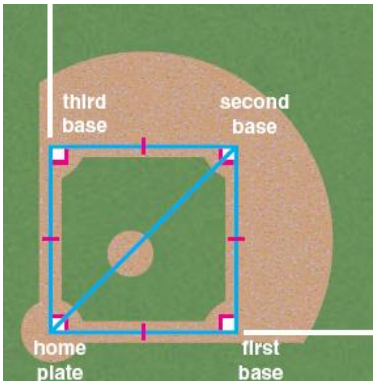
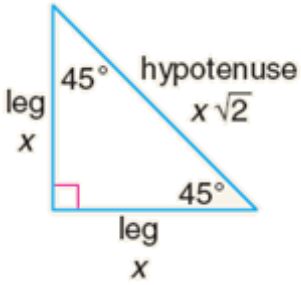
Special Right Triangles

If you're a baseball fan, you know that home plate, first base, second base, and third base form the baseball "diamond." But geometrically, a baseball diamond is actually a square.

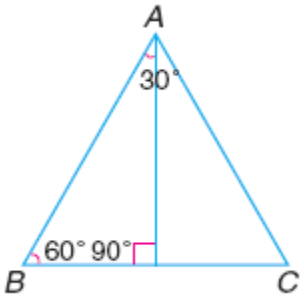


The line segment from home plate to second base is a diagonal of the square. The diagonal of a square separates the square into two **45°-45°-90° triangles**. This is an **isosceles right triangle**. An **isosceles right triangle** has the characteristic of both the isosceles and the right triangles. It has two equal sides, two equal angles, and one right angle. (The right angle cannot be one of the equal angles because the sum of the angles would exceed 180°.)

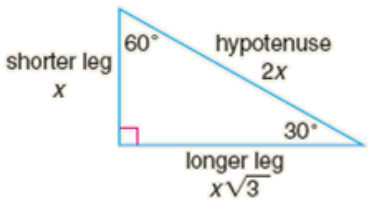
Theorem 1: In a **45°-45°-90°triangle, the hypotenuse is $\sqrt{2}$ times the length of a leg**



An equilateral triangle has three equal sides and three equal angles. Because the sum of the measures of the angles in a triangle is 180°, the measure of each angle in an equilateral triangle is 60°. If you draw a median from vertex *A* to side *BC*, the median bisects the angle *A*. The median of an equilateral triangle separates it into two **30°-60°-90° triangles**.



Theorem 2: In a **30°-60°-90° triangles**, the hypotenuse is twice the length of the shorter leg, and the longer leg is $\sqrt{3}$ **times the length of the shorter leg.**



Pattern right triangles are made up of–The Pythagorean Triples (based on lengths of sides)
3, 4, 5
5, 12, 13
8, 15, 17
7, 24, 25

The Special Right Triangles (based on angles)
•45-45-90; Based on sides: 1, 1, $\sqrt{2}$.
•30-60-90; Based on sides: 1, $\sqrt{3}$, 2

Pattern right triangles can also be seen as RATIOS!–The Pythagorean Triples (based on lengths of sides)
$3x : 4x : 5x$
$5x : 12x : 13x$
$8x : 15x : 17x$
$7x : 24x : 25x$

The Special Right Triangles (based on angles)
•45-45-90; Based on sides: $1x$, $1x$, $\sqrt{2}\ x$.
•30-60-90; Based on sides: $1x$, $\sqrt{3}\ x$, $2x$

Example 1: If one of the equal sides of an isosceles right triangle is 3, what are the measures of the other two sides?
Using the ratio $x : x : x\sqrt{2}$ for isosceles right triangles, then $x = 3$, and the other sides must be 3 and $3\sqrt{2}$.