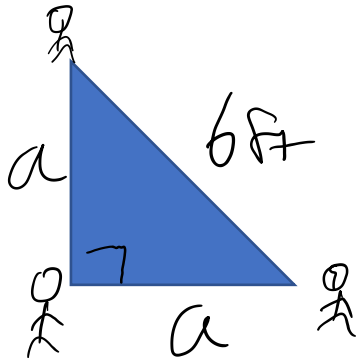
Solutions to Quarantine Questions #3: Social Distancing.

1. This sign has got the diagonal distances correct at 6 ft, but neglects to consider how far the people at the corners are from the people closest to them – not on the diagonal. For this, we will need the Pythagorean theorem.
   a. The four people form a square. Let's take one person out, and we are left with a right isosceles triangle (one right angle, two equal length sides).



Instead of using a and b for the legs, we will use a twice, since we know that those distances are the same. So our Pythagorean Theorem:
$A^2 + B^2 = C^2$
Now looks like this:
$A^2 + A^2 = C^2$

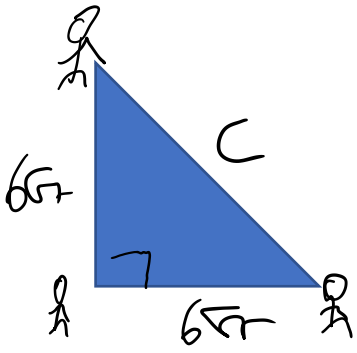
Let's combine like terms on the left and we get:
$2A^2 = C^2$

Replace the C (the hypotenuse) with the 6 ft given to us in the sign, and we get:

$2A^2 = 6^2$	square the 6.
$2A^2 = 36$	divide both sides by 2.
$A^2 = 18$	take the square root of both sides.
$A = 4.24$ feet	

This diagram shows the people at the corners only 4.24 feet apart.

   b. If we want to redraw this diagram to represent true 6ft minimum distance between people, we need to start with legs of 6ft.

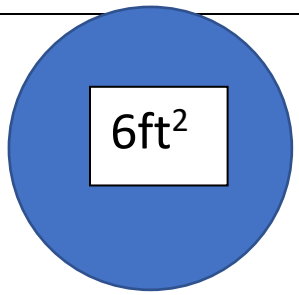


In this case, we know the legs of the right isosceles triangle, and need to find the hypotenuse. Using the Pythagorean theorem:
$A^2 + B^2 = C^2$

We get $6^2 + 6^2 = C^2$
Simplifying the left side: $36 + 36 = C^2$
$72 = C^2$
Taking the square root of both sides: $C = 8.49$ft.

You would need to replace the number at the center of this sign with **8.49ft** in order to represent 6 ft social distancing between the people at the corners.

2a. If everyone had 6 square feet of space to themselves, and this area was centered at the person and extended equally in all directions, we would get a circle with an area of 6 square feet.



We know that the area of a circle can be described by the formula $A = \pi r^2$, where r is the radius of the circle. The radius also represents the distance from the person at the center to the edge of the circle.

$A = \pi r^2$
$6 = (3.14)r^2$
$1.91 = r^2$ divide both sides by 3.14 (π)
$r = 1.38ft$ take the square root of both sides

6 square feet of space would allow each person a distance of **1.38ft** from the person next of them.

Important note: this does not take into account that the person takes up a significant amount of space themselves. The distance from the outside edge of the person to the enge of the 6 square feet of space would be even less.

2b. If we were to require 6 feet od distance around us in all directions, that would form a circle with a radius of 6 ft. The area of a circle is defined by:
$A = \pi r^2$

Replace radius with 6 ft and solve for area:

$A = (3.14)(6^2)$

$A = 3.14*36 =$ **$113.04\ ft^2$** of area per person.