**Activity 1.2.7 Midpoints**



In the figure at the right$\overbar{ AB}$ is a line segment with endpoints *A*(5, –2) and *B*(1, 4).

1. Describe the vector from *A* to *B* terms of
run and rise:

 run = \_\_\_\_\_\_\_\_ rise = \_\_\_\_\_\_\_\_\_\_

2. Name the vector from A to B as *u*. Find a mapping rule for the translation by the vector *u*.

 (*x*, *y*) 🡪 (\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_)

3. Find the coordinates of the image of *A* under this translation (\_\_\_\_\_\_, \_\_\_\_\_\_). What is the name of this point?\_\_\_\_\_\_\_\_*.*

4. Now consider the vector *v* that is half the size of *u*. Describe its run and rise:

 run = \_\_\_\_\_\_\_\_\_ rise = \_\_\_\_\_\_\_\_\_

5.Find a mapping rule to the translation by vector *v*.

 (*x*, *y*) 🡪 (\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_)

6. Find the coordinates of the image of *A* under this translation (\_\_\_\_\_\_, \_\_\_\_\_\_).
Name this point *M*.

7.  *M* is called the **midpoint** of segment $\overbar{AB.}$ Why is this an appropriate name for this point?

8. Use the distance formula to find *AM* and *MB.* What do you notice?

9. Approximate to the nearest 0.001 the two distances you found in question 8.

 *AM* ≈ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *MB* ≈ \_\_\_\_\_\_\_\_\_\_\_\_\_

10. Now find a decimal approximation for the length of segment $\overbar{AB}$, that is the distance
*AB* ≈ \_\_\_\_\_\_\_\_\_\_. What do you notice?

11. Summarize what you have learned so far about midpoints.

12. Here is another way to think about midpoints: the coordinates of the midpoint are the averages of the *x*- and *y*-coordinates of the endpoints. For the segment $\overbar{AB}$, the endpoints are *A*(5, –2) and *B*(1, 4).

 What is the average of the *x*-coordinates? \_\_\_\_\_\_\_

 What is the average of the *y*-coordinates? \_\_\_\_\_\_\_

 How are these averages related to the coordinates of *M*?

13. Find the average of the coordinates of these two points ($x\_{1}, y\_{1}$) and ($x\_{2}, y\_{2}$):

 ( \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_).

This result is called the **Midpoint Formula**.

14. Find the midpoint of segment $\overbar{CD}$ where the coordinates of the endpoints are *C*(–1, 4) and *D*(7, 10). Call this midpoint *P*.

 *P*(\_\_\_\_\_\_, \_\_\_\_\_\_)

15. Find the distances *CP*, *PD* and *CD* from question 14.

 *CP* = \_\_\_\_\_\_\_\_\_ *PD* = \_\_\_\_\_\_\_\_\_ *CD* = \_\_\_\_\_\_\_\_\_

 What do you notice?

16. Find *Q*, the midpoint of segment$ \overbar{EF}$ where the coordinates of the endpoints are *E*(0, –4) and *F*(–5, –2).

 *Q*(\_\_\_\_\_\_, \_\_\_\_\_\_)

17. In answering questions 9 and 10 Tanya says: It looks like the distance *AB* is 4 times the distance *AM* because $\sqrt{52}$ is four times as large as $\sqrt{13}$. How would you respond to her statement?