[How to Measure the Height of a Tree](http://www.wikihow.com/Measure-the-Height-of-a-Tree)

**Shadow Method**

**1. Know your exact height in the shoes you will be wearing to perform this method**.

**2. Stand next to the tree or the object to be measured**. *For best results, do this method on a bright, sunny day. If the sky is overcast, it may be difficult to tell exactly where the shadow’s tip is.*

**3. Measure the length of your shadow**. *Use a tape measure or yardstick (meter ruler) to measure your shadow from your feet to the tip of your shadow. If you don’t have someone to assist you, you can mark the end of the shadow by tossing a rock onto it while you’re standing. Or better yet, place the rock anywhere on the ground, and then position yourself so the tip of your shadow is at the rock; then measure from where you're standing to the rock.*

**4. Measure the length of the tree’s shadow**. *Use your measuring tape to determine the length of the tree’s shadow from the base of the tree to the tip of the shadow. This works best if the ground all along the shadow is fairly level; if the tree is on a slope, for example, your measurement won’t be very accurate. You want to do this as quickly as possible after measuring your shadow, since the sun’s position in the sky (and hence the shadow length) is slowly but constantly changing. If you have an assistant, you can hold one end of the measuring tape while he or she measures the tree’s shadow, and then you can immediately measure your shadow.*

**5. Calculate the tree’s height by using the proportion of your shadow’s length to your height**. *Since you know the length of the tree’s shadow, and you also know that a certain height (your height) produces a certain shadow length (the length of your shadow), you can determine the tree’s height with a little math. Multiply the length of the tree’s shadow by your height, and then divide the resulting number by the length of your shadow. For example, if you are 1.5 metres tall, your shadow is 2.4 metres long, and the tree’s shadow is 30.48 metres long, the height of the tree is (30.48 x 1.5 metres) / 2.4 metres. Note that the order of your multiplication does not matter.*

**Angle of Elevation Method**

**1. Measure the distance to a sighting position**. *Stand with your back to the tree and walk out to a point that is approximately level with the ground at the tree’s base and from which you can clearly see the tree’s top. Walk in a straight line, and use a measuring tape to measure your distance from the tree. You need not stand any set distance from the tree, but this method generally works best if your distance from the tree is about 1-1.5 times the height of the tree.*

**2. Measure the angle of elevation to the tree’s top**. *Sight the top of the tree and use a clinometer or transit to measure the "angle of elevation" between the tree and the ground. The angle of elevation is the angle formed between two lines—the flat plane of the ground and your sightline, to some elevated point (in this case, the tree’s top) — with you as the vertex of the angle.*

**3. Find the tangent of the angle of elevation**. *You can find the tangent of an angle using a calculator or table of trigonometric functions. The method for finding the tangent may differ depending on your calculator, but usually you just push the “TAN” button, enter the angle, and then press the “equal” button (=). Thus if the angle of elevation is 60 degrees, you simply push “TAN” and then enter “60” and then press the equal sign.*

**4. Multiply your distance from the tree (measured in step 1), by the tangent of the angle of elevation**. *The resulting number is the height of the tree minus your height.*

**5. Add your height to the height you calculated in the previous step**. *Now you have the height of the tree. You need to add your height because you measured the angle of elevation from eye level, not from the ground.*

**Pencil Method: Requires an Assistant**

**1. Stand far enough from the tree so you can view the whole tree—top to bottom—without moving your head**. *For the most accurate measurement, you should stand so that you are on a piece of ground that is about level with the ground at the tree’s base. Your view of the tree should be as unobstructed as possible.*

**2. Have a friend stand near the tree**.

**3. Hold a pencil or a small, straight stick (such as a paint stick or ruler) in one hand and stretch your arm out so that the pencil is at arm’s length in front of you (between you and the tree)**.

**4. Close one eye and adjust the pencil up or down so that you can sight the very top of the tree at the top of the pencil**. *This is easiest if you turn the pencil so that the sharpened point is pointing straight up. The tip of the pencil should thus just cover the top of the tree in your line of sight as you look at the tree “through” the pencil.*

**5. Move your thumb up or down the pencil so that the tip of your thumbnail is aligned with the tree’s base**. *While holding the pencil in position so that the tip is aligned with the tree’s top (as in step 3), move your thumb to the point on the pencil that covers the point (again, as you look “through” the pencil with one eye) where the tree meets the ground.*

**6. Rotate your arm so that the pencil is horizontal (parallel to the ground)**. *Keep your arm held straight out, and make sure your thumbnail is still aligned with the tree’s base.*

**7. Have your friend move so that you can sight his or her feet “through” the point of your pencil**. *That is, your friend’s feet should be aligned with the pencil’s tip. He or she may need to move backward, sideways, or diagonally. Since, depending on the height of the tree, you may need to be some distance away from your friend, consider using hand signals (with the hand that is not holding the pencil) to tell him or her to go farther, come closer, or move to the left or right.*

**8. Measure the distance between your friend and the tree**. *Have your friend remain in the place or mark the spot with a stick or rock. Then use a measuring tape to measure the straight-line distance between that spot and the base of the tree. If you don’t have a measuring tape you can pace out the distance, although this will not be as accurate. The distance between your friend and the tree is the height of the tree.*

**Fixed Angle of Elevation Method**

**1. Fold a square piece of paper in half so that it forms a triangle**. *The triangle will have one right (90 degree) angle and two 45 degree angles.*

**2. Hold the triangle near one eye so that the right angle is away from you, facing you, and one side is horizontal (parallel to the ground, assuming the ground is level)**.

**3. Move back from the tree until you can sight the top of the tree at the top tip of the triangle**. *Close one eye to sight the tree’s top. You want to find the point where your line of sight follows the hypotenuse of the triangle to the very top of the tree.*

**4. Mark this spot and measure the distance from it to the base of the tree**. *This distance, plus your height(because you used the angle of elevation from eye level, not from the ground)is also the height of the tree. This works because the angle of elevation using your triangle is 45 degrees, and the tangent of 45 degrees = 1.*