

MYSTERY PICTURE



THE DISTANCE AND MIDPOINT FORMULAS

The Distance Formula: Is It Set Up Right?

25 setups · x with x, y with y · no calculator · a picture appears

FREE

1 $A(-3, 7) B(5, 2)$ across = $5 - (-3)$ up = $2 - 7$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	2 $A(4, -6) B(-1, 3)$ across = $4 - (-1)$ up = $-6 - 3$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	3 $A(-8, -2) B(-3, 4)$ across = $-3 - (-8)$ up = $4 - (-2)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	4 $A(6, 5) B(-2, -1)$ across = $6 - (-2)$ up = $5 - (-1)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	5 $A(-7, 3) B(2, -4)$ across = $2 - (-7)$ up = $-4 + 3$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
6 $A(1, -8) B(-5, -2)$ across = $-5 - 1$ up = $-2 - (-8)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	7 $A(-4, -5) B(3, 6)$ across = $-4 - 3$ up = $-5 - 6$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	8 $A(9, -3) B(2, 4)$ across = $9 - (-3)$ up = $2 - 4$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	9 $A(-6, 8) B(-1, -2)$ across = $-1 - 6$ up = $-2 - 8$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	10 $A(3, 9) B(-4, 1)$ across = $3 - 4$ up = $9 - 1$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
11 $A(-2, -9) B(6, -3)$ across = $6 - (-2)$ up = $-3 - (-9)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	12 $A(7, -1) B(-5, 6)$ across = $7 - (-5)$ up = $-1 - 6$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	13 $A(-9, 4) B(-3, -5)$ across = $-3 - (-9)$ up = $-5 - 4$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	14 $A(5, -7) B(-2, -3)$ across = $-2 - 5$ up = $-3 - (-7)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	15 $A(-1, 6) B(8, -4)$ across = $-1 - 6$ up = $8 - (-4)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
16 $A(2, -5) B(-7, 1)$ across = $2 - (-7)$ up = $-5 - 1$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	17 $A(-5, -3) B(4, 8)$ across = $4 - (-5)$ up = $8 - (-3)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	18 $A(8, 2) B(-3, -6)$ across = $8 - 3$ up = $2 - (-6)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	19 $A(-4, 9) B(5, 3)$ across = $-4 - 5$ up = $9 - 3$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	20 $A(6, -9) B(-1, -4)$ across = $-1 + 6$ up = $-4 + (-9)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
21 $A(-3, -7) B(-8, 2)$ across = $-3 - (-8)$ up = $-7 - 2$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	22 $A(9, 5) B(-6, -2)$ across = $-6 - 9$ up = $-2 - 5$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	23 $A(-2, 3) B(7, -8)$ across = $-2 - 7$ up = $3 - (-8)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	24 $A(4, -2) B(-9, -5)$ across = $-9 - 4$ up = $-5 - (-2)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	25 $A(-7, -6) B(3, -1)$ across = $-7 - (-6)$ up = $3 - (-1)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$

Mystery Picture — how to run it

25–35 minutes

1. **Give each student page 3** and a pencil. No calculator is needed.
2. **Say this once:** *“Do not work anything out. Check how each square sets up the distance from A to B. If it is set up correctly, fill the square with slanted lines. If not, leave it white.”*
3. **Let them work.** The picture shows when they are right. Nothing else is needed.

Student sheet page 3, one per student. A box at the top shows the distance formula on a right triangle.
Answers pages 4–5, for you.

Each square gives two points, A and B, and one setup of the distance AB in three lines, such as across = $5 - (-3)$, up = $2 - 7$, $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$. The student does not compute anything. A correct setup finds across from the two x -coordinates and up from the two y -coordinates, subtracting in the same order, keeps every minus sign, and puts the square root over the whole sum. Fifteen squares are filled. Some subtract A from B and some subtract B from A. Both are correct.

Each white square has one common mistake. In three squares across and up each use one point's own x and y . In three the minus sign of a negative coordinate is lost. In two the square root is missing. In two the coordinates are added, as in the midpoint formula.

If part of a student's picture looks wrong, the mistake is in that square. Ask: *“Which numbers are the two x -coordinates? Are they both in across, with their signs?”* Guessing does not work. Every simple guessing rule, such as filling every square that has a root sign, gets at least six squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
chooseyourlesson.com — 135 free geometry lessons.

Mystery Picture — is it set up right?

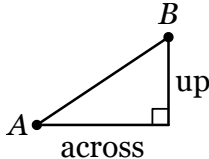
The distance formula

Name _____

Period _____

Date _____

Each square gives two points, A and B, and a setup for the distance AB. Do not work it out. **If the setup is correct, fill the square with slanted lines. If not, leave it white.** A picture appears. If part of it is missing, or one square does not fit, check that square again.

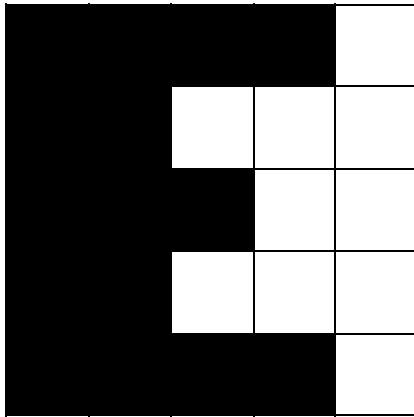
 across = the difference of the two x-coordinates. up = the difference of the two y-coordinates. $AB = \sqrt{\text{across}^2 + \text{up}^2}$. Subtract in the same order for across and for up: B - A, or A - B. A minus sign stays with its number: $5 - (-3)$. The root covers the whole sum.				
1 A(-3, 7) B(5, 2) across = $5 - (-3)$ up = $2 - 7$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	2 A(4, -6) B(-1, 3) across = $4 - (-1)$ up = $-6 - 3$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	3 A(-8, -2) B(-3, 4) across = $-3 - (-8)$ up = $4 - (-2)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	4 A(6, 5) B(-2, -1) across = $6 - (-2)$ up = $5 - (-1)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	5 A(-7, 3) B(2, -4) across = $2 + (-7)$ up = $-4 + 3$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
6 A(1, -8) B(-5, -2) across = $-5 - 1$ up = $-2 - (-8)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	7 A(-4, -5) B(3, 6) across = $-4 - 3$ up = $-5 - 6$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	8 A(9, -3) B(2, 4) across = $9 - (-3)$ up = $2 - 4$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	9 A(-6, 8) B(-1, -2) across = $-1 - 6$ up = $-2 - 8$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	10 A(3, 9) B(-4, 1) across = $3 - 4$ up = $9 - 1$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
11 A(-2, -9) B(6, -3) across = $6 - (-2)$ up = $-3 - (-9)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	12 A(7, -1) B(-5, 6) across = $7 - (-5)$ up = $-1 - 6$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	13 A(-9, 4) B(-3, -5) across = $-3 - (-9)$ up = $-5 - 4$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	14 A(5, -7) B(-2, -3) across = $-2 - 5$ up = $-3 - (-7)$ $AB = \text{across}^2 + \text{up}^2$	15 A(-1, 6) B(8, -4) across = $-1 - 6$ up = $8 - (-4)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
16 A(2, -5) B(-7, 1) across = $2 - (-7)$ up = $-5 - 1$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	17 A(-5, -3) B(4, 8) across = $4 - (-5)$ up = $8 - (-3)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	18 A(8, 2) B(-3, -6) across = $8 - 3$ up = $2 - (-6)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	19 A(-4, 9) B(5, 3) across = $-4 - 5$ up = $9 - 3$ $AB = \text{across}^2 + \text{up}^2$	20 A(6, -9) B(-1, -4) across = $-1 + 6$ up = $-4 + (-9)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$
21 A(-3, -7) B(-8, 2) across = $-3 - (-8)$ up = $-7 - 2$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	22 A(9, 5) B(-6, -2) across = $-6 - 9$ up = $-2 - 5$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	23 A(-2, 3) B(7, -8) across = $-2 - 7$ up = $3 - (-8)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	24 A(4, -2) B(-9, -5) across = $-9 - 4$ up = $-5 - (-2)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$	25 A(-7, -6) B(3, -1) across = $-7 - (-6)$ up = $3 - (-1)$ $AB = \sqrt{\text{across}^2 + \text{up}^2}$



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Mystery Picture — answers

For the teacher



The finished picture is **the letter E**. Fifteen squares are filled.

A setup is correct when across subtracts the two x -coordinates and up subtracts the two y -coordinates, in the same order, with every minus sign kept and the root over the whole sum. The table gives the reason for every square. It goes on over the page.

	The square	Answer	Why
1	$A(-3, 7), B(5, 2)$. across = $5 - (-3)$; up = $2 - 7$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x , y with y . The root covers the whole sum. $AB = \sqrt{89}$.
2	$A(4, -6), B(-1, 3)$. across = $4 - (-1)$; up = $-6 - 3$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x , y with y . The root covers the whole sum. $AB = \sqrt{106}$.
3	$A(-8, -2), B(-3, 4)$. across = $-3 - (-8)$; up = $4 - (-2)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x , y with y . The root covers the whole sum. $AB = \sqrt{61}$.
4	$A(6, 5), B(-2, -1)$. across = $6 - (-2)$; up = $5 - (-1)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x , y with y . The root covers the whole sum. $AB = 10$.
5	$A(-7, 3), B(2, -4)$. across = $2 + (-7)$; up = $-4 + 3$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	Across and up add the coordinates. The distance subtracts them. Adding belongs to the midpoint.
6	$A(1, -8), B(-5, -2)$. across = $-5 - 1$; up = $-2 - (-8)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x , y with y . The root covers the whole sum. $AB = 6\sqrt{2}$.
7	$A(-4, -5), B(3, 6)$. across = $-4 - 3$; up = $-5 - 6$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x , y with y . The root covers the whole sum. $AB = \sqrt{170}$.
8	$A(9, -3), B(2, 4)$. across = $9 - (-3)$; up = $2 - 4$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	Across uses A's own x and y (9 and -3), and up uses B's. Across needs the two x -coordinates, 9 and 2 .
9	$A(-6, 8), B(-1, -2)$. across = $-1 - 6$; up = $-2 - 8$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	The coordinate -6 is written as 6 . Its minus sign is lost.
10	$A(3, 9), B(-4, 1)$. across = $3 - 4$; up = $9 - 1$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	The coordinate -4 is written as 4 . Its minus sign is lost.
11	$A(-2, -9), B(6, -3)$. across = $6 - (-2)$; up = $-3 - (-9)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x , y with y . The root covers the whole sum. $AB = 10$.
12	$A(7, -1), B(-5, 6)$. across = $7 - (-5)$; up = $-1 - 6$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x , y with y . The root covers the whole sum. $AB = \sqrt{193}$.

Mystery Picture — answers, squares 13 to 25

For the teacher

	The square	Answer	Why
13	$A(-9, 4), B(-3, -5)$. across = $-3 - (-9)$; up = $-5 - 4$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x, y with y. The root covers the whole sum. $AB = 3\sqrt{13}$.
14	$A(5, -7), B(-2, -3)$. across = $-2 - 5$; up = $-3 - (-7)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	The square root is missing, so this gives the square of the distance. The distance is $\sqrt{65}$.
15	$A(-1, 6), B(8, -4)$. across = $-1 - 6$; up = $8 - (-4)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	Across uses A's own x and y (-1 and 6), and up uses B's. Across needs the two x-coordinates, -1 and 8 .
16	$A(2, -5), B(-7, 1)$. across = $2 - (-7)$; up = $-5 - 1$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x, y with y. The root covers the whole sum. $AB = 3\sqrt{13}$.
17	$A(-5, -3), B(4, 8)$. across = $4 - (-5)$; up = $8 - (-3)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x, y with y. The root covers the whole sum. $AB = \sqrt{202}$.
18	$A(8, 2), B(-3, -6)$. across = $8 - 3$; up = $2 - (-6)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	The coordinate -3 is written as 3 . Its minus sign is lost.
19	$A(-4, 9), B(5, 3)$. across = $-4 - 5$; up = $9 - 3$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	The square root is missing, so this gives the square of the distance. The distance is $3\sqrt{13}$.
20	$A(6, -9), B(-1, -4)$. across = $-1 + 6$; up = $-4 + (-9)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	Across and up add the coordinates. The distance subtracts them. Adding belongs to the midpoint.
21	$A(-3, -7), B(-8, 2)$. across = $-3 - (-8)$; up = $-7 - 2$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x, y with y. The root covers the whole sum. $AB = \sqrt{106}$.
22	$A(9, 5), B(-6, -2)$. across = $-6 - 9$; up = $-2 - 5$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x, y with y. The root covers the whole sum. $AB = \sqrt{274}$.
23	$A(-2, 3), B(7, -8)$. across = $-2 - 7$; up = $3 - (-8)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract B from A: x with x, y with y. The root covers the whole sum. $AB = \sqrt{202}$.
24	$A(4, -2), B(-9, -5)$. across = $-9 - 4$; up = $-5 - (-2)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	fill	Across and up both subtract A from B: x with x, y with y. The root covers the whole sum. $AB = \sqrt{178}$.
25	$A(-7, -6), B(3, -1)$. across = $-7 - (-6)$; up = $3 - (-1)$; $AB = \sqrt{(\text{across}^2 + \text{up}^2)}$.	white	Across uses A's own x and y (-7 and -6), and up uses B's. Across needs the two x-coordinates, -7 and 3 .