

Geogebra


Distance Formula


Name: _____

Follow each step and answer the following questions. The questions should be answered in this document and needs to be Italicized or you can make a new word document with the answers.

Goal: Discover how/why the distance formula is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

- 1) Open Geogebra and you will have to switch the background to a grid. All you have to do is right click on graphics window and click on "grid".


- 2) Create the point A at (1, 1) and point B at (4, 5). Click on  and then put your cursor at each point.

- 3) Create a segment between points A and B. Click on  and then click on point A and then point B and then the segment will appear between the two points.

- 4) Now to calculate the distance between A and B, we could use the distance formula but we won't. Instead, we are going to make a triangle. Create point C at (4, 1).

- 5) Create a segment between point A and point C, and point B and point C.

Question 1: What type of triangle did we just create?

- 6) Label your three sides of the triangle. To do this click on  and then click your cursor on the side between point A and point B. A text box will pop up and then type in "a". We are notating this side as "a" because this is the side we want to find the length of. I want you to label the segment between point A and point C as "b", and label the segment between point B and point C as "c".

Question 2: What is the name of the side of the triangle were "a" is located?

- 7) Now you need to find the lengths of \overline{AC} and \overline{BC} .

Questions 3: What is the distance between point A and point C? Show your work!
(Hint: How do you find the distance of a horizontal or vertical line)

Question 4: What is the distance between point B and point C? Show your work!

Note: Geogebra already has calculated the distances of \overline{AC} and \overline{BC} . You can see this on the left where it says "Algebra", and underneath the "segment" heading you can now see the lengths.

- 8) Now that you know the length of side b and c, we can now use Pythagorean theorem to solve for side a. If you do not know Pythagorean theorem $a^2 + b^2 = c^2$.

Question 5: What is the length of side a? Show your work!

Note: Again you should already know the length of side a, but we should also know how to use the Pythagorean Theorem.

- 9) Now that was a lot of work to find the distance of side a, so let's now do the exact same thing but I want you to no longer consider point A as (1, 1) and point B as (4, 5). Instead consider point A (x_1, y_1) and point B (x_2, y_2) .

Question 6: If I changed the coordinates of point A and point B what is the new coordinate of points C? (Hint: It will not have any numerical value for x or y)

Question 7: Now that we know the coordinate of point C, what is the length of side b?

Question 8: What is the length of side c?

- 10) Now that you found the length of side b and side c, I want you to put that on your diagram in Geogebra. Put the expressions by each side. You can use the "insert text" button to write them.

- 11) Now let's think, after you found the distance of the sides, what do you do next? If you stuck looked at what we did in step 8.

Question 9: What do you have to do to side b and side c?

- 12) Finally, you just put the side b and side c in the Pythagorean Theorem, what do we have to do to isolate "a" in the Pythagorean Theorem?

- 13) Now put it all together, write me six steps to prove the distance formula:

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

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