Section 8.5
The Distance Formula

Using *x*-*y* graphical notation, the distance formula is:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

In a few words, the distance between two points is:

"*The square root of the sum of the squares of the differences of the horizontal and vertical coordinates.*"

Example: What is the distance from point A(–34,–22) to point B(62,8)?

The formula is: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

horizontal distance; vertical distance

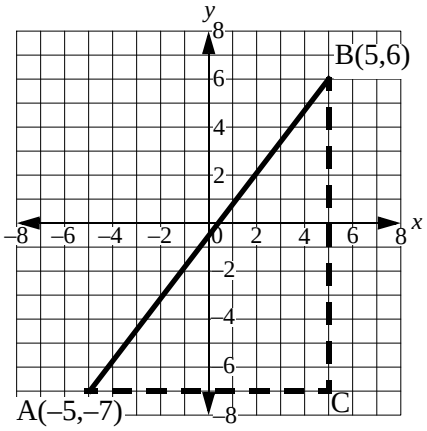
Where:

$x_1 = -34$
$x_2 = 62$
$y_1 = -22$
$y_2 = 8$

$d = \sqrt{[62 - (-34)]^2 + [8 - (-22)]^2}$
$d = \sqrt{(62 + 34)^2 + (8 + 22)^2}$
$d = \sqrt{(96)^2 + (30)^2}$
$d = \sqrt{9216 + 900}$
$d = \sqrt{10116}$
$d = 100.6$

The distance formula is an adaptation of the pythagorean theorem. In the graph below, $\overline{AB}$ is the hypotenuse of ΔABC, $\overline{BC}$ is the difference in *y* values, and $\overline{AC}$ is the difference of *x* values. In the graph you can count the distance from A to C (10), and from B to C (13). Using the pythagorean theorem:

$$AB = \sqrt{10^2 + 13^2} = \sqrt{100 + 169} = \sqrt{269} = 16.4$$



Using the distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = \sqrt{[5 - (-5)]^2 + [6 - (-7)]^2}$
$d = \sqrt{(5 + 5)^2 + (6 + 7)^2}$
$d = \sqrt{10^2 + 13^2}$
$d = \sqrt{100 + 169}$
$d = \sqrt{269}$
$d = 16.4$ check!

Practice:

Find the distance from point A to point B.

1. A(1,1) B(9,3)
2. A(–9,8) B(10,–3)
3. A(4,–5) B(–12,–9)
4. A(–12,6) B(8,–19)
5. A(–5,7) B(3,–10)
6. A(–10,–9) B(–1,6)
7. A(–2–1) B(–9,–9)
8. A(–16,15) B(–1,1)
9. A(1,3) B(23,17)
10. A(–7,–6) B(9,9)
11. A(0,0) B(–16,–9)
12. A(9,10) B(–5,–12)
13. A(6,7) B(–29,0)
14. A(45,66) B(33,78)
15. A(0,6) B(45,62)
16. A(103,220) B(3,3)

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