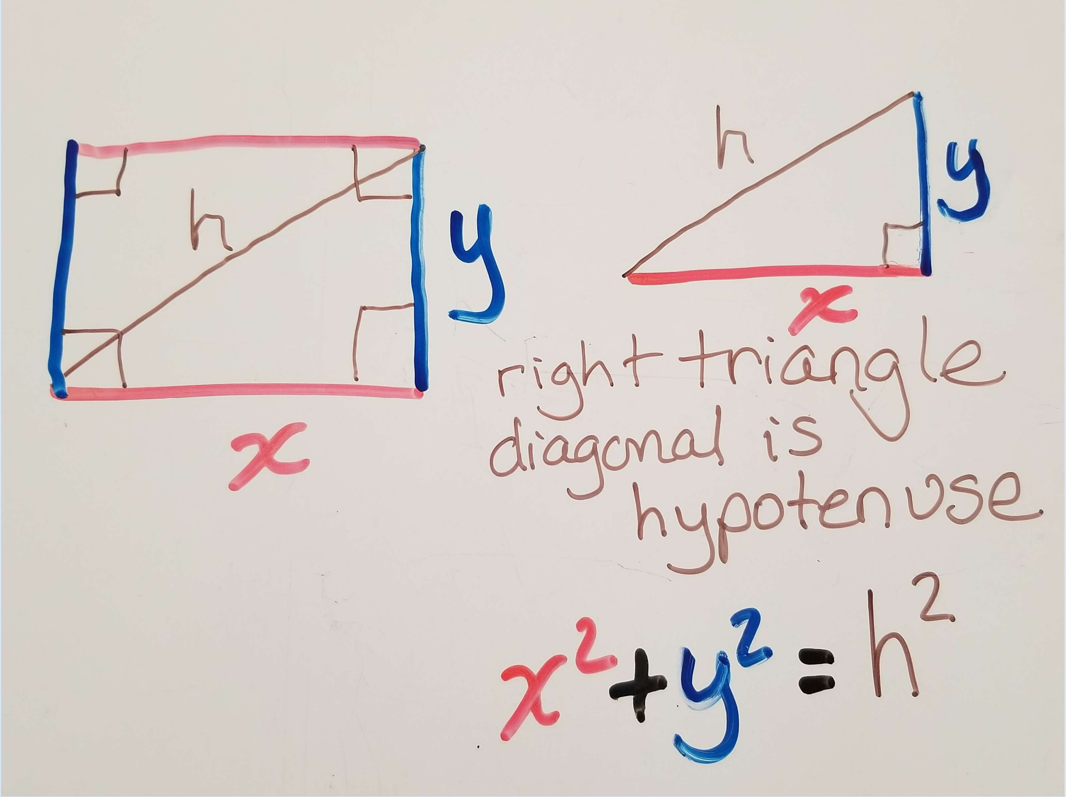
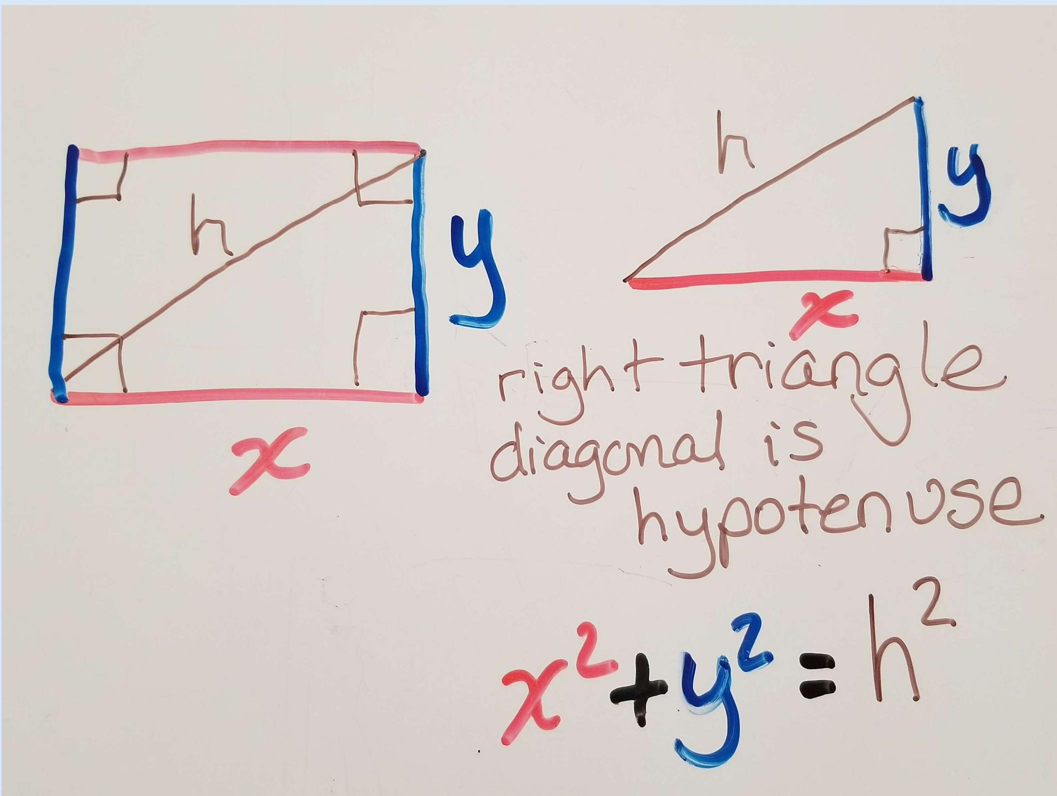
The diagonal length of a right triangle is opposite the right angle and is called the hypotenuse. When we try and calculate the hypotenuse of a right triangle, we run into another type of irrational number.



A number times a number is that number to the second power or squared.



$1 \cdot 1 = 1^2 = 1$

$2 \cdot 2 = 2^2 = 4$

$3 \cdot 3 = 3^2 = 9$

$x^2 = x \cdot x$

$y^2 = y \cdot y$

$h^2 = h \cdot h$

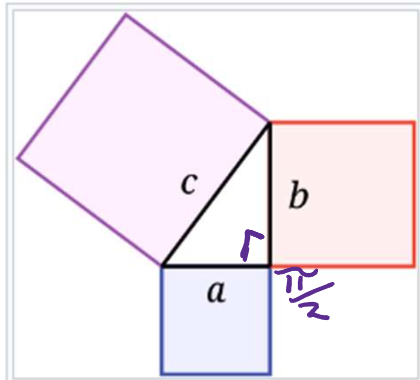
The Pythagorean theorem says that the hypotenuse squared equals the sum of each side squared. [Pythagorean theorem - Simple English Wikipedia, the free encyclopedia]

Pythagorean theorem

From Simple English Wikipedia, the free encyclopedia

In mathematics, the **Pythagorean theorem** or **Pythagoras's theorem** is a statement about the sides of a right triangle.

One of the angles of a right triangle is always equal to 90 degrees. This angle is the right angle. The two sides next to the right angle are called the legs and the other side is called the hypotenuse. The hypotenuse is the side opposite to the right angle, and it is always the longest side.



Pythagorean theorem
The sum of the areas of the two squares on the legs (*a* and *b*) equals the area of the square on the hypotenuse (*c*).

Contents [hide]

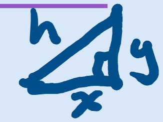
The Pythagorean theorem says that the hypotenuse squared equals the sum of each side squared. Pythagorean theorem - Simple English Wikipedia, the free encyclopedia

Pythagoras’ theorem, an animated explanation! - Bing video

Pythagoras' Theorem - Animated proof - Melissa Maths - Bing video

The Pythagorean theorem says that the hypotenuse squared equals the sum of each side squared. Pythagorean triple – Wikipedia

$h^2 = x^2 + y^2$



Pythagorean triples are the positive integer triples that satisfy the equation.

There are 16 primitive Pythagorean triples of numbers up to 100:

(3, 4, 5)	(5, 12, 13)	(8, 15, 17)	(7, 24, 25)
(20, 21, 29)	(12, 35, 37)	(9, 40, 41)	(28, 45, 53)
(11, 60, 61)	(16, 63, 65)	(33, 56, 65)	(48, 55, 73)
(13, 84, 85)	(36, 77, 85)	(39, 80, 89)	(65, 72, 97)

$3^2 + 4^2 = 5^2$

$(n3)^2 + (n4)^2 = (n5)^2$

$6^2 + 8^2 = 10^2$

$9^2 + 12^2 = 15^2$

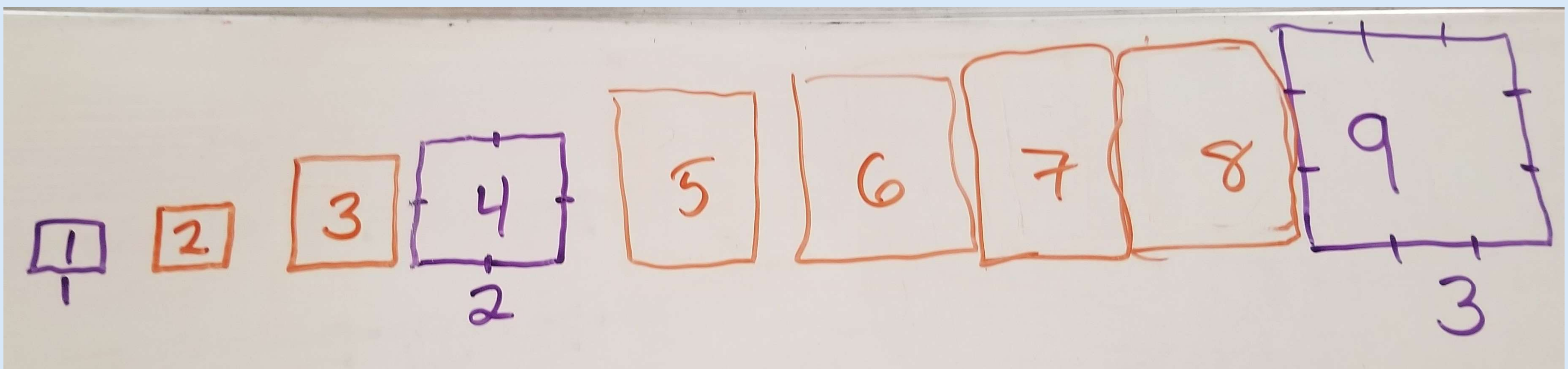
For sides with lengths other than the Pythagorean triples, we run into incommensurability.

$$1^2 + 1^2 = 2 = h^2$$

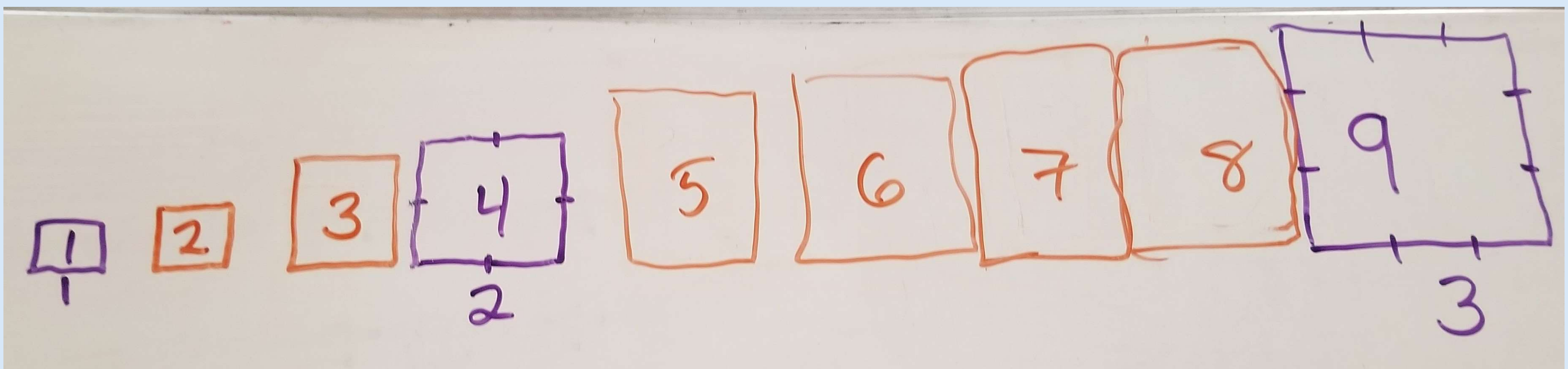
What is the number that we square to get 2?

$$h^2 = 2$$

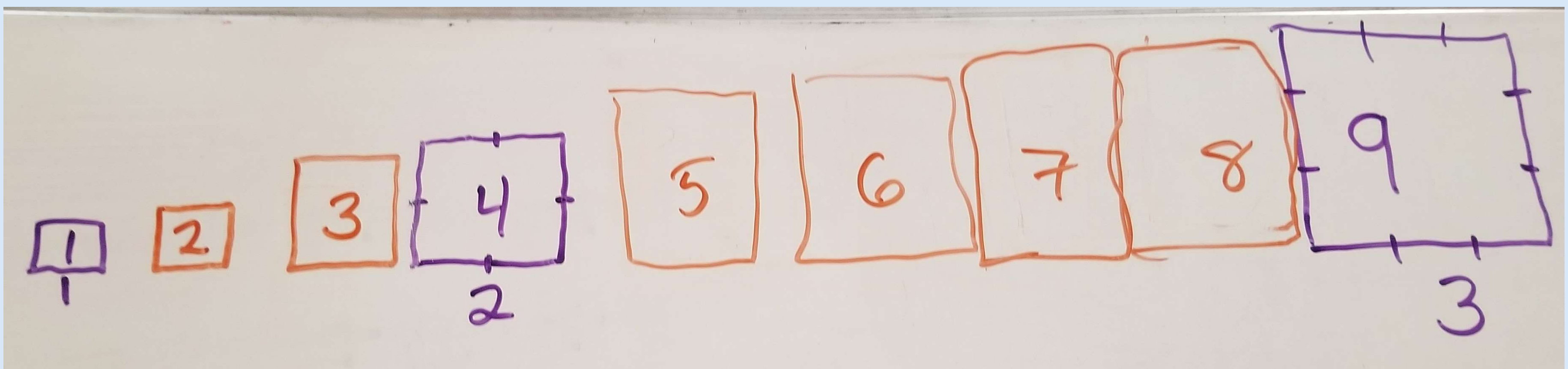
Other than perfect squares, you get an irrational number when you take the square root.



Unsquaring a number is called taking the square root of the number.



Unsquaring a number is called taking the square root of the number. We have a special symbol for the square root. $\sqrt{\ }$



$\sqrt{1} = 1$

$1^2 = 1$

$\sqrt{1^2} = 1$

$2^2 = 4$

$\sqrt{2^2} = 2$

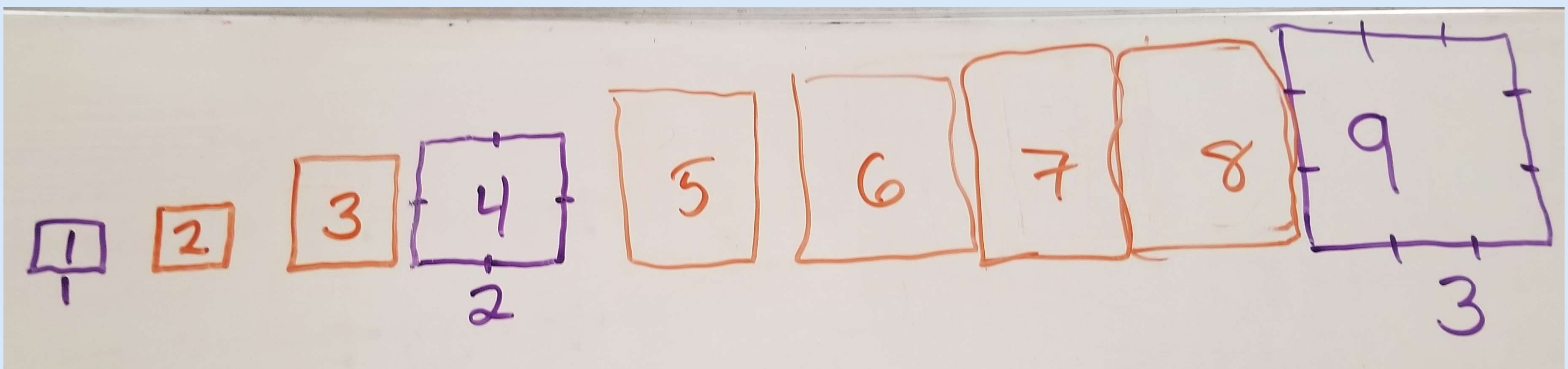
$\sqrt{4} = 2$

$3^2 = 9$

$\sqrt{3^2} = 3$

$\sqrt{9} = 3$

In geometry, we only use positive numbers, but in algebra we can get a positive and negative square root for any positive number.



$\sqrt{1} = 1$

$1^2 = 1$

$\sqrt{1^2} = 1$

$2^2 = 4$

$\sqrt{2^2} = 2$

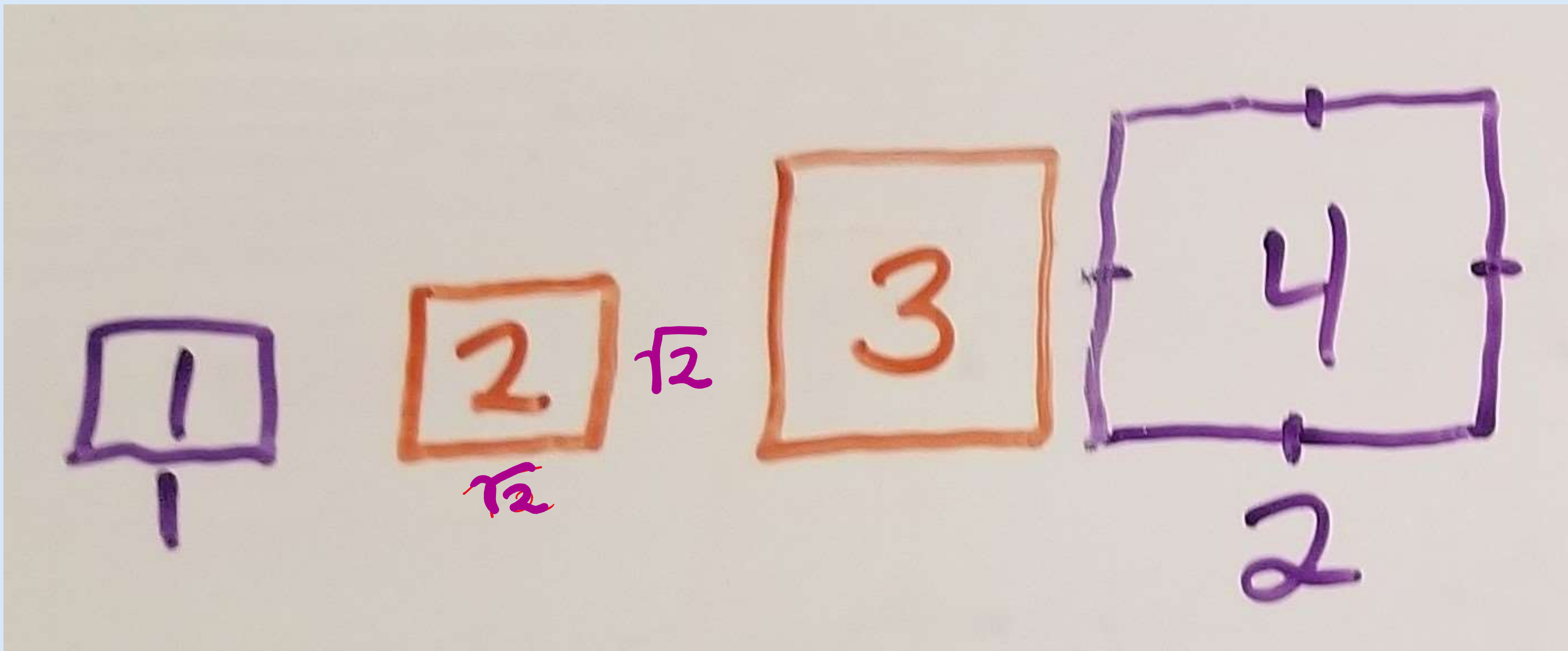
$\sqrt{4} = 2$

$3^2 = 9$

$\sqrt{3^2} = 3$

$\sqrt{9} = 3$

Finding or approximating the square root of 2. We can see that it is between 1 and 2 and probably closer to 1.



Can approximate by getting closer to two when multiplying a number by itself.

1.4*1.4= 1.96

1.41*1.41=1.9881

1.414*1.414=1.999396

1.4149*1.4149=2.00194201

1.4145*1.4145=2.00081025

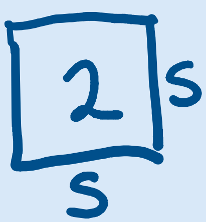
1.4142*1.4142=1.99996164

1.4143*1.4143=2.00024449

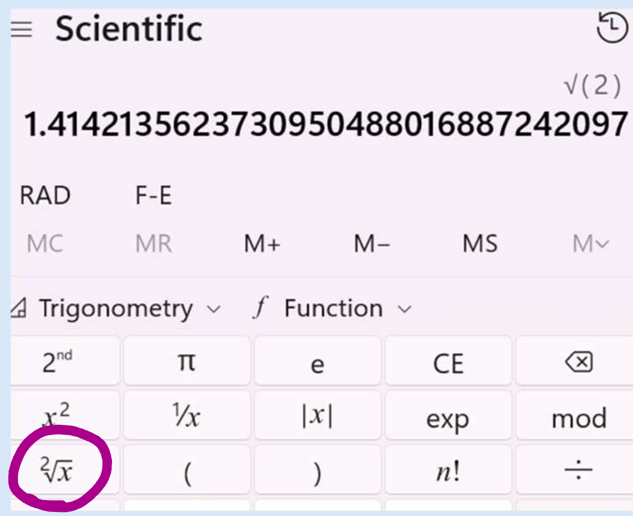
So, 1.4142 is the next one

The problem is that for a number that times itself gives exactly 2, we don't get a rational number. The number can't be written as a ratio of integers and is an irrational number. That means it is a decimal that goes on infinitely.

Since we can't write it as a rational number, we have a symbol for the exact number that you square to get 2. It is called the square root of 2.

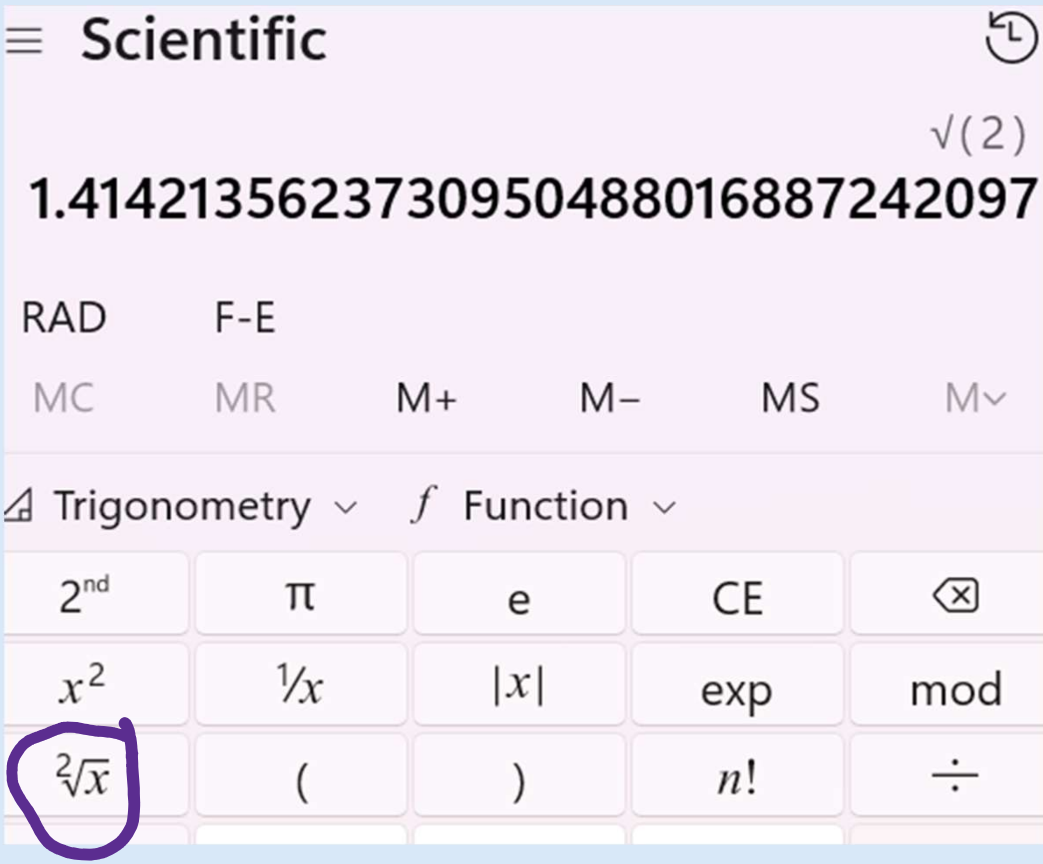


side $= \sqrt{2} \approx$



$\sqrt{2}$

Here you can see how to get it on a calculator:

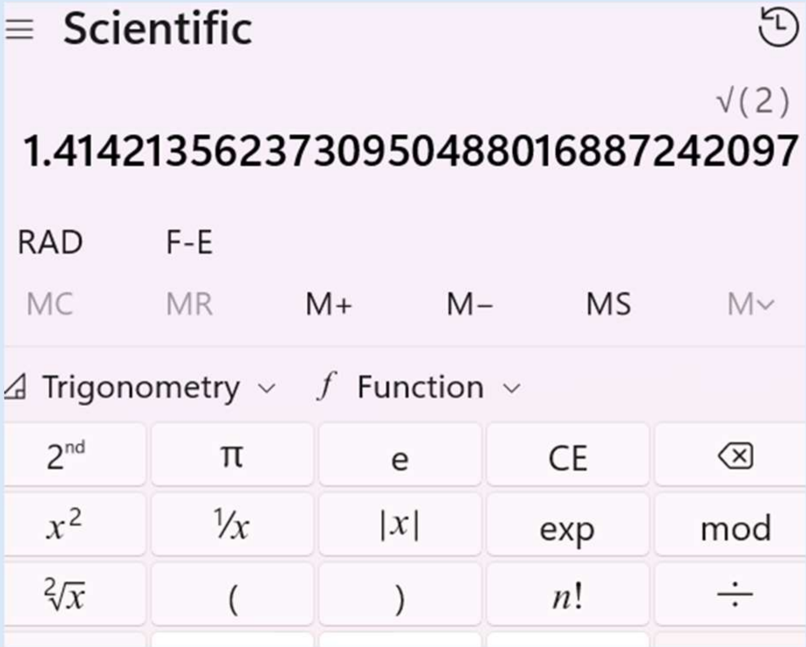


Since it is an irrational number, and we want to use the exact number, we use the symbol in math. $\sqrt{2}$ $\sqrt{3}$ $\sqrt{4} = \pm 2$

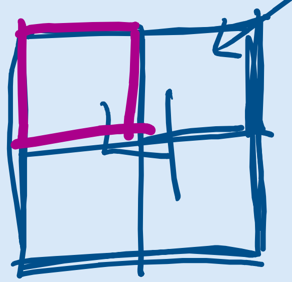
If a number is a perfect square, then we simplify it to the rational number.

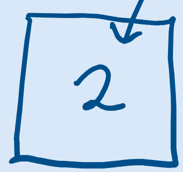
$\sqrt{9} = \pm 3$

$\sqrt{x^2} = \pm x$



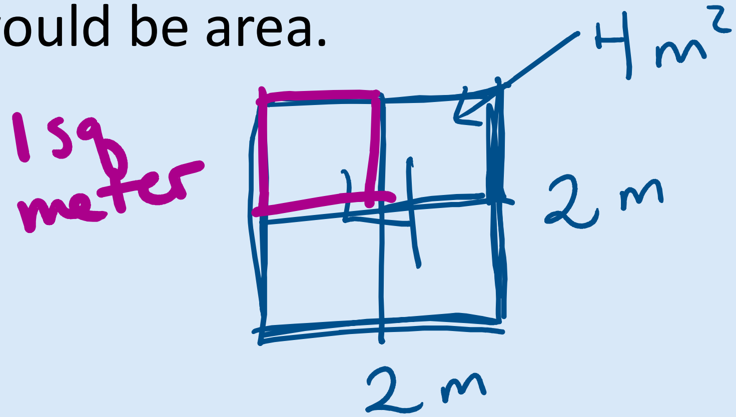
The units in science, arts, or construction, are the units squared or the linear units.

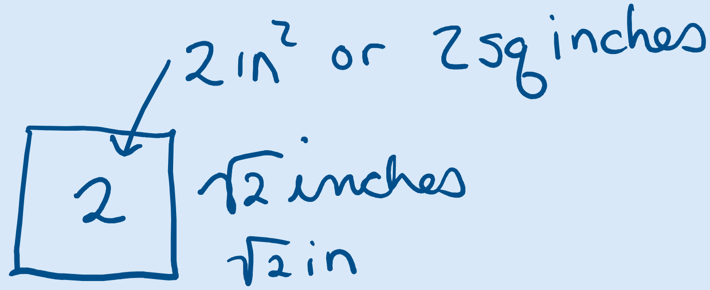


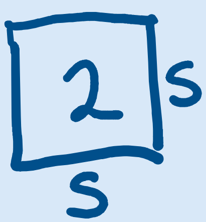


$\text{side} = \sqrt{2} \approx 1.414$

Cord or edging would be in linear measure and the fabric in the sq would be area.







side $= \sqrt{2} \approx 1.414$

In algebra, the square root function undoes squaring a number, and is the inverse operation. Unsquaring any number (taking the square root) that has been squared will give you that number.

In algebra, we get the positive and negative square root, but since we only want the positive length in geometry, we just talk about the positive square root. Don't forget that algebra includes both pos and neg square roots!

$$\sqrt{x^2} = \pm x$$

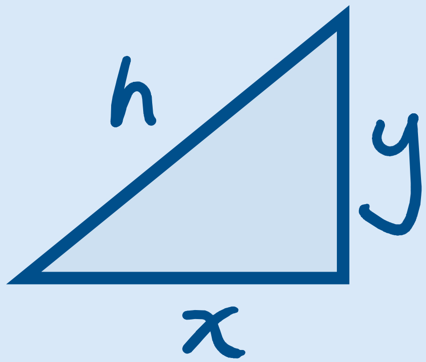
$$(-1)\cdot(-1) = +1 = 1\cdot 1$$

$$(-2)\cdot(-2) = +4 = 2\cdot 2$$

$$(-\sqrt{2})\cdot(-\sqrt{2}) = +2 = \sqrt{2}\cdot\sqrt{2}$$

To find the length of the hypotenuse when you know the length of the sides, you square each side, add them and then take the square root of the sum of the squares. Remember, for a length, we only care about the positive square root.

$$h = \sqrt{x^2 + y^2}$$



The square root symbol can also be a grouping symbol.

$\sqrt{2+2} = \sqrt{4} = \sqrt{\ }(2+2)$

$\sqrt{2} + 2 = \sqrt{\ }2 + 2 =$

√ (2 + 2)

2

$\sqrt{2+2}$

2 + √ (2) =

3.4142135623730950488016887242097

$2 + \sqrt{2}$

The triangle can be put on a coordinate axis system for what we call analytic geometry. Analytic geometry - Wikipedia

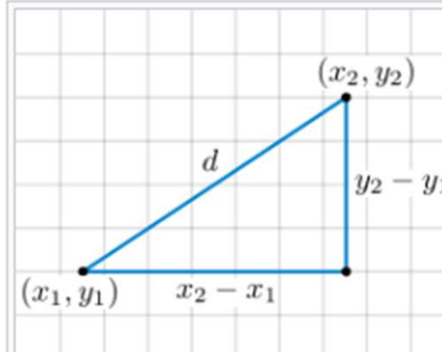
Distance and angle [edit source]

Main articles: Distance and Angle

In analytic geometry, geometric notions such as distance and angle measure are defined using formulas. These definitions are designed to be consistent with the underlying Euclidean geometry. For example, using Cartesian coordinates on the plane, the distance between two points (x_1, y_1) and (x_2, y_2) is defined by the formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2},$$

which can be viewed as a version of the Pythagorean theorem. Similarly, the angle that a line makes with the horizontal can be defined by the formula



The distance formula on the plane follows from the Pythagorean theorem