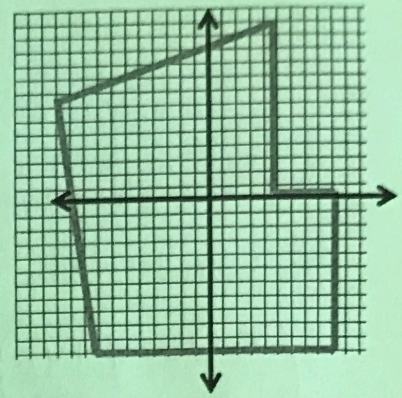
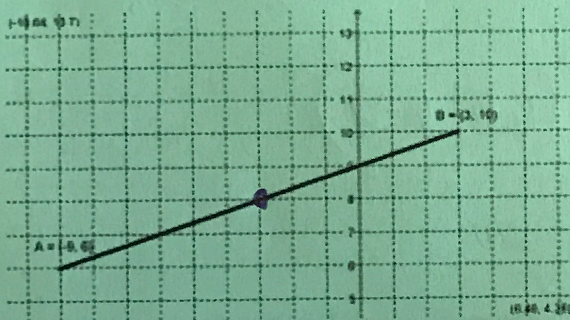


6.6 Yard Work in Segments



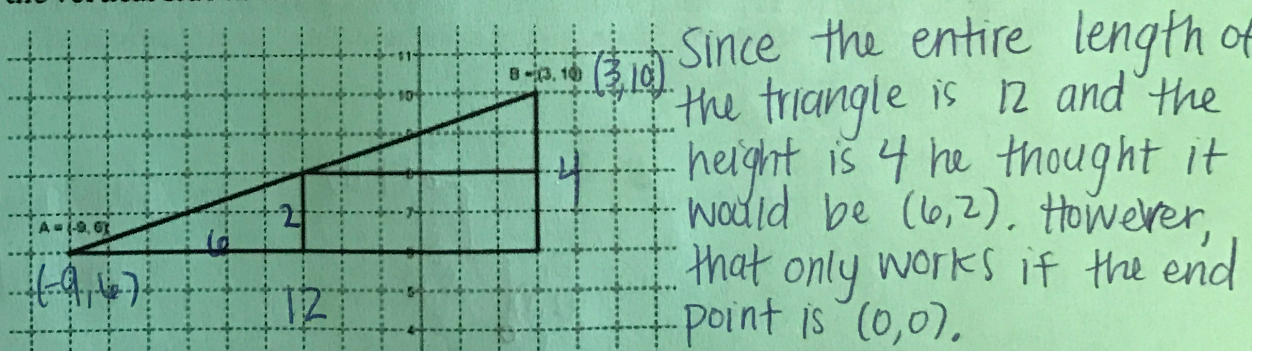
Malik and his family are using the map to set up gardens and patios for the yard. They plan to lay out the yard with stakes and strings so they know where to plant grass, flowers, or vegetables. They want to begin with a vegetable garden that will be parallel to the fence shown at the top of the map above.

- They set the first stake at $(-9, 6)$ and the stake at the end of the garden at $(3, 10)$. They want to mark the middle of the garden with another stake. Where should the stake that is the midpoint of the segment between the two end stakes be located? Use a diagram to describe your strategy for finding this point.



Explain your strategy

- Malik figured out the midpoint by saying, "It makes sense to me that the midpoint is going to be halfway over and halfway up, so I drew a right triangle and cut the horizontal side in half and the vertical side in half like this:"



Malik continued, "That put me right at $(-3, 8)$. The only thing that seems funny about that to me is that I know the base of the big triangle was 12 and the height of the triangle was 4, so I thought the midpoint might be $(6, 2)$."

Explain to Malik why the logic that made him think the midpoint was $(6, 2)$ is almost right, and how to extend his thinking to use the coordinates of the endpoints to get the midpoint of $(-3, 8)$.

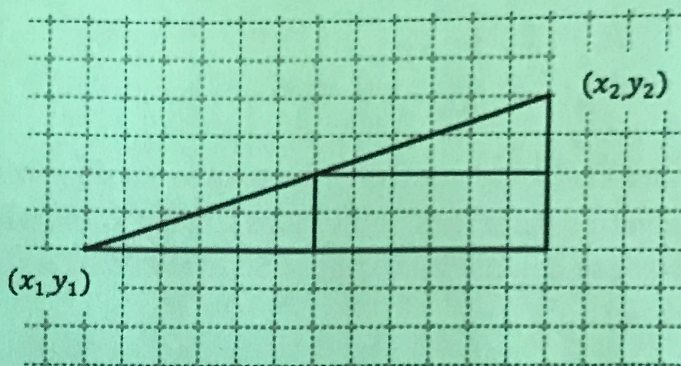
He can take $(-9, 6) + (6, 2) = (-3, 8)$ correct midpoint

3. Mid-point formula:

coordinates

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

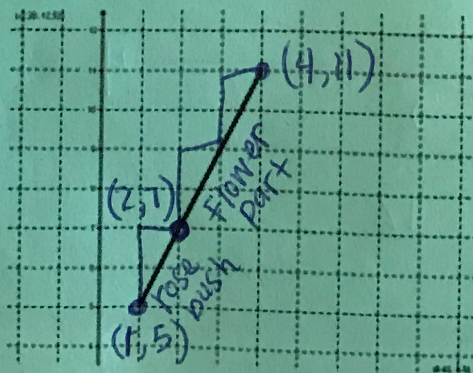
Use either strategy to find the midpoint of the segment between (x_1, y_1) and (x_2, y_2) .



4. Choose a strategy and use it to find the midpoint of the segment with endpoints $(-3, 4)$ and $(2, 9)$.

$$\left(\frac{-3+2}{2}, \frac{4+9}{2} \right) = \left(-\frac{1}{2}, \frac{13}{2} \right) = (0.5, 6.5)$$

6. The next area in the garden to be marked is for a flower garden. Malik's parents have the idea that part of the garden should contain a big rose bush and the rest of the garden with have smaller flowers like petunias. They want the section with the other flowers to be twice as long as the section with the rose bush. The stake on the endpoints of this garden will be at $(1, 5)$ and $(4, 11)$. Malik's dad says, "We'll need a stake that marks the end of the rose garden." Help Malik and Sapana figure out where the stake will be located.



The point $(3, 9)$
would also work.

7. There's only one more set of stakes to put in. This time the endpoint stakes are at $(-8, 5)$ and $(2, -10)$. Another stake needs to be set that partitions the segment into two parts so that the ratio of the lengths is 2:3. Where must the stake be located?

over $\rightarrow 10 \div 5 = 2$
 down $\rightarrow -15 \div 5 = -3$
 ↑
 For 5 parts

5 parts total

$$(-8, 5) + (2, -3) = (-6, 2) \text{ 1 part}$$

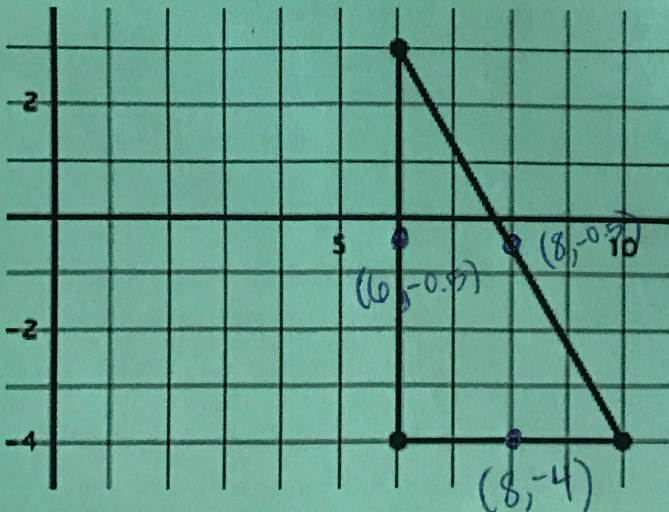
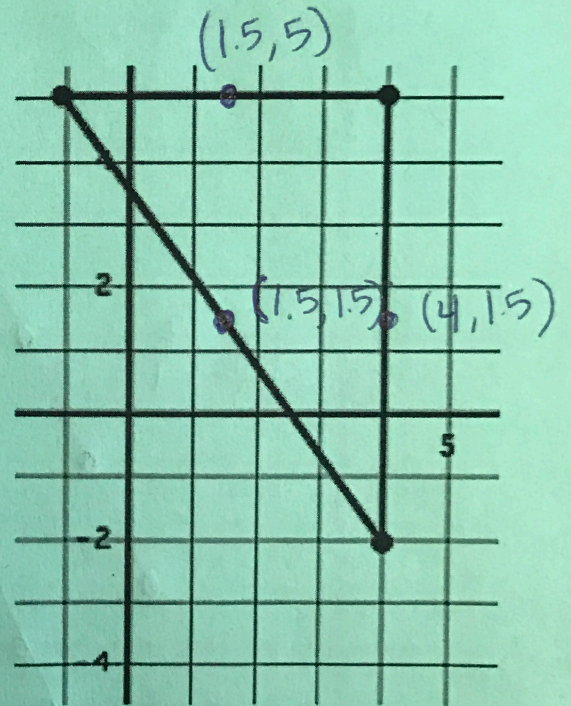
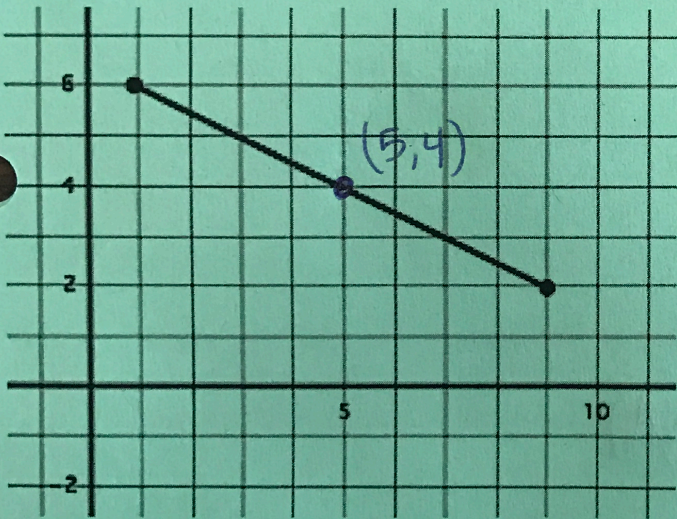
$$(-6, 2) + (2, -3) = (-4, -1) \text{ 2 parts}$$

$$(-4, -1)$$

$(-2, -4)$ also works

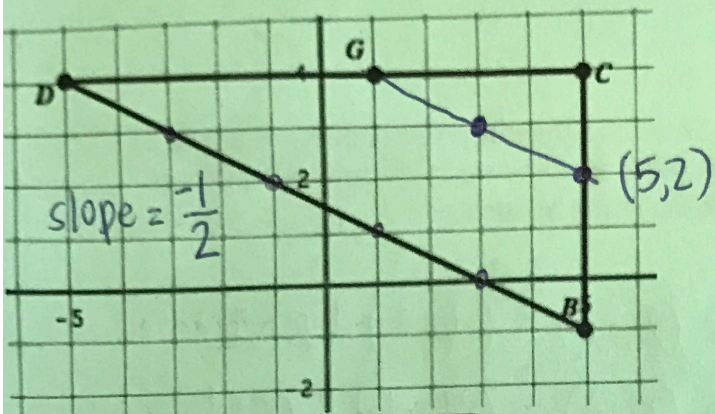
Practice:

Find the mid-point and write the coordinates of the point. If multiple lines then find the midpoint for all three.



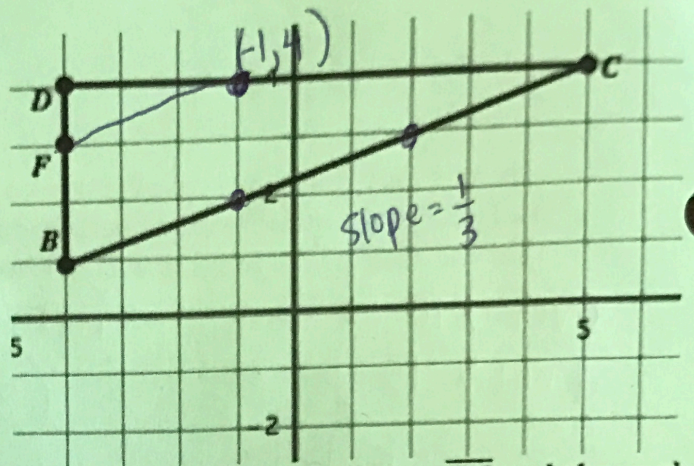
A line segment between $(2, 3)$ and $(10, 15)$

$$\left(\frac{2+10}{2}, \frac{3+15}{2} \right) = (6, 9)$$



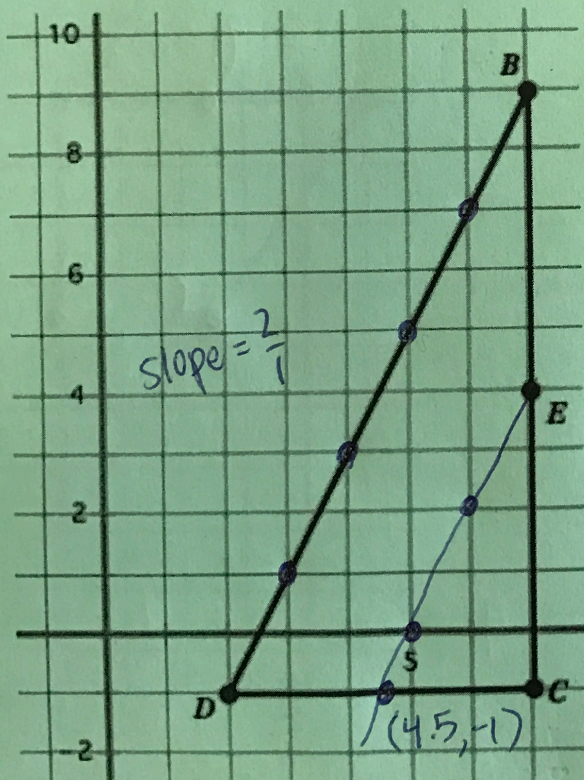
If a line is drawn parallel to \overline{BD} and through point G. At what coordinate will the intersection of this parallel line be with \overline{BC} ?

(5, 2)



If a line is drawn parallel to \overline{BC} and through point F. At what coordinate will the intersection of this parallel line be with \overline{DC} ?

(-1, 4)



If a line is drawn parallel to \overline{DB} and through point E. At what coordinate will the intersection of this parallel line be with \overline{DC} ?

(4.5, -1)