Finding an angle in a right-angled triangle.

METHOD 1: If you have the length of at least two of the sides, then use SOHCAHTOA

Step 1: Identify the "types" (H, O, A) of the sides of your triangle with respect to the angle θ you wish to find.
H is always the hypotenuse
O is the side opposite θ
A is the side adjacent to θ

Step 2: You will use two of these "types" that correspond to two of the sides with known side lengths to identify which trigonometric function to select in SOHCAHTOA.

Step 3 The 3 letters in SOHCAHTOA give the equation

$$\text{Function}(\theta) = \frac{\text{Type A}}{\text{Type B}}$$

Step 4 The inverse of the appropriate trigonometric function will give the value for θ.

(Some examples are on the following page.)

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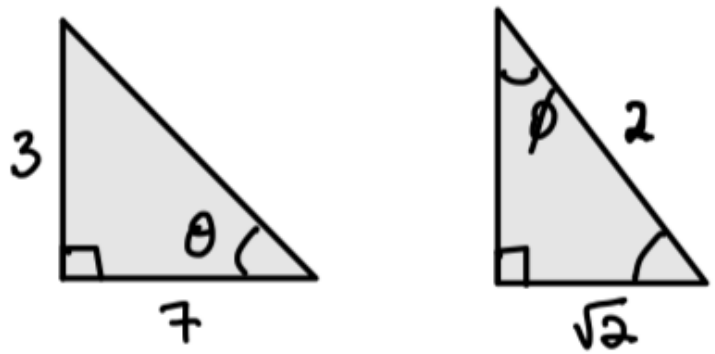

Examples: We will use radians as the measure of the angles in these examples.
The first triangle has a side of length 3 **o**pposite the angle θ and a side of length 7 **a**djacent to the angle θ. As we have O and A, we use TOA, that is,

$$\tan(\theta) = \frac{3}{7} \Rightarrow \theta = \tan^{-1}(\frac{3}{7}) \text{ radians.}$$

This is the exact answer, but if you were asked to give the answer to 3 decimal places, you would find $\theta = \tan^{-1}(\frac{3}{7})$ radians ≈ 0.405 radians.
The second triangle has **h**ypotenuse of length 2 and the side **o**pposite the angle ϕ of length $\sqrt{2}$. As we have O and H, we use SOH, that is,

$$\sin(\phi) = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}} \Rightarrow \phi = \sin^{-1}(\frac{1}{\sqrt{2}}) \Rightarrow \phi = \frac{\pi}{4} \text{ radians.}$$

Note: in the second example we used one of the special triangles.

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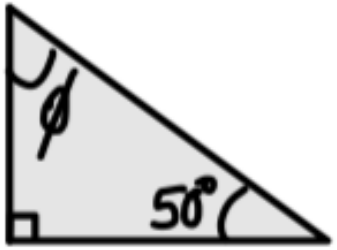

METHOD 2: If you have two angles in a triangle, then you can find the third angle by using the fact that the three angles sum to 180^o (or to π radians).

Step 1: Identify the angles you know, noting that one is the right-angle which is 90^o (or $\frac{\pi}{2}$ radians).

Step 2: Subtract the non-right angle you know from 90^o (or from $\frac{\pi}{2}$ if you are working in radians) to find the other angle.

Example: The triangle above has an angle 50^o, so the angle ϕ is

$$\phi = 90 - 50 = 40^o.$$

Note: we can check the answer by adding all the angles together and checking they add to 180^o. In this example, we have $90 + 50 + \phi = 90 + 50 + 40 = 180^o$.