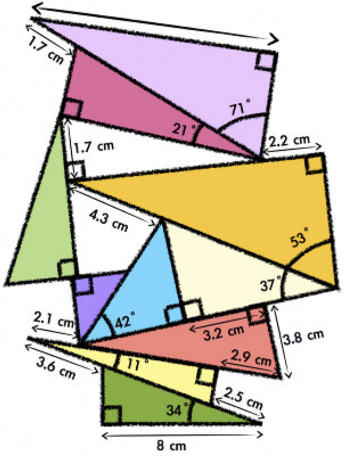
MPM2D: Principles of Mathematics

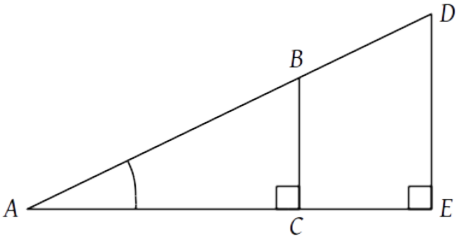
Primary Trigonometric Ratios

J. Garvin



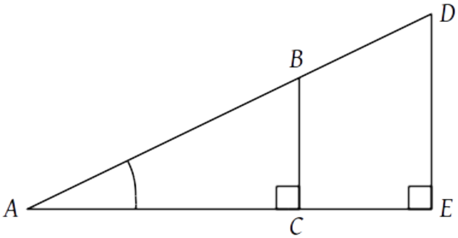
Similar Triangles

In the diagram below, $\Delta ABC \sim \Delta ADE$ since $\angle A$ is common to both triangles, and $\angle ACB = \angle AED$.



Similar Triangles

In the diagram below, $\Delta ABC \sim \Delta ADE$ since $\angle A$ is common to both triangles, and $\angle ACB = \angle AED$.



This means that any ratio of two sides in ΔABC is equal to the ratio of corresponding sides in ΔADE.

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Therefore, a specific measure of $\angle A$ can be associated with a specific ratio of two sides in a right triangle.

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Therefore, a specific measure of $\angle A$ can be associated with a specific ratio of two sides in a right triangle.

Is the ratio of two sides associated with a given angle unique?

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Therefore, a specific measure of $\angle A$ can be associated with a specific ratio of two sides in a right triangle.

Is the ratio of two sides associated with a given angle unique?

Consider the ratio of the opposite side to the hypotenuse.

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Therefore, a specific measure of $\angle A$ can be associated with a specific ratio of two sides in a right triangle.

Is the ratio of two sides associated with a given angle unique?

Consider the ratio of the opposite side to the hypotenuse.

If $\angle A$ increases, the length of the opposite side also increases. Thus, the ratio will increase.

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Therefore, a specific measure of $\angle A$ can be associated with a specific ratio of two sides in a right triangle.

Is the ratio of two sides associated with a given angle unique?

Consider the ratio of the opposite side to the hypotenuse.

If $\angle A$ increases, the length of the opposite side also increases. Thus, the ratio will increase.

If $\angle A$ decreases, the length of the opposite side also decreases. Thus, the ratio will decrease.

Similar Triangles

By varying the measure of $\angle A$, the ratio of two sides in ΔABC will change, but will remain equal to the ratio of corresponding sides in ΔADE.

Therefore, a specific measure of $\angle A$ can be associated with a specific ratio of two sides in a right triangle.

Is the ratio of two sides associated with a given angle unique?

Consider the ratio of the opposite side to the hypotenuse.

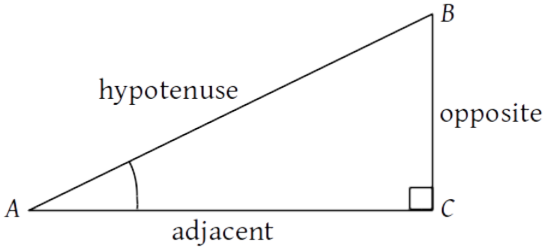
If $\angle A$ increases, the length of the opposite side also increases. Thus, the ratio will increase.

If $\angle A$ decreases, the length of the opposite side also decreases. Thus, the ratio will decrease.

In both scenarios, the ratio changes with the measure of $\angle A$. Therefore, the ratio associated with a specific angle is unique.

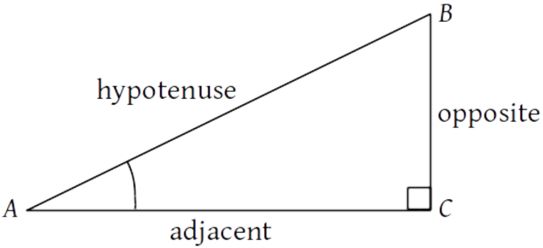
Primary Trigonometric Ratios

In the right triangle ΔABC below, the three sides have been labelled based on their position relative to $\angle A$.



Primary Trigonometric Ratios

In the right triangle ΔABC below, the three sides have been labelled based on their position relative to $\angle A$.



The opposite and adjacent sides are reversed relative to $\angle B$, but the hypotenuse is *always* across from the right angle.

Primary Trigonometric Ratios

There are six possible ratios of sides that can be made from the three sides.

Primary Trigonometric Ratios

There are six possible ratios of sides that can be made from the three sides.

The three *primary trigonometric ratios* are *sine*, *cosine* and *tangent*.

Primary Trigonometric Ratios

There are six possible ratios of sides that can be made from the three sides.

The three *primary trigonometric ratios* are *sine*, *cosine* and *tangent*.

Primary Trigonometric Ratios

Let ΔABC be a right triangle with $\angle A \neq 90^\circ$. Then, the three primary trigonometric ratios for $\angle A$ are:

Sine: $\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$

Cosine: $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$

Tangent: $\tan A = \frac{\text{opposite}}{\text{adjacent}}$

Primary Trigonometric Ratios

There are six possible ratios of sides that can be made from the three sides.

The three *primary trigonometric ratios* are *sine*, *cosine* and *tangent*.

Primary Trigonometric Ratios

Let ΔABC be a right triangle with $\angle A \neq 90^\circ$. Then, the three primary trigonometric ratios for $\angle A$ are:

Sine: $\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$

Cosine: $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$

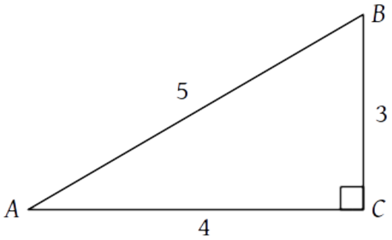
Tangent: $\tan A = \frac{\text{opposite}}{\text{adjacent}}$

The phrase *SOH-CAH-TOA* is a mnemonic for these ratios.

Primary Trigonometric Ratios

Example

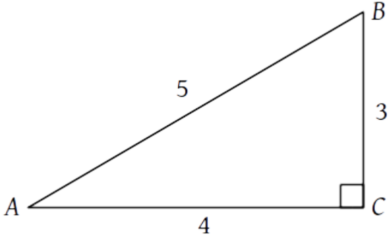
State the three primary trigonometric ratios for $\angle A$ in ΔABC.



Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC.

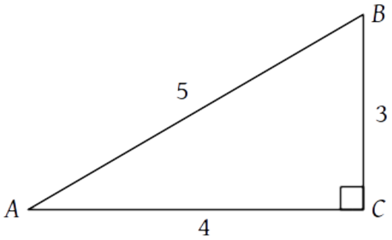


$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{3}{5}$$

Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC.



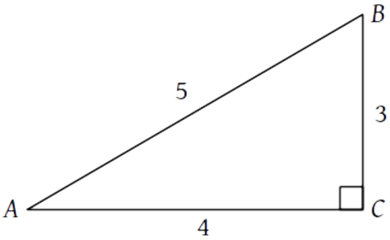
$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{3}{5}$$

$$\cos A = \frac{\text{adj}}{\text{hyp}} = \frac{4}{5}$$

Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC.



$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{3}{5}$$

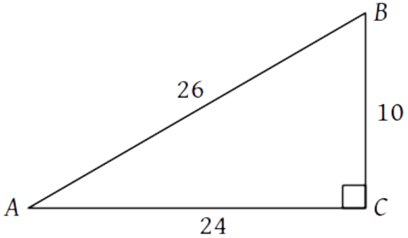
$$\cos A = \frac{\text{adj}}{\text{hyp}} = \frac{4}{5}$$

$$\tan A = \frac{\text{opp}}{\text{adj}} = \frac{3}{4}$$

Primary Trigonometric Ratios

Example

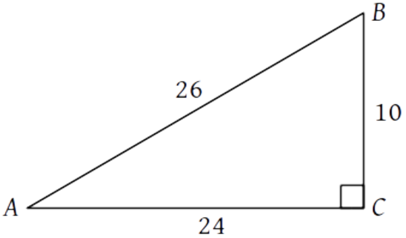
State the three primary trigonometric ratios for $\angle A$ in ΔABC. Express all ratios in simplest form.



Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC. Express all ratios in simplest form.

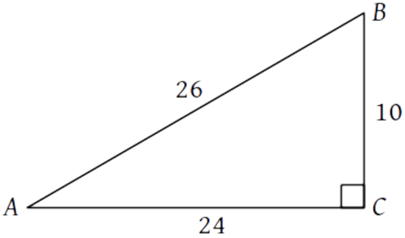


$$\sin A = \frac{\text{opp}}{\text{hyp}}$$
$$= \frac{5}{13}$$

Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC. Express all ratios in simplest form.



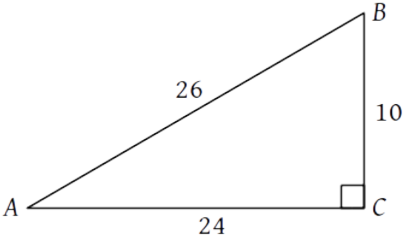
$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{5}{13}$$

$$\cos A = \frac{\text{adj}}{\text{hyp}} = \frac{12}{13}$$

Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC. Express all ratios in simplest form.



$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{5}{13}$$

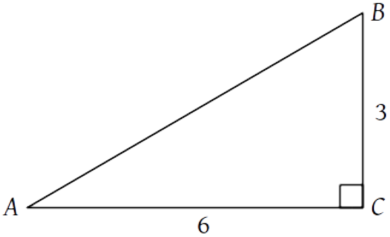
$$\cos A = \frac{\text{adj}}{\text{hyp}} = \frac{12}{13}$$

$$\tan A = \frac{\text{opp}}{\text{adj}} = \frac{5}{12}$$

Primary Trigonometric Ratios

Example

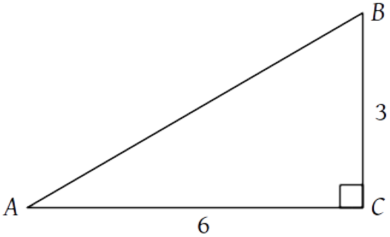
State the three primary trigonometric ratios for $\angle A$ in ΔABC.



Primary Trigonometric Ratios

Example

State the three primary trigonometric ratios for $\angle A$ in ΔABC.

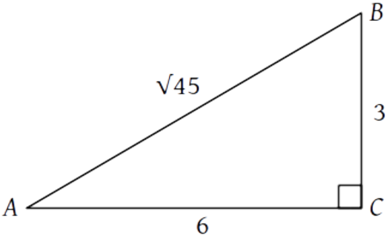


Use the Pythagorean Theorem to determine the length of the hypotenuse, h.

$$h^2 = 6^2 + 3^2$$
$$h^2 = 45$$
$$h = \sqrt{45}$$

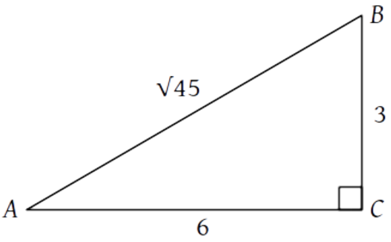
Primary Trigonometric Ratios

This gives us the following right triangle.



Primary Trigonometric Ratios

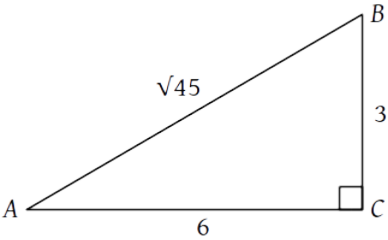
This gives us the following right triangle.



$$\sin A = \frac{\text{opp}}{\text{hyp}}$$
$$= \frac{3}{\sqrt{45}}$$

Primary Trigonometric Ratios

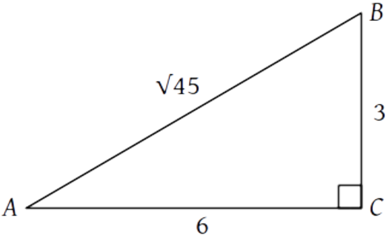
This gives us the following right triangle.



$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{3}{\sqrt{45}} \qquad \cos A = \frac{\text{adj}}{\text{hyp}} = \frac{6}{\sqrt{45}}$$

Primary Trigonometric Ratios

This gives us the following right triangle.



$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{3}{\sqrt{45}}$$

$$\cos A = \frac{\text{adj}}{\text{hyp}} = \frac{6}{\sqrt{45}}$$

$$\tan A = \frac{\text{opp}}{\text{adj}} = \frac{3}{6} = \frac{1}{2}$$

Questions?