Trigonometric Ratios

*** Must have calculator in DEGREE mode ***
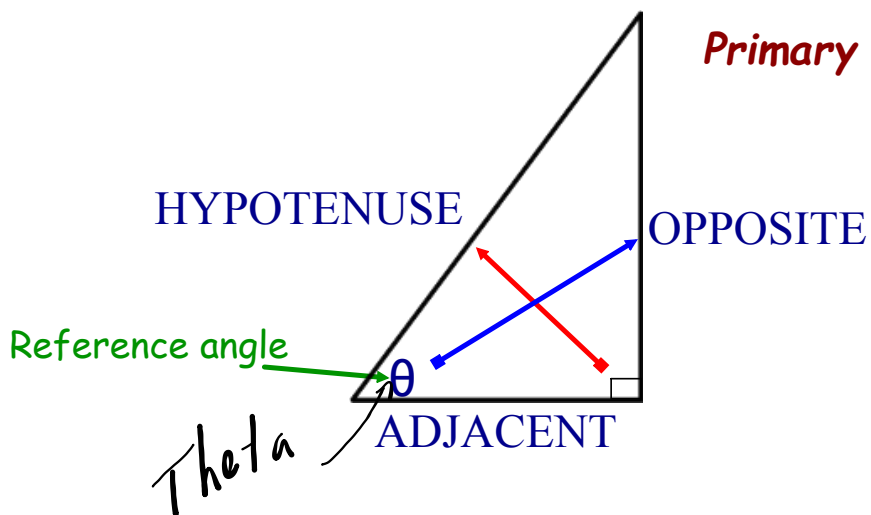
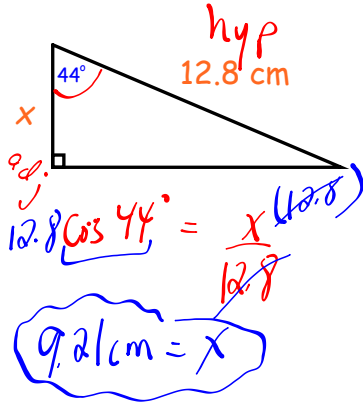*Primary Trigonometric Ratios*

HYPOTENUSE   OPPOSITE

Reference angle   θ

Thela

ADJACENT

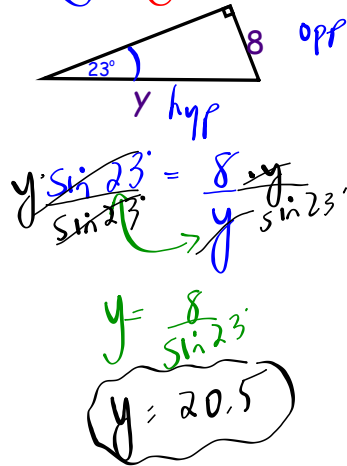$$\sin \theta = \frac{opp}{hyp}$$

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

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

Memory Aid: "SOH CAH TOA"

EXAMPLE - Finding an unknown side

SOH, CAH, TOA

hyp
12.8 cm
44°
x
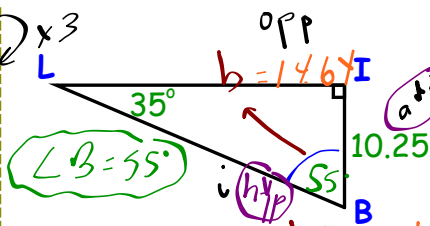adj.

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

$9.21 cm = x$

8   opp
23°
y   hyp

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

$y = \dfrac{8}{\sin 23°}$

$y = 20.5$

inverse

EXAMPLE - Finding an unknown angle

18.1 m   opp
adj
14.3 m
θ

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

$\theta = 52$
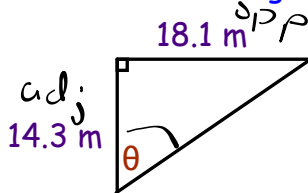
EXAMPLE - Solve the triangle (find ALL sides and angles)

S-12-13 ×3
15-(36)-39

M
15 mm adj
67°
a
A
39 mm hyp
G

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

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

$a = 36$

$\cos^{-1} A = \dfrac{15}{39}$

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

$\angle A = 67°$
$\angle G = 23$

opp
L   b = 14.64 I
35°
adj
10.25
∠B = 55°
hyp 55°
B

$10.25 \tan 55° = \dfrac{b}{10.25}(10.25)$

$14.64 = b$

$\cos 55° = \dfrac{10.25}{i}$

$i = \dfrac{10.25}{\cos 55°}$

$i = 17.87$
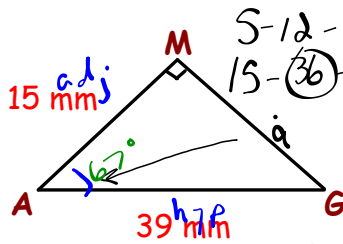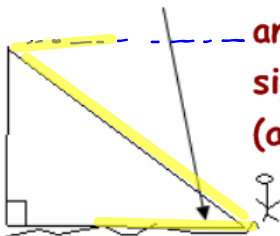
$$\sqrt{1296} = 36$$

$$\sqrt{x} = x^{1/2}$$

$$x^{-1} = \frac{1}{x}$$

$$\sqrt{x^2} = (x^2)^{1/2}$$

$$= x^1$$
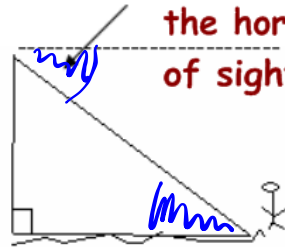
Applications of Right Angle Trigonometry

ANGLE OF ELEVATION/DEPRESSION

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

Angle of Depression – is the angle between the horizon and the line of sight.
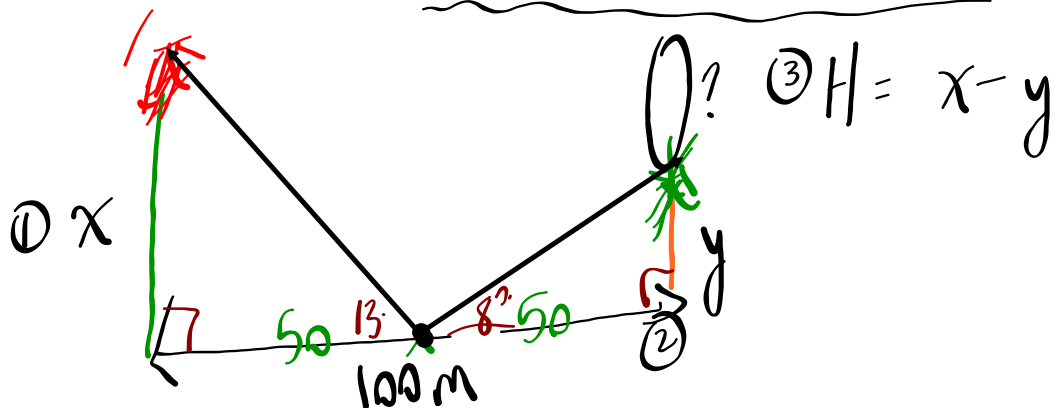
Always from the GROUND up

Always outside the triangle

$\angle$ of elevation = $\angle$ of depression

Example 1:

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

③ $H = x - y$

① x

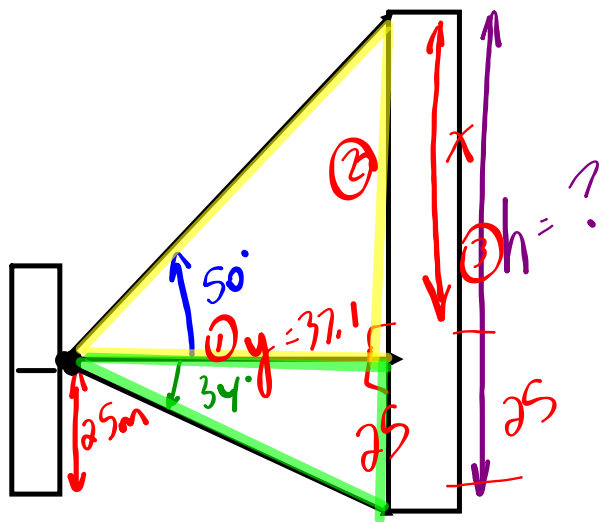③ $\tan 13 = \frac{x}{50}$ (50)

$11.5^m = x$

② $\tan 8 = \frac{y}{50}$

$50 \tan 8 = y$

$7.0 = y$

③ $H = 11.5 - 7$

$= 4.5 m$

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 $\tan 50° = \dfrac{x}{37.1}$

$37.1 \tan 50° = x$

$44.2 = x$

③ $h = 44.2 + 25$.

$h = 69.2$

(diagram labels) 50°, ① y = 37.1, 34°, 25m, ②, x, ③ h = ?, 25, 25

HOMEWORK:

Trig Booklet...

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

10.8 - #1, 3, 4, 6