

# Observation Squares

**Estimated Time: 30 minutes**

## SUMMARY

Many different types of scientists use observation squares, or grids, to make observations about what they see in the world. Ecologists use 1 by 1 meter observation squares to sample soil, plant, and animal life, forensic scientists use many 1 by 1 meter observation squares to record evidence from a crime scene, and archaeologists use 1 by 1 meter excavation units to record cultural activities found in soils. Why do all these scientists use a series of 1 by 1 meter squares to record their observations? In this activity students will learn how to set up their own 1 by 1 meter square using triangles and the Pythagorean Theorem. Then, they will try their hand at making observations like a scientist!

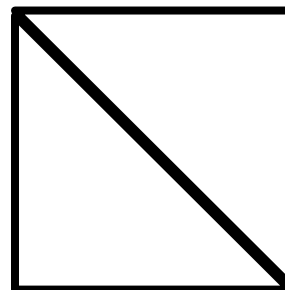
## WHAT YOU'LL LEARN

- How to make a 1 m by 1 m observation square using the Pythagorean Theorem
- How to make observations of a sampled area and make interpretations

| Materials Used  | Resources Used   |
|---|--|
| <ul style="list-style-type: none"> <li>• Paper (Graph paper if possible)</li> <li>• Pen or pencil</li> <li>• Tape (painter's tape or masking tape)</li> <li>• Measuring tape (with metric units preferred)</li> </ul> | <ul style="list-style-type: none"> <li>• Setting up an excavation unit:<br/><a href="https://www.youtube.com/watch?v=O93KnliZZho">https://www.youtube.com/watch?v=O93KnliZZho</a></li> </ul> |

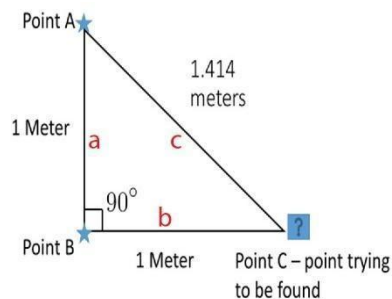
## WHAT TO DO

1. Many scientists use observation squares to sample and record the object they study. For many scientists, they start their observations using a 1 by 1 meter square.
2. How do scientists establish this square? Well, a square is a shape that has four sides that are all the same length and all angles are  $90^\circ$ . When a square is cut in half along the diagonal, the resulting shapes are two right triangles in which one of the angles in the triangle is  $90^\circ$  and the smaller angles are both  $45^\circ$ . So, to make a square with all angles at  $90^\circ$  for their observation square, scientists use the fact that the square is two right triangles!
3. Let's try to construct a 1 by 1 meter square now where we know that squares are two right triangles. We'll set this up on the floor first using a visible type of tape like masking or painter's tape. Tape out the first line of your square that is a meter long using a measuring tape. This will give you Point A and Point B on your right triangle (see figure



on the right). To make sure you have a right triangle, we are now going to set up Point C.

4. Scientists set up Point C and the next side of the square from Point B to Point C using the Pythagorean Theorem ( $a^2+b^2=c^2$ ). Using the Pythagorean Theorem, we find out that the distance between Point A and Point C should be 1.414m or 141.4 centimeters ( $1^2 + 1^2 = 2$ ;  $c^2 = 2$ ;  $c = 1.414$ ). On your tape measure find 141cm (as close as possible) from Point A and Point C. Then measure from Point B to Point C which should be 1 meters. Where your Point C, using the hypotenuse of 1.414 m and the measure of 1 meter from Point B to Point C intersect should give you the exact spot where Point C should be. This gives you a  $90^\circ$  from Point A to B to C.
5. Replicate this process using Point B as your anchor to find Point D, the last point in your square. So, Point B to Point D should equal 1.414 meters and Point A to Point D should be 1 meter. Where the 1 meter and 1.414 meter intersect should be the exact point for Point D to give you a 1 by 1 meter square.
6. Once you have the square established, go back and measure all the sides to make sure they are all 1 meter long. Adjust as needed.
7. Now you've practiced making a 1 by 1 meter square. You can use the tape you have established indoors to make observations. Pretend that your square is a crime scene. What evidence is in that square? Are there dog or cat hairs? Objects that might help you understand what took place???
8. You can also make a square outside using yarn or string and some nails. Wrap the string just under the head of the nail and use the string as you did the tape indoors. You can press the nail into the ground to establish your points. Once you have your observation square established, examine the plants and animals in your square. What plants do you see? Do you see any insects, spiders, or other animals living among the plants? How many places around your house would you like to sample to understand what the ecology of your yard is like?



### TIPS

- To practice your archaeological skills, [refer back to our STEM @ Home archaeology week.](#)
- Set up a crime scene for your student. Have them establish multiple 1 by 1 meter squares to record their observations. They can use graph paper to practice their mapping skills.
- If you are using your observation square outside, do this activity throughout the year to see how plants and animals change throughout the annual cycle.