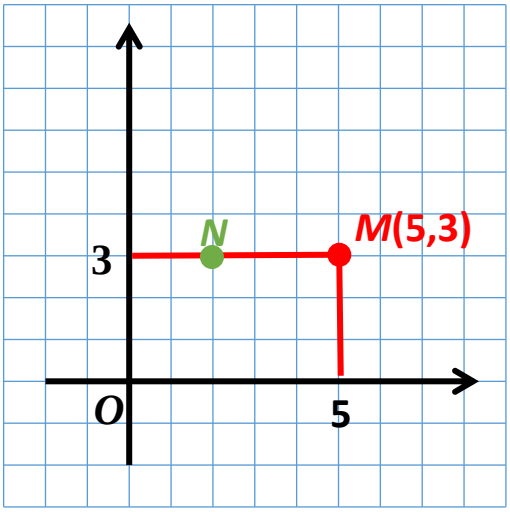
Math 6d: Homework 13

HW#13 is due January 20; submit to Google classroom 15 minutes before the class time.
Please, write clearly which problem you are solving and show all steps of your solution.

Summary from the classwork

This week we discussed how one can introduce coordinates in a plane so that every point is described by a pair of numbers. To do this, we need to choose:

- The origin (usually denoted *O*)
- Unit length
- Two perpendicular axes (usually called *x* and *y*)



For point *M*(5, 3), the *x*-coordinate is 5, the *y*-coordinate is 3. Order matters:

$$x_M = 5,\ y_M = 3$$

To find the distance along *x* between two points, at the same *y*, you need to subtract their *x*-coordinates and take the absolute value: The size of MN or distance is:

$$MN(x) = |x_M - x_N|$$

$$MN(x) = |5 - 2| = 3$$

In this case, similarly: the distance along y is:

$$MN(y) = |y_M - y_N|$$

$$MN(y) = |3 - 3| = 2$$

Homework questions

1. A point *B* is 5 units above and 2 units to the left of *A*(7,5). What are the coordinates of point *B*?

2. You may try this in ***desmos*** or on paper. If in ***desmos,*** take a snapshot and add in your homework.
   Plot on the coordinate plane the following, and connect each dot to the next one. If you did everything correctly, you will get a picture…
   (0,2); (0,0); (1,3); (2,3); (3,2); (3,0); (1,-1); (2,-1); (1,-3); (0,-1);
   (-1,-3); (-2,-1); (-1,-1); (-3,0); (-3,2); (-2,3); (-1,3); (0,0).

3. Find the coordinates of the midpoint of the segment *AB*, where *A*= (3,11) and *B*=(7,5). Can you find a general rule (an equation) for the midpoint of any line using the x- and y-coordinates of the two end points?

4. Draw points $A(4,1)$, $B(3,5)$, $C(-1,4)$. If you did everything correctly, you will have 3 vertices of a square. What are the coordinates of the fourth vertex? What is the area of the square?

5. Find the missing coordinates:
   (a) 3 points $A(0,0)$, $B(1,3)$, $D(5,-2)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C?
   (b) 3 points $A(0,0)$, $B(2,3)$, $D(4,1)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C?
   (c) 3 points $A(0,0)$, $B(1,5)$, $D(3,-2)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C?
   (d) Can you guess the general rule: if $A(0,0)$, $B(b_1,b_2)$, $D(d_1,d_2)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C?

6. Point M has coordinates (5,7)
   (a) Find the coordinates of the point M_1 obtained from M by reflection about the x-axis.
   (b) Find the coordinates of the point M_1 obtained from M by reflection about the y-axis.
   (c) Find the coordinates of the point M_1 obtained from M by reflection about the diagonal line $x=y$.