

Ch. 7 Right Triangles

7.1 Pythagorean Theorem

- Right Triangles:
 - 2 sides called legs
 - Longest side (opposite right angle) called Hypotenuse
- IN ANY RIGHT TRIANGLE: $a^2 + b^2 = c^2$
 - C = hypotenuse

- Pythagorean Triples:

3,4,5 6,8,10 5,12,13 8,15,17
7,24,25

Square Root Rules

1. No perfect square number as a factor
2. No fraction under $\sqrt{\quad}$
3. No $\sqrt{\quad}$ in denominator

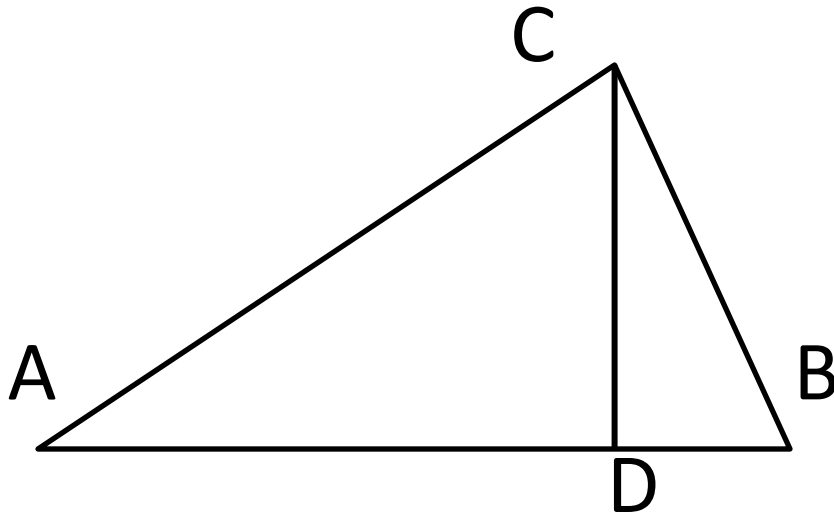
7.2 Converse of Pythagorean Theorem

- 1. If it's Right Triangle, then $a^2 + b^2 = c^2$
- 2. If $a^2 + b^2 = c^2$, then it's Right Triangle

- **Classify Triangles:**
 - 1. If $a^2 + b^2 = c^2$, then $\angle C$ is right, Right Triangle
 - 2. If $a^2 + b^2 > c^2$, then $\angle C$ is acute, Acute Triangle
 - 3. If $a^2 + b^2 < c^2$, then $\angle C$ is obtuse, Obtuse Triangle

7.3 Use Similar Triangles

- **Theorem:** When you draw an altitude in Right Triangle you form 3 similar triangles



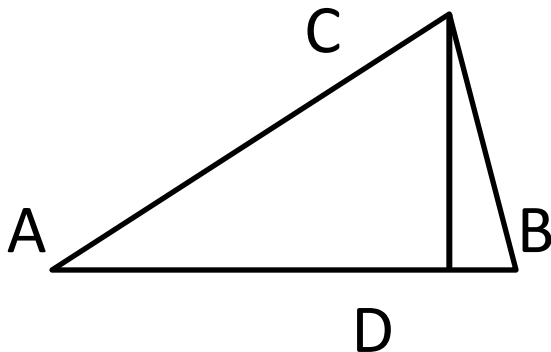
$$\triangle CBD \sim \triangle ACD \sim \triangle ABC$$

- **Short Cuts:**

- Geometric Mean: $\frac{a}{x} = \frac{x}{b}$ x is the geometric mean

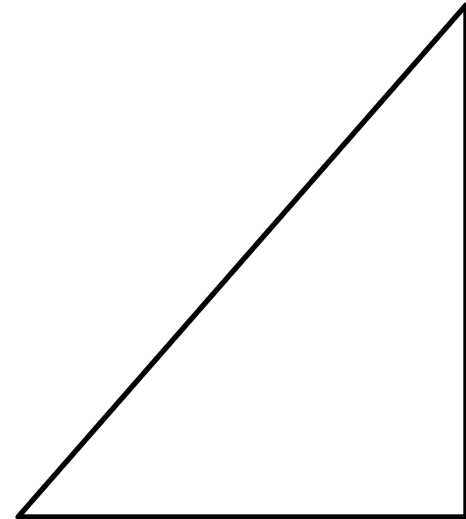
- 1. The **altitude** is the geometric mean: $\frac{AD}{CD} = \frac{CD}{DB}$

- 2. The **legs** are geometric means: $\frac{AB}{CB} = \frac{CB}{DB}$ and $\frac{AB}{AC} = \frac{AC}{AD}$

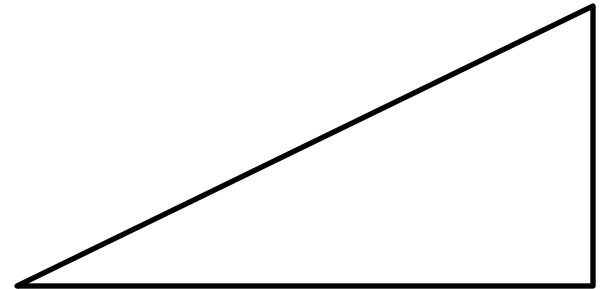


7.4 Special Right Triangles

- In a 45-45-90 right Triangle:
- The two legs are equal
- The Hypotenuse = leg $\cdot \sqrt{2}$



- In a 30-60-90 right Triangle:
- The hypotenuse = 2·short leg
- The long leg = short leg · $\sqrt{3}$



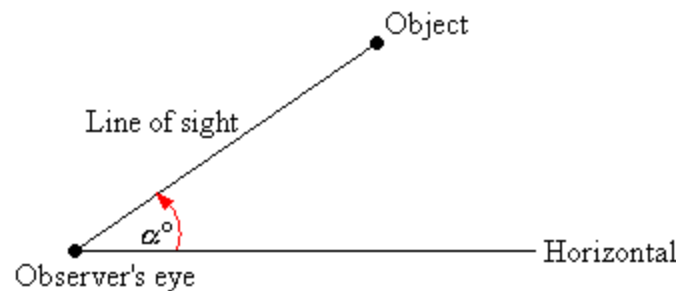
7.5 The Tangent Ratio

- In a right triangle there are special ratios made from the sides.
- **Trigonometric Ratios:**
 - 1. Tangent Ratio: $\text{Tan } \angle A = \frac{\text{length of side opposite } \angle A}{\text{length of side adjacent } \angle A}$
 - Tangent does not use the Hypotenuse

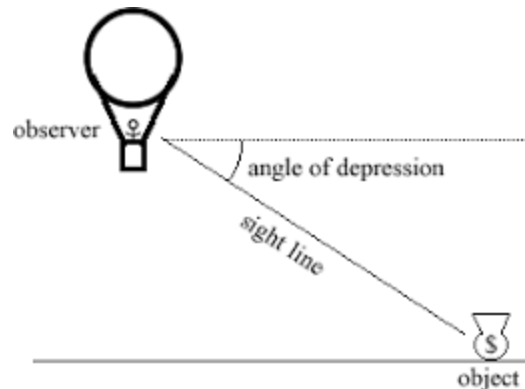
7.6 The Sine and Cosine Ratio

- The other 2 trigonometric ratios involve the Hypotenuse
- **2. Sine Ratio:** $\text{Sin}\angle A = \frac{\text{length of opposite side}\angle A}{\text{length of Hypotenuse}}$
- **3. Cosine Ratio:** $\text{Cos}\angle A = \frac{\text{length of adjacent side}\angle A}{\text{length of Hypotenuse}}$

- **Angle of Elevation:** Angle from ground (horizon) up



- **Angle of Depression:** Angle from horizon down



7.7 Solve Right Triangles

- **Right Triangles:**
 - 1. 2 in 1: Make Ratios of sides
 - 2. Use Pythagorean Theorem
 - 3. Use “Special Triangles” 30-60-90 and 45-45-90
 - 4. Use Trig Ratios to find sides AND angles
- To **Solve** a Right Triangle: find all sides and angles

- The **Inverse** Trig Function gives you the Angle
 - Use Inverse to find Angle
- If $\tan A = x$, then $\tan^{-1} x = m < A$
- If $\sin A = x$, then $\sin^{-1} x = m < A$
- If $\cos A = x$, then $\cos^{-1} x = m < A$