

ST. JEAN DE BREBEUF
MATHEMATICS

CHAPTER 2.4

THE



TANGENT RATIO

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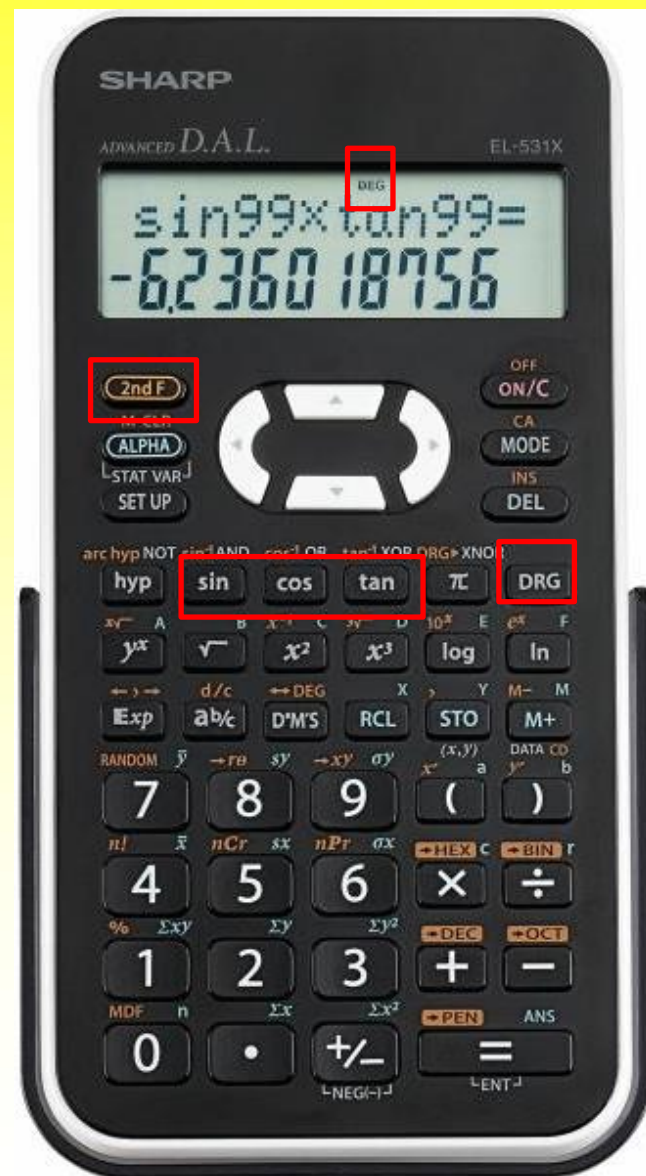
EXAMPLE 1

Using Your Calculator

Make sure the calculator is in **DEG** mode!
→ If it is NOT, Press the **DRG** key until you get **DEG** at the top

We will be using the **SIN**, **COS** and **TAN** keys this Chapter!

To solve for an **angle**, you also need to press the **2ndF** key and *sin*, *cos* or *tan* key



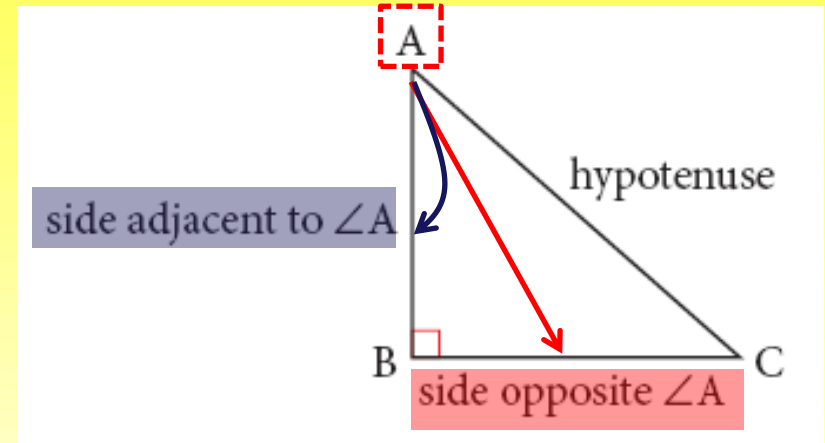
CHAPTER 2.4 THE TANGENT RATIO

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



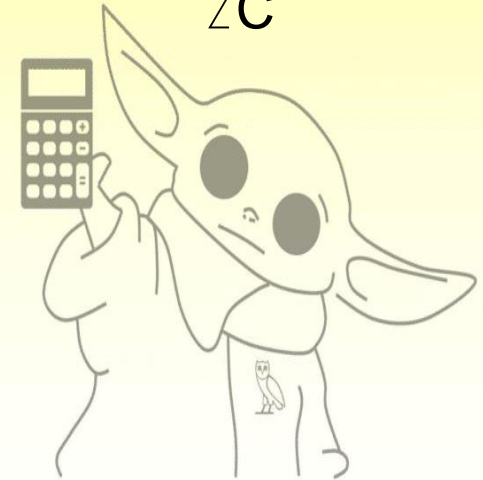
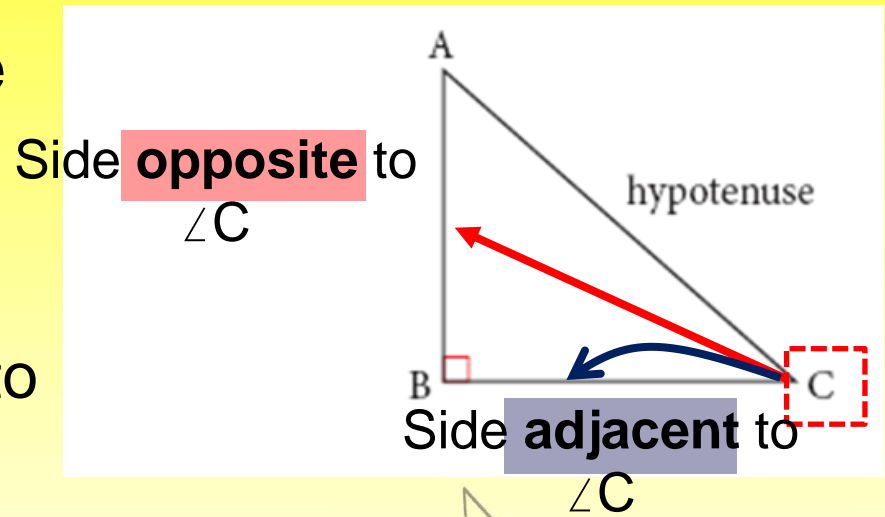
CHAPTER 2.4 THE TANGENT RATIO

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: $\tan C = \frac{\text{OPPOSITE}}{\text{ADJACENT}}$



CHAPTER 2.4 THE TANGENT RATIO

EXAMPLE 1 Using Your Calculator

*** MAKE SURE YOUR CALCULATOR IS IN **DEGREES** MODE!!!

- (a) Find the value of $\tan 52^\circ$. Express your answer to four decimal places. 1.2799
- (b) Find the angle measure of $\tan A = 5.1446$.

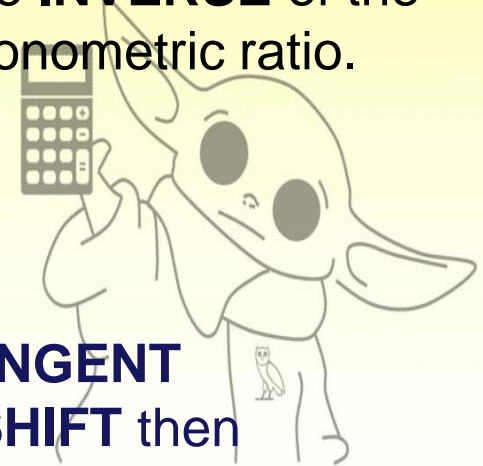
Recall: To find the angle measure, you have to take the **INVERSE** of the trigonometric ratio by pressing **2nd/SHIFT** then the trigonometric ratio.

$$\tan A = 5.1446$$

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

$$\angle A = \underline{79}^\circ$$

INVERSE TANGENT
→ Press **2nd/SHIFT** then
TAN

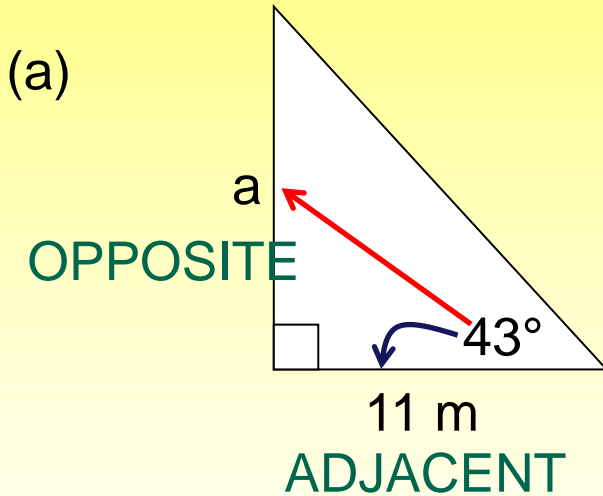


CHAPTER 2.4 THE TANGENT RATIO

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.



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

$$\tan 43^\circ = \frac{a}{11}$$

$$\frac{\tan 43^\circ}{1} = \frac{a}{11}$$

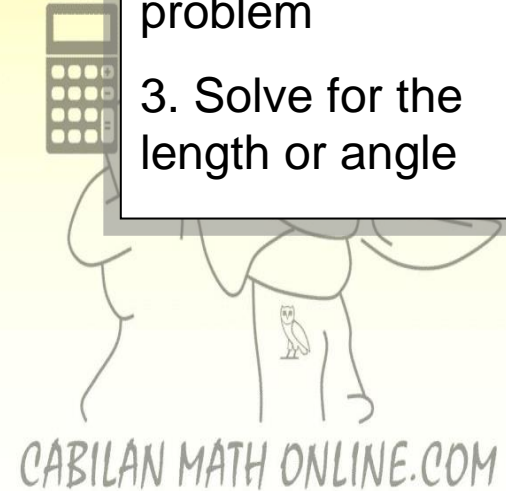
$$a = 11 \tan 43^\circ$$

$$a = 10.3 \text{ m}$$

- * Put over "1"
- * Cross-multiply

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

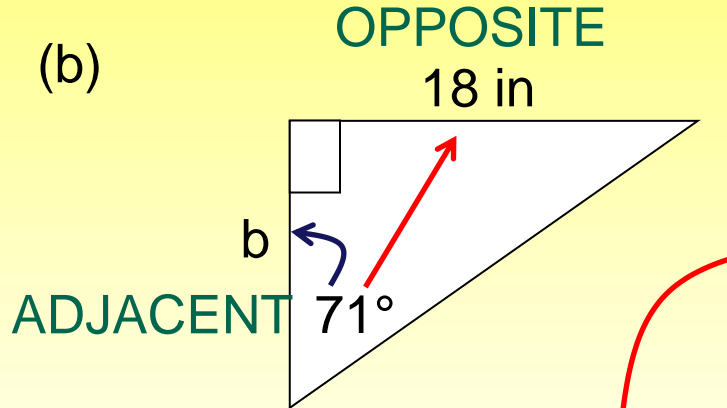


CHAPTER 2.4 THE TANGENT RATIO

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.



* Put over "1"
* Cross-multiply

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

$$\tan 71^\circ = \frac{18}{b}$$

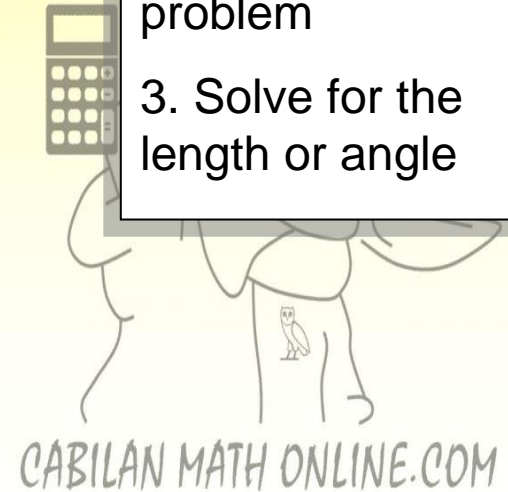
$$\frac{\tan 71^\circ}{1} = \frac{18}{b}$$

$$\frac{b \tan 71^\circ}{\tan 71^\circ} = \frac{18}{\tan 71^\circ}$$

$$b = 6.2 \text{ in}$$

STEPS FOR USING THE TRIGONOMETRIC RATIOS

1. Label the sides with respect to the given angle
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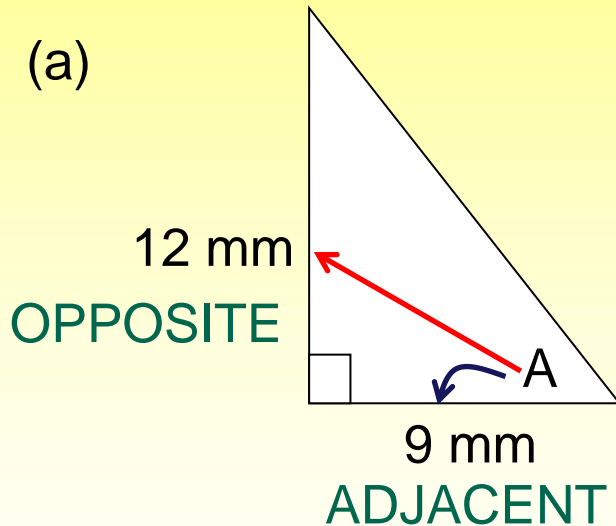


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EXAMPLE 3

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.



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

$$\tan A = \frac{12}{9}$$

$$\tan A = 1.3333$$

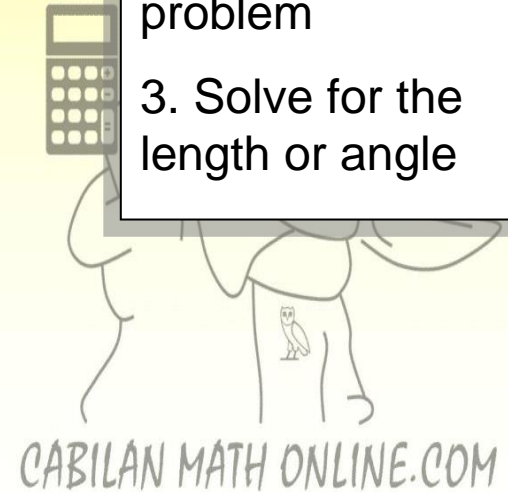
$$\angle A = \tan^{-1}(1.3333)$$

$$\angle A = 53^\circ$$

INVERSE TANGENT
→ Press **2nd/SHIFT**
then **TAN**

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



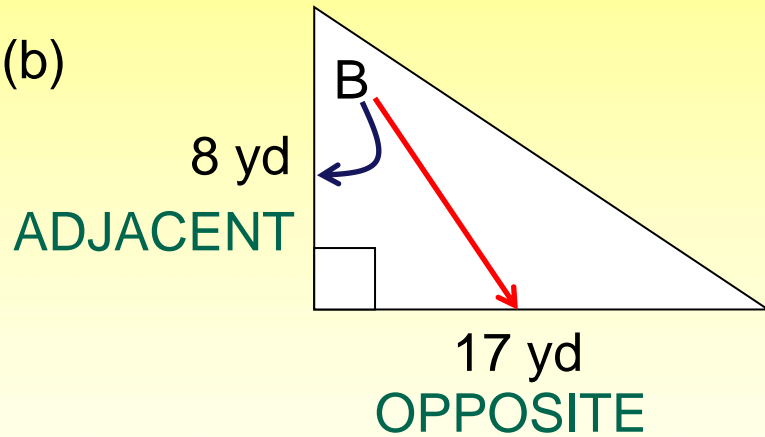
CHAPTER 2.4 THE TANGENT RATIO

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.

(b)



$$\tan B = \frac{\text{OPPOSITE}}{\text{ADJACENT}}$$

$$\tan B = \frac{17}{8}$$

$$\tan B = 2.125$$

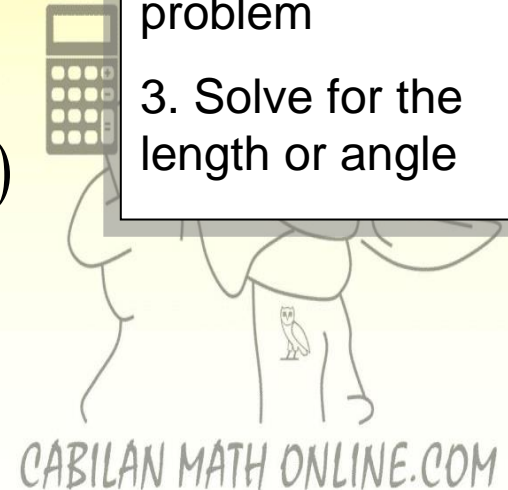
$$\angle B = \tan^{-1}(2.125)$$

$$\angle B = 65^\circ$$

INVERSE TANGENT
→ Press **2nd/SHIFT**
then **TAN**

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

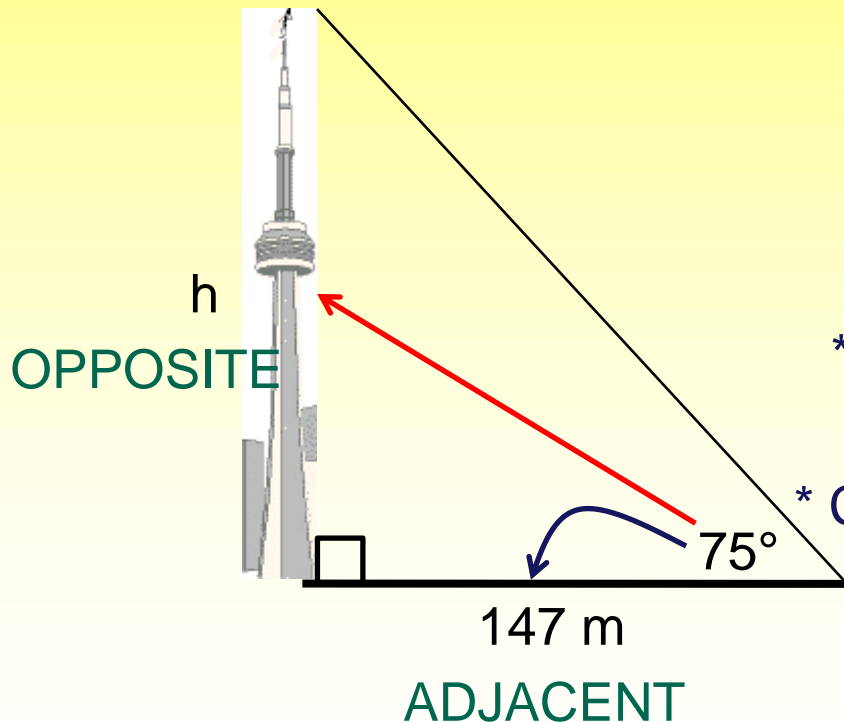


CHAPTER 2.4 THE TANGENT RATIO

EXAMPLE 4 Application: Finding Heights Using the Tangent Ratio

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.



Let “h” represent the height of the tower

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

* Put over “1”

$$\tan 75^\circ = \frac{h}{147}$$

* Cross-multiply

$$\frac{\tan 75^\circ}{1} = \frac{h}{147}$$

$$h = 147 \tan 75^\circ$$

$$h = 548.6 \text{ m}$$

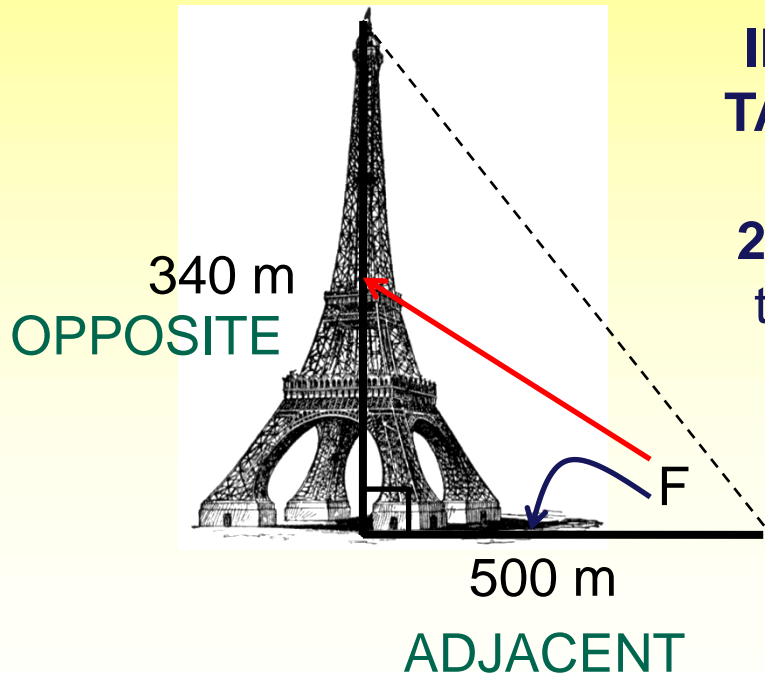
The CN Tower is **548.6 metres** tall.

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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.



INVERSE TANGENT
→ Press
2nd/SHIFT
then **TAN**

$$\tan F = \frac{\text{OPPOSITE}}{\text{ADJACENT}}$$

$$\tan F = \frac{340}{500}$$

$$\tan F = 0.68$$

$$\angle F = \tan^{-1}(0.68)$$

$$\angle F = 34^\circ$$

Francois is looking up at the tower at an angle of **34°**.

Homework:

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#1ac, 2ac, 3, 7, 9, 11,
12

