Big idea

You will learn how mathematics can be used to represent distances, midpoints, and specific lines (such as bisectors, medians and tangents). You will use these concepts to find shortest distances and altitudes. Keep in mind that although there are few applications to real life in this unit, you must learn these basic concepts so that you can continue building upon them in your later studies. Think of this unit as a learning curve to be able to communicate well in the mathematical language. Also if you ever take the Calculus course later on, you'd learn how vectors help you solve shortest distance problems in a faster way.

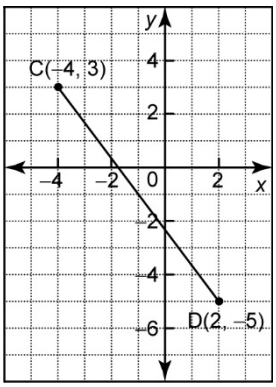
Feedback & Assessment of Your Success

Date	Pages	Topics	Finished assignment pages? Made corrections?	Summarized notes in a journal? Added your own explanations?	How many extra practice questions did you try in each topic?	Tentative TEST date: _____ Questions to ask the teacher:
1.5days	2-5	Midpoint & Slope (MPM) Journal #1				
	6-8	Distance/Length (MPM) Journal #2				
0.5days	9-10	Circles (MPM) Journal #3				
2days	11-16	Apply Slope, Midpoint & Length (MPM) Journal #4				

ASSIGNMENT Midpoint & Slope of a Line Segment (MPM)

1. Determine the coordinates of the midpoint of each

a)



b) $\left(-\frac{2}{5}, -\frac{3}{4}\right)$ and $\left(\frac{4}{5}, \frac{3}{4}\right)$

NOTES:

MIDPOINT Formula:

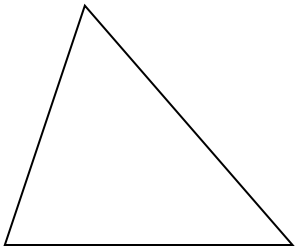
How to find the "OTHER endpoint"

2. The endpoints of the diameter of a circle are A(−5, −3) and B(3, 7). Find the coordinates of the centre of this circle.

3. One endpoint of a diameter of a circle centred at (3, – 4) is (−5, 2). Find the coordinates of the other endpoint of this diameter.

4. Write an expression for the coordinates of the midpoint of the line segment with endpoints A(2*a*, 3*b*) and B(4*a*, 5*b*). Explain your reasoning.

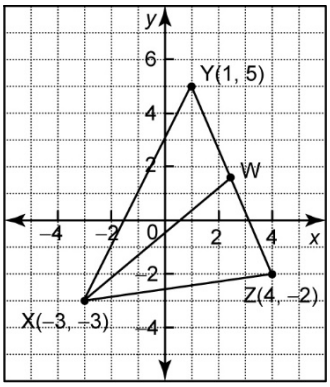
NOTES:
MEDIAN line definition:



Action Plan:

NOTES:
SLOPE Formula:

5. Find the slope of the median shown.



6. **a)** Draw △JKL with vertices J(−6, 4), K(−4, −5), and L(6, 1).
   b) Draw the median from vertex J. Then, find an equation in slope *y*-intercept form for this median.

NOTES:

PERPENDICULAR BISECTOR line definition:

Action Plan:

7. **a)** Draw △JKL with vertices J(−6, 4), K(−4, −5), and L(6, 1).
   b) Draw the right bisector of KL. Then, find an equation in slope *y*-intercept form for this right bisector.

8. Find the perpendicular bisector equation of line segment AB if A(-4, 5) and B(2, -3)

NOTES:

Parallel lines have _____ Perpendicular lines have _____

Vertical lines: Horizontal lines:

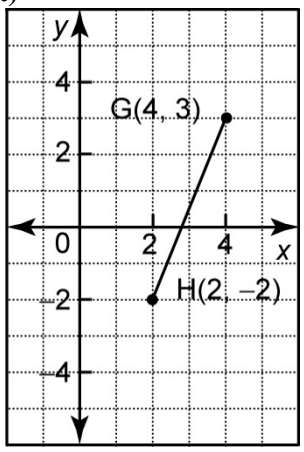
9. **a)** Draw △ABC with vertices A(−8, 0), B(0, 0), and C(0, −8).
   b) Construct the midpoints of AB, BC, and AC and label them D, E, and F, respectively.
   c) Join the midpoints to form △DEF.
   d) Show that the line segment DE is parallel to the line segment AC.

10. Find the median equation line from vertex A(-4, -6) to base BC where B(-3, 1) and C(6,0)

ASSIGNMENT Distance or Length of a Line Segment (MPM)

1. Calculate the length of the line segment defined by each pair of endpoints.

a)



NOTES:
DISTANCE Formula:

b) $\left(-\frac{3}{4}, -\frac{2}{5}\right)$ and $\left(\frac{1}{4}, \frac{3}{5}\right)$

2. The endpoint of a radius of a circle with centre C(2, 3) is D(5, 5). Determine
   a) the length of the diameter of the circle
   b) the coordinates of the endpoint E of the diameter DE of the circle

3. Determine the length of the median from vertex A in the triangle with vertices A(−6, 5), B(−2, 8), and C(4, −4).

4. Classify the $\triangle XYZ$ if X(−6, 8), Y(−2, −4), and Z(4, 6).

5. Classify the triangle with vertices D(−2, −5), E(2, 3), and F(4, −3).

6.

a) For quadrilateral STUV with vertices, S(−2, 4), T(− 4, −2), U(2, − 4), and V(4, 0). Find the midpoint D of side ST, the midpoint E of side TU, the midpoint F of side UV, and the midpoint G of side VS.

b) Verify that opposite sides of DEFG are parallel and equal in length.

c) What type of shape is DEFG?

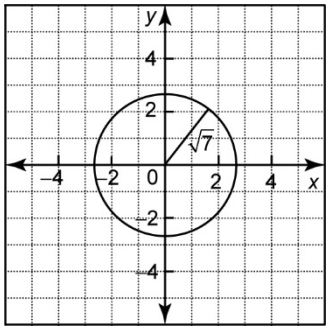
d) Draw the STUV quadrilateral and join the midpoints of adjacent sides to form a new quadrilateral DEFG to check your answer.

ASSIGNMENT Circles (MPM)

NOTES:
EQUATION of a CIRCLE:

Point inside/on/outside:

1. Determine an equation for the circle.



2. Determine whether each point is on, inside, or outside the circle defined by $x^2 + y^2 = 26$.
   a) (1, 3) **b)** (−4, 6) **c)** (1, 5)

3. State the radius of the circle defined by the equation and give the coordinates of one point on the circle $x^2 + y^2 = 1.44$

4. The point A(4, b) lies on the circle defined by $x^2 + y^2 = 25$.
   a) Find the possible value(s) of b.
   b) Use a graph to show that the point(s) corresponding to the possible value(s) of b are on the circle.

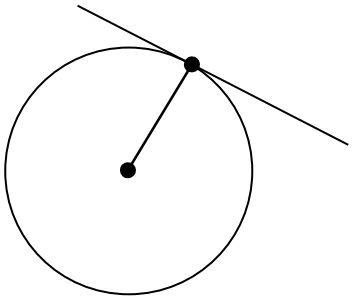
NOTES:
Suppose the circle is NOT centred at the origin. Develop the equation of a circle using the length formula for a circle centred at (2, -3) with a radius of 8 units.

5. Determine an equation for the circle that has a diameter with endpoints B(−4, 7) and C(4, −7).

Method 1 Method 2

NOTES:

TANGENT line definition:



Action Plan:

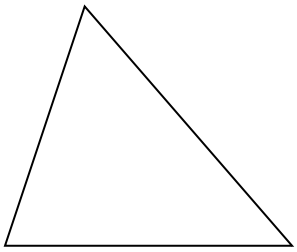
6. **a)** Graph the circle defined by $x^2 + y^2 = 100$.
   b) Verify algebraically that the point D(6, −8) lies on this circle.
   c) Determine an equation for the tangent line DO.

7. Find tangent equation line at point (3, 4) of circle $x^2+y^2=25$

ASSIGNMENT Apply Slope, Midpoint & Length Formulas (MPM)

NOTES:

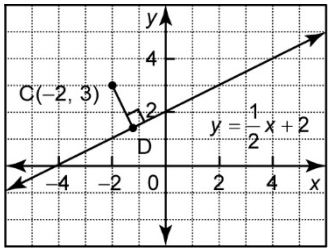
ALTITUDE line definition:



Action Plan:

1. Find the altitude equation line from vertex A(-4, -6) to base BC where B(-3, 1) and C(6,0)

2. Find an equation for the line containing line segment CD.



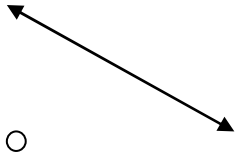
3. Find whether the point A(2, - 5) lies on the right bisector of the line segment of P(4, 2) and Q(-4, -6). (HINT do not use pt A, until you're ready to check if it is on the line that you find first)

4. The points W(−2, −2), X(−6, 2), and Y(2, 5) are three vertices of parallelogram WXYZ.
   a) Find the coordinates of vertex Z.
   b) Show that the diagonals XZ and WY bisect each other.

5. Determine the shortest distance from the point P(−5, 3) to the line $y = \frac{2}{3}x + 2$

NOTES:

SHORTEST DISTANCE:



Action Plan:

6. Determine the shortest distance from the point P(4, −5) to the line joining C(−3, 1) and D(6, 4)

7. A triangle has vertices G(−5, −4), H(−1, 8), and I(3, −6)
   a) Find the equation of the altitude from H.
   b) Find the length of the altitude

#7 continued

c) Find the area of this triangle.

8. **a)** Graph the circle defined by $x^2 + y^2 = 45$.

b) Verify algebraically that the line segment joining P(−3, 6) and Q(6, −3) is a chord of this circle.

c) Find an equation of the line that passes through the origin and is perpendicular to the chord PQ.

d) Verify that this line passes through the midpoint of the chord.