

1. The Distance Formula
2. You should be familiar with the Pythagorean Theorem. In this lesson, we will find the distance between two points in the Cartesian plane.
3. Recall the Pythagorean Theorem for a right triangle, which finds the length of the hypotenuse,  $c$ , given the length of the legs,  $a$  and  $b$ .
4.
  - (a) If we are given two points with the same  $y$ -coordinate,
  - (b) we can find the  $x$ -distance by subtracting the  $x$ -values.
  - (a) In two dimensions, we have a change in both the  $x$ -values and  $y$ -values. The distance we are looking for, the distance between  $(2, 1)$  and  $(7, 4)$  is the hypotenuse of a right triangle.
  - (b) We find the  $x$ -distance and  $y$ -distance,  $a$  and  $b$  respectively, by subtracting coordinates.
  - (c) We compute the distance using the Pythagorean Theorem.
  - (d) We can take a square root to simplify.
5. In general, to find the length of the hypotenuse, the distance between the two points, subtract  $x$ -coordinates to calculate  $a$  and subtract  $y$ -coordinates to calculate  $b$ . Use the Pythagorean Theorem to find  $c$ , taking a square root to simplify.
6. To recap: The distance formula is the Pythagorean Theorem after taking a square root on both sides. The lengths of the  $x$ -leg and  $y$ -leg are found by subtracting coordinates.