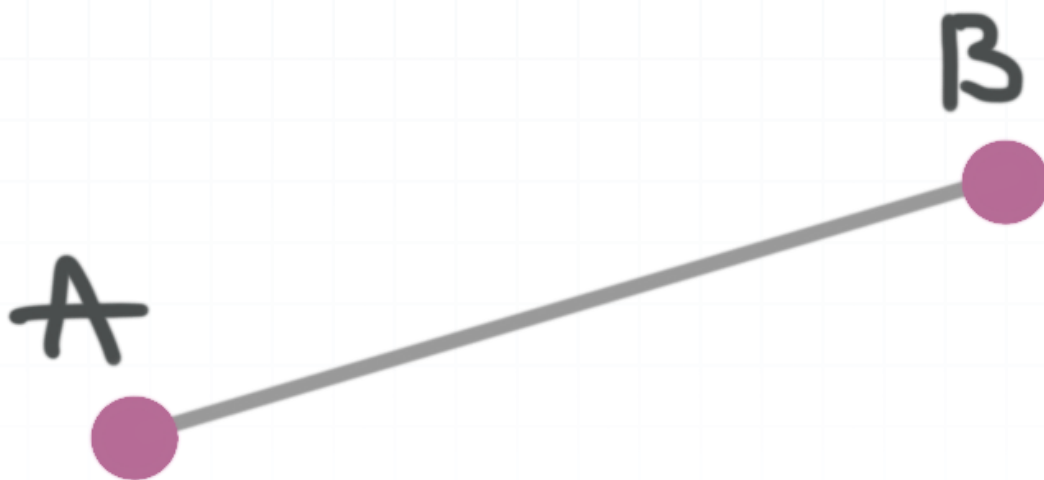


# Length of a line segment

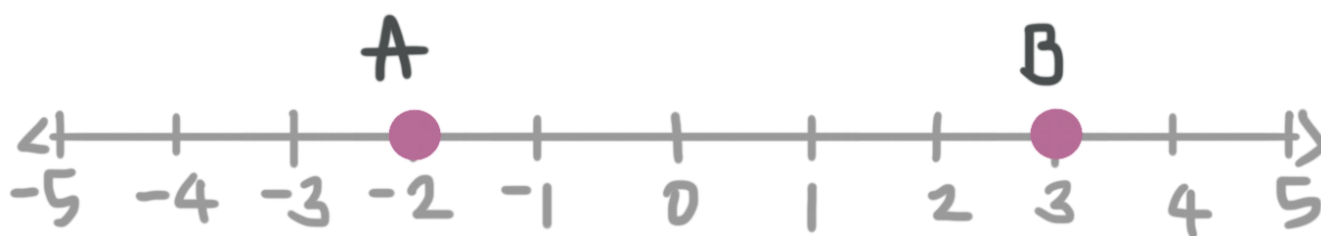
In this lesson we'll look at how to find the length of a line segment algebraically when we're given information and measurements about parts of the line segment.

Remember that a line segment is a finite piece of a line, named by its endpoints. For instance, the line segment  $\overline{AB}$  might look like this:



## Line segments and distance

The distance between two points on a line segment is called the length of the segment. We usually use the same symbol for the length of the line segment that we use for the segment itself. So  $\overline{AB}$  could be used to represent the segment itself, but also the length of the segment.



In this example, the distance between points  $A$  and  $B$  is

$$\overline{AB} = |3 - (-2)|$$

$$\overline{AB} = |3 + 2|$$

$$\overline{AB} = |5|$$

$$\overline{AB} = 5$$

In this example, you could also count from  $A$  to  $B$  and get a distance of 5. As you can see, sometimes it may be helpful to draw a number line in order to visualize the length of a line segment.

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### Example

Points  $S$ ,  $T$ ,  $U$ ,  $V$ , and  $W$  lie, in order from left to right, on a number line. Point  $U$  is at  $-2$ . Where are the rest of the points located?

$$\overline{ST} = 2$$

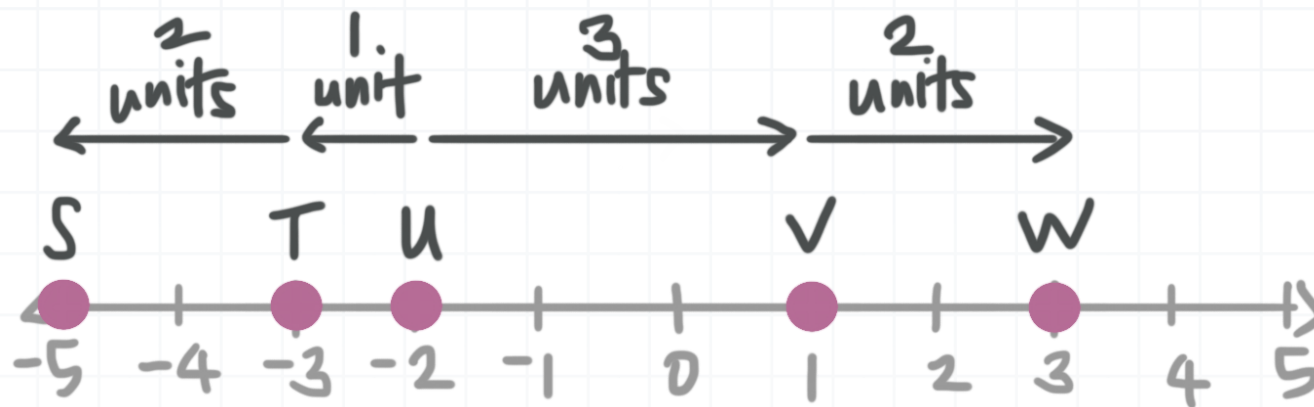
$$\overline{TU} = 1$$

$$\overline{UV} = 3$$

$$\overline{VW} = 2$$

If we plot point  $U$  at  $-2$ , then  $S$ ,  $T$ ,  $U$ ,  $V$ , and  $W$  must be plotted this way:



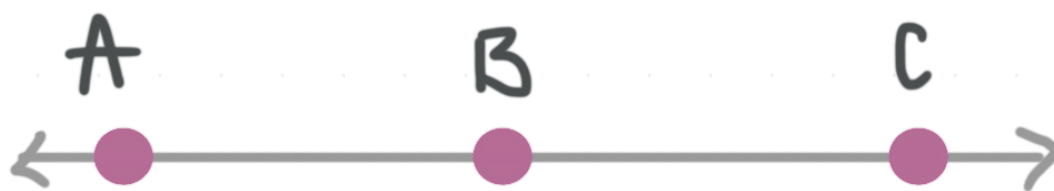


We know point  $U$  is at  $-2$  and  $\overline{TU} = 1$ . This lets us locate point  $T$  at  $-3$ . Now we can use  $\overline{ST} = 2$  to find that  $S = -5$ , and  $\overline{UV} = 3$  to find that  $V = 1$ . Now we can locate point  $W$  by using  $\overline{VW} = 2$ , so  $W = 3$ .

Let's look at another example.

### Example

Find  $\overline{AB}$ , if  $\overline{AC} = 12$  and  $\overline{BC} = 7$ .



We know that  $\overline{AC} = 12$  and  $\overline{BC} = 7$ . From the diagram, we also know that  $\overline{AB}$  is part of  $\overline{AC}$ .

We can see that  $\overline{AC} - \overline{BC} = \overline{AB}$ , so we have  $\overline{AB} = 12 - 7 = 5$ .



Let's look at one last example.

### Example

The locations of four points on a number line are  $A = 2$ ,  $B = 4$ ,  $C = -3$ , and  $D = -6$ . What is the value of  $\overline{AB} + \overline{CD}$ ?

We can draw a number line to help solve the problem.



Now we can see that  $\overline{AB} = |4 - 2| = 2$  and  $\overline{CD} = |-3 - (-6)| = 3$ . So  $\overline{AB} + \overline{CD} = 2 + 3 = 5$ .

