Trigonometry

Unit 8 Lesson 3

Students will be able to:

Understand the trigonometric ratios and their inverses to find the angles in a right triangle.

Key Vocabulary:

- Right triangle
- Hypotenuse, Opposite, Adjacent
- Sine, cosine, Tangent
- Cosecant, Secant, Cotangent
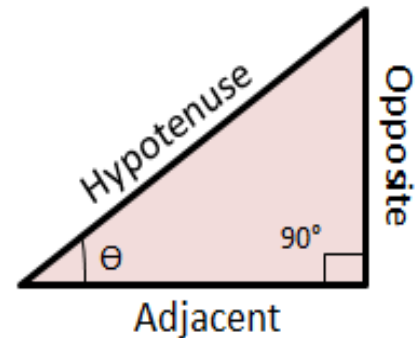- Inverse of Trigonometric ratios

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A **Right-angled triangle(named as right triangle)** is a triangle which has one of its angles equal to 90 degrees.

90°

θ
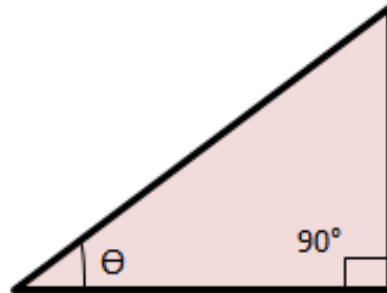
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There are properties associated with a right triangle.

- A **hypotenuse** is the line segment opposite to the right-angle.
- An **opposite** is the line segment opposite to the angle Ө.
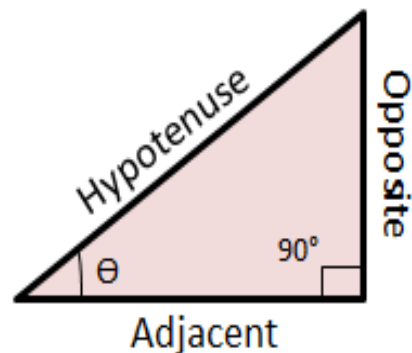- An **adjacent** is the line segment next to the angle Ө.

Trigonometric Ratios

There are three basic trigonometric ratios:

1. Sine

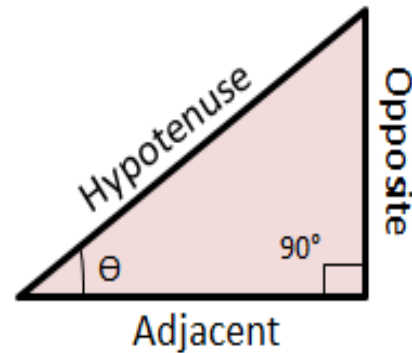$$sin(\theta) = \frac{opposite}{hypotenuse}$$

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Trigonometric Ratios

2. Cosine

$$cos(\theta) = \frac{adjacent}{hypotenuse}$$

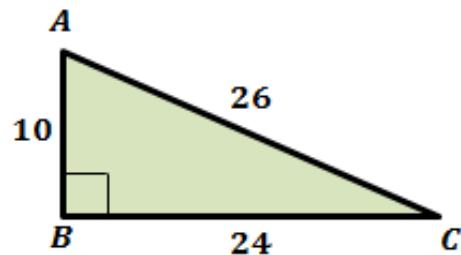### 3. Tangent

$$tan(\theta) = \frac{opposite}{adjacent}$$

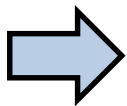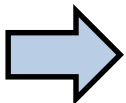**Problem 1**: Write the trigonometric ratios $\sin(C)$, $\cos(C)$ and $tan(C)$ for the triangle shown.

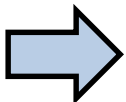**Problem 1**: Write the trigonometric ratios $\sin(C)$, $\cos(C)$ and $tan(C)$ for the triangle shown.

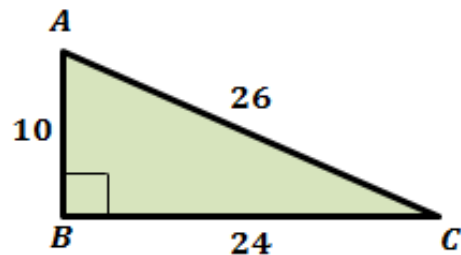$$\boldsymbol{sin(C)} = \frac{\mathbf{10}}{\mathbf{26}} = \frac{\mathbf{5}}{\mathbf{13}}$$

$$\boldsymbol{cos(C)} = \frac{\mathbf{24}}{\mathbf{26}} = \frac{\mathbf{12}}{\mathbf{13}}$$

$$\boldsymbol{tan(C)} = \frac{\mathbf{10}}{\mathbf{24}} = \frac{\mathbf{5}}{\mathbf{12}}$$
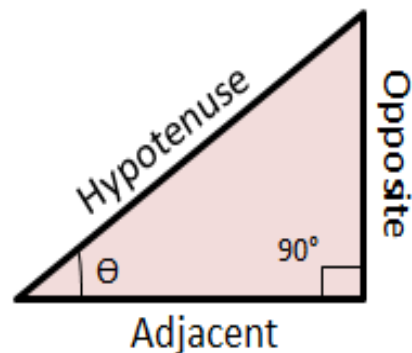
Reciprocal Trigonometric Ratios

Each of the three trigonometric ratios has a reciprocal ratio:

1. Cosecant

$$cosec(\theta) = \frac{hypotenuse}{opposite} = \frac{1}{sin(\theta)}$$

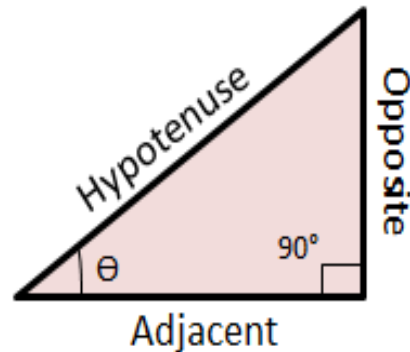## <u>Reciprocal Trigonometric Ratios</u>

2. Secant

$$sec(\theta) = \frac{hypotenuse}{adjacent} = \frac{1}{cos(\theta)}$$

3. Cotangent

$$cot(\theta) = \frac{adjacent}{opposite} = \frac{1}{cot(\theta)}$$
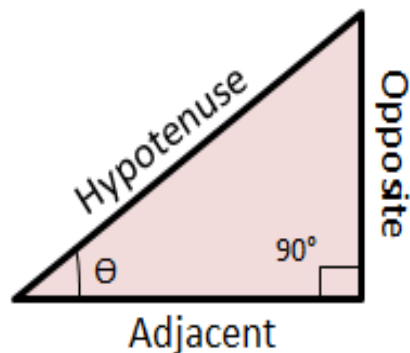

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Inverse of Trigonometric Ratios

The inverse of a trigonometric ratio can be used to find the unknown angles in a right triangle.

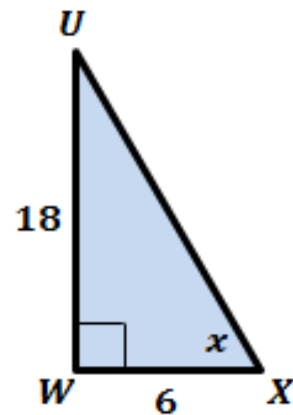$$\theta = sin^{-1}\left(\frac{opposite}{hypotenuse}\right)$$

$$\theta = cos^{-1}\left(\frac{adjacent}{hypotenuse}\right)$$

$$\theta = tan^{-1}\left(\frac{opposite}{adjacent}\right)$$

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Problem 2: Find the value of x. Round to the nearest degree.

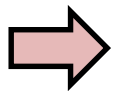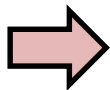**Problem 2**: Find the value of x. Round to the nearest degree.

We know that:

$$tan(\theta) = \frac{opposite}{adjacent}$$ ⟹ $$\theta = tan^{-1}\left(\frac{opposite}{adjacent}\right)$$

⟹ $$\theta = tan^{-1}\left(\frac{18}{6}\right)$$

$$\theta = tan^{-1}(3)$$

$$\theta = 71.6°$$

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