8.0 – Naming Triangles and Pythagoras

Name: KEY
Date:

To learn how to correctly name triangles, their sides and their angles, and to use Pythagoras.

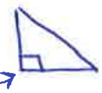
Learning Target: ↑

Toolkit:

- Labeling angles and sides of triangles
- All angles in a triangle add to 180°
- Pythagoras: $a^2 + b^2 = c^2$ (c is hyp!)
- Labelling triangles from a target angle

Definitions

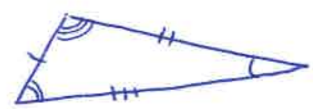
Right triangle – Has an angle of 90°



Equilateral triangle – All three sides are equal lengths. All three angles are equal.

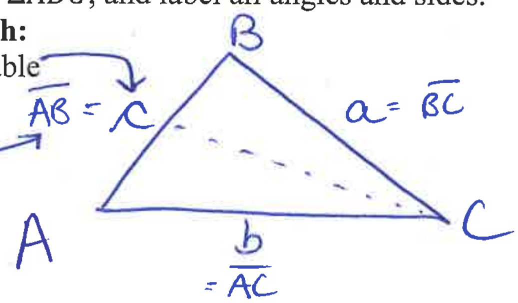
Isosceles triangle – 2 sides are equal lengths. The 2 angles OPPOSITE equal sides are equal.

Scalene triangle – All three sides are different lengths. All three angles are different.



Labelling angles and sides of triangles

Ex 1) Draw a triangle, ΔABC, and label all angles and sides.
Label sides using both:
- One lower case variable
- Two endpoints



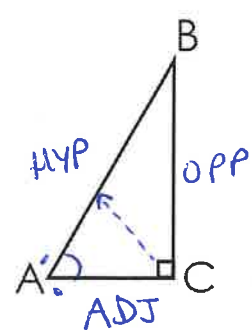
Big letters for angles. Lower case for sides. Angles/sides across from eachother have same letter.

Labelling angles from a target angle

(Only for right triangles!)

In this chapter, we will also want to label the sides of a RIGHT triangle based their position in relation to a target angle which we use as a reference point.

Ex 2) In reference to angle A, label
- the hypotenuse (HYP) - across from 90°
- the side opposite to A (OPP)
- the side adjacent to A (ADJ)

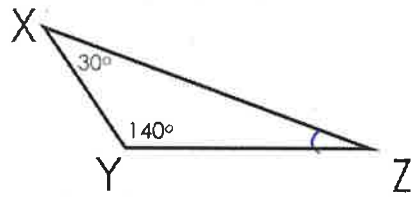


Angles in a triangle

The sum of the angles in a triangle is 180°

Ex 3) Find the missing angle(s).

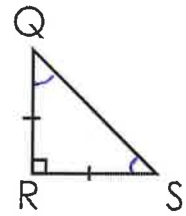
a)



$\angle Z = 180° - 140° - 30°$

$\angle Z = 10°$

b)



Isosceles $\Rightarrow \angle Q = \angle S$

$\angle R = 90°$ so $180° - 90° = 90°$

The remaining 90° is split evenly: $90° \div 2$

$\angle Q = \angle S = 45°$

Pythagoras

(Only for right triangles!)

Pythagoras – Remember, "c" MUST be the hypotenuse, or the side across from the right angle!

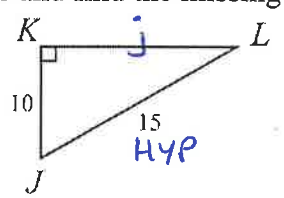
find hyp

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

note: $a^2 = c^2 - b^2$ can use to find a short side (not hyp).

Ex 4) Name and find the missing side(s) (nearest tenth)

a)



$j^2 = k^2 - l^2$

$j^2 = 15^2 - 10^2$

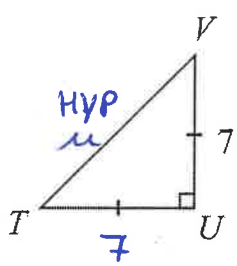
$j^2 = 225 - 100$

$j^2 = 125$ $\boxed{\sqrt{\ }}$ both sides

$j = 11.1803$

$j = 11.2$

b)



$t^2 + v^2 = u^2$

$7^2 + 7^2 = u^2$

$49 + 49 = u^2$

$98 = u^2$ $\boxed{\sqrt{\ }}$

$u = \sqrt{98}$

$u = 9.899$

$u = 9.9$

8.1A– Finding Angles and Sides from the Tangent Ratio

Learning Target:

to develop the tangent ratio and use it to find missing sides and angles in a right triangle

Toolkit:

- Similar Triangles
- Labeling sides and angles of a triangle
- All angles add to 180°

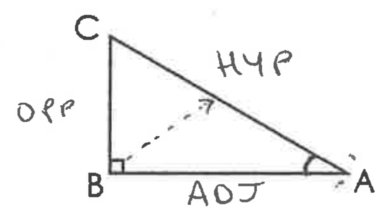
Terminology:

Hypotenuse: The longest side of a right triangle (and always opposite the right angle) (HYP)
Opposite: The side that does NOT touch the angle (OPP)
Adjacent: The side that DOES touch the angle (and is not the hypotenuse) (ADJ)

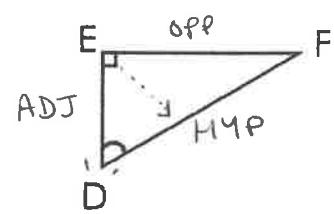
Naming Sides:

We name the sides of a right triangle (a triangle with a 90° angle) in relation to one of its acute angles (one of the angles that is NOT 90°)

Ex 1)



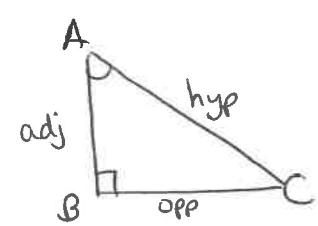
TRY:



THE TANGENT RATIO

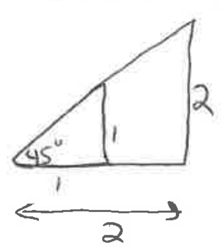
If $< A$ is an acute angle in a right triangle, then:

$$\text{Tan A} = \frac{\textit{length of side opposite} <A}{\textit{length of side adjacent to} <A}$$



*** MAKE SURE CALCULATOR IS IN DEGREE MODE***

Similar △s:



$\tan 45° = \frac{1}{1} = 1$

$\tan 45° = \frac{2}{2} = 1$

Determining the Tangent Ratios for Angles:

Ex 2) Determine each tangent ratio to FOUR decimal places:

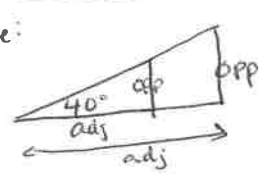
a) $\tan 40°$

0.8391

b) $\tan 70°$

2.7475

note:



Determining Angles from Tangent Ratios:

You can use a scientific calculator to find an angle when you know its tangent. The $\boxed{\tan^{-1}}$ operation does this.

➔ $\boxed{\text{Shift}}\boxed{\text{Tan}}$

or

➔ $\boxed{\text{2ndF}}\boxed{\text{Tan}}$

Ex 3) Determine the measure of each angle, to the nearest degree:

"theta"

a) $\tan\theta = 4.5$

$\theta = \tan^{-1}(4.5)$

$\theta = 77.47$

$\theta = 77°$

b) $\tan B = \frac{3}{4}$

or type in $3/4 = 0.75$ $\tan^{-1}(0.75)$

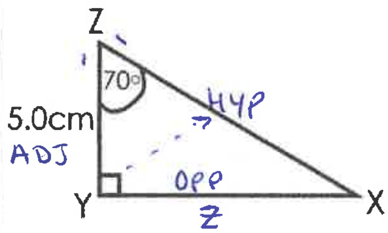
$B = \tan^{-1}(3/4)$

$B = 36.8699$

$B = 37°$

Using the Tan Ratio to Determine the Measure of a Side:

Ex 4) Determine the length of side **z** to the nearest tenth of a centimeter.



angle = θ

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

$5 \times \tan 70° = \frac{z}{5} \times 5$

solve for z.
H is being ÷ 5
opposite operation?
× 5
same to both sides.

$z = 5 \times \tan(70)$

$z = 13.7374$

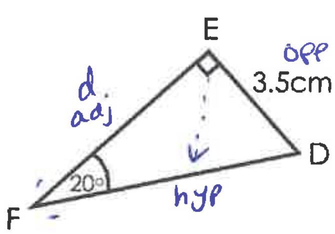
$z = 13.7\text{ cm}$

Steps:

given angle when looking for a side

1) Label the triangle (use the missing angle as your target angle)
2) Write out the Tan formula (with variables for the angle and the 2 sides)
3) Fill in the formula with the values you know (you must know 2 of the 3)
4) Solve for the variable you are missing.
   a) If you are finding a SIDE, use Tan.
   b) If you are finding and ANGLE, use Tan^{-1}.

Ex 5) Determine the length of side **d** to the nearest tenth of a centimeter.



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

$\tan 20 = \frac{3.5}{d}$

$d = \frac{3.5}{\tan 20}$

$d = 3.5/(\tan 20)$

$d = 9.6\text{ cm}$

- d is on the bottom!
- cross multiplication says we can SWAP tan20 and d

Cross Multiply:

$\frac{\tan 20}{1} = \frac{3.5}{d}$

multiply the pair

divide by the spare

$d = 1 \times 3.5 \div \tan 20$

$d = \frac{3.5}{\tan 20}$

How is the calculation different solving for the OPPosite side compared to the ADJacent side?

$\tan 32 = \frac{x}{4}$ x on top?

multiply by 4

$x = 4\tan 32$

vs

$\tan 65 = \frac{7}{x}$ x on bottom?

Swap x and tan 65

$x = \frac{7}{\tan 65}$

Remember the Steps:

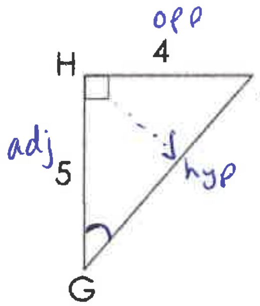
1) Label the triangle: your target angle is either the given angle (when looking for a side) or the angle you are looking for
2) Write out the Tan formula (with variables for the angle and the 2 sides)
3) Fill in the formula with the values you know (you must know 2 of the 3)
4) Solve for the variable you are missing.
   a) If you are finding a SIDE, use Tan.
   b) If you are finding and ANGLE, use Tan^{-1}.

Using the Tan Ratio to Determine the Measure of an Angle:

Looking for an angle? use $\tan^{-1}$

$\boxed{\text{2ndF}}$ or $\boxed{\text{Shift}}$ button.

Ex 6) Determine the measure of <G and to the nearest tenth of a degree.



target angle. "stand here" and label opp/adj/hyp.

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

$\tan^{-1} \tan G = \frac{4}{5} \tan^{-1}$

to get "G" alone - we need the opposite of tan → $\boxed{\tan^{-1}}$ same to both sides

$G = \tan^{-1}(4/5)$

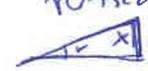
$G = 38.6598$

$G = 38.7$

Definition:

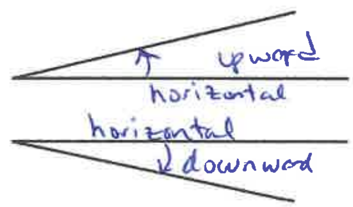
Angle of Inclination – This is the ACUTE angle that a line makes with the horizontal

(never vertical)



Angle of Elevation

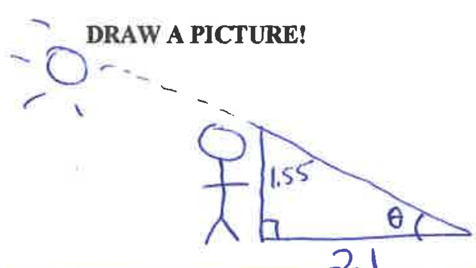
Angle of Depression



Using the Tan Ratio to Determine the Angle of Inclination:

Ex 7) Sarah is 1.55m tall and her shadow is 2.1m long. Determine the angle of elevation of the sun to the nearest degree.

DRAW A PICTURE!



The angle of inclination of the sun is 36°.

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

$\tan\theta = \frac{1.55}{2.1}$

$\theta = \tan^{-1}(1.55/2.1)$

$\theta = 36.4309$

$\theta = 36°$

8.1B – The Sine and Cosine Ratios

Learning Target:

to develop the sine and cosine ratios and use them to find missing sides and angles in a right triangle

Toolkit:

- Labeling sides and angles of a triangle
- What you have learned about the Tan ratio
- Angle of elevation vs depression

(HYP) – **Hypotenuse**: The longest side of a right triangle (and always across from right angle)
(OPP) – **Opposite**: The side opposite the target angle that does NOT touch that angle
(ADJ) – **Adjacent**: The side next to the target angle that DOES touch that angle (and is not the hypotenuse)

THE SINE RATIO

If < A is an acute angle in a right triangle, then

$$\text{Sin A} = \frac{\text{length of side opposite} < A}{\text{length of hypotenuse}}$$

THE COSINE RATIO

If < A is an acute angle in a right triangle, then

$$\text{Cos A} = \frac{\text{length of side adjacent} < A}{\text{length of hypotenuse}}$$

How can I remember the formulas for Sin/Cos/Tan?

"S O H | C A H | T O A"

Sin = Opp ÷ Hyp | Cos = Adj ÷ Hyp | Tan = Opp ÷ Adj

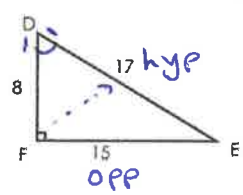
$$S\frac{O}{H}\ C\frac{A}{H}\ T\frac{O}{A}$$

Determining Sine and Cosine of an Angle

Ex1) a) In triangle DEF, identify the side opposite <D, the side adjacent to <D, and the hypotenuse

↑ target angle. "stand" here to label

adj



b) Determine the ratios Sin D and Cos D, and give the values as ratios in lowest terms AND as decimals (nearest hundredth)

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

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

$\sin D = \frac{15}{17} = 0.8824$

$\cos D = \frac{8}{17} = 0.4706$

Determining the Sin and Cos Ratios for Angles

Ex 2) Determine each ratio to FOUR decimal places:

a) sin 20°

$= 0.3420$

b) cos 60°

0.5

Determining Angles from Sin and Cos Ratios

Ex 3) Determine the measure of each angle, to the nearest degree:

a) $\cos\theta = 0.3333$

$\theta = \cos^{-1}(0.3333)$

$\theta = 70.53$

$\theta = 71°$

b) $\sin B = \frac{3}{5}$

$B = \sin^{-1}(3/5)$

$B = 36.8699$

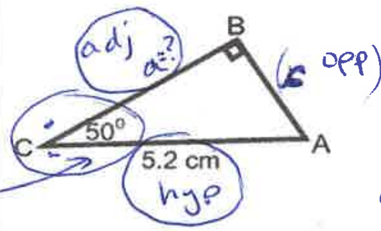
$B = 37°$

You can use a scientific calculator to find an angle when you know its tan, sin or cos. The $\boxed{}^{-1}$ operation does this.

➔ Shift
or
➔ 2ndF

Determining the Measure of a Side

Ex 4) Determine the length of side **a** to the nearest tenth of a centimeter.



Target angle - use "given" acute angle.

given ✓ angle
✓ hyp
need → adj

working with "AH" → use cos

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

$5.2 \times \cos 50° = \frac{a}{5.2} \times 5.2$

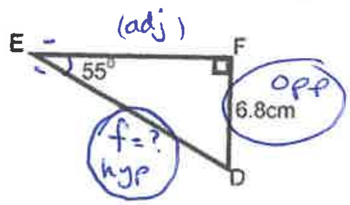
$a = 5.2 \times \cos 50°$

$a = 3.3\text{ cm}$ (makes sense - shorter than hyp!)

How are the steps different now?

1) Label the triangle: your target angle is either the given angle (when looking for a side) or the angle you are looking for
2) Decide which formula to use (Sin, Cos, or Tan?). You must know 2 of the 3 measures in the formula (2 sides to find the angle, or an angle and one side to find a missing side). Write out the formula.
3) Fill in the formula with the values you know (you must know 2 of the 3)
4) Solve for the variable you are missing.
   a) If you are finding a SIDE, use Sin, Cos, or Tan.
   b) If you are finding and ANGLE, use $\boxed{}^{-1}$.

Ex 5) Determine the length of side **f** to the nearest tenth of a centimeter.



given ✓ angle
✓ opp
need → hyp

working with "OH" → use sin

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

$\sin 55 = \frac{6.8}{f}$

Switch (or cross multiply)

$f = \frac{6.8}{\sin 55}$

$f = 8.3\text{cm}$

(makes sense - longest side!)

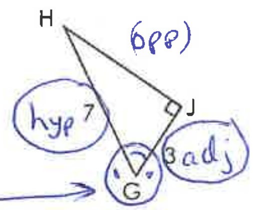
Remember the steps:

1) Label the triangle: your target angle is either the given angle (when looking for a side) or the angle you are looking for
2) Decide which formula to use (Sin, Cos, or Tan?). You must know 2 of the 3 measures in the formula (2 sides to find the angle, or an angle and one side to find a missing side). Write out the formula.
3) Fill in the formula with the values you know (you must know 2 of the 3)
4) Solve for the variable you are missing.
   a) If you are finding a SIDE, use Sin, Cos, or Tan.
   b) If you are finding and ANGLE, use $\square^{-1}$.

Determining the measure of an angle

need $\square^{-1}$

Ex 6) Determine the measure of <G and to the nearest tenth of a degree.



G is target angle because you are trying to find it.

given ✓ adj, ✓ hyp, need → angle } working with AH → cos

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

$(\cos^{-1}) \cos G = \frac{3}{7} (\cos^{-1})$

$G = \cos^{-1}(3/7)$

$G = 64.6231$

$\angle G = 64.6°$

Using Sine or Cosine to Solve a Problem

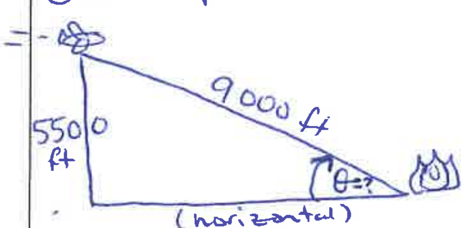
Ex 7) A water bomber is flying at an altitude of 5500 ft. The plane's radar shows that it is 9000 ft from the target site in a forest fire. What is the angle of elevation of the plane measured from the target site, to the nearest degree?

hyp

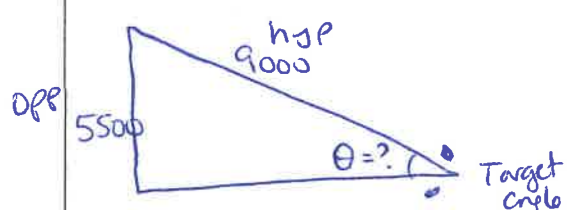
vertical

(measured from horizontal.

Draw a picture!



Need angle? use $\square^{-1}$



given ✓ opp, ✓ hyp, need → angle } working with OH → Sin

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

$(\sin^{-1}) \sin\theta = \frac{5500}{9000} (\sin^{-1})$

$\theta = \sin^{-1}(5500/9000)$

$\theta = 37.6699$

$\theta = 38°$

Note: you can type 5500/9000 in to calc first: 0.6111 keep 4 decimal places! then $\sin^{-1}(0.6111)$

The angle of elevation is 38°.

8.1C – Solving Triangles

Learning Target:

Use a trigonometric ratio to solve a problem involving a right triangle

Toolkit:

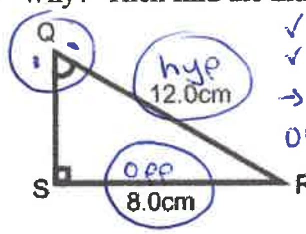
- $S\frac{O}{H}C\frac{A}{H}T\frac{O}{A}$ (SOHCAHTOA!)
- The sum of the angles in any triangle is 180°
- Pythagoras → $a^2 + b^2 = c^2$

Which Trig Ratio should be used?

Find the missing angle or side using trig...

Ex 1) To determine the measure of the indicated angle or side, which trig ratio would you use? Why? Then find the indicated angle or side, to the nearest tenth of a degree.

a)



✓ opp
✓ hyp
→ angle
OH → sin

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

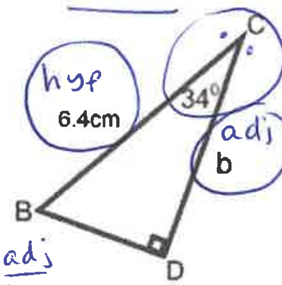
$\sin Q = \frac{8}{12}$

$\sin^{-1}$ $\sin^{-1}$

$Q = \sin^{-1}(8/12)$

$\angle Q = 41.8°$

b)



✓ angle
✓ hyp
→ adj
AH → cos

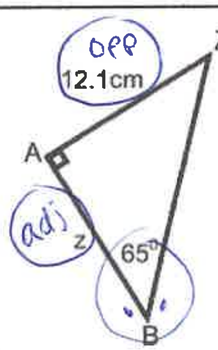
$\cos\theta = \frac{adj}{hyp}$

$6.4 \times \cos 34 = \frac{b}{6.4} \times 6.4$

$b = 6.4\cos 34$

$b = 5.3\text{ cm}$

c)



✓ opp
✓ angle
→ adj
OA → tan

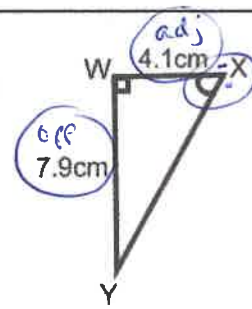
$\tan\theta = \frac{opp}{adj}$

$\tan 65 = \frac{12.1}{z}$

$z = \frac{12.1}{\tan 65}$

$z = 5.6\text{ cm}$

d)



✓ opp
✓ adj
→ angle
OA → tan

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

$\tan X = \frac{7.9}{4.1}$

$\tan^{-1}$ $\tan^{-1}$

$X = \tan^{-1}(7.9/4.1)$

$\angle X = 62.6°$

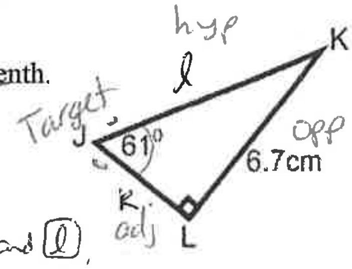
How do you *SOLVE* a triangle?

Hint: try to use GIVEN Information as often as possible.

Solving a triangle means to determine the measures of all the angles and the lengths of all the sides in a triangle. We will need to use:

- $S\frac{O}{H}C\frac{A}{H}T\frac{O}{A}$
- The sum of the angles in any triangle is 180°
- Pythagoras → $a^2 + b^2 = c^2$

Ex 2) Solve ΔJKL. Give measures to the nearest tenth.



Inventory: * fill in "givens" and units *

<J = 61°	j = 6.7 cm
<K = 29°	k = 3.7 cm
<L = 90°	l = 7.7 cm

↑start with missing angle if you can!

$\boxed{\angle k}$

$\angle k = 180° - 90° - 61$

$\angle k = 29°$

To find $\boxed{k}$ and $\boxed{l}$ order doesn't matter:

$\boxed{k}$ ✓opp ✓angle → adj $\Big\}$ $\tan\theta = \frac{opp}{adj}$

$\tan 61 = \frac{6.7}{k}$

$k = \frac{6.7}{\tan 61}$

$k = 3.714$

$\boxed{l}$ ✓opp ✓angle → hyp $\Big\}$ $\sin\theta = \frac{opp}{hyp}$

$\sin 61 = \frac{6.7}{l}$

$l = \frac{6.7}{\sin 61}$

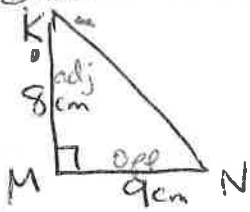
$l = 7.6605$

How do you solve a triangle without the picture of the triangle?

Ex 3) In right triangle ΔKMN, $< M = 90°$, $KM = 8cm$, and $MN = 9cm$. Solve this triangle. Give measures to the nearest tenth. n

Draw a Rt △ first. Then label!

(Draw and label the triangle, then solve!)



has to be "M" because it's the 90°

Make Inventory!

$\angle K = 48.4°$	$k = 9cm$
$\angle M = 90°$	$m = 12.0cm$
$\angle N = 41.6°$	$n = 8cm$

(order of ∠K and ∠N doesn't matter.)

Can't start with angle, BUT we can get missing side with Pythag.

$\boxed{m}$ is hypotenuse, so

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

$k^2 + n^2 = m^2$

$9^2 + 8^2 = m^2$

$81 + 64 = m^2$

$\sqrt{145} = \sqrt{m^2}$

$m = 12.04$

$\boxed{\angle K}$ use ∠K as target

✓opp ✓adj →angle $\Big\}$ $\tan\theta = \frac{opp}{adj}$

$\tan K = \frac{9}{8}$

tan⁻¹ tan⁻¹

$K = \tan^{-1}(9/8)$

$K = 48.4°$

$\boxed{\angle N}$ as soon as you have 2 angles, use 180° − to get 3rd:

$\angle N = 180° - 90° - 48.4°$

$\angle N = 41.6°$

8.4 – Applications of Trigonometry

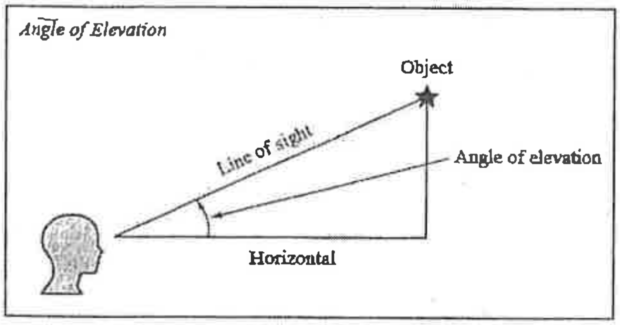
Learning Target: to apply trigonometric concepts to solve word problems

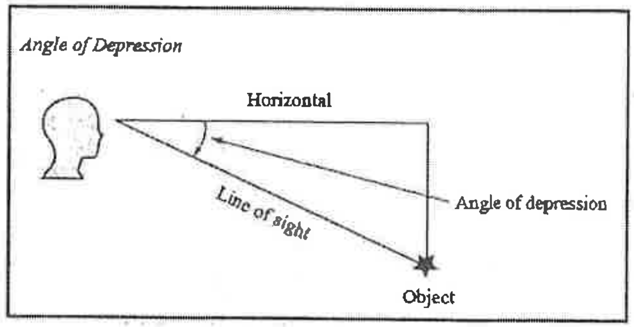
Toolkit:

- SOHCAHTOA
- Equilateral, isosceles, scalene
  - Equilateral → All sides equal; isosceles → two sides equal; scalene → no sides equal
- Horizontal ↔ vs. Vertical ↕

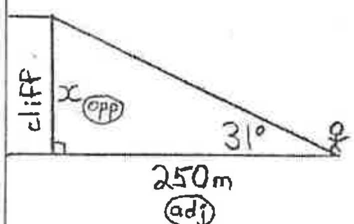
* 3 angles in any triangle add to 180°

Terminology:





Ex 1) Standing 250 metres from the base of a cliff, there is a 31° angle from your feet to the top of the cliff. How tall is the cliff? round to nearest tenth



T O A, so use tan!

$$(\tan 31^\circ) = \left(\frac{x}{250}\right) \quad \times 250$$

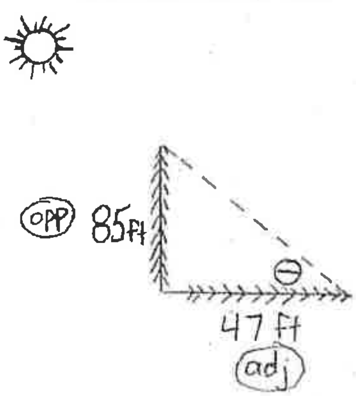
$$x = (\tan 31^\circ) \times 250$$

$$x = 150.2$$

$\boxed{\text{The cliff is 150.2m tall}}$

Ex 2) A Douglas Fir tree 85 feet high casts a shadow of 47 feet. What is the angle of elevation of the sun? round to nearest tenth

not to scale



T O A, so use tan!

$$\tan\theta = \frac{85}{47}$$

$$\angle\theta = \tan^{-1}\left(\frac{85}{47}\right)$$

$$\angle\theta = \tan^{-1}(1.80851)$$

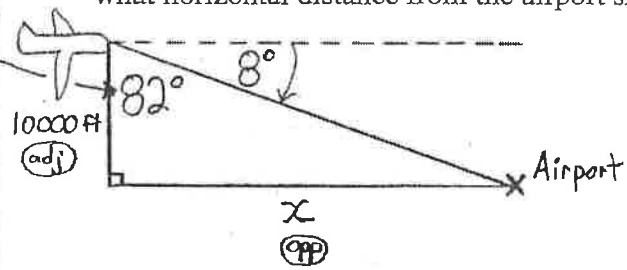
$$\angle\theta = 61.1^\circ$$

$\boxed{\text{The angle of elevation of the sun is } 61.1^\circ}$

Ex 3) A pilot is required to approach Vancouver airport at an 8° angle of descent (angle of depression). If the plane is travelling at an altitude of 10 000 ft, at what horizontal distance from the airport should the descent begin?

round to nearest tenth

$90° - 8°!$



TOA, so use tan!

$$\left(\tan 82°\right) = \left(\frac{x}{10000}\right) \times 10000$$

$$x = (\tan 82°) \times 10000$$

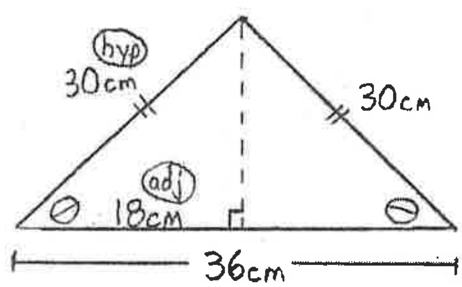
$$x = 71153.7 \text{ Ft}$$

The descent should begin when the horizontal distance to the airport is 71153.7 Ft

Ex 4) The equal sides of an isosceles triangle are 30cm, and the third side is 36 cm. Determine the measure of the interior angles of the triangle. round to nearest tenth

* angles opposite equal sides are equ.

$\frac{36}{2} = 18!$



CAH, so use cos!

$$\cos\theta = \frac{18}{30}$$

$$\angle\theta = \cos^{-1}\left(\frac{18}{30}\right)$$

$$\angle\theta = \cos^{-1}(0.6)$$

$$\angle\theta = 53.1°$$

bottom left and bottom right angles are both 53.1°!

top angle is $180° - 53.1° - 53.1° = 73.8°$

∴ The three interior angles are 53.1°, 53.1°, and 73.8°

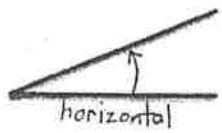
8.5 – Compound Trigonometry Applications

Learning Target: to apply trigonometry to solve problems, sometimes with two right triangles

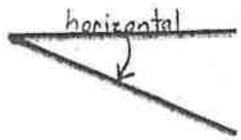
Toolkit:

- $S\frac{O}{H}C\frac{A}{H}T\frac{O}{A}$
- Making a PLAN to solve the problem
- $a^2+b^2=c^2$

Angle of elevation:

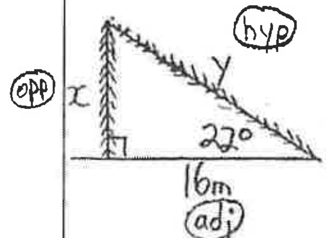


Angle of depression:



Ex 1) The top of an arbutus tree broken in the wind hits the ground 16 metres from the base of the tree. If the top of the tree now makes an angle of 22° with the ground, what was the original height of the arbutus tree?

Round to nearest tenth



* original height of tree is $x + y$!

Find x:

$T\frac{O}{A}$, use tan!

$(\tan 22°)\times 16 = \left(\frac{x}{16}\right)\times 16$

$x = (\tan 22°)\times 16$

$x = 6.46$

find y: (or pythag!)

$C\frac{A}{H}$, use cos!

$\cos 22° = \frac{16}{y}$

$y = \frac{16}{\cos 22°}$

$y = 17.26$

height $= x + y$

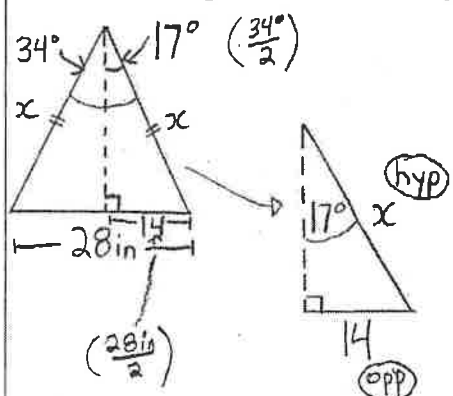
$= 6.46 + 17.26$

$\boxed{= 23.7\text{m}}$

The original height was 23.7m

Ex 2) An isosceles triangle has a base of 28 in. If the legs (the two equal sides) meet at an angle of 34°, how long are they? (x)

Round to nearest tenth



$S\frac{O}{H}$, so use sin!

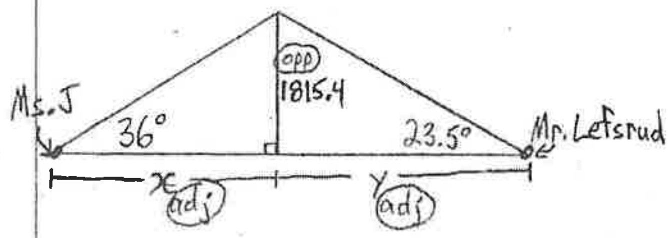
$\sin 17° = \frac{14}{x}$

$x = \frac{14}{\sin 17°}$

$\boxed{x = 47.9\text{ in}}$

Each leg is 47.9 in

Ex 3) The CN Tower is 1815.4 ft high. Ms. J measures the angle of elevation to the top of the tower at 36°. Mr. Lefsrud, directly opposite the tower, measures the angle of elevation to the top of the tower at 23.5°. How far apart are Ms. J and Mr. Lefsrud? *Round to nearest tenth*



distance apart is $x + y$!

$= 2498.68 + 4175.13$

$= 6673.8$ ft

find x: TOA, use tan!

$\tan 36° = \frac{1815.4}{x}$

$x = \frac{1815.4}{\tan 36°}$

$x = 2498.68$ ft

find y: TOA, use tan!

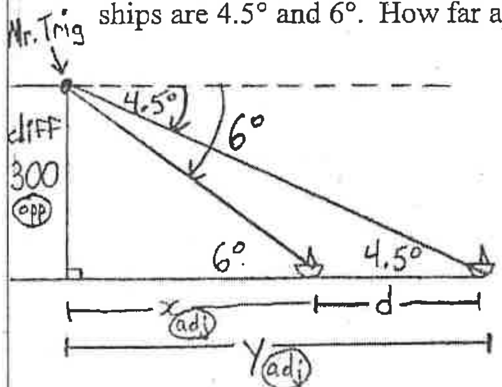
$\tan 23.5° = \frac{1815.4}{y}$

$y = \frac{1815.4}{\tan 23.5°}$

$y = 4175.13$ ft

Ms. J and Mr. Lefsru are 6673.8 ft apart

Ex 4) A lighthouse keeper, Mr. Trig, who is at the top of a cliff 300 m above sea level, spots two ships directly off shore. The angles of depression of the ships are 4.5° and 6°. How far apart are the ships? *Round to nearest tenth*



distance between ships (d):

$d = y - x$

$d = 3811.86 - 2854.31$

$d = 957.6$ m

$\boxed{\text{The ships are } 957.6\text{m apart}}$

Find y using large right triangle:

TOA, use tan!

$\tan 4.5° = \frac{300}{y}$

$y = \frac{300}{\tan 4.5°}$

$y = 3811.86$ m

Find x using small right triangle:

TOA, use tan!

$\tan 6° = \frac{300}{x}$

$x = \frac{300}{\tan 6°}$

$x = 2854.31$