8th floor of an apartment building is 25m above the ground. From the 8th floor, the angle of elevation to the top of the other building is 50°. The angle of depression to the base of the taller building is 34°. Determine the height of the taller building.

① $\tan 34° = \dfrac{25}{y}$

$y = \dfrac{25}{\tan 34°}$

$y = 37.1$

② $\tan 50° = \dfrac{x}{37.1}$ (37.1)

$44.2 = x$

③ $h = 44.2 + 25$

$h = 69.2 \, m$

HOMEWORK:

Trig Booklet...

10.7 - #2, 3, 10, 11a, b

10.8 - #1, 3, 4, 6