

(A) Lesson Context

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> mastery with algebraic skills to be used in our work with co-ordinate geometry (midpoint, length, slope) understanding various geometric properties of quadrilaterals & triangles how do you really prove that something is “true”? 		
CONTEXT of this LESSON:	Where we’ve been You know about triangles & quadrilaterals and now you know how to find a slope, midpoint & length	Where we are Investigating various properties of triangles & quadrilaterals using slope, midpoint & length & dynamic geometry software.	Where we are heading How can I prove various geometric properties of quadrilaterals and triangles?

(B) Lesson Objectives:

- Exploring the construction of geometric figures through dynamic geometry software (geogebra)
- Using algebra & geometry software as tools, use slopes, midpoints & lengths of line segments to problem solving questions

(C) EXPLORATION ASSIGNMENT #1: Dynamic geometry software: Working with Geogebra

Open Geogebra (by now, downloaded onto your computer) and show me:

- Show me an axes with a grid
- Show me that you can construct a line segment between 2 points and measure its length and slope and find its midpoint.
- Show me that you can construct a line through two points & determine the lines slope and equation
- Show me that you can construct a triangle and measure the slope of each side and the area
- Show me you can reflect a triangle across the x-axis and across the y-axis
- Show me that you can translate a triangle 3 units to the left and 6 units down.
- Show me that you can construct a perpendicular bisector of a side of a triangle
- Show me that you can construct an angle bisector of an angle in a triangle
- Show me that you can construct a median (as a line segment) in a triangle
- Show me how to construct an altitude of a triangle

(D) EXPLORATION ASSIGNMENT #2: Working with Triangles & Quadrilaterals

- a. Use slopes to prove that $\triangle ABC$ is a right triangle, given that $A(4,2)$, $B(-2,4)$, $C(2,-4)$
- b. A triangle is enclosed by the lines $3x + 13y = 56$, $5x - 8y = 34$, $-8x - 5y = -1$. Determine
 1. the coordinates of the vertices and
 2. the type of triangle (scalene, isosceles, equilateral)
 3. The area of the triangle
- c. Construct a parallelogram, where 2 of the points MUST be $(-2,5)$ and $(-6,-3)$
 1. Construct the diagonals of the parallelogram. Do they BISECT each other?
 2. Construct the midsegments of your parallelogram. Is the new quadrilateral also a parallelogram?
- d. Show me whether or not the diagonals of a rhombus are perpendicular bisectors of each other?

(E) EXPLORATION ASSIGNMENT #3 (EXTENSION): Triangle Centers (research required)

- a. Perform a construction to find the INCENTER in a triangle → explain/construct significance
- b. Perform a construction to find the CIRCUMCENTER in a triangle → explain/construct significance
- c. Perform a construction to find the CENTROID in a triangle → explain/construct significance
- d. Perform a construction to find the ORTHOCENTER in a triangle → explain/construct significance
- e. Prove that the centroid divides a median into a 2:1 ratio

EXPLORATION ASSIGNMENT #1: Dynamic geometry software: Working with Geogebra

1. Show me an axes with a grid	5 pts
2. Show me that you can construct a line segment between 2 points and measure its length, slope and find its midpoint	5 pts
3. Show me that you can construct a line through two points & determine the slope and equation	5 pts
4. Show me that you can construct a triangle and measure the slope of each side and the area	5 pts
5. Show me you can reflect a triangle across the x-axis and across the y-axis	5 pts
6. Show me that you can translate a triangle 3 units to the left and 6 units down	5 pts
7. Show me that you can construct a perpendicular bisector of a side of a triangle	5 pts
8. Show me that you can construct an angle bisector of an angle in a triangle	5 pts
9. Show me that you can construct a median (as a line segment) in a triangle	5 pts
10. Show me how to construct an altitude of a triangle	5 pts

EXPLORATION ASSIGNMENT #2: Working with Triangles & Quadrilaterals

(A) Use slopes to prove that $\triangle ABC$ is a right triangle, given that $A(4,2)$, $B(-2,4)$, $C(2,-4)$	10 pts
(B) A triangle is enclosed by the lines $3x + 13y = 56$, $5x - 8y = 34$, $-8x - 5y = -1$. Determine: a. the coordinates of the vertices and b. the type of triangle (scalene, isosceles, equilateral) c. its area	10 pts
(C) Construct a parallelogram, where 2 of the points MUST be $(-2,5)$ and $(-6,-3)$ a. Show me whether or not the diagonals BISECT each other? b. Construct the midsegments of your parallelogram. Is the new quadrilateral also a parallelogram	10 pts
(D) Show me whether or not the diagonals of a rhombus are perpendicular bisectors of each other?	10 pts

EXPLORATION ASSIGNMENT #3 (EXTENSION): Triangle Centers (research required)

(A) Perform a construction to find the INCENTER in a triangle → explain/construct significance	
(B) Perform a construction to find the CIRCUMCENTER in a triangle → explain/construct significance	
(C) Perform a construction to find the CENTROID in a triangle.	
(D) Perform a construction to find the ORTHOCENTER in a triangle.	