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# §1.5 Locating Points on a Number Line

Today we will learn how to find a point on a line segment that is a distance from the initial point and how to find a point that creates a ratio of a line segment.

**Definitions:**

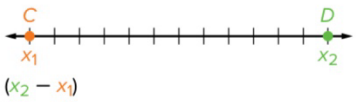
Directed line segment-

Fractional distance-

**Key Concept • Locating a Point at Fractional Distances on a Number Line**

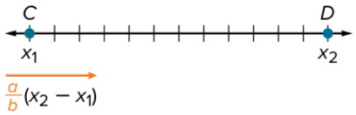
Find the coordinate of a point that is $\frac{a}{b}$ of the distance from point $C$ to point $D$.

**Step 1** Calculate the difference of the coordinates of point $C$ and point $D$.



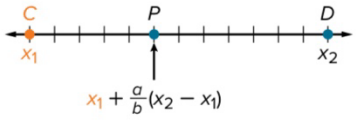

**Step 2** Multiply the difference by the given fraction.

The fractional distance is given by $\frac{a}{b}(x_2 - x_1)$.



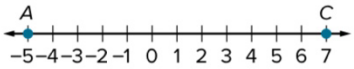

**Step 3** Add the fractional distance to the coordinate of the initial point $x_1$.

The coordinate of point $P$ is given by $x_1 + \frac{a}{b}(x_2 - x_1)$.



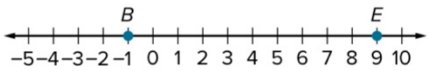

The coordinate of a point on a line segment with endpoints $x_1$ and $x_2$ is given by $x_1 + \frac{a}{b}(x_2 - x_1)$, where $\frac{a}{b}$ is the fraction of the distance.

**Example 1.5.1:** Find $B$ on $\overline{AC}$ that is $\frac{1}{4}$ of the distance from $A$ to $C$.




**Example 1.5.2:** Find $X$ on $BE$ that is $\frac{3}{5}$ of the distance from $B$ to $E$.

Ⓐ 2
Ⓑ 3
Ⓒ 5
Ⓓ 6




**Activity 1.5.3:** DECORATING Taji is hanging a picture $\frac{5}{8}$ of the distance from the floor to the ceiling. If the distance between the floor and the ceiling is 12 feet, how high should he hang the picture?

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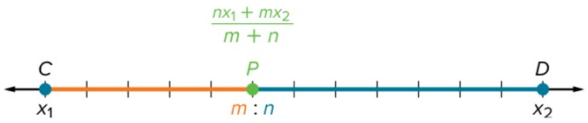
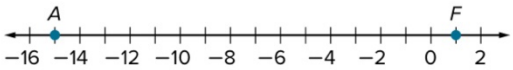
**Example 1.5.4:** Find $B$ on $\overline{AC}$ such that the ratio of $AB$ to $BC$ is $3:4$.


**Key Concept • Section Formula on a Number Line**

If $C$ has coordinate $x_1$ and $D$ has coordinate $x_2$, then a point $P$ that partitions the line segment in a ratio of $m:n$ is located at coordinate $\frac{nx_1 + mx_2}{m+n}$, where $m \neq -n$.




**Activity 1.5.5:** Find P on AF such that the ratio of AP to PF is 1:3.




P is located at _____ on the number line.

**Example 1.5.6:** ERRANDS Eduardo travels 30 miles from his house to the bike shop. When Eduardo goes to the bike shop, he always stops at a local pizza place that is along the way. The ratio of the distance Eduardo travels from his house to the pizza place to the distance he travels from the pizza place to the bike shop is 2:3. How far is the pizza place from Eduardo's house?