**1. Length:** If the endpoints of are A(3, 2) and B(3, 8), what is the length *AB*?

a) Plot and label the points and line segment.

b) Calculate algebraically.

1. *Geometry*: State the equation for (vertical) length.
2. *Substitution*: Replace variables with values.
3. *Algebra*: Calculate the length  
     
    A*B* =
4. *Check*: Do you graphical and algebraic solutions match? Count the squares on the graph. (show it)
5. Does it matter in which order you subtract the two *y* values? Why or why not?

**1. Midpoint**   
a) Plot and label line segment  and its endpoints

 *R*(9,8) and *S*(1,4)

b) Solve for the coordinates of the midpoint *M* of 

1. *Geometry*: State the equation for the midpoint.
2. *Substitution*: Replace variables with values.
3. *Algebra*: Solve for unknowns. (put your result in the box)  
     
    *M* = ( , )
4. *Check*: Mark *M* on the graph. Does it bisect ? Count the squares across the *x* and *y* dimensions.

v) Would the midpoint of the segment be the same as the midpoint of the segment ? Why or why not.**2.** The endpoints of  are *P*(2, 1) and *Q*(6, 4). Find the length *PQ*. Show the formula, and then make the calculation. Check by plotting and labeling .

1. *Geometry*: State the (Pythagorean) length formula.
2. *Substitution*: Replace variables with values.
3. *Algebra*: Calculate the length  
     
     
     
    *PQ* =
4. *Check*: With a compass construct an arc equating  to a horizontal or vertical distance. Do your graphical and algebraic lengths match?

v) Can you simply count the squares that  crosses diagonally to determine its length? Why or why not? **4.** *M* is the midpoint of . Given *A*(1,9) and *M*(5,6).

Determine the coordinates of *B* graphically and algebraically.

1. Plot *A* and *M*, then draw the ray . Using a compass, a ruler, or by counting squares, plot *B* such that *AM* = *BM.*
2. Solve for *B* algebraically.
3. *Geometry*: State the midpoint formula.
4. *Substitution*: Replace variables with values.
5. *Algebra*: solve for unknowns (put your result in the box)  
     
    *B* = ( , )
6. *Check*: Do you graphical and algebraic solutions match?

v) What is the relationship between the length *AM* and *AB*?**7a.** Plot and label the rectangle *ABCD*

*A*(2,1) *B*(2,9) *C*(7,9) *D*(7,1)

**b.** Calculate the area of *ABCD* showing the steps.

1. *Geometry*: State the equations to calculate the area of a rectangle, and the formulas for the length and width. (you must show 3 formulas)
2. *Substitution*: replace variables with values
3. *Algebra*: solve for unknowns

(the length and width are interchangeable)  
 *l* =   
 *w* =  
 Area of *ABCD* =

1. *Check*: Do your calculations match the graph? Count the squares across the *x* and *y* dimensions.
2. Rectangle *ABCD* has two diagonals. What are they? State them using geometric notation.

**8**a) Plot and label **.

 *A*(1,2) *B*(9,8) *C*(9,2)

b) Calculate the perimeter of **showing the steps.

1. *Geometry*: State an equation for the perimeter of a triangle, and state the formulas for the lengths of each side, using vertical, horizontal, and diagonal distance formulas as appropriate. (four equations)
2. *Substitution*: replace variables with values
3. *Algebra*: solve for unknowns

*AB* =   
 *BC* =  
 A*C* =  
 Perimeter of **=

1. *Check*: Do your calculations match the graph? Count the squares across the *x* and *y* dimensions. Use a compass to check the hypotenuse (show the arc).

v) What type of triangle is **? **1) Perimeter**   
a) Plot and label the parallelogram *EFGH*

*E*(-5,1) *F*(-2,5) *G*(8,5) *H*(5,1)

b) Calculate the perimeter of *EFGH* showing the steps

1. *Geometry*: State the formula for the perimeter of a parallelogram, and the formulas for the lengths of a sides.
2. *Substitution*: Replace variables with values
3. *Algebra*: Solve for unknowns

*l1* =   
 *l2* =  
 Perimeter of *EFGH* =

1. *Check*: Do your calculations match the graph? Use a ruler or compass to measure the sum of the sides.

If you multiplied the lengths of two sides of *EFGH* would that be the area? Why or why not?**2) Perimeter**   
a) Plot and label line segment  and its endpoints

*A*(-2,3) and *B*(8,-5)

b) Solve for the coordinates of the midpoint *M* of 

1. *Geometry*: state the midpoint formula
2. *Substitution*: replace variables with values
3. *Algebra*: solve for unknowns (put your result in the box)  
     
    *M* = ( , )
4. *Check*: mark *M* on the graph. Does it bisect ? Count the squares across the *x* and *y* dimensions.
5. In the midpoint formula, why do you divide by 2?

**2) Midpoint extension**  
*M* is the midpoint of . Given *A*(-6,2) and *M*(1,5).

Determine the coordinates of the *M* graphically and algebraically.

1. Plot *A* and *M*, then draw . Using a compass, a ruler, or by counting squares, plot *B* such that *AM* = *BM.*
2. Follow the algebraic steps:
3. *Geometry*: state the midpoint formula
4. *Substitution*: replace variables with values
5. *Algebra*: solve for unknowns (put your result in the box)  
     
    *B* = ( , )
6. *Check*: Do you graphical and algebraic solutions match?
7. To cut a segment into thirds what formula would you use?

**1) Length:** If the endpoints of are A(3, -2) and B(3, 5), what is the length *AB*?

a) Plot and label the points and line segment.

b) Calculate algebraically.

1. *Geometry*: state the (simple) length formula
2. *Substitution*: replace variables with values
3. *Algebra*: Calculate the length  
     
    A*B* =
4. *Check*: Do you graphical and algebraic solutions match?
5. Does it matter in which order you subtract the two *y* values?

**5)** **Midpoint:** What are the coordinates of the midpoint M of a line segment with end points A and B? Write your answer as an ordered pair. Show your work.

A = (-5, -10)

B = (-1, 20)

**6) Midpoint:** On the graph, clearly label the end points A, B, and accurately mark the midpoint M.

b) Write each end point as an ordered pair

A =

B =

c) Calculate the coordinates of the midpoint M. Show your work and write your answer as an ordered pair.

7) On the graph, show the line segment with end points A and B.

A = (-4, 1)

B = (8, 7)

b) Length: Show the formula and calculate the length *AB*

c) Calculate the coordinates of the midpoint *M* of the line segment. Write the midpoint *M* as an ordered pair and mark it accurately on the graph.

M =

d) What is the point that is one-third of the way from point *A* to point *B*? Show your calculations and state your result as an ordered pair.