Partitioning a Segment using Similar Triangles

Point P divides \( \overline{AB} \) into the ratio 3 to 1.

This means that the distance from A to P is 3 times the distance from P to B.

What is the ratio of \( \overline{AP} \) to \( \overline{AB} \)? ___________  What is the ratio of \( \overline{PB} \) to \( \overline{AB} \)? ____________

Example 1: Find the coordinates of point P that lies along the directed line segment from A (0,0) to B (8,6) and partitions the segment into the ratio 3 to 1.

A. Graph points A and B on the coordinate plane and connect.

B. Estimate where you would think P would be located and plot that point.

C. Make a vertical line to the x-axis from points P and B. (you should see two right triangles)

D. Use the Pythagorean theorem to find the length of \( \overline{AB} \).__________

E. The ratio of \( \overline{AP} \) to \( \overline{AB} \) is 3:4. This means that the length of \( \overline{AP} \) is \( \frac{3}{4} \) times the length of \( \overline{AB} \) so \( AP = \frac{3}{4} * _____ = ________ \)

F. Redraw right triangle built using A and P and the triangle built using A and B below.

G. Label the sides of the triangles with the measure you know. (Hint: You should know all the sides of the larger triangle and the hypotenuse of the smaller triangle)

H. The two triangles above are similar by the AA Postulate, so find the two missing sides of the smaller triangle by setting up a ratio and cross multiplying. (or just multiply by \( \frac{3}{4} \))

I. The coordinates of P are found by adding the horizontal length (for the small triangle) to the x-value of A and the vertical length (of the small triangle) to the y-value of A.
So \( P = (0 + _____, 0 +_______) \), thus \( P = (____,____) \)
Example 2: Find the coordinates of point P that lies along the directed line segment from A (3,4) to B (6,8) and partitions the segment into the ratio 3 to 2.

A. Graph points A and B on the coordinate plane and connect.

B. Estimate where you would think P would be located and plot that point.

C. Draw a vertical and horizontal line to connect points A and B. Do the same for points A and P. (you should see two right triangles)

D. Use the Pythagorean theorem to find the length of AB.__________

E. The ratio of AP to AB is 3:5. This means that the length of AP is \( \frac{3}{5} \) times the length of AB so \( AP = \frac{3}{5} * \) ________ = ________.

F. Redraw right triangle built using A and P and the triangle built using A and B below.

G. Label the sides of the triangles with the measure you know. (Hint: You should know all the sides of the larger triangle and the hypotenuse of the smaller triangle)

H. The two triangles above are similar by the AA Postulate, so find the two missing sides of the smaller triangle by setting up a ratio and cross multiplying.(or just multiply each side by \( \frac{3}{5} \) from above)

I. The coordinates of P are found by adding the horizontal length to the x-value of A and the vertical length to the y-value of A. So P = (3 + _____, 4 +______) thus P = (_____ ,_____)
Example 3: Find the coordinates of the point P that lies along the directed segment from A(1, 1) to B(7, 3) and partitions the segment in the ratio of 1 to 4

Example 4: Find the coordinates of point P that lies along the directed line segment from M to N and partitions the segment in the ratio of 3 to 2