In this worksheet, you review the Pythagorean Theorem applied to triangles and, in the process, derive an equation for a circle in the $xy$-plane.

The following figure depicts a right triangle (meaning one of the interior angles is a right angle). The numbers $a$, $b$ and $c$ refer to the lengths of the sides of the triangle.

1. Write down the Pythagorean Theorem in terms of $a$, $b$ and $c$.

2. Fill in the blanks to make a sentence that describes what the Pythagorean Theorem tells us:

   The ________ of the length of the hypotenuse of a ________ triangle is equal to the ________ of the squares of the ________ of the other two.

3. Find the unknown side length for each of the following triangles.

   (a)

   (b)
4. On the coordinate plane below, plot the points \((-2, 4)\) and \((4, 6)\). Then draw a triangle, with those two points as the ends of a hypotenuse, so that you can calculate the distance between those two points. Then calculate the distance. Give an exact answer and a decimal approximation.

\[
\text{distance} = \sqrt{\text{result}}
\]

5. As in the previous problem, draw a triangle that allows you to use the Pythagorean Theorem to find the distance between the two points shown in the figure. Then calculate the distance. (Hint: After you draw a triangle, don’t forget to label the lengths of the sides.)

\[
\text{distance} = \sqrt{\text{result}}
\]
6. Use your answer for the previous problem to fill in the missing parts of the following formula for the distance between two points \((x_1, y_1)\) and \((x_2, y_2)\).

\[ D = \sqrt{(x_2 - y_1)^2 + (y_2 - y_1)^2} \]

7. Write down an equation, using your result from the previous question, that says the distance of \((x, y)\) from the origin is 2. Then sketch a graph of all the points that satisfy this equation.
Find an equation for a circle, centered at the origin, with radius 3. Simplify your equation to remove any square-root symbols.

The circle in the picture below has a radius of 4 and a center at the origin. The line is horizontal and has the equation $y = 2$. Find the x-coordinates of the points where the line and the circle intersect.

$x = \underline{\hspace{1cm}} \text{ or } \underline{\hspace{1cm}}$