Lesson 12: Dividing Segments Proportionately

Classwork

Exercises 1–4

1. Find the midpoint of $\overline{ST}$ given $S(-2, 8)$ and $T(10, -4)$.

2. Find the point on the directed segment from $(-2, 0)$ to $(5, 8)$ that divides it in the ratio of $1 : 3$.

3. Given $\overline{PQ}$ and point R that lies on $\overline{PQ}$ such that point R lies $\frac{7}{9}$ of the length of $\overline{PQ}$ from point P along $\overline{PQ}$.

    a. Sketch the situation described.

    b. Is point R closer to P or closer to Q, and how do you know?

c. Use the given information to determine the following ratios:

   i. $PR:PQ$

   ii. $RQ:PQ$

   iii. $PR:RQ$

   iv. $RQ:PR$

d. If the coordinates of point P are $(0,0)$ and the coordinates of point R are $(14,21)$, what are the coordinates of point Q?

4. A robot is at position $A(40, 50)$ and is heading toward the point $B(2000, 2000)$ along a straight line at a constant speed. The robot will reach point B in 10 hours.

   a. What is the location of the robot at the end of the third hour?

   b. What is the location of the robot five minutes before it reaches point B?

c.   If the robot keeps moving along the straight path at the same constant speed as it passes through point B, what will be its location at the twelfth hour?

d.   Compare the value of the abscissa (x-coordinate) to the ordinate (y-coordinate) before, at, and after the robot passes point B?
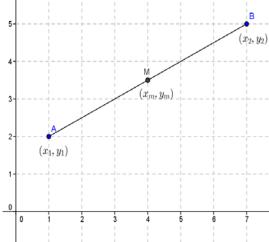
e.   Could you have predicted the relationship that you noticed in part (d) based on the coordinates of points A and B?

Problem Set

1. Given $F(0, 2)$ and $G(2, 6)$. If point S lies $\frac{5}{12}$ of the way along $\overline{FG}$, closer to F than to G, find the coordinates of S. Then verify that this point lies on $\overline{FG}$.

2. Point C lies $\frac{5}{6}$ of the way along $\overline{AB}$, closer to B than to A. If the coordinates of point A are $(12, 5)$ and the coordinates of point C are $(9.5, -2.5)$, what are the coordinates of point B?

3. Find the point on the directed segment from $(-3, -2)$ to $(4, 8)$ that divides it into a ratio of $3 : 2$.

4. A robot begins its journey at the origin, point O, and travels along a straight line path at a constant rate. Fifteen minutes into its journey the robot is at $A(35, 80)$.

   a. If the robot does not change speed or direction, where will it be 3 hours into its journey (Call this point B)?

   b. The robot continues past point B for a certain period of time until it has traveled an additional $\frac{3}{4}$ the distance it traveled in the first 3 hours and stops.

      i. How long did the robot's entire journey take?

      ii. What is the robot's final location?

      iii. What was the distance the robot traveled in the last leg of its journey?

5. Given $\overline{LM}$ and point R that lies on $\overline{LM}$, identify the following ratios given that point R lies $\frac{a}{b}$ of the way along $\overline{LM}$, closer to L than to M.

   a. $LR : LM$

   b. $RM : LM$

   c. $RL : RM$

6. Given $\overline{AB}$ with midpoint M as shown, prove that the point on the directed segment from A to B that divides $\overline{AB}$ into a ratio of $1 : 3$ is the midpoint of $\overline{AM}$.