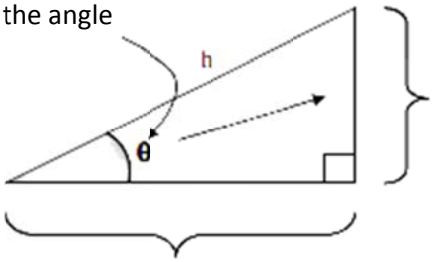
Trigonometric Ratios

This is the known angle or the angle under consideration



This is the side '*opposite*' the given/known angle

This is the side '*adjacent*' the given/known angle.

The adjacent side touches the angle in question and the right angle

In a right-angled triangle the following ratios are defined SOH CAH TOA:

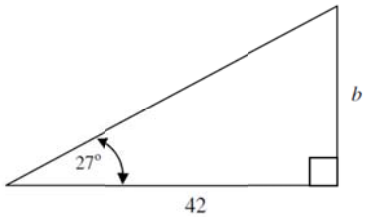
$$\sin\theta = \frac{Opposite\ side}{Hypotenuse} = \frac{O}{H}$$

$$\cos\theta = \frac{Adjacent\ side}{Hypotenuse} = \frac{A}{H}$$

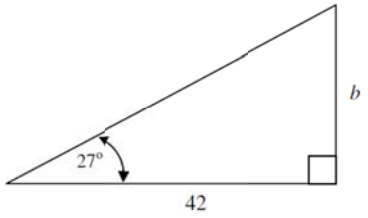
$$\tan\theta = \frac{Opposite\ side}{Adjacent\ side} = \frac{O}{A}$$

Where θ is the angle as shown.

Example 1: Finding the length of an unknown side (unknown on top)



1. Label the sides of the triangle that have information



Opposite

Adjacent

2. Choose the right ratio

Consider what you know and what you want to know.

We know the angle and the adjacent; we want to know the opposite

X	Angle
	Hypotenuse
X	Opposite
X	Adjacent

We need the ratio that has opposite and adjacent:

$$\tan\theta = \frac{Opposite\ side}{Adjacent\ side} = \frac{O}{A}$$

3. Substitute the known values:

$$\tan(27) = \frac{b}{42}$$

4. Now rearrange the equation to get b by itself. We need to multiply both sides of the equation by 42

$$\tan(27) = \frac{b}{42}$$

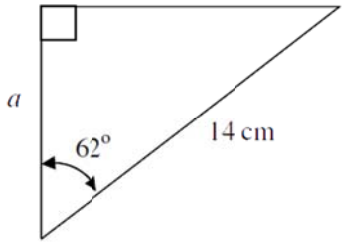
$$42 \times \tan(27) = \frac{b}{42} \times 42$$

5. Solve for b

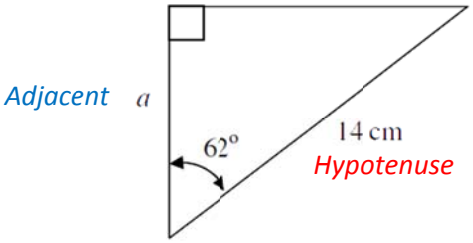
$$42 \times \tan(27) = b$$

$$b = 21.4$$

Example 2: Finding the length of an unknown side (unknown on top)



1. Label the sides of the triangle that have information on them



2. Choose the right ratio

Consider what you know and what you want to know.

We know the angle and the adjacent; we want to know the hypotenuse

X	Angle
X	Hypotenuse
	Opposite
X	Adjacent

We need the ratio that has opposite and adjacent:

$$\cos\theta = \frac{Adjacent\ side}{Hypotenuse} = \frac{A}{H}$$

3. Substitute the known values:

$$\cos(62) = \frac{a}{14}$$

4. Now rearrange the equation to get a by itself. We need to multiply both sides of the equation by 14

$$\cos(62) = \frac{a}{14}$$

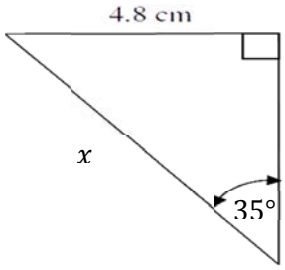
$$14 \times \cos(62) = \frac{a}{14} \times 14$$

5. Solve for a

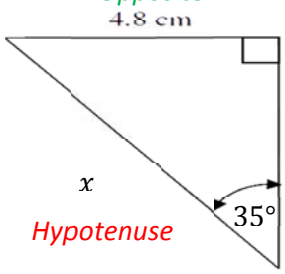
$$14 \times \cos(62) = a$$

$$a = 6.57cm$$

Example 3: Finding the length of an unknown side (unknown on bottom)



1. Label the sides of the triangle that have information on them



2. Choose the right ratio

Consider what you know and what you want to know.

We know the angle and the opposite; we want to know the hypotenuse

X	Angle
X	Hypotenuse
X	Opposite
	Adjacent

We need the ratio that has opposite and hypotenuse:

$$\sin\theta = \frac{Opposite\ side}{Hypotenuse} = \frac{A}{H}$$

3. Substitute the known values:

$$\sin(35) = \frac{4.8}{x}$$

4. Now rearrange the equation to get x by its self. We switch the $\sin\theta$ with the x

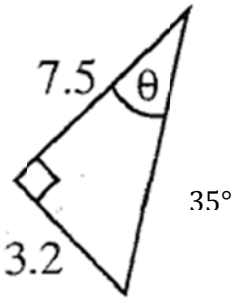
$$\sin(35) = \frac{4.8}{x}\ equal\ to:$$

$$x = \frac{4.8}{\sin(35)}$$

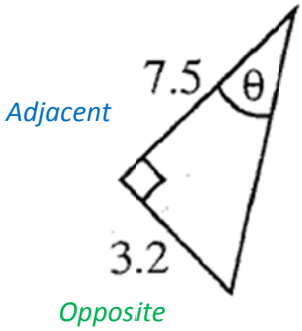
5. Solve for x

$$x = 8.37cm$$

Example 3: Finding an angle



1. Label the triangles sides



2. Choose the right ratio

Consider what you know and what you want to know.

We know the opposite and the adjacent; we want to know the angle

X	Angle
	Hypotenuse
X	Opposite
X	Adjacent

We need the ratio that has opposite and adjacent:

$$\tan\theta = \frac{Opposite\ side}{Adjacent} = \frac{O}{A}$$

3. Substitute the known values:

$$\tan\theta = \frac{3.2}{7.5}$$

4. Now rearrange the equation to get θ by its self. We use the inverse of either Tangent, Cosine or Sine

$$\theta = \tan^{-1}(\frac{3.2}{7.5})$$

5. Solve for θ

$$\theta = 23.11°$$