Midpoint of a Line

Terms:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>midpoint</td>
<td>The midpoint of a segment divides the segment into two congruent parts.</td>
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<tr>
<td>segment bisector</td>
<td>A segment bisector is a point, ray, line, or line segment that intersects the segment at its midpoint (a segment bisector bisects a segment).</td>
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</tbody>
</table>

Example: Point M is the midpoint of $\overline{VW}$. Find the length of $\overline{VM}$. What do we know about $\overline{VM}$ and $\overline{MW}$?______________

Solve:

You Try...

Identify the bisector of $\overline{PQ}$. Then find PQ.

a) 

b) 

- Find the midpoint of a segment in the coordinate plane by finding the average (mean) of the abscissas (x-coordinates) and ordinates (y-coordinates)

Midpoint Formula

Given points $A(x_1, y_1)$ and $B(x_2, y_2)$, the midpoint $M$ has coordinates:

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

Examples:

1) Find the midpoints of $\overline{RS}$ if the coordinates are $R(1, -3)$ and $S(4,2)$

2) The midpoint of $\overline{JK}$ is $M(2, 1)$. One endpoint is $J(1, 4)$. Find the coordinates of the other endpoint $K$. 
You try:
Find AM given M bisects $\overline{AC}$

Find the midpoint given the coordinates of endpoints:
- C(3, 5) and D(7,5)
- J(-7, -5) and K(-3,7)
- Find the endpoint S given endpoint R and midpoint M:
  - R(5, 1), M(1, 4)

**Distance Between Two Points on a Line**

**Distance Formula**
Given points $A(x_1, y_1)$ and $B(x_2, y_2)$ are points on the coordinate plane, then the distance between A and B is:

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

The distance formula is based on the Pythagorean Theorem

Example: Find the length of $\overline{RS}$.  

- $(x_1, y_1) = ______$
- $(x_2, y_2) = ______$
- $(x_2 - x_1) = ______$
- $(y_2 - y_1) = ______$

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

You try:
- e) Find the length of the segment with endpoints $P(1, 2)$ and $Q(5, 4)$
- f) Find the length of the segment with endpoints $S(-1,2)$ and $T(3, -2)$