Ruler Postulate and Distance Formula - Student Notes

RULER POSTULATE

In Geometry, a rule that is accepted without proof is called an axiom or postulate. These are important because these are the building blocks that allow us to construct logical arguments (which we will do later).

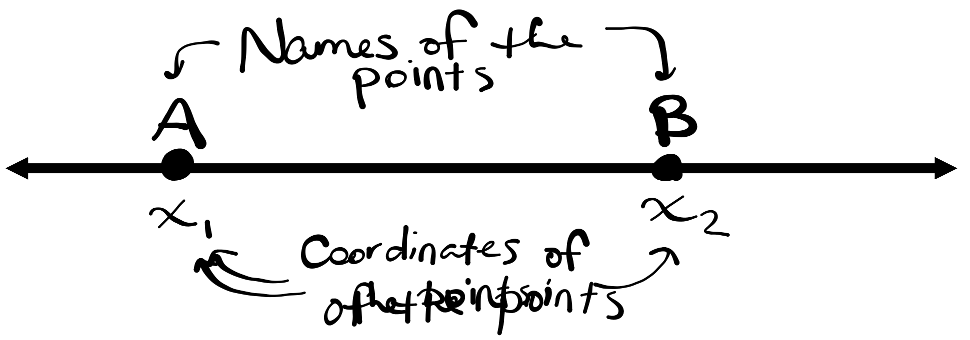
An axiom is a rule that doesn't require proof; it just is. An example of an axiom is $2 = 2$. (This is called the Reflexive Property, which we'll discuss later also.)

A postulate is a type of "Geometry axiom" in that it requires some sort of basic construction to show that it's true.

The Ruler Postulate

The points on the line can be matched up one-to-one with the real numbers.

These are called the coordinates *of the point.*

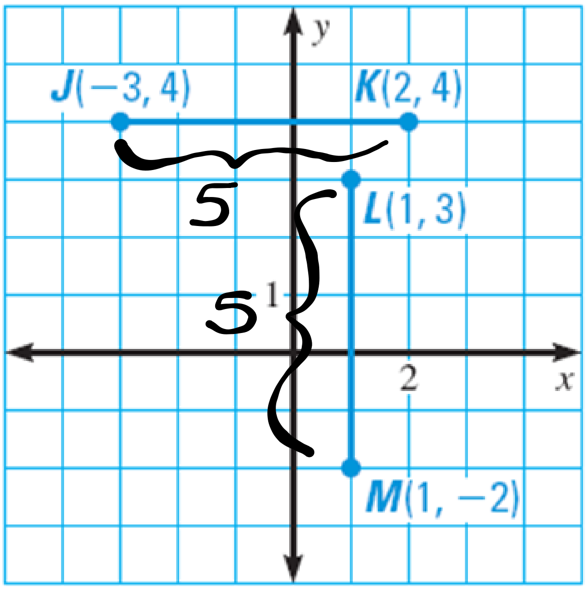


For instance, consider $\overleftrightarrow{AB}$. Basically, we can put a ruler up to the line and numbers on the ruler will correspond to the two points.

The distance between points A and B, written as AB, is the absolute value of the difference of the coordinates of A and B.

$$AB = |x_2 - x_1|$$

<u>DISTANCE - HORIZONTAL AND VERTICAL SEGMENTS</u>



Find JK.

$JK =$ 5 units

Find LM.

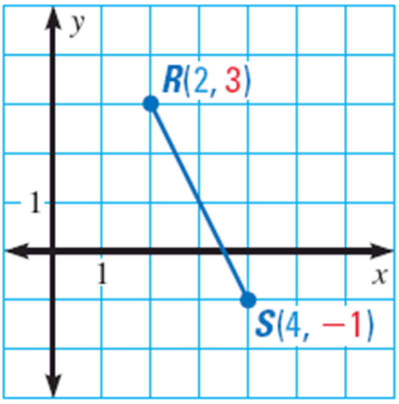
$LM =$ 5 units

What is the difference between $\overline{JK}$ and JK ?

JK is talking about the segment itself; JK refers to its length (a number).

DISTANCE FORMULA

Horizontal and vertical segments are one thing, but whenever a segment is neither of those things, it gets a little trickier:



To find the length of the line segment, we use the Distance Formula.

Distance Formula

If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the distance between A and B is

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Find the length of $\overline{RS}$ using the distance formula.

$$R(\underset{x_1}{2}, \underset{y_1}{3}) \qquad S(\underset{x_2}{4}, \underset{y_2}{-1})$$

$$RS = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$ } Distance Formula

$$= \sqrt{(4 - 2)^2 + (-1 - 3)^2}$$ } Substitute values

$$= \sqrt{(2)^2 + (-4)^2}$$

$$= \sqrt{4 + 16}$$

$$= \sqrt{20}$$

$$\boxed{\approx 4.47 \text{ units}}$$

} Simplify using PEMDAS

If $A(-2, 3)$ and $B(-7, -7)$, find AB.

x_1 y_1 x_2 y_2

$$AB = \sqrt{(-7-(-2))^2 + (-7-3)^2}$$

$$= \sqrt{(-5)^2 + (-10)^2}$$

$$= \sqrt{25 + 100}$$

$$= \sqrt{125}$$

$$\boxed{\approx 11.18 \text{ units}}$$

If $M(8, 5)$ and $N(-1, 3),$ find $MN.$

$$MN = \sqrt{(-1-8)^2 + (3-5)^2}$$

$$= \sqrt{(-9)^2 + (-2)^2}$$

$$= \sqrt{81 + 4}$$

$$= \sqrt{85}$$

$$\boxed{\approx 9.22 \text{ units}}$$