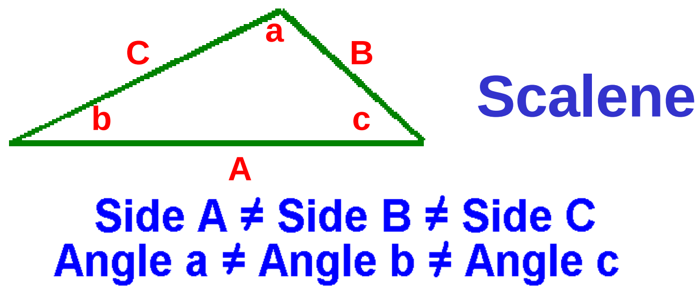
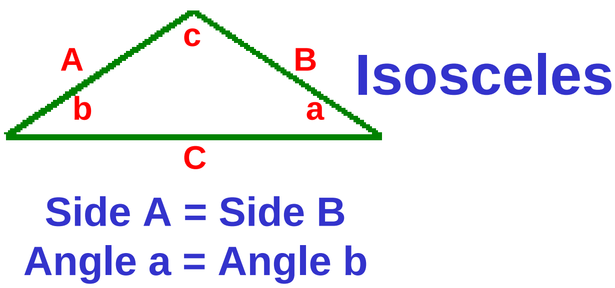
Mathematics Lesson MC4111 Types of Triangles

Triangles are classified based on the relationship of their side lengths and angles.

Scalene: This has three different angles and three different length sides.



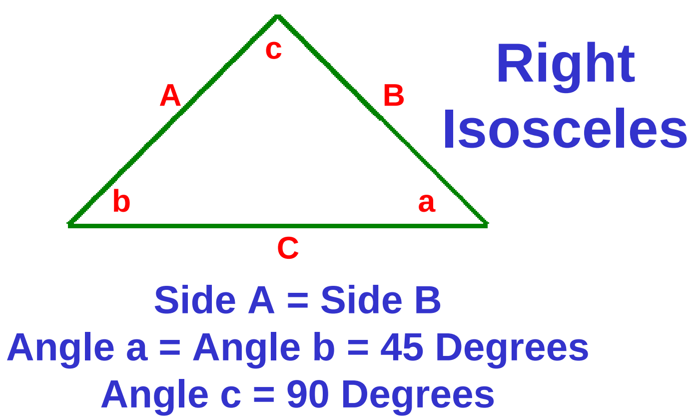


Isosceles: This has two sides equal and two angles equal.

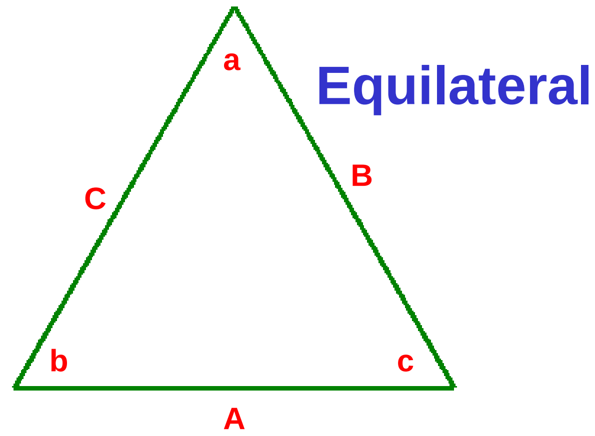
Right Isosceles: This is an isosceles triangle with two 45 degree angles and one 90 degree angle.

The two sides opposite the 45 degree angles are equal.

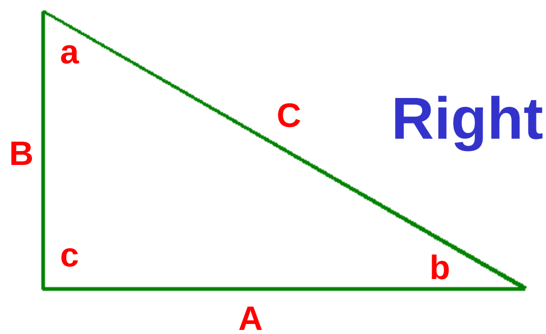
It is better to have a right isosceles triangle instead of a wrong one! (Just a joke!)



Equilateral: This has three 60 degree angles and three equal length sides.



Side A = Side B = Side C
Angle a = Angle b = Angle c = 60 Degrees



Side A ≠ Side B ≠ Side C
Angle a ≠ Angle b
Angle c = 90 Degrees
$A^2 + B^2 = C^2$

Right: This has one right angle. The sum of the other two angles (a + b) is equal to 90 degrees since the sum of the angles in a triangle must always equal 180 degrees.

The side opposite the right angle is called the hypotenuse. The two sides that include the right angle are often called legs.

Thousands of years ago, an ancient Greek mathematician, named Pythagoras, discovered an interesting property of right triangles. If you square the length of the hypotenuse (This means that you multiply it by itself.) you will find that it is always equal to the sum of the squares of the two other sides.

We write this relationship like this:

$$A^2 + B^2 = C^2$$

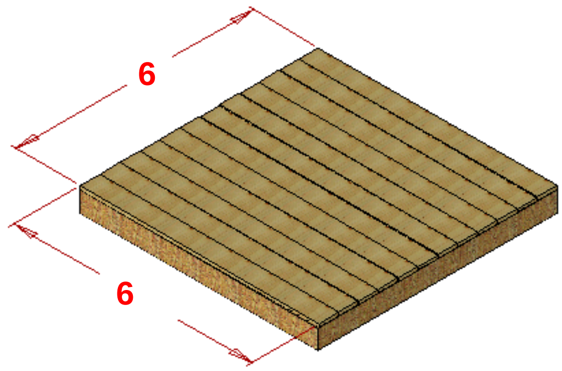
This is known as the Rule of Pythagoras or the Pythagorean Theorem.

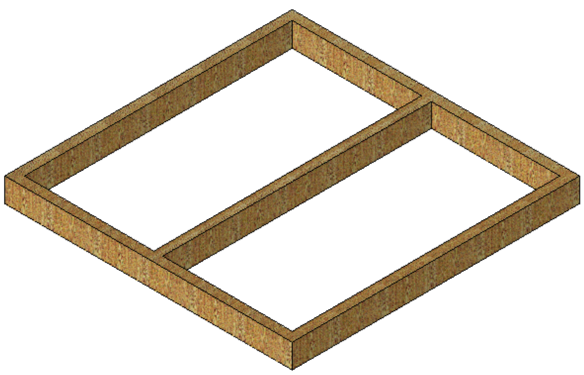
Application of the Theorem of Pythagoras

The relationship between the sides of a right triangle known as the Theorem of Pythagoras has a very useful practical application. You'll want to remember this if you like to build things.

Let's say that you want to make a small wood platform that is six feet by six feet square.

I've illustrated this to the right.

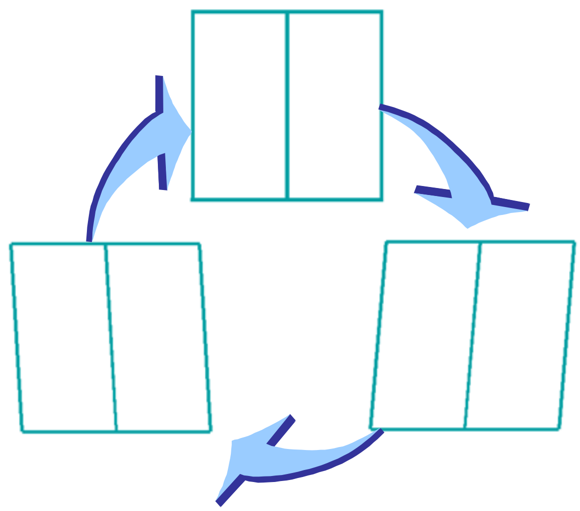




You start by nailing up a support frame that looks like the one illustrated to the left.

Before the deck boards are added, the frame is quite flexible and it can be pushed back and forth so that it does not form a perfect square.

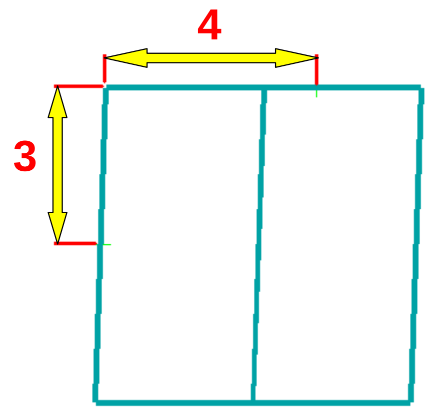
Let's suppose that you don't have a carpenter's square handy. (This is a precision tool that let's you mark and check perfect right angles.) How can you make sure the frame is perfectly square before nailing on the deck boards?

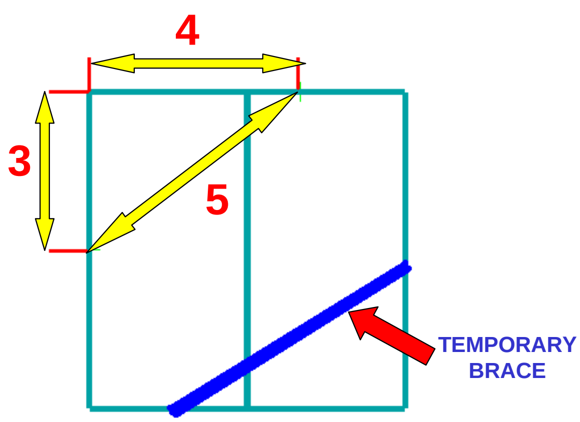


An easy solution is to use the Theorem of Pythagoras to make the frame perfectly square. Follow these three simple steps:

Step One: Use a ruler or tape measure to mark off exactly three feet along one edge of the frame.

Step Two: Mark off exactly four feet along a side that connects to the first side.





Step Three: Measure from the first mark to the second mark and push on the frame until this distance is exactly five feet. Hold the frame in this position (You can use a temporary board nailed across a corner.) until you get a few deck boards nailed on.

Your finished frame will be perfectly square since you had Uncle Pythagoras giving you some help!

Note: This trick is especially handy if you need to square up a large area like a playing field for sports where using a mechanical square would not really help. Any triangle that has sides in a ratio of 3 to 4 to 5 will work.

So you could use a long tape measure and measure off, for example, 30 feet, 40 feet, and then 50 feet for the hypotenuse.

Work through the following problems to make sure you understand what was covered in this chapter.

Answers to the problems are provided at the back of the book.

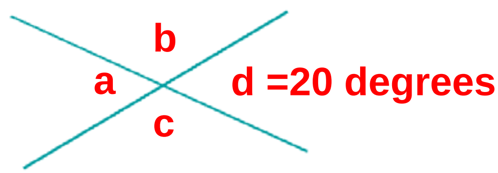
1. How many degrees are in a half circle? How many Radians?

2. What is another name for a quarter circle?

   A. How many degrees are in a quarter circle?
   B. How many Radians are in a quarter circle?

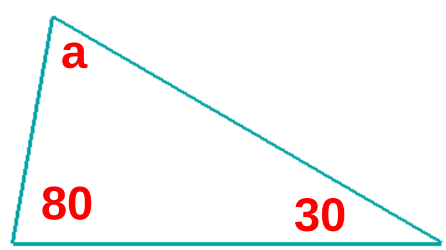
3. Angles a and b are supplementary angles. If angle a = 40 degrees, what is the value of b?

4. Find the values of angles a, b, and c in the illustration to the right.

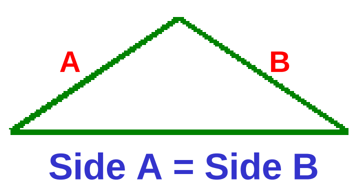


5. Angles a and b are complementary angles. If a = 15 degrees, how big is angle b?

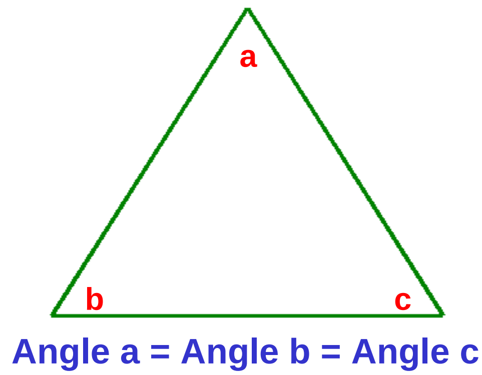
6. What is the value of angle a in the illustration to the right?



7. In the illustration to the right, side A is equal to side B. What type of triangle is this?



8. In the illustration to the right, angle a = angle b = angle c. What type of triangle is this?



9. The triangle illustrated to the right is a right triangle. Notice that the two short sides (legs) are 6 inches and 8 inches. What is the length of the hypotenuse?