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CHAPTER 1 and 2: Similar Triangles and Right Angle Trigonometry

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2	1.3 - Similar Triangles	Page 25 – 29 #1a, 2ac, 3, 4, 8, 9
3	1.4 - Solving Problems Using Similar Triangles	Page 33 – 37 #4 – 7, 10, 12
4	Quick Review **Quiz** **(Similar Triangles and Pythagorean Theorem)**	
5	2.3 - The Sine and Cosine Ratios	Page 71 – 73 #1ac, 2ab, 3a, 4, 6, 8, 11, 12
6	2.4 - The Tangent Ratio	Page #79 – 82 #1ac, 2ac, 3, 7, 9, 11, 12
7	**QUIZ (Basic Trigonometric Ratios [Sine/Cosine/Tangent])** 2.5 - Solve Problems Using Right Triangles	Page 86 – 87 #2, 4, 5
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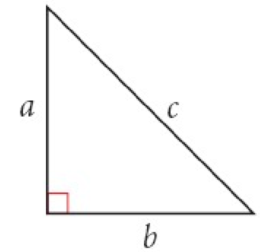
2.1 – THE PYTHAGOREAN THEOREM

KEY CONCEPTS



In a right triangle, the **hypotenuse**
→is the longest side
→the side opposite the *right* angle

The square of the hypotenuse is equal to the sum of the squares of the legs.

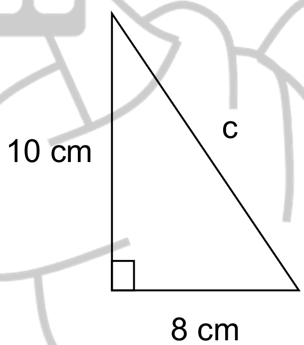
FORMULA: $c^2 = a^2 + b^2$, where **"c"** always represents the *hypotenuse*

You can use the **Pythagorean Theorem** to find the **length** of one side of a *right* triangle, given the lengths of the other two sides.

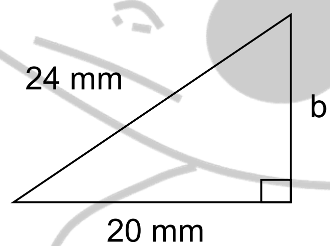
EXAMPLE 1 *Finding the Length of a Side*

Find the length of each unknown side. Round your answer to one decimal place.

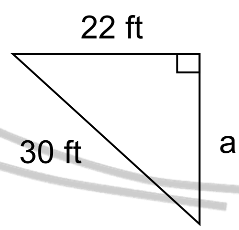
(a)



(b)



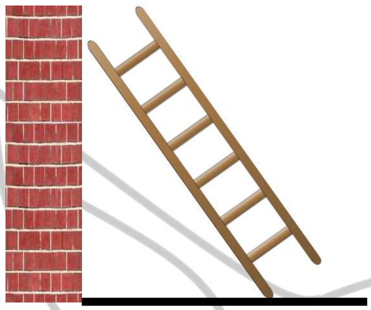
(c)



EXAMPLE 2

A ladder is placed on a wall which is **10 feet** high. The foot of the ladder is placed **7 feet** from the base of the wall?

How long is the ladder? Round your answer to the nearest whole number.



EXAMPLE 3

The new sports complex has to build a wheelchair ramp outside the front doors. The current stairs go through a **vertical rise of 1.5 metres**. If the ramp is to be **15 metres** long, how far from the sports complex will the ramp start? Round your answer to one decimal place.

Homework:
Page 50 – 53 #2ac, 3ac, 4ab, 5, 6a, 7ab, 10

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1.3 – SIMILAR TRIANGLES

KEY CONCEPTS

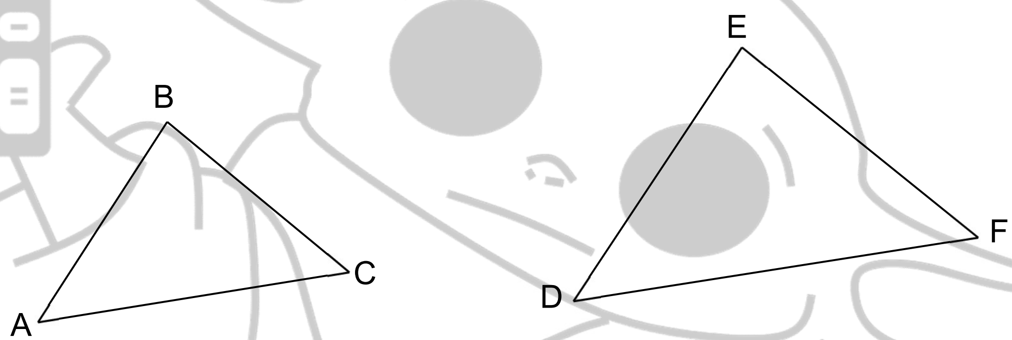
Two triangles are similar if corresponding angles are equal and the lengths of corresponding sides are **proportional**.

→two quantities are proportional if they have the same constant ratio

→the side lengths of two triangles are proportional if there is a single value which will multiply all of the side lengths of the first triangle to get the side lengths of the second triangle

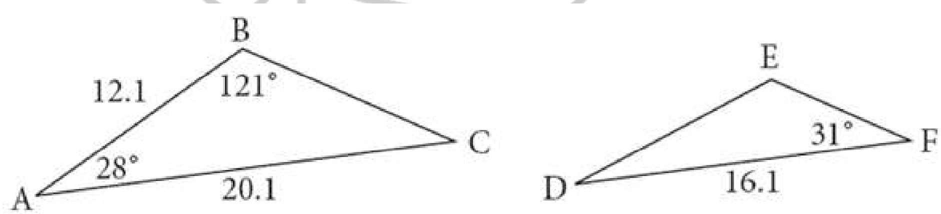
When naming similar triangles (the symbol "~" indicates that the triangles are similar), the letters representing the equal angles are written in the same order. If ΔABC ~ ΔDEF, then

∠A = ∠D
∠B = ∠E
∠C = ∠F



EXAMPLE 1 *Finding the Length of Missing Sides and Angles*

Given ΔABC ~ ΔDEF



(a) Find the measure of ∠**C**

(b) Find the length of **DE** to <u>one decimal place</u>.

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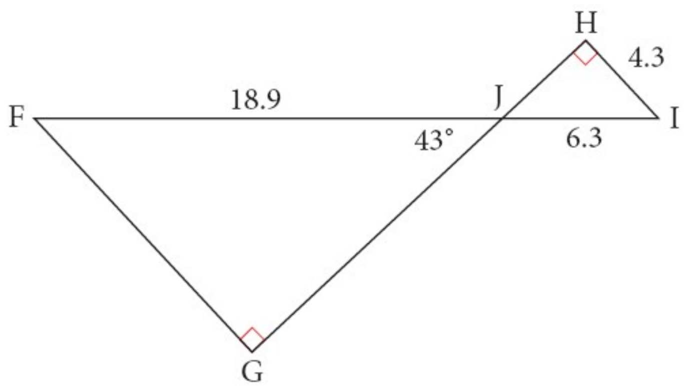
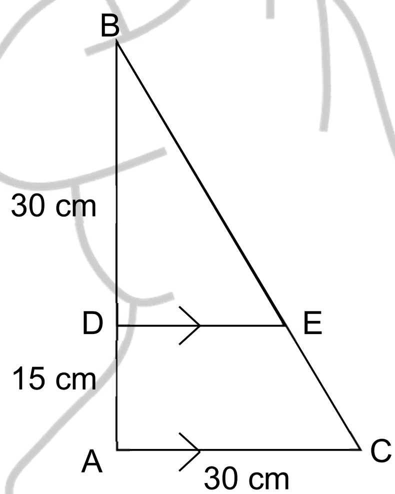
EXAMPLE 2
Using Opposite Angles and Similar Triangles to Find Missing Side Lengths

Given ΔFGJ ~ ΔIHJ, find the length of **FG**. Round your answer to <u>one</u> decimal place.



EXAMPLE 3
Using Parallel Lines and Similar Triangles to Find Missing Measures

In this diagram, DE is <u>parallel</u> to AC. Find the length of **DE**.



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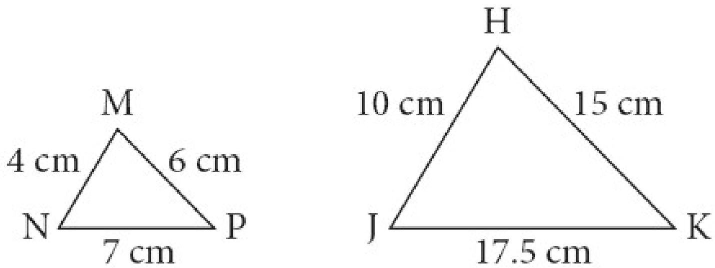
EXAMPLE 4 *Using Side Lengths to Determine if Triangles are Similar*

Show that ΔMNP ~ ΔHJK.



<u>Homework</u>:
Page 25 – 29 #1a, 2ac, 3, 4, 8, 9

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1.4 – SOLVING PROBLEMS USING SIMILAR TRIANGLES

KEY CONCEPTS

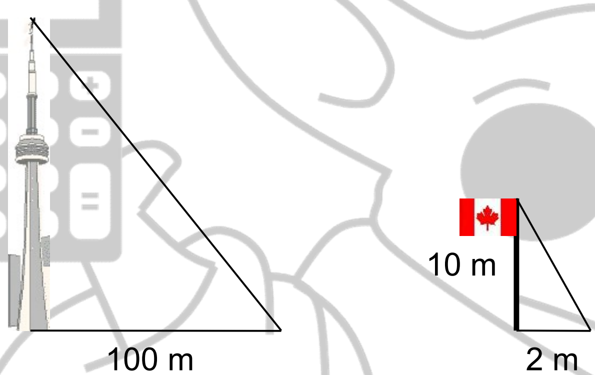
Similar triangles can be used to find **heights** or **distances** that are difficult to measure.

Similar triangles have many practical applications.

EXAMPLE 1 *Finding the Height of an Object*

A **10 metre** flag pole casts a shadow **2 metres** long. The CN Tower casts a shadow which is **100 metres** long.

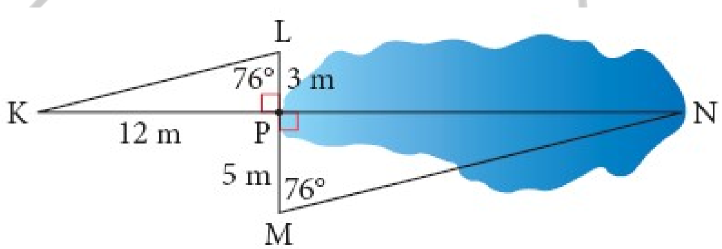
How **tall** is the CN Tower?



EXAMPLE 2 *Finding the Length of an Object*

To find the length of a pond, a surveyor took some measurements. She recorded them on the diagram below.

What is the **length** of the pond?



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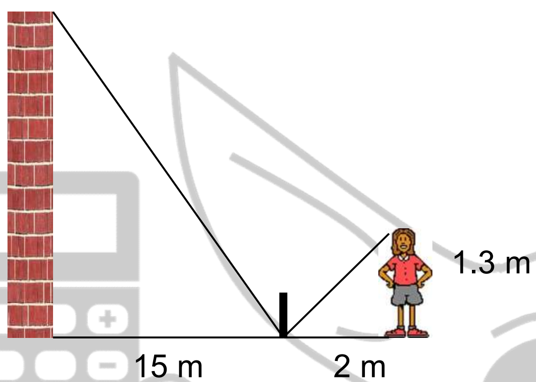
EXAMPLE 3 *Using Mirrors to Find Height*

Ginger's eyes are **1.3 m** from the floor. She places a mirror on the floor **15 m** from the base of a brick wall. She walks backward **2 m**, until she sees the top of the wall in the mirror.

What is the **height** of the brick wall?



<u>Homework</u>:
Page 33 – 37 #4 – 7, 10, 12

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2.3 – THE SINE AND COSINE RATIOS

KEY CONCEPTS

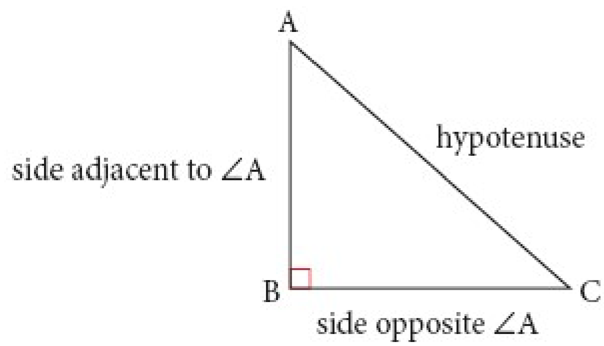
The **sine** and **cosine ratios** compare the lengths of the legs of a *right* triangle to the length of the **hypotenuse**.

The **sine** and **cosine ratios** can be used to
→find side lengths in right triangles
→find angle measures in right triangles.

FORMULAS

$$\sin A = \frac{OPPOSITE}{HYPOTENUSE}$$

$$\cos A = \frac{ADJACENT}{HYPOTENUSE}$$



EXAMPLE 1 *Using Your Calculator*

Evaluate the following to four decimal places. *** MAKE SURE YOUR CALCULATOR IS IN DEGREES MODE!!!

(a) sin 47° = _________ (b) cos 63° = ________

EXAMPLE 2 *Using Your Calculator to Find an Angle Measure*

Find the measure of each angle to the nearest degree.

*** To find the angle, you use the **INVERSE** of the trigonometric ratio by pressing **2nd/SHIFT** then the trigonometric ratio

(a) sin A = 0.9613

∠A = $\sin^{-1}$(0.9613)

∠A = _____°

(b) cos A = 0.06976

∠A = $\cos^{-1}$(0.06976)

∠A = _____°

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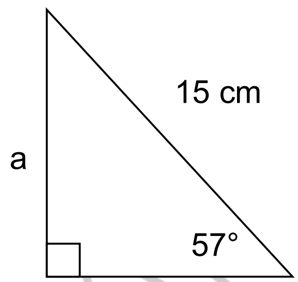
EXAMPLE 3 *Using the Sine and Cosine Ratio to Find Side Lengths*

Use the appropriate ratio (Sine or Cosine) to calculate the length of the unknown side.

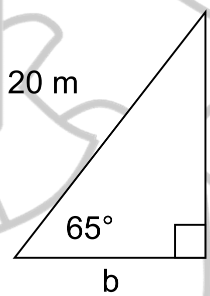
STEPS FOR USING THE SINE AND COSINE RATIOS

1. Label the sides with respect to the given angle
2. Identify which trigonometric ratio to use to solve the problem
3. Solve for the length or angle

(a)



(b)



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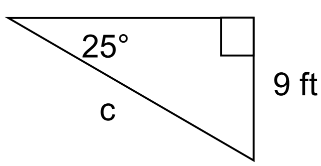

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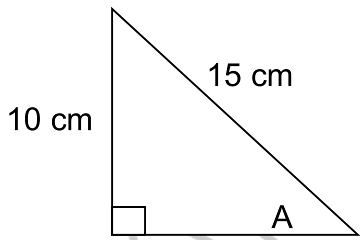
EXAMPLE 4 *Using the Sine and Cosine Ratio to Find Angles*

Use the appropriate ratio (Sine or Cosine) to calculate the angle measure. Express your answer to the <u>nearest whole degree</u>.

STEPS FOR USING THE SINE AND COSINE RATIOS

1. Label the sides with respect to the given angle
2. Identify which trigonometric ratio to use to solve the problem
3. Solve for the length or angle

(a)



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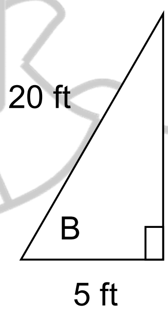
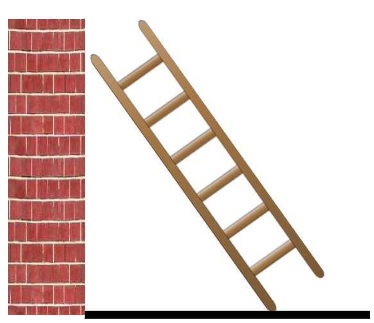


EXAMPLE 5 *Application: The Ladder on the Wall (Revisited)*

A **6 metre** ladder is placed on a brick wall. The angle between the floor and the ladder is **29°**.

How far is the *foot (bottom)* of the ladder from the base of the wall? Use the diagram provided to help you with this question.



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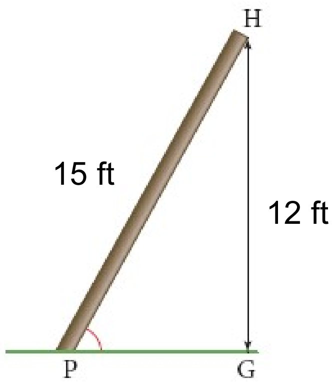
EXAMPLE 6 *Application: Find the Measure of an Angle*

A storm caused a **15 foot** hydro pole to lean over. The top of the pole is now **12 feet** above the ground.

Find the measure of the angle between the hydro pole and the ground, to the <u>nearest degree.</u>



<u>Homework</u>:
Page 71 – 73 #1ac, 2ab, 3a, 4, 6, 8, 11, 12

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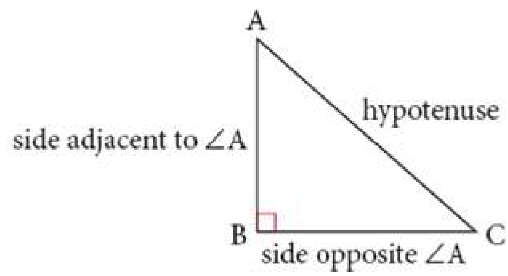
2.4 – THE TANGENT RATIO

KEY CONCEPTS

The **tangent ratio** compares the lengths of the legs of a *right triangle*.

The **tangent ratio** can be used to find side lengths and angle measures in right triangles.



FORMULA:

$$\tan A = \frac{OPPOSITE}{ADJACENT}$$

EXAMPLE 1 *Using Your Calculator*

(a) Find the value of **tan 52°**. Express your answer to four decimal places.

____

(b) Find the angle measure of **tan A = 5.1446**.

Recall: To find the angle measure, you have to take the **INVERSE** of the trigonometric ratio by pressing **2nd/SHIFT** then the trigonometric ratio.

$\tan A = 5.1446$

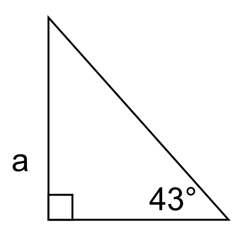
$\angle A = \tan^{-1}(5.1446)$

$\angle A =$ ______°

EXAMPLE 2
Using the Tangent Ratio to Find Side Lengths

Use the *Tangent Ratio* to solve the unknown side lengths. Express your answer to one decimal place.

(a)

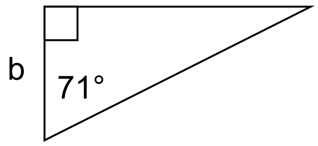


11 m
18 in

STEPS FOR USING THE TRIGONOMETRIC RATIOS

1. Label the sides with respect to the given angle
2. Identify which trigonometric ratio to use to solve the problem
3. Solve for the length or angle

(b)

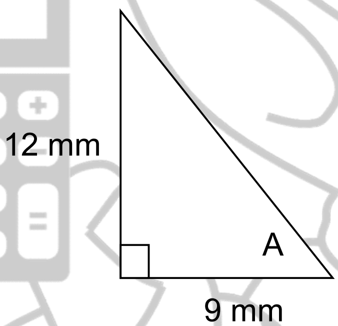


EXAMPLE 3

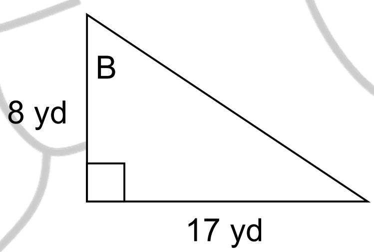
Using the Tangent Ratio to Find the Angle Measure

Use the *Tangent Ratio* to solve the unknown angle measure. Express your answer to the nearest whole number.

(a)



(b)



STEPS FOR USING THE TRIGONOMETRIC RATIOS

1. Label the sides with respect to the given angle
2. Identify which trigonometric ratio to use to solve the problem
3. Solve for the length or angle

EXAMPLE 4 *Application: Finding Heights Using the Tangent Ratio*

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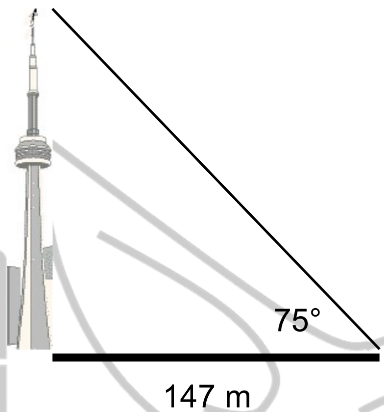
A person,standing **147 metres** in front of the CN Tower looks up at the CN Tower at a **75°** angle.

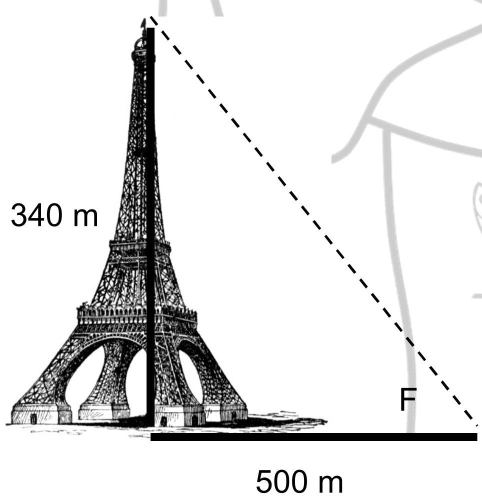
How tall is the CN Tower? Express your answer to one decimal place.



EXAMPLE 5 *Application: Finding the Angle*

Francois stands **500 metres** in front of the **340 metre** tall Eiffel Tower.

At what *angle* is Francois looking up at the tower? Express your answer to the nearest whole number.



Homework: Page #79 – 82 #1ac, 2ac, 3, 7, 9, 11, 12

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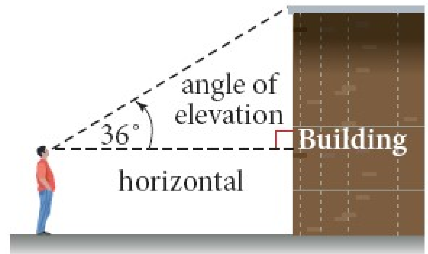
2.5 – SOLVE PROBLEMS USING RIGHT TRIANGLES

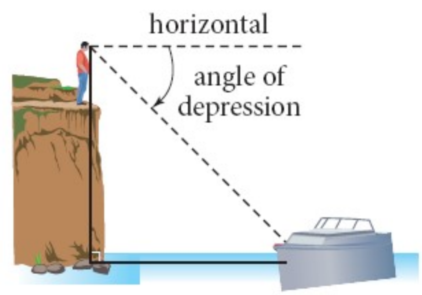
KEY CONCEPTS

The **trigonometric ratios** and **angles of elevation** or **depression** can be used to find hard-to-measure distances.

Angle of elevation
→the angle between the **horizontal** and the **line of sight up to an object**
→also known as an **angle of inclination**



Angle of depression
→the angle between the **horizontal** and the **line of sight down to an object**.

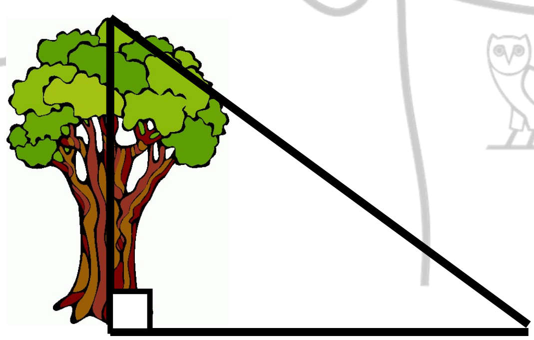


When solving problems involving right triangles
→sketch and label a diagram
→identify the angle of interest
→identify the **hypotenuse**, **opposite** and **adjacent** side with respect to the angle of interest.

EXAMPLE 1 *Finding the Height of a Tree*

From a point **10 metres** from the base of a tree, the *angle of elevation* to the top of the tree is **40°**.

Find the **height of the tree** to one decimal place.



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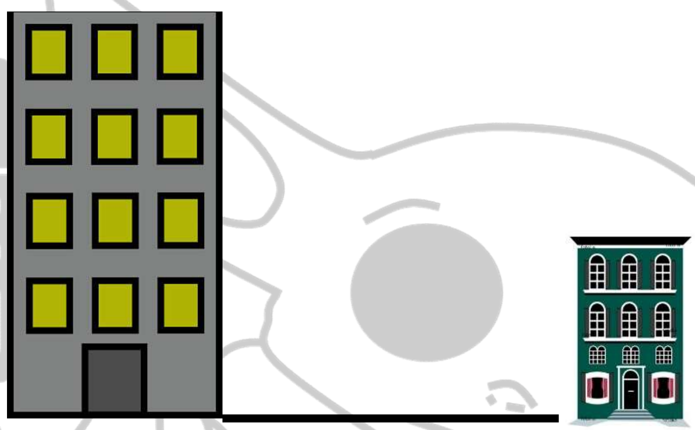
EXAMPLE 2 *Finding the Heights of Two Buildings*

Two buildings are **125 feet** apart.

From the roof of the shorter building, the *angle of elevation* to the top of the taller building is **45°** and the *angle of depression* to the base of the taller building is **30°**.

Find the heights of both buildings to one decimal place.



EXAMPLE 3

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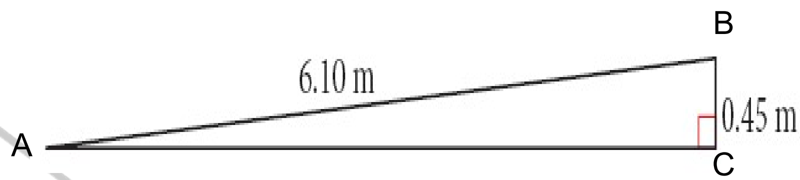
A wheelchair ramp is needed at the entrance of a restaurant. The ramp is to be **6.10 m** long and have a rise of **0.45 m**.

Calculate the **angle of elevation** of the ramp. Round your answer to the <u>nearest whole number</u>.



<u>Homework</u>:
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