Lesson 5.1.1 Resource Page Name _____

TRIANGLE TOOLKIT

OPP / ADJ

TAN

Tool Name: **Tangent Ratio**

When can we use this?

Right Δ only!

Involves: an acute angle

its **Opposite Leg**

and its **Adjacent Leg**

$\tan(45) = \frac{1}{1}$

$$\frac{\tan(<)}{1} = \frac{Opposite\ Leg}{Adjacent\ Leg}$$

$$\frac{\tan(<)}{1} = \frac{rise}{run}\ or\ \frac{\Delta y}{\Delta x}$$

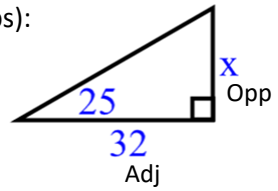
$$\tan(<) = Slope$$

Example (must show all steps):

$$\frac{\tan(25)}{1} = \frac{x}{32}$$

$$32 \cdot \tan(25) = x$$

$$14.92 \approx x$$



OPP / HYP

SIN

Tool Name: **Sine Ratio**

When can we use this?

Right Δ only!

Involves: an acute angle

its **Opposite Leg**

and the **Hypotenuse**

$\sin(60) = \frac{\sqrt{3}}{2}$

$$\frac{\sin(<)}{1} = \frac{Opposite\ Leg}{Hypotenuse}$$

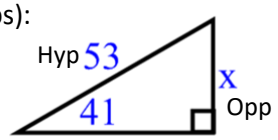
$$\frac{\sin(<)}{1} = \frac{rise}{hyp}\ or\ \frac{\Delta y}{hyp}$$

Example (must show all steps):

$$\frac{\sin(41)}{1} = \frac{x}{53}$$

$$53 \cdot \sin(41) = x$$

$$34.77 \approx x$$



ADJ / HYP

COS

Tool Name: **Cosine Ratio**

When can we use this?

Right Δ only!

Involves: an acute angle

its **Adjacent Leg**

and the **Hypotenuse**

$\cos(60) = \frac{1}{2}$

$$\frac{\cos(<)}{1} = \frac{Adjacent\ Leg}{Hypotenuse}$$

$$\frac{\cos(<)}{1} = \frac{run}{hyp}\ or\ \frac{\Delta x}{hyp}$$

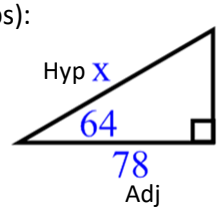
Example (must show all steps):

$$\frac{\cos(64)}{1} = \frac{78}{x}$$

$$x \cdot \cos(64) = 78$$

$$x = \frac{78}{\cos(64)}$$

$$x \approx 177.93$$



HYP IS C !

Tool Name: **Pythagorean Theorem**

When can we use this?

Right Δ only!

Involves: Angle measures ok, but not needed

Must have: **2 side lengths**

Trying to find: **3rd side length**

$$leg^2 + leg^2 = hyp^2$$

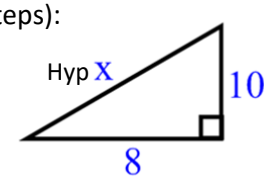
$$a^2 + b^2 = c^2$$

Example 1 (must show all steps):

$$8^2 + 10^2 = x^2$$

$$164 = x^2$$

$$\sqrt{164} = x$$



Example 2 (must show all steps):

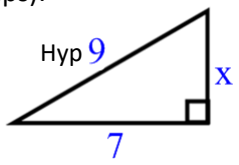
$$x^2 + 7^2 = 9^2$$

$$x^2 + 49 = 81$$

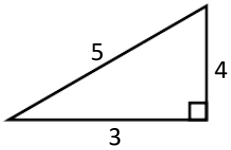
$$-49 \quad -49$$

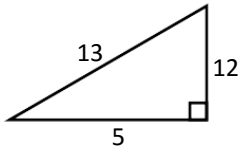
$$x^2 = 32$$

$$x = \sqrt{32}$$



Common triples:





FIND THE ANGLE

Tool Name: **Inverse Trig**

When can we use this?

Right Δ only!

Involves: Must have: **2 side lengths**

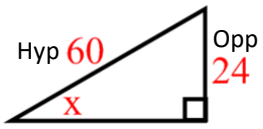
Trying to find: **one acute angle**

Can be: **tan^{-1} or sin^{-1} or cos^{-1}**

Remember!

$$\frac{\tan(<)}{1} = \frac{Opp}{Adj} \qquad \frac{\sin(<)}{1} = \frac{Opp}{Hyp} \qquad \frac{\cos(<)}{1} = \frac{Adj}{Hyp}$$

Example (must show all steps):



$$\frac{\sin(x)}{1} = \frac{24}{60}$$

$$x = \sin^{-1}\left(\frac{24}{60}\right)$$

$$23.58 \approx x$$

30-60

Tool Name: **30-60-90 Δ**

When can we use this?

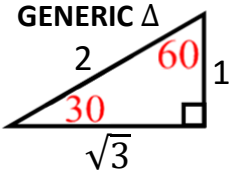
30-60-90 Δ only!

Must have: **a 30-60-90 Δ**

Can't assume: **Angle measures**

In the **generic Δ**, $\sqrt{3}$ is **ALWAYS** across from the 60° angle!

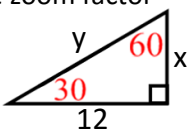
GENERIC Δ



Just multiply the sides of the **GENERIC by the zoom factor**

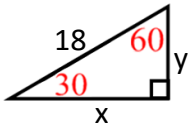
$$zf = \frac{12 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \frac{12\sqrt{3}}{\sqrt{9}} = \frac{12\sqrt{3}}{3} = 4\sqrt{3},$$

so $x = 4\sqrt{3} \cdot 1 = 4\sqrt{3}$, and $y = 4\sqrt{3} \cdot 2 = 8\sqrt{3}$



$$zf = \frac{18}{2} = 9, \text{ so } y = 9 \cdot 1 = 9,$$

and $x = 9 \cdot \sqrt{3} = 9\sqrt{3}$



45-45

Tool Name: **45-45-90 Δ**

When can we use this?

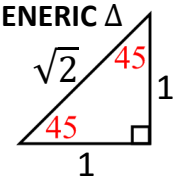
45-45-90 Δ only!

Must have: **a 45-45-90 Δ**

Can't assume: **Angle measures**

In the **generic Δ**, $\sqrt{2}$ is **ALWAYS** the hypotenuse!

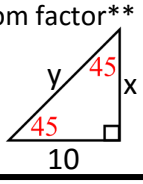
GENERIC Δ



Just multiply the sides of the **GENERIC by the zoom factor**

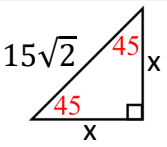
$$zf = \frac{10}{1} = 10, \text{ so } x = 10 \cdot 1 = 10,$$

and $y = 10 \cdot \sqrt{2} = 10\sqrt{2}$



$$zf = \frac{15\sqrt{2}}{\sqrt{2}} = 15,$$

so $x = 15 \cdot 1 = 15$



NON RIGHT Δ's !

Tool Name: **Law of Sines** **Can be used on a non-right Δ!**

When can we use this?

Must have: **2 angles and one opposite side**

Trying to find: **other opposite side**

OR

Must have: **2 sides and one opposite angle**

Trying to find: **other opposite angle**

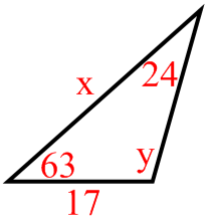
Example (must show all steps):

$$\frac{\sin(24)}{17} = \frac{\sin(93)}{x}$$

$$x \cdot \sin(24) = 17 \cdot \sin(93)$$

$$x = \frac{17 \cdot \sin(93)}{\sin(24)}$$

$$x \approx 41.74$$



$$y = 93 \ (\Delta \text{ sum})$$

NON RIGHT Δ's ! LOOK FOR SAS !

Tool Name: **Law of Cosines** **Can be used on a non-right Δ!**

When can we use this?

Must have: **SAS (side-angle-side)**

Trying to find: **3rd side**

OR

Must have: **3 sides**

Trying to find: **one angle**

Example (must show all steps):

$$x^2 = 15^2 + 12^2 - 2 \cdot 15 \cdot 12 \cdot \cos(110)$$

$$x^2 = 369 - 360 \cdot \cos(110)$$

$$x = \sqrt{369 - 360 \cdot \cos(110)}$$

$$x \approx 22.18$$