Distance, the Pythagorean Theorem on the Grid

Count a horizontal or vertical segment. For a slant, draw the right triangle: legs across and up, segment as hypotenuse. $a^2 + b^2 = c^2$, then the square root. That pattern is the distance formula.

1 THE VOCABULARY
Words we use

Distance how long a segment is; always positive.

Legs the across and up sides of the right triangle; countable.

Hypotenuse the slanted segment, across from the right angle.

Pythagorean theorem $a^2 + b^2 = c^2$.

Square root undoes squaring; give it exact and to the hundredth.

- Watch out for these.
- Forgetting the square root and reporting c^2.
- Subtracting the x's and y's in different orders is fine; forgetting to square is not.
- Simplifying the square root. Not yet (Unit 13).
- Dividing instead of squaring: that is slope, not distance.

2 THE METHOD
Find a distance

1. ACROSS subtract the x's.
2. UP subtract the y's.
3. SQUARE BOTH signs disappear.
4. ADD that is c^2.
5. SQUARE ROOT undo the square: exact, then to the hundredth.

WHY IT WORKS

The segment is the hypotenuse of a right triangle whose legs run along the grid. The Pythagorean theorem gives the hypotenuse squared, and the square root undoes the square.

3 TWO EXAMPLES
(1, 2) to (4, 6); (–3, –1) to (2, 5)

across 3, up 4	4 – 1 and 6 – 2
$9 + 16 = 25$	square and add
$d = \sqrt{25} = 5$	square root
across 5, up 6	2 – (–3) and 5 – (–1)
$d = \sqrt{61} \approx 7.81$	exact, then decimal

ORDER DOES NOT MATTER

(4, 6) to (1, 2): legs –3 and –4. Squared: 9 and 16. Still $\sqrt{25} = 5$.

SAY IT OUT LOUD

Across, up, square, add, square root. The square root undoes the square.