THE ERINDALE ACADEMY

COURSE NAME: MPM2D – Principles of Mathematics	
Unit 2 – Analytic Geometry (Assignment #6: Advanced Shapes: (Parallelograms and Triangles) 2.1 to 2.7) **Teacher: Antonio Pietrangelo** **Time: as needed.** **Pages: 10**	**Student's Name: Instructor** **Student#: Answer Key** **Due Date: Friday, October 22nd, 23:59pm (EST)** **Mark: /100**

Categories	Knowledge/ Understanding	Thinking/Inquiry/ Problem Solving	Communication	Application
Symbol	K/U	T/I	C	A
Weight	25 %	25 %	25 %	25 %
Level				

Overall Expectations:

All Overall Expectations as listed in the Ontario Curriculum course outline for your specific course.

Overall Expectations:

2. Analytic Geometry: Line Segments and Circles, Other Shapes (Parallelogram and Triangles)

Specific Expectations:

2.1 Midpoint of a Line Segment
2.2 Length of a Line Segment
2.3 Equation of a Circle
2.4 Classifying Figures on a Coordinate Grid
2.5 Verifying Properties of Geometric Figures (Right Bisector of a Triangle, etc.)
2.6 Exploring Properties of Geometric Figures (Centroid of Triangle, etc.)
2.7 Using Coordinates to Solve Problems

Key Terms:
1. Slopes of Lines
2. Parallel lines
3. Perpendicular bisector
4. Length of Line Segment
5. Length of a hypotenuse
6. Pythagorean Theorem
7. Equation of a circle
8. Point on a circle
9. Median of a Triangle
10. Equidistance
11. Cartesian Grid
12. Midpoint
13. Altitude
14. Radius of a Circle
15. Fractal
16. centroid
17. Parallelogram
18. Varignon Parallelogram
19. Right-angle Triangle
20. Isosceles Triangle
21. Scalene Triangle
22. Equilateral Triangle

Rubrics:

Category	Level R (0 – 49%)	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)	Level/ Mark
Knowledge – Understanding of: **(Unit/Section - 2.1 to 2.7)**	demonstrates insufficient understanding	demonstrates limited understanding	demonstrates some understanding	demonstrates considerable understanding	demonstrates thorough understanding	
					Individual Mark	___

Category	Level R (0 – 49%)	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)	Level/ Mark
Thinking and Inquiry (What if scenarios) of **(Unit/Section - 2.1 to 2.7)**	demonstrates insufficient ability to apply different scenarios	demonstrates limited ability to apply different scenarios	demonstrates some ability to apply different scenarios	demonstrates considerable ability to apply different scenarios	demonstrates through ability to apply different scenarios	
					Individual Mark	_______

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Category	Level R (0 – 49%	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)	Level/ Mark
Communication **Communicates effectively with the use of** **(Unit/Section: 2.1 to 2.7)**	demonstrates **insufficient** ability to communicate effectively	demonstrates **limited** ability to communicate effectively	demonstrates **some** ability to communicate effectively	demonstrates **considerable** ability to communicate effectively	demonstrates **through** ability to communicate effectively	
					Individual Mark	______

THE ERINDALE ACADEMY

Category	Level R (0 – 49%	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)	Level/ Mark
Application: Demonstrates the ability to implement mathematical modules in real world applications: **(Unit/Section : 2.1 to 2.7)**	demonstrates **insufficient ability**	demonstrates **limited ability**	demonstrates **some ability**	demonstrates **considerable ability**	demonstrates **thorough ability**	
					Individual Mark	____

PART A: KNOWLEDGE AND UNDERSTANDING (K/U) – 25%

2 Marks Per Question

Instructions:

Question 1: A triangle that has a 90° angle is considered a right-angle Triangle? (True or False)

True

Question 2: A trapezoid is not a parallelogram? (True or False)

True

Question 3: A parallelogram has two pairs of sides that are parallel in to each other? (True or False)

True

Question 4: The equation of a circle is $x^2 + y^2 = 81$. Does point(0, -10) is outside the circle? (True or False)

True

Question 5: The centroid of a triangle divides all 3 medians of a triangle by a ratio of 3:1? (True or False)

False

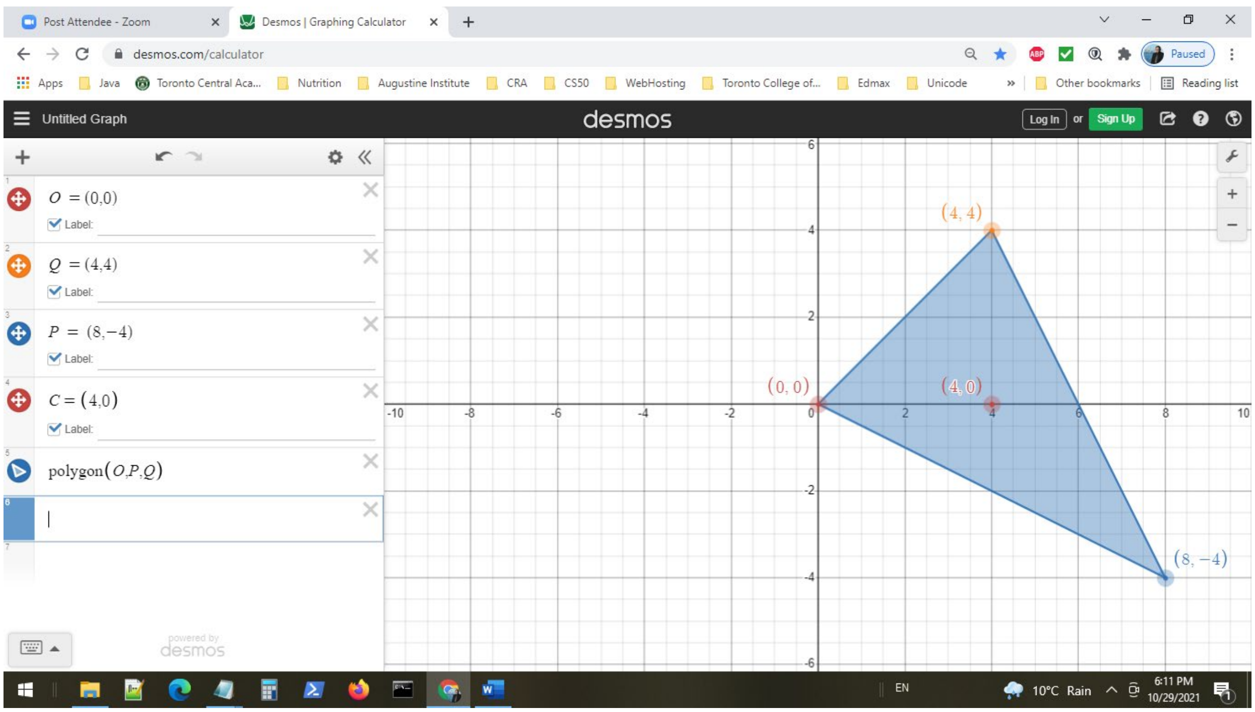
PART B: THINKING AND INQUIRY (T/I) – 25 %

5 Marks Per Question

Show your work:

Use Desmos graphing software to plot the points and join the points using polygon(O, Q, P) statement. Points are: O(0, 0), Q(4, 4), and P(8, -4).

Question 1: Find the midpoint of the line segments that joins these points:
Let R be the midpoint of OQ
Let S be the midpoint of OP
Let T be the midpoint of PQ



Formula for midpoint: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Midpoint of Segment OQ: O(0, 0), Q(4, 4)

$MP_{oq} = (\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

$MP_{oq} = (\frac{0+4}{2}, \frac{0+4}{2}) = (\frac{4}{2}, \frac{4}{2}) = (2, 2)$

$MP_{oq} = (2, 2)$

Call Point R(x, y) = MP_{oq} = (2, 2)

Midpoint of Segment OP: O(0, 0), P(8, -4).

$MP_{OP} = (\frac{x1 + x2}{2}, \frac{y1 + y2}{2}) = (\frac{5 + (-3)}{2}, \frac{5 + (-1)}{2})$

$MP_{OP} = (\frac{0+8}{2}, \frac{0+(-4)}{2}) = (\frac{8}{2}, \frac{-4}{2}) = (4, -2)$

MP_{OP} = (4, -2)

Call Point S(x, y) = MP_{OP} = (4, -2)

Midpoint of Segment PQ: P(8, -4), Q(4, 4)

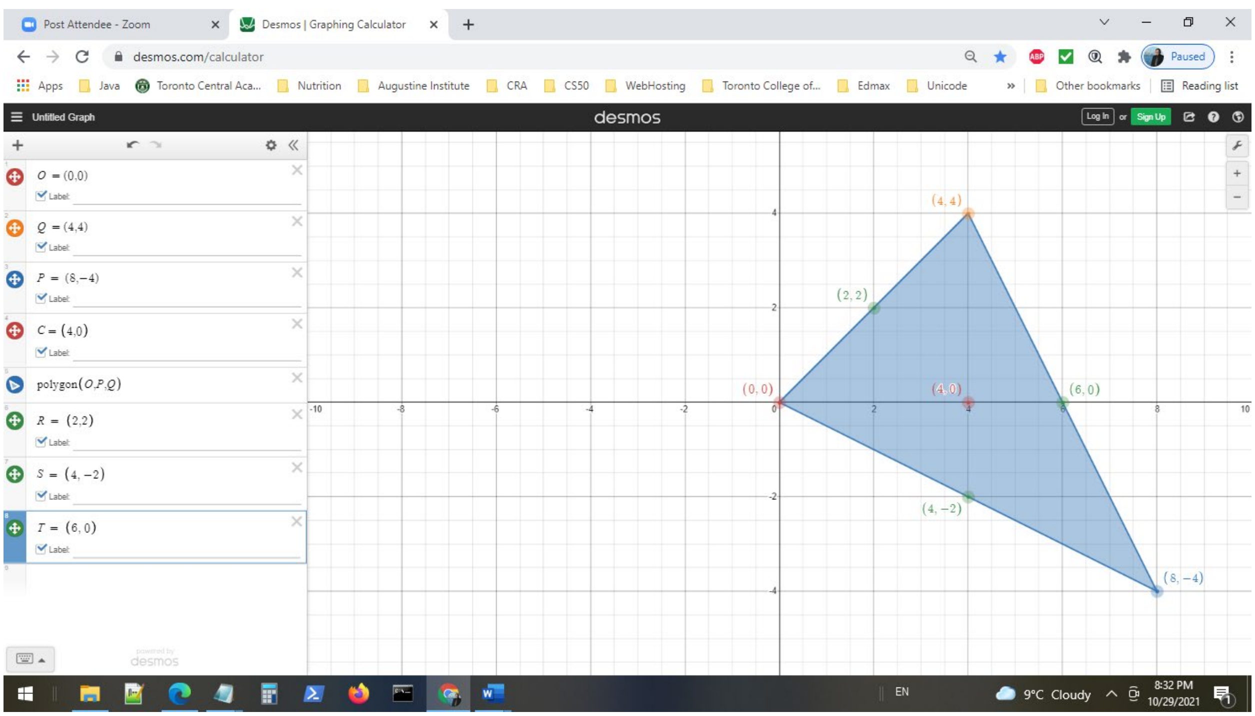
$MP_{pq} = (\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

$MP_{pq} = (\frac{8+4}{2}, \frac{-4+4)}{2}) = (\frac{12}{2}, \frac{0}{2}) = (6, 0)$

MP_{pq} = (6, 0)

Call Point T(x, y) = MP_{pq} = (6, 0)

Plot R(2, 2), S(4, -2), T(6, 0) on graph



<u>Question 2:</u> Find the length of each line segment joining the same points above

Formula for Length of Line Segment: $\sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

<u>Length of Segment OP:</u> O(0, 0), P(8, -4). $L_{OP} = \sqrt{(8-0)^2 + (-4-0)^2}$ $L_{OP} = \sqrt{(8)^2 + (-4)^2}$ $L_{OP} = \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$ $L_{OP} = 4\sqrt{5}$	**<u>Length of Segment: OQ:</u>** O(0, 0), Q(4, 4) $L_{OQ} = \sqrt{(4-0)^2 + (4-0))^2}$ $L_{OQ} = \sqrt{(4)^2 + (4)^2}$ $L_{OQ} = \sqrt{16+16} = \sqrt{2 \cdot 16} = 4\sqrt{2}$ $L_{OQ} = 4\sqrt{2}$
<u>Length of Segment PQ:</u> P(8, -4), Q(4, 4) $L_{AC} = \sqrt{(8-4)^2 + (-4-4)^2}$ $L_{AC} = \sqrt{(4)^2 + (-8)^2}$ $L_{AC} = \sqrt{16+64} = \sqrt{80} = 4\sqrt{5}$ $L_{AC} = \sqrt{80} = \sqrt{16 \cdot 5} = 4\sqrt{5}$	

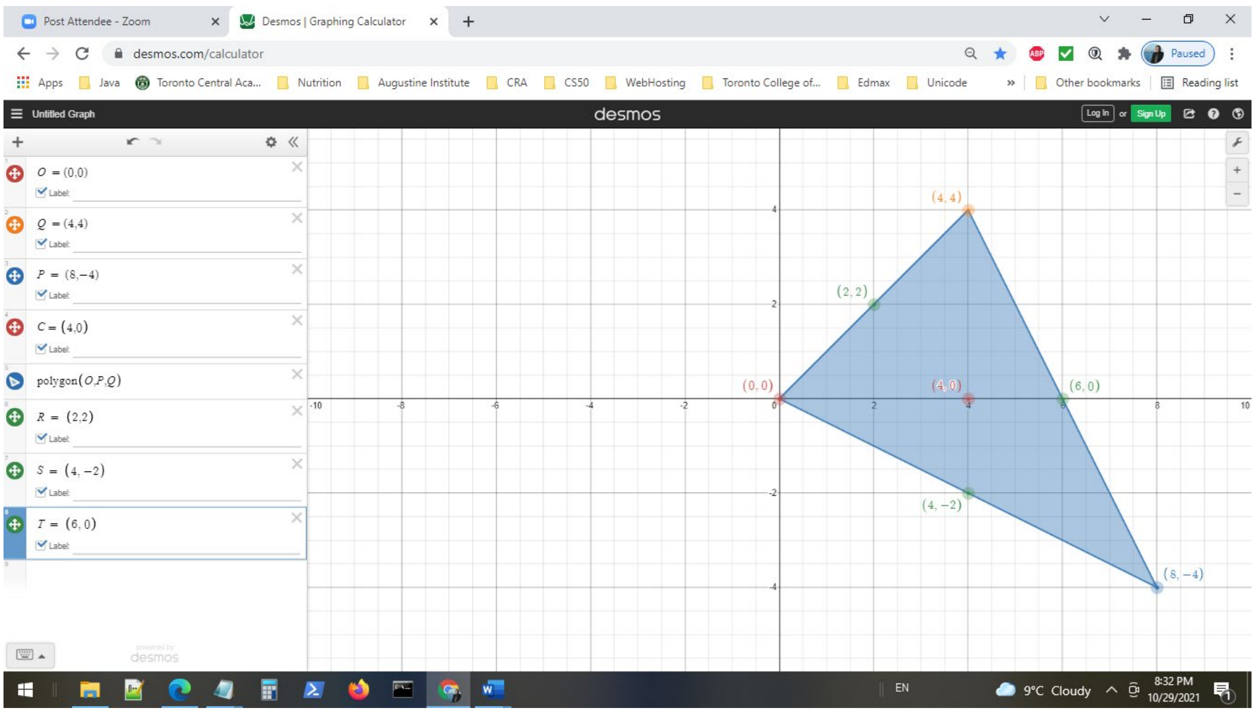
PART C: COMMUNICATION (C) – 25%

10 Marks Per Question

Using the same points as in PART B, above: O(0, 0), Q(4, 4), and P(8, -4).

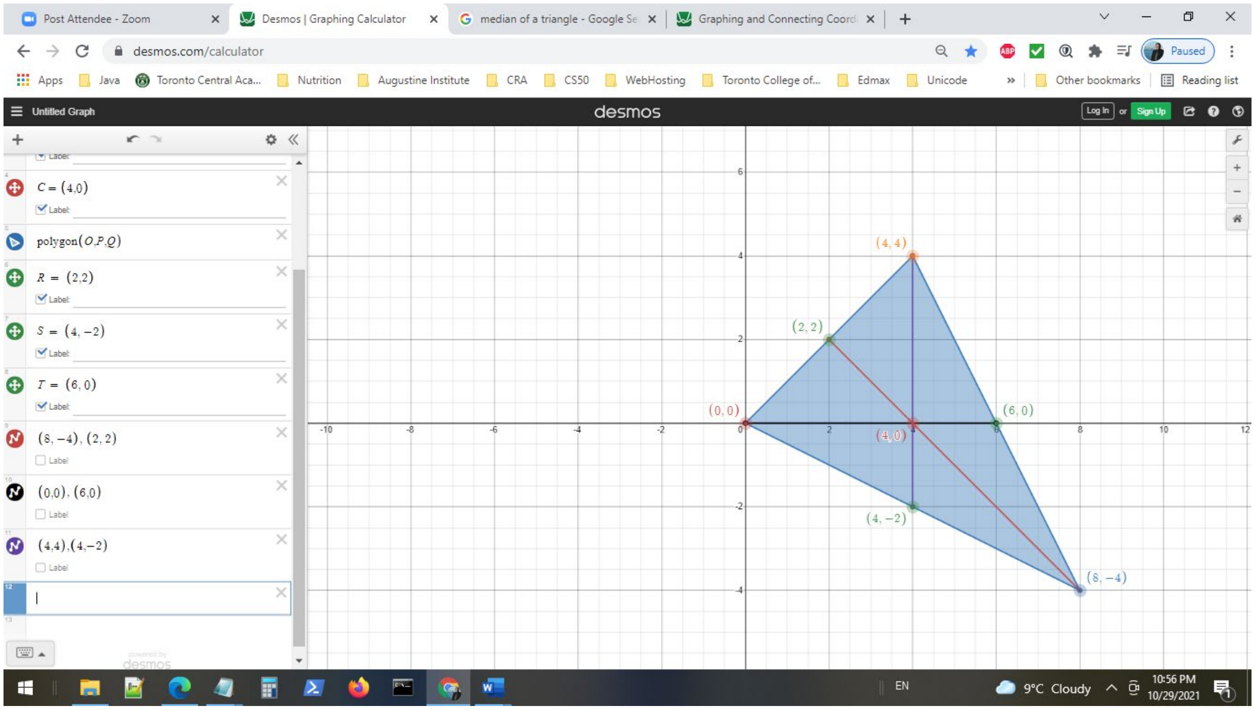
Question 1: Verify that point C(4, 0) is the centroid to of triangle ΔOQP.

Hint: A centroid of a triangle is the point of intersection of the three medians of a triangle.



By definition, the centroid of a triangle is the centre point of the three medians of a triangle.

The medians of the triangle **Δ OPQ** are PR, OT, QS.



The centroid of any triangle would be the point of intersection of the equations of the three medians PR, OT, QS.

Find equation of line for median PR:

Slope for median PR: Points: P(8, -4), R(2, 2)

$M_{pr} = \frac{y2-y1}{x2-x1} = \frac{2-(-4)}{2-8} = \frac{6}{-6}$

$M_{pr} = -1$

y = mx + b

y = (-1)x + b

Find y-intercept by using point R(2, 2)

(2) = (-1)(2) + b

b = 2 + 2 = 4

y = -x + 4

Substitute C(4, 0) into equation y = -x + 4
L.S. = 0

R.S. = -x + 4
R.S. = -(4) + 4 = r
R.S. = 0

L.S. = R.S. = 0

∴ C(4,0) falls on the equation of the line y = -x + 4, which is also equation for median PR.

The method above used to solve median PR will also that point C(4,0) lines on medians OT, and QS.

Find equation of line for median OT:

Slope for median OT: Points: O(0, 0), T(6, 0)

$M_{OT} = \frac{y2-y1}{x2-x1} = \frac{0-0}{0-6} = \frac{0}{6} = 0$

$M_{OT} = 0$

y = mx + b
y = 0x + b

Find y-intercept by using point T(6, 0), and slope of 0.
(0) = (0)(6) + b
b = 0

y = 0 + 0

y = 0 or
y = 0x + 0

The equation of the line for Median OT is: y = 0 or y = 0x + 0

Substitute C(4, 0) into equation y = 0x + 0
L.S. = 0

R.S. = 0x + 0
R.S. = (0)(4) + 0 = 0
R.S. = 0

L.S. = R.S. = 0

∴ C(4,0) falls on the equation of the line y = 0

Find equation of line for median QS:
median QS: Points: **Q**(4, 4), **S**(4, -2),

The general equation for slope of a can not be used to determine equation of line since x_2, and x_1 and equal.

$M_{QS} = \frac{y2-y1}{x2-x1} = \frac{-2-4}{4-4} = \frac{6}{0}$ = unknown

In some circumstances, we need to use special equation of line forms:

Vertical line form: $x = x_n$, when $x_1 = x_2$ of two points $P_1 = (x_1, y_1)$, $P_2 = (x_2, y_2)$

The equation for median QS is x = 4.

By analysis, **C(4,0) falls on the equation of the median QS, which x =4.**

Equation of medians:

PR: y = -x + 4
OT: y = 0
QS: x = 4

Therefore, **C(4,0) is the centroid of the triangle Δ OPQ with medians** PR, OT, and QS, since **point C(4,0) satisfies the equations of all 3 medians and is the point of intersection from graphical using algebra and graphical analysis.**

PART D: APPLICATION (A) – 25%

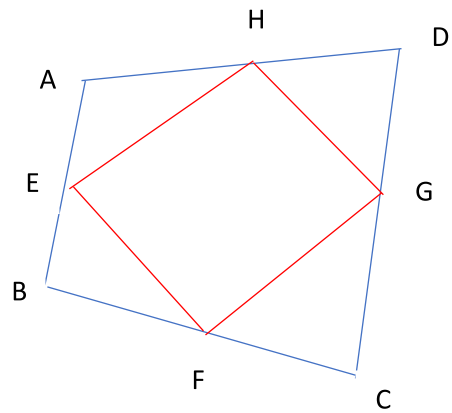
10 Marks Per Question

Question 1:

Proof of a parallelogram, Varignon parallelogram:
Inside any random 4-sided polygon, i.e. a quadrilateral, where there midpoints of any 4-side polygon, when connected produce a parallelogram.

Follow the steps below per students randomly assigned points for A, B, C, D and follow the steps in the tables below. Please come up with a conclusion, and also verify another student's calculations along with your calculations.

What conclusion or observation have you make?



Step 1: Table of Points: Randomly give table of points to each student.

Student Name	Point A	Point B	Point C	Point D
Joanna	(-6, 8)	(-12,0)	(12, 0)	(6, 10)
Hayden	(-9, 13)	(-11, -7)	(9, -6)	(12,10)
Cody	(-6, 5)	(-14, -11)	(8, -9)	(5, 10)

Sherry	(-11, -14)	(4, -13)	(12, 6)	(-11, 12)
Leon	(-3, 1)	(-4, 1)	(5, -1)	(1, 4)
Tee	(-10, 4)	(-10, -12)	(10, -9)	(0, 14)
Brian N.	(-9, 6)	(-9, -5)	(12, -11)	(7, 10)
Henry T.	(-10, 3)	(-10, -6)	(10, -7)	(1, 13)
Roy	(-9, 9)	(-9, -5)	(9, -10)	(6, 14)
Kyle	(-7, 12)	(-10, -11)	(9, -11)	(9, 12)
Henry N.	(-4, -2)	(1, -1)	(4,4)	(-6,4)
Lavinia	(-5, -6)	(10, -4)	(5,8)	(-7,4)
Jason	(-6, -8)	(5, -10)	(5, 5)	(-1,5)
Alex	(-7, 9)	(-11, 1)	(12, 1)	(7, 9)

Step 2: Table of MidPoints:

Student Name	MidPoint E(X,Y) is for AB	MidPoint F(X,Y) is for BC	MidPoint G(X,Y) is for CD	MidPoint H(X,Y) is for DA	Verified by
Joanna	**Formula Midpoints:** $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$ **Points:** A(-6, 8), B(-12,0), C(12, 0), D(6, 10)				Hayden

Mid$_{AB}$ = $(\frac{-6\ -12}{2}, \frac{8+0}{2})$	E(x, y) = $(\frac{-18}{2}, \frac{8}{2})$ = (-9, 4)	E(-9, 4)
Mid$_{BC}$ = $(\frac{-12+12}{2}, \frac{0+\ 0}{2})$	F(x, y) = $(\frac{0}{2}, \frac{0}{2})$ = (0, 0)	F(0, 0)
Mid$_{CD}$ = $(\frac{12+6}{2}, \frac{0+10}{2})$	G(x, y) = $(\frac{18}{2}, \frac{10}{2})$ = (9, 5)	G(9, 5)
Mid$_{DA}$ = $(\frac{6+(-6)}{2}, \frac{10+8}{2})$	H(x, y) = $(\frac{0}{2}, \frac{18}{2})$ = (0, 9)	H(0, 9)

Student Name	MidPoint E(X,Y) is for AB	MidPoint F(X,Y) is for BC	MidPoint G(X,Y) is for CD	MidPoint H(X,Y) is for DA	Verified by
Hayden	**Formula Midpoints:** $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$ **Points:** A(-9, 13), B(-11, 7), C(9, -6), D(12,10)				Cody

Mid$_{AB}$ = $(\frac{-9+(-11)}{2}, \frac{13+7}{2})$	E(x, y)=$(\frac{-20}{2}, \frac{20}{2})$ = (-10, 10)	E(-10, 10)
Mid$_{BC}$ = $(\frac{-11+9)}{2}, \frac{7+(-6)}{2})$	F(x, y)=$(\frac{-2}{2}, \frac{1}{2})$ = $(-1, \frac{1}{2})$	F$(-1, \frac{1}{2})$
Mid$_{CD}$ = $(\frac{9+12}{2}, \frac{-6+10}{2})$	G(x, y) = $(\frac{21}{2}, \frac{4}{2})$ = $(\frac{21}{2}, 2)$	G$(\frac{21}{2}, 2)$
Mid$_{DA}$ = $(\frac{12+(-9)}{2}, \frac{10+13}{2})$	H(x, y) = $(\frac{3}{2}, \frac{23}{2})$	H$(\frac{3}{2}, \frac{23}{2})$

Student Name	MidPoint E(X,Y) is for AB	MidPoint F(X,Y) is for BC	MidPoint G(X,Y) is for CD	MidPoint H(X,Y) is for DA	Verified by
Cody	**Formula Midpoints:** $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$ **Points:** A(-6, 5), B(-14,-11), C(8, -9), D(5, 10)				Sherry

Mid$_{AB}$ = $(\frac{-6+(-14)}{2}, \frac{5+(-11)}{2})$	E(x, y) = $(\frac{-20}{2}, \frac{-6}{2})$ = (-10, -3)	E(-10, -3)
Mid$_{BC}$ = $(\frac{-14+8)}{2}, \frac{-11+(-9)}{2})$	F(x, y) = $(\frac{-6}{2}, \frac{-20}{2})$ = (-3, -10)	F(-3, -10)
Mid$_{CD}$ = $(\frac{8+5}{2}, \frac{-9+10}{2})$	G(x, y) = $(\frac{13}{2}, \frac{1}{2})$	G$(\frac{13}{2}, \frac{1}{2})$

	$Mid_{DA} = (\frac{5+(-6)}{2}, \frac{10+5}{2})$	$H(x, y) = (\frac{-1}{2}, \frac{15}{2})$	$H(\frac{-1}{2}, \frac{15}{2})$	
Sherry	**Formula Midpoints:** $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$ **Points:** **A(-11, -14), B(4, -13), C(12, 6), D(-11, 12)**			Leon
	$Mid_{AB} = (\frac{-11+4}{2}, \frac{-14+(-13)}{2})$	$E(x, y) = (\frac{-7}{2}, \frac{-27}{2})$	$E(\frac{-7}{2}, \frac{-27}{2})$	
	$Mid_{BC} = (\frac{4+12}{2}, \frac{-13+6}{2})$	$F(x, y) = (\frac{16}{2}, \frac{-7}{2}) = (8, \frac{-7}{2})$	$F(8, \frac{-7}{2})$	
	$Mid_{CD} = (\frac{12+(-11)}{2}, \frac{6+12}{2})$	$G(x, y) = (\frac{1}{2}, \frac{18}{2})$	$G(\frac{1}{2}, 9)$	
	$Mid_{DA} = (\frac{-11+(-11)}{2}, \frac{12+(-14)}{2})$	$H(x, y) = (\frac{-22}{2}, \frac{-2}{2})$	H(-11, -1)	
Leon	**Formula Midpoints:** $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$ **Points:** **A(-3, 1), B(-4, 1), C(5, -1), D(1, 4)**			Tee
	$Mid_{AB} = (\frac{-3+(-4)}{2}, \frac{1+1}{2})$	$E(x, y) = (\frac{-7}{2}, \frac{2}{2})$	$E(\frac{-7}{2}, 1)$	
	$Mid_{BC} = (\frac{-4+5}{2}, \frac{1+(-1)}{2})$	$F(x, y) = (\frac{1}{2}, \frac{0}{2}) = (\frac{1}{2}, \frac{0}{2})$	$F(\frac{1}{2}, 0)$	
	$Mid_{CD} = (\frac{5+1}{2}, \frac{-1+4}{2})$	$G(x, y) = (\frac{6}{2}, \frac{3}{2})$	$G(3, \frac{3}{2})$	
	$Mid_{DA} = (\frac{1+(-3)}{2}, \frac{4+1}{2})$	$H(x, y) = (\frac{-2}{2}, \frac{5}{2})$	$H(-1, \frac{5}{2})$	
Tee	**Formula Midpoints:** $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$ **Points:** **A(-10, 4), B(-10, -12), C(10, -9), D(0, 14)**			Brian N.
	$Mid_{AB} = (\frac{-10+(-10)}{2}, \frac{4+(-12)}{2})$	$E(x, y) = (\frac{-20}{2}, \frac{-8}{2})$	E(-10, -4)	
	$Mid_{BC} = (\frac{-10+10}{2}, \frac{-12+(-9)}{2})$	$F(x, y) = (\frac{0}{2}, \frac{-21}{2})$	$F(0, \frac{-21}{2})$	
	$Mid_{CD} = (\frac{10+0}{2}, \frac{-9+14}{2})$	$G(x, y) = (\frac{10}{2}, \frac{5}{2})$	$G(5, \frac{5}{2})$	
	$Mid_{DA} = (\frac{0+(-10)}{2}, \frac{14+4}{2})$	$H(x, y) = (\frac{-10}{2}, \frac{18}{2})$	$H(-5, 9)$	

Brian N.

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-9, 6), B(-9, -5), C(12, -11), D(7, 10)

$Mid_{AB} = (\frac{-9+(-9)}{2}, \frac{6+(-5)}{2})$	$E(x, y) = (\frac{-18}{2}, \frac{1}{2})$	$E(-9, \frac{1}{2})$
$Mid_{BC} = (\frac{-9+12}{2}, \frac{-5+(-11)}{2})$	$F(x, y) = (\frac{3}{2}, \frac{-16}{2}) = (\frac{3}{2}, \frac{-16}{2})$	$F(\frac{3}{2}, -8)$
$Mid_{CD} = (\frac{12+7}{2}, \frac{-11+10}{2})$	$G(x, y) = (\frac{19}{2}, \frac{-1}{2})$	$G(\frac{19}{2}, \frac{-1}{2})$
$Mid_{DA} = (\frac{7+(-9)}{2}, \frac{10+6}{2})$	$H(x, y) = (\frac{-2}{2}, \frac{16}{2})$	$H(-1, 8)$

Henry T.

Henry T.

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-10, 3), B(-10, -6), C(10, -7), D(1, 13)

$Mid_{AB} = (\frac{-10+(-10)}{2}, \frac{3+(-6)}{2})$	$E(x, y) = (\frac{-20}{2}, \frac{-3}{2})$	$E(-10, \frac{-3}{2})$
$Mid_{BC} = (\frac{-10+10)}{2}, \frac{-6+(-7)}{2})$	$F(x, y) = (\frac{0}{2}, \frac{-13}{2}) = (\frac{0}{2}, \frac{-13}{2})$	$F(0, \frac{-13}{2})$
$Mid_{CD} = (\frac{10+1}{2}, \frac{-7+13}{2})$	$G(x, y) = (\frac{11}{2}, \frac{6}{2})$	$G(\frac{11}{2}, 3)$
$Mid_{DA} = (\frac{1+(-10)}{2}, \frac{13+3}{2})$	$H(x, y) = (\frac{-9}{2}, \frac{16}{2})$	$H(\frac{-9}{2}, 8)$

Roy

Roy

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-9,9), B(-9, -5), C(9, -10), D(6, 14)

$Mid_{AB} = (\frac{-9+(-9)}{2}, \frac{9+(-5)}{2})$	$E(x, y) = (\frac{-18}{2}, \frac{4}{2})$	$E(-9, 2)$
$Mid_{BC} = (\frac{-9+9)}{2}, \frac{-5+(-10)}{2})$	$F(x, y) = (\frac{0}{2}, \frac{-13}{2}) = (\frac{0}{2}, \frac{-15}{2})$	$F(0, \frac{-15}{2})$
$Mid_{CD} = (\frac{9+6}{2}, \frac{-10+14}{2})$	$G(x, y) = (\frac{15}{2}, \frac{4}{2})$	$G(\frac{15}{2}, 2)$
$Mid_{DA} = (\frac{6+(-9)}{2}, \frac{14+9}{2})$	$H(x, y) = (\frac{-3}{2}, \frac{23}{2})$	$H(\frac{-3}{2}, \frac{23}{2})$

Kyle

Kyle

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-7,12), B(-10, -11), C(9, -11), D(9, 12)

Mid$_{AB}$ = $(\frac{-7+(-10)}{2}, \frac{12+(-11)}{2})$	E(x, y) = $(\frac{-17}{2}, \frac{1}{2})$	E$(\frac{-17}{2}, \frac{1}{2})$
Mid$_{BC}$ = $(\frac{-10+9)}{2}, \frac{-11+(-11)}{2})$	F(x, y) = $(\frac{-1}{2}, \frac{-22}{2})$	F$(\frac{-1}{2}$, -11)
Mid$_{CD}$ = $(\frac{9+9}{2}, \frac{-11+12}{2})$	G(x, y) = $(\frac{18}{2}, \frac{1}{2})$	G(9, $\frac{1}{2}$)
Mid$_{DA}$ = $(\frac{9+(-7)}{2}, \frac{12+12}{2})$	H(x, y) = $(\frac{2}{2}, \frac{24}{2})$	H(1, 12)

Henry N.

Henry N.

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-4, -2), B(1,-1), C(4,4), D(-6,4)

Mid$_{AB}$ = $(\frac{-4+1}{2}, \frac{-2+(-1)}{2})$	E(x, y) = $(\frac{-3}{2}, \frac{1}{2})$	E$(\frac{-3}{2}, \frac{-3}{2})$
Mid$_{BC}$ = $(\frac{1+4)}{2}, \frac{-1+4}{2})$	F(x, y) = $(\frac{5}{2}, \frac{3}{2})$	F$(\frac{5}{2}, \frac{3}{2})$
Mid$_{CD}$ = $(\frac{4+(-6)}{2}, \frac{4+4}{2})$	G(x, y) = $(\frac{-2}{2}, \frac{8}{2})$	G(-1, 4)
Mid$_{DA}$ = $(\frac{-6+(-4)}{2}, \frac{4+(-2)}{2})$	H(x, y) = $(\frac{-10}{2}, \frac{2}{2})$	H(-5, 1)

Lavinia

Lavinia

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-5,-6), B(10,-4), C(5,8), D(-7,4)

Mid$_{AB}$ = $(\frac{-5+10}{2}, \frac{-6+(-4)}{2})$	E(x, y) = $(\frac{5}{2}, \frac{-10}{2})$	E$(\frac{5}{2}$, -5)
Mid$_{BC}$ = $(\frac{10+5}{2}, \frac{-4+8}{2})$	F(x, y) = $(\frac{15}{2}, \frac{4}{2})$	F$(\frac{15}{2}$, 2)
Mid$_{CD}$ = $(\frac{5+(-7)}{2}, \frac{8+4}{2})$	G(x, y) = $(\frac{-2}{2}, \frac{12}{2})$	G(-1, 6)
Mid$_{DA}$ = $(\frac{-7+(-5)}{2}, \frac{4+(-6)}{2})$	H(x, y) = $(\frac{-12}{2}, \frac{-2}{2})$	H(-6, -1)

Jason

Jason

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-6,-8), B(5,-10), C(5, 5), D(-1,5)

Alex

Mid$_{AB}$ = $(\frac{-6+5}{2}, \frac{-8+(-10)}{2})$	E(x, y) = $(\frac{-1}{2}, \frac{-18}{2})$	E$(\frac{-1}{2}$, -9)
Mid$_{BC}$ = $(\frac{5+5}{2}, \frac{-10+5}{2})$	F(x, y) = $(\frac{10}{2}, \frac{-5}{2})$	F(**5**, $\frac{-5}{2}$)
Mid$_{CD}$ = $(\frac{5+(-1)}{2}, \frac{5+5}{2})$	G(x, y) = $(\frac{4}{2}, \frac{10}{2})$	G(2, 5)
Mid$_{DA}$ = $(\frac{-1+(-6)}{2}, \frac{5+(-8)}{2})$	H(x, y) = $(\frac{-7}{2}, \frac{-3}{2})$	H$(\frac{-7}{2}, \frac{-3}{2})$

Alex

Formula Midpoints: $(\frac{x1 + x2}{2}, \frac{y1 + y2}{2})$

Points: A(-7, 9), B(-11,1), C(12, 1), D(7, 9)

Mid$_{AB}$ = $(\frac{-7+(-11)}{2}, \frac{9+1}{2})$	E(x, y) = $(\frac{-18}{2}, \frac{10}{2})$	E(-9, 5)
Mid$_{BC}$ = $(\frac{-11+12}{2}, \frac{1+1}{2})$	F(x, y) = $(\frac{1}{2}, \frac{2}{2})$	F($\frac{1}{2}$, **1**)
Mid$_{CD}$ = $(\frac{12+7}{2}, \frac{1+9}{2})$	G(x, y) = $(\frac{19}{2}, \frac{10}{2})$	G($\frac{19}{2}$, 5)
Mid$_{DA}$ = $(\frac{7+(-7)}{2}, \frac{9+9}{2})$	H(x, y) = $(\frac{0}{2}, \frac{18}{2})$	H(**0, 9**)

Joanna

THE ERINDALE ACADEMY

Step 3: Table of Lengths:

Student Name	Length Of (AE, BE)	Length Of (BF, CF)	Length Of (CG, DG)	Length Of (AH, DH)	Verified by (V1)
Joanna	Formula for Length of Line Segment:				Hayden

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-6, 8), B(-12,0), C(12, 0), D(6, 10)	E(-9, 4), F(0, 0), G(9, 5), H(0, 9)

Length of Segment AE: A(-6, 8), **E(-9, 4**

$L_{AE} = \sqrt{(-9-(-6))^2 + (4-(-8))^2}$
$L_{AE} = \sqrt{(-3)^2 + (4)^2}$
$L_{AE} = \sqrt{9+16} = \sqrt{25} = 5$
$L_{AE} = 5$

Length of Segment BE: B(-12,0), **E(-9, 4)**

$L_{BE} = \sqrt{(-9-(-12))^2 + (4-0)^2}$
$L_{BE} = \sqrt{(3)^2 + (4)^2}$
$L_{BE} = \sqrt{9+16} = \sqrt{25} = 5$
$L_{BE} = 5$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-12,0), **F(0, 0)**

$L_{BF} = \sqrt{(0 - (-12))^2 + (0-(0)^2}$
$L_{BF} = \sqrt{(-12)^2 + (0)^2}$
$L_{BF} = \sqrt{144} = 12$
$L_{BF} = 12$

Length of Segment CF: C(12, 0), **F(0, 0)**

$L_{CF} = \sqrt{(0 - (12))^2 + (0-0)^2}$

$L_{CF} = \sqrt{(12)^2 + (0)^2}$

$L_{CF} = \sqrt{144}$

$L_{CF} = 12$

$L_{BF} = L_{CF}$

<u>Length of Segment CG:</u> C(12, 0), G(9, 5)

$L_{CG} = \sqrt{(9 - 12))^2 + (5 - 0)^2}$

$L_{CG} = \sqrt{(-3)^2 + (5)^2}$

$L_{CG} = \sqrt{9 + 25} = \sqrt{34}$

$L_{CG} = \sqrt{34}$

<u>Length of Segment DG:</u> D(6, 10), G(9, 5)

$L_{DG} = \sqrt{(9 - 6)^2 + (5 - 10)^2}$

$L_{DG} = \sqrt{(3)^2 + (-5)^2}$

$L_{DG} = \sqrt{9 + 25} = \sqrt{34}$

$L_{DG} = \sqrt{34}$

$L_{CG} = L_{DG}$

<u>Length of Segment AH:</u> A(-6, 8), H(0, 9)

$L_{AH} = \sqrt{(0 - (-6))^2 + (9 - 8)^2}$

$L_{AH} = \sqrt{(6)^2 + (1)^2}$

$L_{AH} = \sqrt{36 + 1} = \sqrt{37}$

$L_{AH} = \sqrt{37}$

<u>Length of Segment DH:</u> D(6, 10), H(0, 9)

$L_{DH} = \sqrt{(0 - 6)^2 + (9 - 10)^2}$

$L_{DH} = \sqrt{(-6)^2 + (-1)^2}$

$L_{DH} = \sqrt{36 + 1} = \sqrt{37}$

$L_{DH} = \sqrt{37}$

$L_{AH} = L_{DH}$

Hayden

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:

Cody

THE ERINDALE ACADEMY

A(-9, 13), B(-11, 7), C(9, -6), D(12,10)	E(-10, 10), F(-1,$\frac{1}{2}$), G($\frac{21}{2}$, 2), H($\frac{3}{2}$, $\frac{23}{2}$)

Length of Segment AE: A(-9, 13), E(-10, 10)

$L_{AE} = \sqrt{(-10-(-9))^2 + (10-13)^2}$
$L_{AE} = \sqrt{(-1)^2 + (-3)^2}$
$L_{AE} = \sqrt{1+9} = \sqrt{10}$
$L_{AE} = \sqrt{10}$

Length of Segment BE: B(-11, 7), E(-10, 10)

$L_{BE} = \sqrt{(-10-(-11))^2 + (10-7)^2}$
$L_{BE} = \sqrt{(1)^2 + (3)^2}$
$L_{BE} = \sqrt{1+9} = \sqrt{10}$
$L_{BE} = \sqrt{10}$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-11, 7), F(-1,$\frac{1}{2}$)

$L_{BF} = \sqrt{(-1-(-11))^2 + (\frac{1}{2}-7)^2}$

$L_{BF} = \sqrt{(10)^2 + (\frac{-13}{2})^2}$

$L_{BF} = \sqrt{100 + (\frac{-13}{2})^2}$

$L_{BF} = 11.9268$

Length of Segment CF: C(9, -6), F(-1,$\frac{1}{2}$)

$L_{CF} = \sqrt{(-1-9))^2 + (\frac{1}{2}-(-6)^2}$

$L_{CF} = \sqrt{(-10)^2 + (\frac{13}{2})^2}$

$L_{CF} = \sqrt{100 + (\frac{13}{2})^2}$

$L_{CF} = 11.9268$

$L_{BF} = L_{CF}$

<u>Length of Segment CG:</u> C(9, -6), G($\frac{21}{2}$, 2),

$L_{CG} = \sqrt{(\frac{21}{2} - 9)^2 + (2 - (-6)^2}$

$L_{CG} = \sqrt{(\frac{3}{2})^2 + (8)^2}$

$L_{CG} = \sqrt{\frac{9}{4} + 64} = \sqrt{66.25}$

$L_{CG} = 8.3194$

<u>Length of Segment DG:</u> D(12,10), G($\frac{21}{2}$, 2),

$L_{DG} = \sqrt{(\frac{21}{2} - 12)^2 + (2 - 10)^2}$

$L_{DG} = \sqrt{(\frac{-3}{2})^2 + (-8)^2}$

$L_{DG} = \sqrt{\frac{9}{4} + 64} = \sqrt{66.25}$

$L_{DG} = 8.3194$

$L_{CG} = L_{DG}$

<u>Length of Segment AH:</u> A(-9, 13), H($\frac{3}{2}$, $\frac{23}{2}$)

$L_{AH} = \sqrt{\left(\frac{3}{2} - (-9)\right)^2 + (\frac{23}{2} - 13)^2}$

$L_{AH} = \sqrt{(\frac{21}{2})^2 + (\frac{-3}{2})^2}$

$L_{AH} = \sqrt{100.25 + 2.25} = \sqrt{102.50}$

$L_{AH} = 10.1242$

<u>Length of Segment DH:</u> D(12, 10), H($\frac{3}{2}$, $\frac{23}{2}$)

$L_{DH} = \sqrt{(\frac{3}{2} - 12)^2 + (\frac{23}{2} - 10)^2}$

$L_{DH} = \sqrt{(\frac{-21}{2})^2 + (\frac{3}{2})^2}$

$L_{DH} = \sqrt{100.25 + 2.25} = \sqrt{102.50}$

$L_{DH} = 10.1242$

$L_{AH} = L_{DH}$

Cody	Formula for Length of Line Segment: $Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$	Sherry

Original Points	Midpoints:
A(-6, 5), B(-14,-11), C(8, -9), D(5, 10)	E(-10, -3), F(-3, -10), G($\frac{13}{2}$, $\frac{1}{2}$), H ($\frac{-1}{2}$, $\frac{15}{2}$)

Length of Segment AE: A(-6, 5),, E(-10, -3),

$L_{AE} = \sqrt{(-10-(-6))^2 + (-3-5)^2}$
$L_{AE} = \sqrt{(-4)^2 + (-8)^2}$
$L_{AE} = \sqrt{16+64} = \sqrt{80}$
$L_{AE} = \sqrt{80}$

Length of Segment BE: B(-14,-11), E(-10, -3),

$L_{BE} = \sqrt{(-10-(-14))^2 + (-3-(-11))^2}$
$L_{BE} = \sqrt{(4)^2 + (8)^2}$
$L_{BE} = \sqrt{16+64} = \sqrt{80}$
$L_{BE} = \sqrt{80}$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-14,-11), F(-3, -10)

$L_{BF} = \sqrt{(-3-(-14))^2 + (\mathbf{-10}-(-11))^2}$
$L_{BF} = \sqrt{(11)^2 + (\mathbf{1})^2}$
$L_{BF} = \sqrt{121+1} = \sqrt{122}$
$L_{BF} = 11.0454$

Length of Segment CF: C(8, -9), F(-3, -10)

$L_{CF} = \sqrt{(-3-8))^2 + (-10-(\mathbf{-9}))^2}$
$L_{CF} = \sqrt{(-11)^2 + (\mathbf{-1})^2}$
$L_{CF} = \sqrt{121+1} = \sqrt{122}$
$L_{CF} = 11.0454$

$L_{BF} = L_{CF}$

Length of Segment CG: C(8, -9), G($\frac{13}{2}$, $\frac{1}{2}$),

$L_{CG} = \sqrt{(\frac{13}{2}-8)^2 + (\frac{1}{2}-(-9))^2}$

	$L_{CG} = \sqrt{(\frac{-3}{2})^2 + (\frac{19}{2})^2}$ $L_{CG} = \sqrt{\frac{9}{4} + \frac{361}{4}} = \sqrt{\frac{370}{4}}$ L_{CG} = 9.6177 **Length of Segment DG:** D(5, 10), G($\frac{13}{2}, \frac{1}{2}$), $L_{DG} = \sqrt{(\frac{13}{2} - 5)^2 + (\frac{1}{2} - 10)^2}$ $L_{DG} = \sqrt{(\frac{3}{2})^2 + (\frac{-19}{2})^2}$ $L_{DG} = \sqrt{\frac{9}{4} + \frac{361}{4}} = \sqrt{\frac{370}{4}}$ L_{DG} = 9.6177 $L_{CG} = L_{DG}$	
	Length of Segment AH: A(-6, 5),, H ($\frac{-1}{2}, \frac{15}{2}$) $L_{AH} = \sqrt{\left(\frac{-1}{2} - (-6)\right)^2 + (\frac{15}{2} - 5)^2}$ $L_{AH} = \sqrt{(\frac{11}{2})^2 + (\frac{5}{2})^2}$ $L_{AH} = \sqrt{\frac{121}{4} + \frac{25}{4}} = \sqrt{\frac{146}{4}}$ L_{AH} = 6.0415 **Length of Segment DH:** D(5, 10), H ($\frac{-1}{2}, \frac{15}{2}$) $L_{DH} = \sqrt{(\frac{-1}{2} - 5)^2 + (\frac{15}{2} - 10)^2}$ $L_{DH} = \sqrt{(\frac{-11}{2})^2 + (\frac{-5}{2})^2}$ $L_{DH} = \sqrt{\frac{121}{4} + \frac{25}{4}} = \sqrt{\frac{146}{4}}$ L_{DH} = 6.0415 $L_{AH} = L_{DH}$	

Sherry

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-11, -14) **B(4, -13)** **C(12, 6)** **D(-11, 12)**	**E($\frac{-7}{2}$, $\frac{-27}{2}$),** **F(8, $\frac{-7}{2}$),** **G($\frac{1}{2}$, 9),** **H(-11, -1)**

Length of Segment AE: A(-11, -14), E($\frac{-7}{2}$, $\frac{-27}{2}$),

$L_{AE} = \sqrt{\left(\frac{-7}{2} - (-11)\right)^2 + \left(\frac{-27}{2} - (-14)\right)^2}$

$L_{AE} = \sqrt{\left(\frac{15}{2}\right)^2 + \left(\frac{1}{2}\right)^2}$

$L_{AE} = \sqrt{\left(\frac{226}{4}\right)}$

L_{AE} = 7.5166

Length of Segment BE: B(4, -13), E($\frac{-7}{2}$, $\frac{-27}{2}$),

$L_{BE} = \sqrt{\left(\frac{-7}{2} - 4\right)^2 + \left(\frac{-27}{2} - (-13)\right)^2}$

$L_{BE} = \sqrt{\left(\frac{-15}{2}\right)^2 + \left(\frac{-1}{2}\right)^2}$

$L_{BE} = \sqrt{\left(\frac{226}{4}\right)}$

L_{BE} = 7.5166

$L_{AE} = L_{BE}$

Length of Segment BF: B(4, -13), F(8, $\frac{-7}{2}$),

$L_{BF} = \sqrt{(8-4)^2 + \left(\frac{-7}{2} - (-13)\right)^2}$

$L_{BF} = \sqrt{(4)^2 + \left(\frac{19}{2}\right)^2}$

$L_{BF} = \sqrt{16 + \left(\frac{19}{2}\right)^2} = \sqrt{106.25}$

L_{BF} = 10.3078

Leon

	<u>Length of Segment CF:</u> C(12, 6), F(8, $\frac{-7}{2}$), $L_{CF} = \sqrt{(8-12)^2 + (\frac{-7}{2} - (6))^2}$ $L_{CF} = \sqrt{(-4)^2 + (\frac{-19}{2})^2}^2$ $L_{CF} = \sqrt{16 + (\frac{-19}{2})^2} = \sqrt{106.25}$ L_{CF} = 10.3078 $L_{BF} = L_{CF}$	
	<u>Length of Segment CG:</u> C(12, 6), G($\frac{1}{2}$, 9), $L_{CG} = \sqrt{(\frac{1}{2} - 12)^2 + (9-6)^2}$ $L_{CG} = \sqrt{(\frac{-23}{2})^2 + (3)^2}$ $L_{CG} = \sqrt{\frac{529}{4} + 9}$ $L_{CG} = \sqrt{141.25}$ L_{CG} = 11.8849 **<u>Length of Segment DG:</u>** D(-11, 12), G($\frac{1}{2}$, 9), $L_{DG} = \sqrt{(\frac{1}{2} - (-11)^2 + (9-12)^2}$ $L_{DG} = \sqrt{(\frac{23}{2})^2 + (-3)^2}$ $L_{DG} = \sqrt{\frac{529}{4} + 9} = \sqrt{141.25}$ L_{DG} = 11.8849 $L_{CG} = L_{DG}$	
	<u>Length of Segment AH:</u> A(-11, -14), H(-11, -1) $L_{AH} = \sqrt{(-11-(-11))^2 + (-1-(-14))^2}$ $L_{AH} = \sqrt{0 + 13^2}$ $L_{AH} = \sqrt{13^2}$ L_{AH} = 13 **<u>Length of Segment DH:</u>** D(-11, 12), H(-11, -1) $L_{DH} = \sqrt{(-11-(-11))^2 + (-1-12)^2}$	

$L_{DH} = \sqrt{0 + (-13)^2}$

$L_{DH} = \sqrt{(-13)^2}$

$L_{DH} = 13$

$L_{AH} = L_{DH}$

Leon

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-3, 1) B(-4, 1) C(5, -1) D(1, 4)	E($\frac{-7}{2}$, 1), F($\frac{1}{2}$, 0), G(3, $\frac{3}{2}$), H(-1, $\frac{5}{2}$)

Length of Segment AE: A(-3, 1), E($\frac{-7}{2}$, 1),

$L_{AE} = \sqrt{\left(\frac{-7}{2} - (-3)\right)^2 + (1 - 1)^2}$

$L_{AE} = \sqrt{(\frac{-1}{2})^2}$

$L_{AE} = \sqrt{(\frac{1}{4})} = \frac{1}{2}$

$L_{AE} = \frac{1}{2}$

Length of Segment BE: B(-4, 1), E($\frac{-7}{2}$, 1),

$L_{BE} = \sqrt{\left(\frac{-7}{2} - (-4)\right)^2 + (1 - 1)^2}$

$L_{BE} = \sqrt{(\frac{1}{2})^2}$

$L_{BE} = \sqrt{(\frac{1}{4})} = \frac{1}{2}$

$L_{BE} = \frac{1}{2}$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-4, 1), F($\frac{1}{2}$, 0),

$L_{BF} = \sqrt{\left(\frac{1}{2} - (-4)\right)^2 + (0 - 1)^2}$

Tee

$L_{BF} = \sqrt{(\frac{9}{2})^2 + (-1)^2}$

$L_{BF} = \sqrt{\frac{81}{4} + 1} = \sqrt{21.25}$

$L_{BF} = 4.6098$

Length of Segment CF: C(5, -1), F($\frac{1}{2}$, 0),

$L_{CF} = \sqrt{\left(\frac{1}{2} - 5\right)^2 + (0 - (-1))^2}$

$L_{CF} = \sqrt{\sqrt{(\frac{-9}{2})^2 + (1)^2}}$

$L_{CF} = \sqrt{\frac{81}{4} + 1} = \sqrt{21.25}$

$L_{CF} = 4.6098$

$L_{BF} = L_{CF}$

Length of Segment CG: C(5, -1), G(3, $\frac{3}{2}$)

$L_{CG} = \sqrt{(3 - 5)^2 + (\frac{3}{2} - (-1))^2}$

$L_{CG} = \sqrt{(-2)^2 + (\frac{5}{2})^2}$

$L_{CG} = \sqrt{4 + (\frac{25}{4})}$

$L_{CG} = \sqrt{10.25}$

$L_{CG} = 3.2016$

Length of Segment DG: D(1, 4), G(3, $\frac{3}{2}$)

$L_{DG} = \sqrt{(3 - 1)^2 + (\frac{3}{2} - 4)^2}$

$L_{DG} = \sqrt{(2)^2 + (\frac{-5}{2})^2}$

$L_{DG} = \sqrt{4 + (\frac{25}{4})}$

$L_{DG} = \sqrt{10.25}$

$L_{DG} = 3.2016$

$L_{CG} = L_{DG}$

Length of Segment AH: A(-3, 1), H(-1, $\frac{5}{2}$)

$L_{AH} = \sqrt{(-1-(-3))^2 + (\frac{5}{2}-1)^2}$

$L_{AH} = \sqrt{(2)^2 + (\frac{3}{2})^2}$

$L_{AH} = \sqrt{4 + (\frac{9}{4})}$

$L_{AH} = \sqrt{6.25}$

$L_{AH} = $ **2.5**

Length of Segment DH: D(1, 4), H(-1, $\frac{5}{2}$)

$L_{DH} = \sqrt{(-1-1)^2 + (\frac{5}{2}-4)^2}$

$L_{DH} = \sqrt{(-2)^2 + (\frac{-3}{2})^2}$

$L_{DH} = \sqrt{4 + (\frac{9}{4})}$

$L_{DH} = \sqrt{6.25}$

$L_{DH} = $ **2.5**

$L_{AH} = L_{DH}$

Tee

Formula for Length of Line Segment:

$Length = \sqrt{(x2-x1)^2 + (y2-y1)^2}$

Original Points	Midpoints:
A(-10, 4) **B(-10, -12)** **C(10, -9)** **D(0, 14)**	**E(-10, -4),** **F(0,** $\frac{-21}{2}$**),** **G(5,** $\frac{5}{2}$**),** **H(−5, 9)**

Length of Segment AE: A(-10, 4), E(-10, -4)

$L_{AE} = \sqrt{(-10-(-10))^2 + (-4-4)^2}$

$L_{AE} = \sqrt{(0)^2 + (-8)^2}$

$L_{AE} = \sqrt{64}$

$L_{AE} = 8$

Length of Segment BE: B(-10, -12), E(-10, -4)

$L_{BE} = \sqrt{(-10-(-10))^2 + (-4-(-12))^2}$

Brian N.

	$L_{BE} = \sqrt{(0)^2 + (8)^2}$ $L_{BE} = \sqrt{64}$ $L_{BE} = 8$ $L_{AE} = L_{BE}$	
	Length of Segment BF: B(-10, -12), F(0, $\frac{-21}{2}$), $L_{BF} = \sqrt{(0-(-10))^2 + (\frac{-21}{2}-(-12))^2}$ $L_{BF} = \sqrt{(10)^2 + (\frac{3}{2})^2}$ $L_{BF} = \sqrt{100 + (\frac{9}{4})} = \sqrt{102.25}$ $L_{BF} = 10.1119$ **Length of Segment CF:** C(10, -9), F(0, $\frac{-21}{2}$), $L_{CF} = \sqrt{(0-10)^2 + (\frac{-21}{2}-(-9))^2}$ $L_{CF} = \sqrt{(-10)^2 + (\frac{-3}{2})^2}$ $L_{CF} = \sqrt{100 + (\frac{9}{4})} = \sqrt{102.25}$ $L_{CF} = 10.1119$ $L_{BF} = L_{CF}$	
	Length of Segment CG: C(10, -9), G(5, $\frac{5}{2}$), $L_{CG} = \sqrt{(5-10)^2 + (\frac{5}{2}-(-9))^2}$ $L_{CG} = \sqrt{(-5)^2 + (\frac{23}{2})^2}$ $L_{CG} = \sqrt{25 + (\frac{529}{4})}$ $L_{CG} = \sqrt{157.25}$ $L_{CG} = 12.5399$ **Length of Segment DG:** D(0, 14), G(5, $\frac{5}{2}$), $L_{DG} = \sqrt{(5-0)^2 + (\frac{5}{2}-(14))^2}$ $L_{DG} = \sqrt{(5)^2 + (\frac{-23}{2})^2}$ $L_{DG} = \sqrt{25 + (\frac{529}{4})}$	

$L_{DG} = \sqrt{157.25}$
$L_{DG} = 12.5399$

$L_{CG} = L_{DG}$

Length of Segment AH: A(-10, 4), H(−5, 9)

$L_{AH} = \sqrt{(-5-(-10))^2 + (9-4)^2}$
$L_{AH} = \sqrt{(5)^2 + (5)^2}$
$L_{AH} = \sqrt{25+25}$
$L_{AH} = \sqrt{50}$

Length of Segment DH: D(0, 14), H(−5, 9)

$L_{DH} = \sqrt{(-5-0))^2 + (9-14)^2}$
$L_{DH} = \sqrt{(-5)^2 + (-5)^2}$
$L_{DH} = \sqrt{25+25}$
$L_{DH} = \sqrt{50}$

$L_{AH} = L_{DH}$

Brian N.

Formula for Length of Line Segment:

$Length = \sqrt{(x2-x1)^2 + (y2-y1)^2}$

Original Points	Midpoints:
A(-9, 6) **B(-9, -5)** **C(12, -11)** **D(7, 10)**	E(-9, $\frac{1}{2}$), F($\frac{3}{2}$,−8), G($\frac{19}{2}$, $\frac{-1}{2}$), H(-1, 8)

Length of Segment AE: A(-9, 6), E(-9, $\frac{1}{2}$),

$L_{AE} = \sqrt{(-9-(-9))^2 + (\frac{1}{2}-6)^2}$

$L_{AE} = \sqrt{(0)^2 + (\frac{-11}{2})^2}$

$L_{AE} = \sqrt{(\frac{-11}{2})^2}$

$L_{AE} = \sqrt{(\frac{-11}{2})^2} = \frac{11}{2}$

Henry T.

Length of Segment BE: B(-9, -5), E(-9, $\frac{1}{2}$),

$L_{BE} = \sqrt{(-9-(-9))^2 + (\frac{1}{2}-(-5))^2}$

$L_{BE} = \sqrt{(0)^2 + (\frac{11}{2})^2}$

$L_{BE} = \sqrt{(\frac{11}{2})^2}$

$L_{BE} = \sqrt{(\frac{11}{2})^2} = \frac{11}{2}$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-9, -5), F($\frac{3}{2}$, −8)

$L_{BF} = \sqrt{\left(\frac{3}{2}-(-9)\right)^2 + (-8-(-5))^2}$

$L_{BF} = \sqrt{(\frac{21}{2})^2 + (-\mathbf{3})^2}$

$L_{BF} = \sqrt{110.25 + 9} = \sqrt{119.25}$

$L_{BF} = 10.9202$

Length of Segment CF: C(12, -11), F($\frac{3}{2}$, −8)

$L_{CF} = \sqrt{\left(\frac{3}{2}-12\right)^2 + (-8-(-11))^2}$

$L_{CF} = \sqrt{(\frac{-21}{2})^2 + (\mathbf{3})^2}$

$L_{CF} = \sqrt{(\frac{21}{2})^2 + 9} = \sqrt{119.25}$

$L_{CF} = 10.9202$

$L_{BF} = L_{CF}$

Length of Segment CG: C(12, -11), G($\frac{19}{2}$, $\frac{-1}{2}$),

$L_{CG} = \sqrt{\left(\frac{19}{2}-12\right)^2 + (\frac{-1}{2}-(-11))^2}$

$L_{CG} = \sqrt{(\frac{-5}{2})^2 + (\frac{21}{2})^2}$

$L_{CG} = \sqrt{(\frac{25}{4}) + (\frac{441}{4})}$

$L_{CG} = \sqrt{(\frac{466}{4})} = \sqrt{116.5}$

$L_{CG} = \sqrt{116.5}$

$L_{CG} = 10.7935$

Length of Segment DG: **D(7, 10),** G($\frac{19}{2}$, $\frac{-1}{2}$),

$L_{DG} = \sqrt{\left(\frac{19}{2} - 7\right)^2 + \left(\frac{-1}{2} - 10\right)^2}$

$L_{DG} = \sqrt{\left(\frac{5}{2}\right)^2 + \left(\frac{-21}{2}\right)^2}$

$L_{DG} = \sqrt{\left(\frac{25}{4}\right) + \left(\frac{441}{4}\right)}$

$L_{DG} = \sqrt{\left(\frac{466}{4}\right)} = \sqrt{116.5}$

$L_{DG} = 10.7935$

$L_{CG} = L_{DG}$

Length of Segment AH: **A(-9, 6),** H(-1, 8)

$L_{AH} = \sqrt{(-1-(-9))^2 + (8-6)^2}$

$L_{AH} = \sqrt{(8)^2 + (2)^2}$

$L_{AH} = \sqrt{64 + 4}$

$L_{AH} = \sqrt{68}$

Length of Segment DH: **D(7, 10),** H(-1, 8)

$L_{DH} = \sqrt{(-1-7))^2 + (8-10)^2}$

$L_{DH} = \sqrt{(-8)^2 + (-2)^2}$

$L_{DH} = \sqrt{64 + 4}$

$L_{DH} = \sqrt{68}$

$L_{AH} = L_{DH}$

Henry T.

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-10, 3) **B(-10, -6)** **C(10, -7)** **D(1, 13)**	E(-10, $\frac{-3}{2}$), F(0, $\frac{-13}{2}$), G($\frac{11}{2}$, 3), H($\frac{-9}{2}$, 8)

Length of Segment AE: **A(-10, 3),** E(-10, $\frac{-3}{2}$),

$L_{AE} = \sqrt{(-10-(-10))^2 + \left(\frac{-3}{2} - 3\right)^2}$

Roy

$L_{AE} = \sqrt{(0)^2 + (\frac{-9}{2})^2}$

$L_{AE} = \sqrt{(\frac{-9}{2})^2}$

$L_{AE} = \sqrt{(\frac{81}{4})} = \frac{9}{2}$

Length of Segment BE: **B(-10, -6),** E(-10, $\frac{-3}{2}$),

$L_{BE} = \sqrt{(-10-(-10))^2 + (\frac{-3}{2}-(-6))^2}$

$L_{BE} = \sqrt{(0)^2 + (\frac{9}{2})^2}$

$L_{BE} = \sqrt{(\frac{9}{2})^2}$

$L_{BE} = \sqrt{(\frac{81}{4})} = \frac{9}{2}$

$L_{AE} = L_{BE}$

Length of Segment BF: **B(-10, -6),** F(0, $\frac{-13}{2}$),

$L_{BF} = \sqrt{(0\ -(-10))^2 + (\frac{-13}{2}-(-6))^2}$

$L_{BF} = \sqrt{(10)^2 + (\frac{-1}{2})^2}$

$L_{BF} = \sqrt{100 + \frac{1}{4}} = \sqrt{100.25}$

$L_{BF} = 10.0125$

Length of Segment CF: **C(10, -7),** F(0, $\frac{-13}{2}$),

$L_{CF} = \sqrt{(0\ -10))^2 + (\frac{-13}{2}-(-7))^2}$

$L_{CF} = \sqrt{(10)^2 + (\frac{1}{2})^2}$

$L_{CF} = \sqrt{100 + \frac{1}{4}} = \sqrt{100.25}$

$L_{CF} = 10.0125$

$L_{BF} = L_{CF}$

Length of Segment CG: **C(10, -7),** G($\frac{11}{2}$, 3),

$L_{CG} = \sqrt{\left(\frac{11}{2}-10\right)^2 + (3-(-7))^2}$

	$L_{CG} = \sqrt{(\frac{-9}{2})^2 + (10)^2}$ $L_{CG} = \sqrt{(\frac{81}{4}) + 100}$ $L_{CG} = \sqrt{120.25}$ L_{CG} = 10.9659 **Length of Segment DG:** **D(1, 13),** G($\frac{11}{2}$, 3), $L_{DG} = \sqrt{\left(\frac{11}{2} - 1\right)^2 + (3 - 13))^2}$ $L_{DG} = \sqrt{(\frac{9}{2})^2 + (-10)^2}$ $L_{DG} = \sqrt{(\frac{81}{4}) + 100}$ $L_{DG} = \sqrt{120.25}$ L_{DG} = 10.9659 $L_{CG} = L_{DG}$ **Length of Segment AH:** **A(-10, 3),** H($\frac{-9}{2}$, 8) $L_{AH} = \sqrt{\left(\frac{-9}{2} - (-10)\right)^2 + (8 - 3))^2}$ $L_{AH} = \sqrt{(\frac{11}{2})^2 + (5)^2}$ $L_{AH} = \sqrt{(\frac{11}{2})^2 + 25}$ $L_{AH} = \sqrt{(\frac{121}{4}) + 25} = \sqrt{55.25}$ L_{DH} = 7.43303 **Length of Segment DH:** **D(1, 13),** H($\frac{-9}{2}$, 8) $L_{DH} = \sqrt{\left(\frac{-9}{2} - 1)\right)^2 + (8 - 13)^2}$ $L_{DH} = \sqrt{(\frac{-11}{2})^2 + (-5)^2}$ $L_{DH} = \sqrt{(\frac{121}{4}) + 25} = \sqrt{55.25}$ L_{DH} = 7.43303 $L_{AH} = L_{DH}$	
Roy	Formula for Length of Line Segment: $Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$	Kyle

Original Points	Midpoints:
A(-9,9) B(-9, -5) C(9, -10) D(6, 14)	E(-9, 2), F(0, $\frac{-15}{2}$), G($\frac{15}{2}$, 2), H($\frac{-3}{2}$, $\frac{23}{2}$)

Length of Segment AE: A(-9,9), E(-9, 2),

$L_{AE} = \sqrt{(-9-(-9))^2 + (2-9)^2}$

$L_{AE} = \sqrt{(0)^2 + (-7)^2}$

$L_{AE} = \sqrt{(-7)^2}$

$L_{AE} = 7$

Length of Segment BE: B(-9, -5), E(-9, 2),

$L_{BE} = \sqrt{(-9-(-9))^2 + (2-(-5)^2}$

$L_{BE} = \sqrt{(0)^2 + (7)^2}$

$L_{BE} = \sqrt{(7)^2}$

$L_{BE} = 7$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-9, -5), F(0, $\frac{-15}{2}$)

$L_{BF} = \sqrt{(0 - (-9)))^2 + (\frac{-15}{2} - (-5))^2}$

$L_{BF} = \sqrt{(9)^2 + (\frac{-5}{2})^2}$

$L_{BF} = \sqrt{81 + \frac{25}{4}} = \sqrt{87.25}$

$L_{BF} = 9.3408$

Length of Segment CF: C(9, -10), F(0, $\frac{-15}{2}$)

$L_{CF} = \sqrt{(0 - (-9)))^2 + (\frac{-15}{2} - (-10))^2}$

$L_{CF} = \sqrt{(9)^2 + (\frac{5}{2})^2}$

$L_{CF} = \sqrt{81 + \frac{25}{4}} = \sqrt{87.25}$

$L_{CF} = 9.3408$

$L_{BF} = L_{CF}$

Length of Segment CG: C(9, -10), G($\frac{15}{2}$, 2),

$L_{CG} = \sqrt{\left(\frac{15}{2} - 9\right)^2 + (2-(-10))^2}$

$L_{CG} = \sqrt{(\frac{-3}{2})^2 + (12)^2}$

$L_{CG} = \sqrt{(\frac{8}{4}) + 144}$

$L_{CG} = \sqrt{146.25}$

$L_{CG} = 12.0934$

Length of Segment DG: D(6, 14), G($\frac{15}{2}$, 2),

$L_{DG} = \sqrt{\left(\frac{15}{2} - 6\right)^2 + (2-14))^2}$

$L_{DG} = \sqrt{(\frac{3}{2})^2 + (-12)^2}$

$L_{DG} = \sqrt{(\frac{8}{4}) + 144}$

$L_{DG} = \sqrt{146.25}$

$L_{DG} = 12.0934$

$L_{CG} = L_{DG}$

Length of Segment AH: A(-9,9), H($\frac{-3}{2}$, $\frac{23}{2}$)

$L_{AH} = \sqrt{\left(\frac{-3}{2} - (-9)\right)^2 + (\frac{23}{2} - 9)^2}$

$L_{AH} = \sqrt{(\frac{15}{2})^2 + (\frac{5}{2})^2}$

$L_{AH} = \sqrt{(\frac{225}{4}) + (\frac{25}{4})}$

$L_{AH} = \sqrt{(\frac{250}{4})} = \sqrt{62.50}$

$L_{DH} = 7.9057$

Length of Segment DH: D(6, 14), H($\frac{-3}{2}$, $\frac{23}{2}$)

$L_{DH} = \sqrt{\left(\frac{-3}{2} - 6\right)^2 + (\frac{23}{2} - 14)^2}$

$L_{DH} = \sqrt{(\frac{-15}{2})^2 + (\frac{-5}{2})^2}$

$L_{DH} = \sqrt{(\frac{225}{4}) + (\frac{25}{4})}$

$L_{DH} = \sqrt{(\frac{250}{4})} = \sqrt{62.50}$

$L_{DH} = 7.9057$

$L_{AH} = L_{DH}$

Kyle

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-7,12) **B(-10, -11)** **C(9, -11)** **D(9, 12)**	E($\frac{-17}{2}$, $\frac{1}{2}$), F($\frac{-1}{2}$, -11), G(9, $\frac{1}{2}$), H(1, 12)

Length of Segment AE: A(-7,12), E($\frac{-17}{2}$, $\frac{1}{2}$)

$L_{AE} = \sqrt{\left(\frac{-17}{2} - (-7)\right)^2 + \left(\frac{1}{2} - 12\right)^2}$

$L_{AE} = \sqrt{\left(\frac{-3}{2}\right)^2 + \left(\frac{-23}{2}\right)^2}$

$L_{AE} = \sqrt{\left(\frac{9}{4}\right) + \left(\frac{529}{4}\right)}$

$L_{AE} = \sqrt{\left(\frac{538}{4}\right)} = \sqrt{134.5}$

$L_{AE} = \sqrt{\left(\frac{538}{4}\right)} = \sqrt{134.5}$

L_{AE} = 11.5974

Length of Segment BE: B(-10, -11), E($\frac{-17}{2}$, $\frac{1}{2}$)

$L_{BE} = \sqrt{\left(\frac{-17}{2} - (-10)\right)^2 + \left(\frac{1}{2} - (-11)\right)^2}$

$L_{BE} = \sqrt{\left(\frac{3}{2}\right)^2 + \left(\frac{23}{2}\right)^2}$

$L_{BE} = \sqrt{\left(\frac{9}{4}\right) + \left(\frac{529}{4}\right)}$

L_{BE} = 11.5974

$L_{AE} = L_{BE}$

Length of Segment BF: C(9, -11), F($\frac{-1}{2}$, -11),

$L_{BF} = \sqrt{\left(\frac{-1}{2} - (-9)\right)^2 + (-\mathbf{11} - (-11))^2}$

$L_{BF} = \sqrt{\left(\frac{17}{2}\right)^2 + (0)^2}$

$L_{BF} = \sqrt{\left(\frac{289}{4}\right)}$

$L_{BF} = \sqrt{72.25}$

L_{BF} = 8.50

Henry N.

Length of Segment CF: C(9, -11), F($\frac{-1}{2}$, -11),

$L_{CF} = \sqrt{\left(\frac{-1}{2} - 9\right)^2 + (-11 - (-11))^2}$

$L_{CF} = \sqrt{(\frac{-17}{2})^2 + (0)^2}$

$L_{CF} = \sqrt{(\frac{289}{4})}$

$L_{CF} = \sqrt{72.25}$

$L_{CF} = 8.50$

$L_{BF} = L_{CF}$

Length of Segment CG: C(9, -11), G(9, $\frac{1}{2}$),

$L_{CG} = \sqrt{(9 - 9)^2 + (\frac{1}{2} - (-11))^2}$

$L_{CG} = \sqrt{(0)^2 + (\frac{23}{2})^2}$

$L_{CG} = \sqrt{(\frac{23}{2})^2}$

$L_{CG} = (\frac{23}{2})$

Length of Segment DG: D(9, 12), G(9, $\frac{1}{2}$),

$L_{DG} = \sqrt{(9 - 9)^2 + (\frac{1}{2} - (-11))^2}$

$L_{DG} = \sqrt{(0)^2 + (\frac{23}{2})^2}$

$L_{DG} = \sqrt{(\frac{23}{2})^2}$

$L_{DG} = (\frac{23}{2})$

$L_{CG} = L_{DG}$

Length of Segment AH: A(-7,12), H(1, 12)

$L_{AH} = \sqrt{(1 - (-7))^2 + (12 - 12)^2}$

$L_{AH} = \sqrt{(8)^2 + (0)^2}$

$L_{AH} = 8$

Length of Segment DH: D(9, 12), H(1, 12)

$L_{DH} = \sqrt{(9 - 1)^2 + (12 - 12)^2}$

$L_{DH} = \sqrt{(8)^2 + (0)^2}$

$L_{DH} = 8$

$L_{AH} = L_{DH}$

Henry N.

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-4, -2) B(1,-1) C(4,4) D(-6,4)	E($\frac{-3}{2}, \frac{-3}{2}$) F($\frac{5}{2}, \frac{3}{2}$), G(-1, 4), H(-5, 1)

Length of Segment AE: A(-4, -2), **E($\frac{-3}{2}, \frac{-3}{2}$)**

$L_{AE} = \sqrt{\left(\frac{-3}{2} - (-4)\right)^2 + (\frac{-3}{2} - (-2))^2}$

$L_{AE} = \sqrt{(\frac{5}{2})^2 + (\frac{1}{2})^2}$

$L_{AE} = \sqrt{(\frac{1}{4}) + (\frac{25}{4})}$

$L_{AE} = \sqrt{(\frac{26}{4})}$

$L_{AE} = 3.5355$

Length of Segment BE: B(1,-1), **E($\frac{-3}{2}, \frac{-3}{2}$)**

$L_{BE} = \sqrt{\left(\frac{-3}{2} - 1\right)^2 + (\frac{1}{2} - (-1))^2}$

$L_{BE} = \sqrt{(\frac{-5}{2})^2 + (\frac{-1}{2})^2}$

$L_{BE} = \sqrt{(\frac{1}{4}) + (\frac{25}{4})}$

$L_{BE} = \sqrt{(\frac{26}{4})}$

$L_{BE} = 3.5355$

$L_{AE} = L_{BE}$

Length of Segment BF: B(1,-1), **F($\frac{5}{2}, \frac{3}{2}$),**

$L_{BF} = \sqrt{\left(\frac{5}{2} - 1\right)^2 + (\frac{3}{2} - (-1))^2}$

$L_{BF} = \sqrt{(\frac{3}{2})^2 + (\frac{5}{2})^2}$

$L_{BF} = \sqrt{(\frac{9+25}{4})} = \sqrt{(\frac{34}{4})}$

$L_{BF} = \sqrt{8.50}$

Lavinia

Length of Segment CF: C(4,4), F($\frac{5}{2}$, $\frac{3}{2}$),

$L_{CF} = \sqrt{\left(\frac{5}{2} - 4\right)^2 + \left(\frac{3}{2} - 4\right)^2}$

$L_{CF} = \sqrt{\left(\frac{-3}{2}\right)^2 + \left(\frac{-5}{2}\right)^2}$

$L_{CF} = \sqrt{\left(\frac{9}{2}\right) + \left(\frac{25}{4}\right)}$

$L_{CF} = \sqrt{\left(\frac{9+25}{4}\right)} = \sqrt{\left(\frac{34}{4}\right)}$

$L_{CF} = \sqrt{8.50}$

$L_{BF} = L_{CF}$

Length of Segment CG: C(4,4), G(-1, 4),

$L_{CG} = \sqrt{(-1 - 4)^2 + (4 - 4)^2}$

$L_{CG} = \sqrt{(-5)^2 + (0)^2}$

$L_{CG} = \sqrt{25}$

$L_{CG} = 5$

Length of Segment DG: D(-6,4), G(-1, 4),

$L_{DG} = \sqrt{(-1 - (-6))^2 + (4 - 4)^2}$

$L_{DG} = \sqrt{(5)^2 + (0)^2}$

$L_{DG} = \sqrt{25}$

$L_{DG} = 5$

$L_{CG} = L_{DG}$

Length of Segment AH: A(-4, -2), H(-5, 1)

$L_{AH} = \sqrt{(-5 - (-4))^2 + (1 - (-2))^2}$

$L_{AH} = \sqrt{(-1)^2 + (3)^2}$

$L_{AH} = \sqrt{10}$

Length of Segment DH: D(-6,4), H(-5, 1)

$L_{DH} = \sqrt{(-5 - (-6))^2 + (1 - 4)^2}$

$L_{DH} = \sqrt{(1)^2 + (-3)^2}$

$L_{DH} = \sqrt{10}$

$L_{AH} = L_{DH}$

Lavinia

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-5,-6) **B(10,-4)** **C(5,8)** **D(-7,4)**	E($\frac{5}{2}$, -5), F($\frac{15}{2}$, **2),** G(-1, 6**),** H**(-6, -1)**

Length of Segment AE: **A(-5,-6)**, E($\frac{5}{2}$, -5)

$L_{AE} = \sqrt{\left(\frac{5}{2} - (-5)\right)^2 + (-5 - (-6))^2}$

$L_{AE} = \sqrt{(\frac{15}{2})^2 + (\mathbf{1})^2}$

$L_{AE} = \sqrt{(\frac{225}{4}) + (\frac{4}{4})}$

$L_{AE} = \sqrt{(\frac{229}{4})} = \sqrt{57.25}$

$L_{AE} = \sqrt{57.25}$

Length of Segment BE: **B(10,-4),** E($\frac{5}{2}$, -5)

$L_{BE} = \sqrt{\left(\frac{5}{2} - 10\right)^2 + (\mathbf{-5} - (-4))^2}$

$L_{BE} = \sqrt{(\frac{-15}{2})^2 + (-\mathbf{1})^2}$

$L_{BE} = \sqrt{(\frac{225}{4}) + (\frac{4}{4})}$

$L_{BE} = \sqrt{(\frac{229}{4})} = \sqrt{57.25}$

$L_{BE} = \sqrt{57.25}$

$L_{AE} = L_{BE}$

Length of Segment BF: **B(10,-4,** F($\frac{15}{2}$, **2),**

$L_{BF} = \sqrt{\left(\frac{15}{2} - 10\right)^2 + (2 - (-4))^2}$

$L_{BF} = \sqrt{(\frac{-5}{2})^2 + (6)^2}$

$L_{BF} = \sqrt{(\frac{25}{4}) + (36)}$

$L_{BF} = \sqrt{(\frac{269}{4})}$

$L_{BF} = \sqrt{67.25}$

$L_{BF} = 8.20$

Jason

	Length of Segment CF: C(5,8), F($\frac{15}{2}$, 2), $L_{CF} = \sqrt{\left(\frac{15}{2} - 5\right)^2 + (2-8)^2}$ $L_{CF} = \sqrt{(\frac{5}{2})^2 + (-6)^2}$ $L_{CF} = \sqrt{(\frac{25}{4}) + (36)}$ $L_{CF} = \sqrt{(\frac{269}{4})}$ $L_{CF} = \sqrt{67.25}$ $L_{CF} = 8.20$ $L_{BF} = L_{CF}$		
	Length of Segment CG: C(5,8), G(-1, 6), $L_{CG} = \sqrt{(-1 - 5)^2 + (6-8)^2}$ $L_{CG} = \sqrt{(-6)^2 + (-2)^2}$ $L_{CG} = \sqrt{40}$ **Length of Segment DG:** D(-7,4), G(-1, 6), $L_{DG} = \sqrt{(-1 - (-7))^2 + (6-4)^2}$ $L_{DG} = \sqrt{(6)^2 + (2)^2}$ $L_{DG} = \sqrt{40}$ $L_{CG} = L_{DG}$		
	Length of Segment AH: A(-5,-6), H(**-6, -1**) $L_{AH} = \sqrt{(-6 - (-5))^2 + (-1 - (-\mathbf{6}))^2}$ $L_{AH} = \sqrt{(-1)^2 + (5)^2}$ $L_{AH} = \sqrt{26}$ **Length of Segment DH:** D(-7,4), H(**-6, -1**) $L_{DH} = \sqrt{(-6 - (-7))^2 + (-1-4)^2}$ $L_{DH} = \sqrt{(1)^2 + (-5)^2}$ $L_{DH} = \sqrt{26}$ $L_{AH} = L_{DH}$		

Jason

Formula for Length of Line Segment:

$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Original Points	Midpoints:
A(-6, -8) **B(5,-10)** **C(5, 5)** **D(-1, 5)**	E($\frac{-1}{2}$, -9), F(**5**, $\frac{-5}{2}$**),** G(2, 5**),** H**(**$\frac{-7}{2}$, $\frac{-3}{2}$**)**

Length of Segment AE: **A(-6, -8),** E($\frac{-1}{2}$, -9),

$L_{AE} = \sqrt{\left(\frac{-1}{2} - (-6)\right)^2 + (-9 - (-8))^2}$

$L_{AE} = \sqrt{(\frac{11}{2})^2 + (-1)^2}$

$L_{AE} = \sqrt{(\frac{121}{4}) + (\frac{4}{4})}$

$L_{AE} = \sqrt{(\frac{125}{4})} = \sqrt{31.25}$

$L_{AE} = \sqrt{31.25}$

Length of Segment BE: **B(5,-10),** E($\frac{1}{2}$, -9),

$L_{BE} = \sqrt{\left(\frac{-1}{2} - 5\right)^2 + (-9 - (-10))^2}$

$L_{BE} = \sqrt{(\frac{-11}{2})^2 + (1)^2}$

$L_{BE} = \sqrt{(\frac{121}{4}) + (\frac{4}{4})}$

$L_{BE} = \sqrt{(\frac{125}{4})} = \sqrt{31.25}$

$L_{BE} = \sqrt{31.25}$

$L_{AE} = L_{BE}$

Length of Segment BF: **B(5,-10),** F(**5**, $\frac{-5}{2}$**),**

$L_{BF} = \sqrt{(5 - 5)^2 + (\frac{-5}{2} - (-10))^2}$

$L_{BF} = \sqrt{(0)^2 + (\frac{15}{2})^2}$

$L_{BF} = \sqrt{(\frac{15}{2})^2}$

$L_{BF} = \frac{15}{2}$

Alex

Length of Segment CF: C(5, 5), F(5, $\frac{-5}{2}$),

$L_{CF} = \sqrt{(5\ - 5)^2 + (\frac{-5}{2} - 5)^2}$

$L_{CF} = \sqrt{(0)^2 + (\frac{-15}{2})^2}$

$L_{CF} = \sqrt{(\frac{-15}{2})^2}$

$L_{CF} = \frac{15}{2}$

$L_{BF} = L_{CF}$

Length of Segment CG: C(5, 5), G(2, 5),

$L_{CG} = \sqrt{(5-2)^2 + (5-5))^2}$

$L_{CG} = \sqrt{(3)^2 + (0)^2}$

$L_{CG} = 3$

Length of Segment DG: D(-1, 5), G(2, 5),

$L_{DG} = \sqrt{(2-(-1))^2 +\ (5-5)^2}$

$L_{DG} = \sqrt{(3)^2 + (0)^2}$

$L_{DG} = 3$

$L_{CG} = L_{DG}$

Length of Segment AH: A(-6, -8), H($\frac{-7}{2}$, $\frac{-3}{2}$)

$L_{AH} = \sqrt{\left(\frac{-7}{2} - (-6)\right)^2 + \left(\frac{-3}{2} - (-8)\right)^2}$

$L_{AH} = \sqrt{(\frac{5}{2})^2 + (\frac{13}{2})^2}$

$L_{AH} = \sqrt{\left(\frac{25}{4}\right) + (\frac{169}{4})}$

$L_{AH} = \sqrt{(\frac{194}{4})} = \sqrt{48.5}$

$L_{AH} = \sqrt{48.5}$

Length of Segment DH: D(-1, 5), H($\frac{-7}{2}$, $\frac{-3}{2}$)

$L_{DH} = \sqrt{\left(\frac{-7}{2} - (-1)\right)^2 + \left(\frac{-3}{2} - 5\right)^2}$

$L_{DH} = \sqrt{(\frac{-5}{2})^2 + (\frac{-13}{2})^2}$

$L_{DH} = \sqrt{\left(\frac{25}{4}\right) + (\frac{169}{4})}$

$L_{DH} = \sqrt{(\frac{194}{4})} = \sqrt{48.5}$

$L_{DH} = \sqrt{48.5}$

$L_{AH} = L_{DH}$

<table>
<tr>
<td>Alex</td>
<td>
Formula for Length of Line Segment:
$Length = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

<table><tr><th>Original Points</th><th>Midpoints:</th></tr>
<tr><td>A(-7, 9)
B(-11, 1)
C(12, 1)
D(7, 9)</td><td>E(-9, 5),
F($\frac{1}{2}$, 1),
G($\frac{19}{2}$, 5),
H(0, 9)</td></tr></table>

Length of Segment AE: A(-7, 9), E(-9, 5),
$L_{AE} = \sqrt{(-9 - (-7))^2 + (5 - 9)^2}$
$L_{AE} = \sqrt{(-2)^2 + (-4)^2}$
$L_{AE} = \sqrt{4 + 16}$
$L_{AE} = \sqrt{20}$
$L_{AE} = 2\sqrt{5}$

Length of Segment BE: B(-11, 1), E(-9, 5),
$L_{BE} = \sqrt{(-9 - (-11))^2 + (5 - 1)^2}$
$L_{BE} = \sqrt{(2)^2 + (4)^2}$
$L_{BE} = \sqrt{4 + 16}$
$L_{BE} = \sqrt{20}$
$L_{BE} = 2\sqrt{5}$

$L_{AE} = L_{BE}$

Length of Segment BF: B(-11, 1), F($\frac{1}{2}$, 1),
$L_{BF} = \sqrt{\left(\frac{1}{2} - (-11)\right)^2 + (1 - 1)^2}$
$L_{BF} = \sqrt{(\frac{23}{2})^2 + (0)^2}$
$L_{BF} = \sqrt{(\frac{23}{2})^2}$
$L_{BF} = \frac{23}{2}$

Length of Segment CF: C(12, 1), F($\frac{1}{2}$, 1),
$L_{CF} = \sqrt{\left(\frac{1}{2} - 12\right)^2 + (1 - 1)^2}$
$L_{CF} = \sqrt{(\frac{23}{2})^2 + (0)^2}$
$L_{CF} = \sqrt{(\frac{23}{2})^2}$
</td>
<td>Joanna</td>
</tr>
</table>

$L_{CF} = \frac{23}{2}$

$L_{BF} = L_{CF}$

Length of Segment CG: **C(12, 1),** **G($\frac{19}{2}$, 5),**

$L_{CG} = \sqrt{\left(\frac{19}{2} - 12\right)^2 + (5-1)^2}$

$L_{CG} = \sqrt{(\frac{-5}{2})^2 + (4)^2}$

$L_{CG} = \sqrt{(\frac{25}{4}) + (\frac{64}{4})}$

$L_{CG} = \sqrt{(\frac{89}{4})}$

Length of Segment DG: **D(7, 9),** **G($\frac{19}{2}$, 5),**

$L_{DG} = \sqrt{\left(\frac{19}{2} - 7\right)^2 + (5-9)^2}$

$L_{DG} = \sqrt{(\frac{5}{2})^2 + (-4)^2}$

$L_{DG} = \sqrt{(\frac{25}{4}) + (\frac{64}{4})}$

$L_{DG} = \sqrt{(\frac{89}{4})}$

$L_{CG} = L_{DG}$

Length of Segment AH: **A(-7, 9),** **H(0, 9)**

$L_{AH} = \sqrt{(0 - (-7))^2 + (9-9)^2}$

$L_{AH} = \sqrt{(7)^2 + (0)^2}$

$L_{AH} = \sqrt{(7)^2}$

$L_{AH} = 7$

Length of Segment DH: **D(7, 9),** **H(0, 9)**

$L_{DH} = \sqrt{(0 - 7)^2 + (9-9)^2}$

$L_{DH} = \sqrt{(-7)^2 + (0)^2}$

$L_{DH} = \sqrt{49}$

$L_{DH} = 7$

$L_{AH} = L_{DH}$

Step 4 & 5: Table of Slopes:

Student Name / Verify by	Slopes (M) = (EH, FG) Slopes (M) = (EF, HG) Formula for Slope of Line Segment: Slope = $\frac{\Delta y}{\Delta x} = \frac{y2-y1}{x2-x1}$

Joanna / Hayden

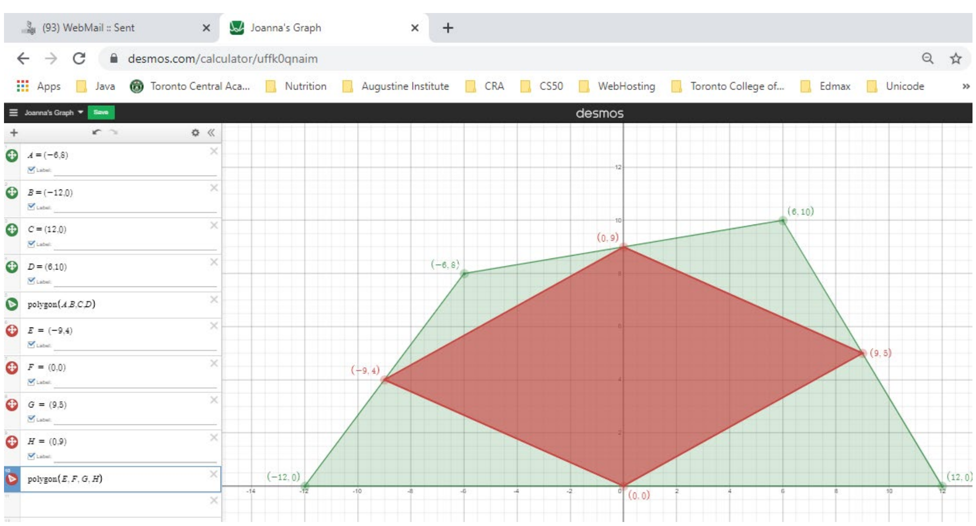
Original Points	Midpoints:
A(-6, 8), B(-12,0), C(12, 0), D(6, 10)	E(-9, 4), F(0, 0), G(9, 5), H(0, 9)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{9-4}{0-(-9)} = \frac{5}{9}$ $M_{FG} = \frac{5-0}{9-0} = \frac{5}{9}$	$M_{EF} = \frac{0-4}{0-(-9)} = (\frac{-4}{9})$ $M_{HG} = \frac{5-9}{9-0} = (\frac{-4}{9})$

$M_{EH} = M_{FG} = \frac{5}{9}$

$M_{EF} = M_{HG} = (\frac{-4}{9})$

∴ The inner quadrilateral is a parallelogram



Hayden / Cody

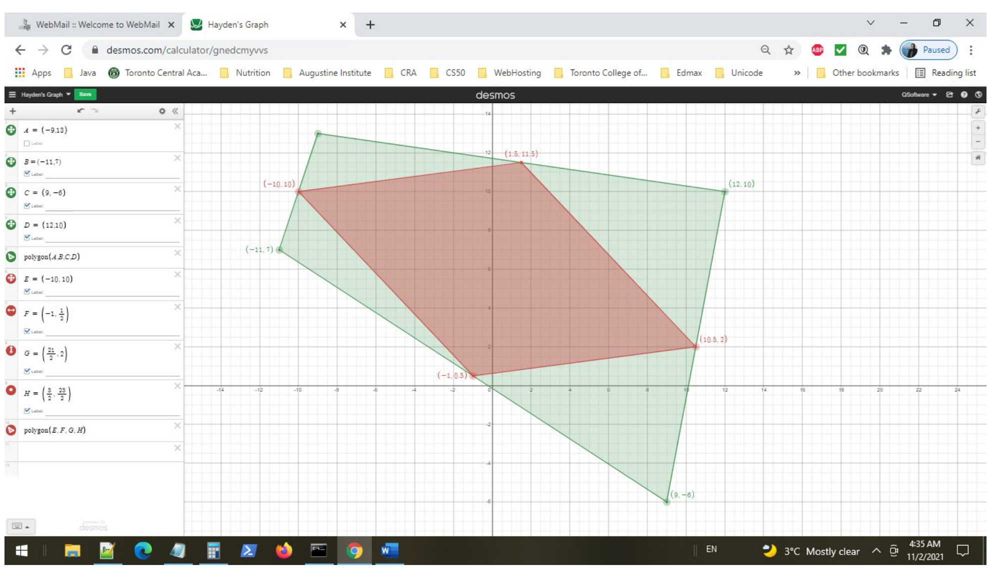
Original Points	Midpoints:
A(-9, 13), B(-11, 7), C(9, -6), D(12,10)	E(-10, 10), F(-1,$\frac{1}{2}$), G($\frac{21}{2}$, 2), H($\frac{3}{2}$, $\frac{23}{2}$)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(\frac{23}{2} - 10)}{(\frac{3}{2} - (-10))} = \frac{(\frac{3}{2})}{(\frac{23}{2})} = (\frac{3}{23})$	$M_{EF} = \frac{(\frac{1}{2} - 10)}{(-1 - (-10))} = \frac{(\frac{-19}{2})}{(\frac{9}{1})} = (\frac{-19}{18})$
$M_{FG} = \frac{(2 - \frac{1}{2})}{(\frac{21}{2} - (-1))} = \frac{(\frac{3}{2})}{(\frac{23}{2})} = (\frac{3}{23})$	$M_{HG} = \frac{(2 - \frac{23}{2})}{(\frac{21}{2} - \frac{3}{2})} = \frac{(\frac{-19}{2})}{(\frac{18}{2})} = (\frac{-19}{18})$

$M_{EH} = M_{FG} = (\frac{3}{23})$

$M_{EF} = M_{HG} = (\frac{-19}{18})$

∴ The inner quadrilateral is a parallelogram



THE ERINDALE ACADEMY

Cody / Sherry

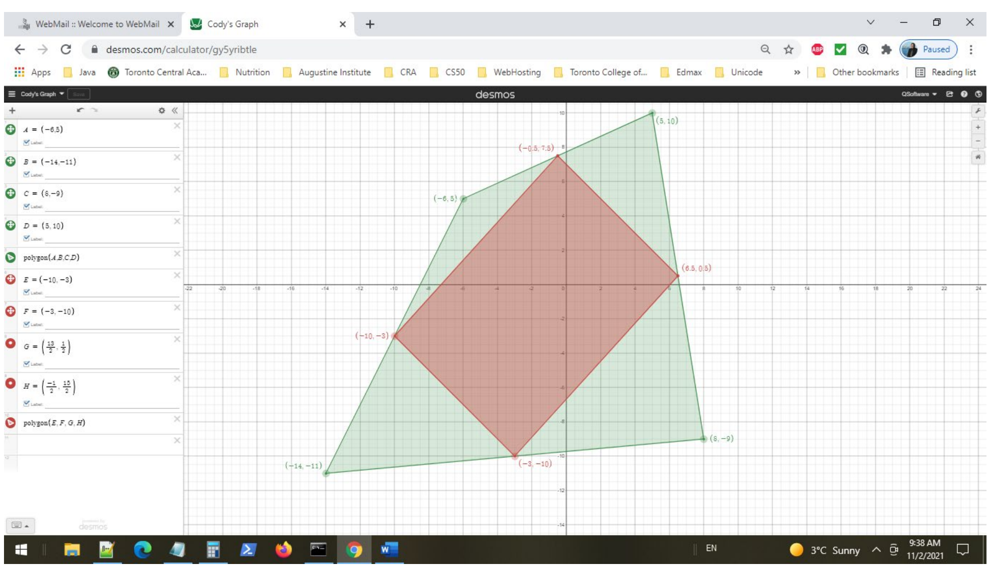
Original Points	Midpoints:
A(-6, 5), B(-14,-11), C(8, -9), D(5, 10)	E(-10, -3), F(-3, -10), G$(\frac{13}{2}, \frac{1}{2})$, H $(\frac{-1}{2}, \frac{15}{2})$

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(\frac{15}{2} - (-3))}{(\frac{-1}{2} - (-10))} = \frac{(\frac{21}{2})}{(\frac{19}{2})} = (\frac{21}{19})$	$M_{EF} = \frac{(-10-(-3))}{(-3-(-10))} = \frac{-7}{7} = -1$
$M_{FG} = \frac{(\frac{1}{2} - (-10))}{(\frac{13}{2} - (-3))} = \frac{(\frac{21}{2})}{(\frac{19}{2})} = (\frac{21}{19})$	$M_{HG} = \frac{(\frac{1}{2} - \frac{15}{2})}{(\frac{13}{2} - (\frac{-1}{2}))} = \frac{(\frac{-14}{2})}{(\frac{14}{2})} = -1$

$M_{EH} = M_{FG} = (\frac{21}{19})$

$M_{EF} = M_{HG} = -1$

∴ The inner quadrilateral is a parallelogram



Sherry / Leon

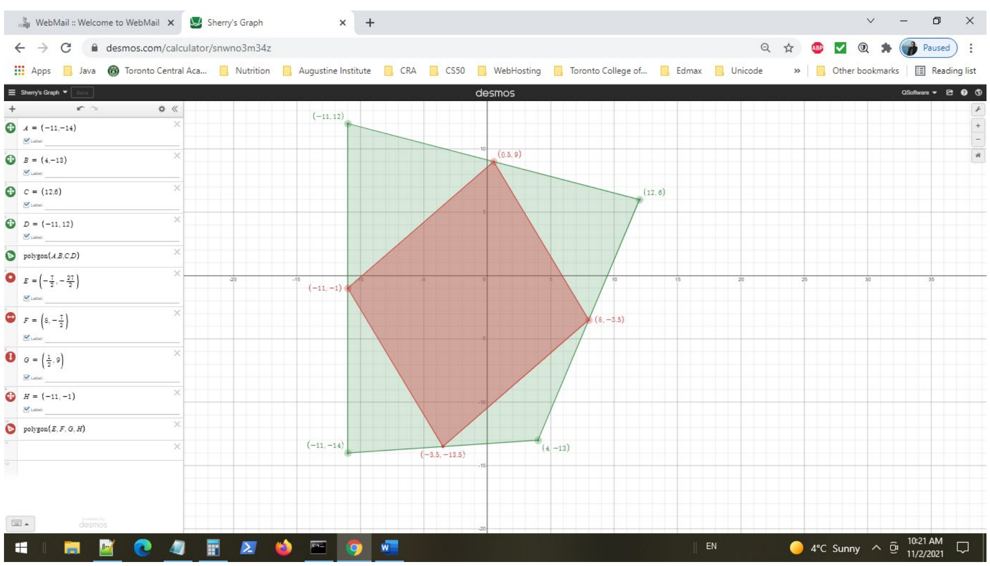
Original Points	Midpoints:
A(-11, -14) **B(4, -13)** **C(12, 6)** **D(-11, 12)**	**E$(\frac{-7}{2}, \frac{-27}{2})$,** **F$(8, \frac{-7}{2})$,** **G$(\frac{1}{2}, 9)$,** **H(-11, -1)**

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(-1-(\frac{-27}{2}))}{(-11-(\frac{-7}{2}))} = \frac{(\frac{25}{2})}{(\frac{-15}{2})} = (\frac{-5}{3})$	$M_{EF} = \frac{(\frac{-7}{2} - (\frac{-27}{2}))}{(8-(\frac{-7}{2}))} = \frac{(\frac{20}{2})}{(\frac{23}{2})} = (\frac{20}{23})$
$M_{FG} = \frac{(9-(\frac{-7}{2}))}{(\frac{1}{2}-8)} = \frac{(\frac{25}{2})}{(\frac{-15}{2})} = (\frac{-5}{3})$	$M_{HG} = \frac{(9-(-1))}{(\frac{1}{2}-(-11))} = \frac{(\frac{20}{2})}{(\frac{23}{2})} = (\frac{20}{23})$

$M_{EH} = M_{FG} = (\frac{-5}{3})$

$M_{EF} = M_{HG} = (\frac{20}{23})$

∴ The inner quadrilateral is a parallelogram



Leon / Tee

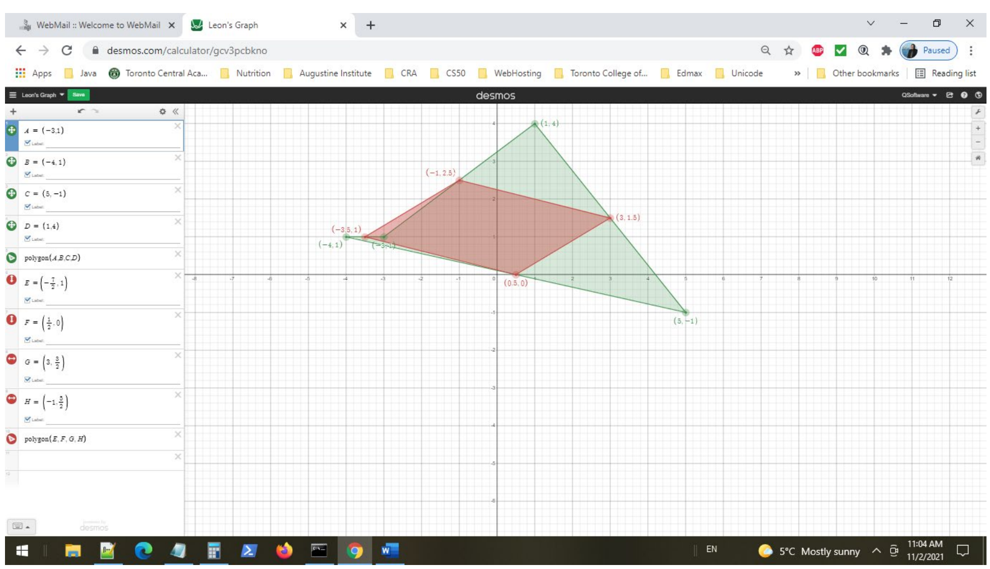
Original Points	Midpoints:
A(-3, 1) B(-4, 1) C(5, -1) D(1, 4)	E($\frac{-7}{2}$, 1), F($\frac{1}{2}$, 0), G(3, $\frac{3}{2}$), H(-1, $\frac{5}{2}$)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(\frac{5}{2} - 1)}{(-1 - (\frac{-7}{2}))} = \frac{(\frac{3}{2})}{(\frac{5}{2})} = (\frac{3}{5})$	$M_{EF} = \frac{(0 - 1)}{(\frac{1}{2} - (\frac{-7}{2}))} = \frac{-1}{(\frac{8}{2})} = (\frac{-1}{4})$
$M_{FG} = \frac{(\frac{3}{2} - 0)}{(3 - \frac{1}{2})} = \frac{(\frac{3}{2})}{(\frac{5}{2})} = (\frac{3}{5})$	$M_{HG} = \frac{(\frac{3}{2} - (\frac{5}{2}))}{(3 - (-1))} = \frac{(\frac{-2}{2})}{4} = (\frac{-1}{4})$

$M_{EH} = M_{FG} = (\frac{3}{5})$

$M_{EF} = M_{HG} = (\frac{-1}{4})$

∴ The inner quadrilateral is a parallelogram



Tee / Brian N.

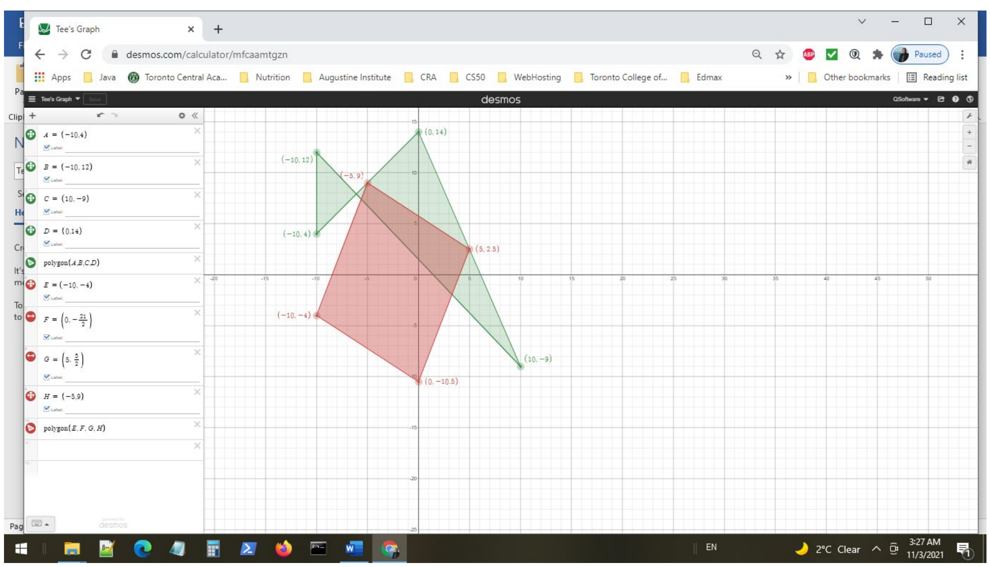
Original Points	Midpoints:
A(-10, 4) **B(-10, -12)** **C(10, -9)** **D(0, 14)**	**E(-10, -4),** **F**$(0, \frac{-21}{2})$, **G**$(5, \frac{5}{2})$, **H**$(-5, 9)$

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(9-(-4))}{(-5-(-10))} = \frac{13}{5} = (\frac{13}{5})$ $M_{FG} = \frac{(\frac{5}{2}-(\frac{-21}{2}))}{(5-0)} = \frac{(\frac{26}{2})}{(5)} = (\frac{13}{5})$	$M_{EF} = \frac{(\frac{-21}{2}-(-4))}{(0-(-10\_))} = \frac{\frac{-13}{2}}{(\frac{20}{2})} = (\frac{-13}{20})$ $M_{HG} = \frac{(\frac{5}{2}-9)}{(5-(-5))} = \frac{(\frac{-13}{2})}{(\frac{20}{2})} = (\frac{-13}{20})$

$M_{EH} = M_{FG} = (\frac{13}{5})$

$M_{EF} = M_{HG} = (\frac{-13}{20})$

∴ The inner quadrilateral is a parallelogram



Brian N. / Henry T.

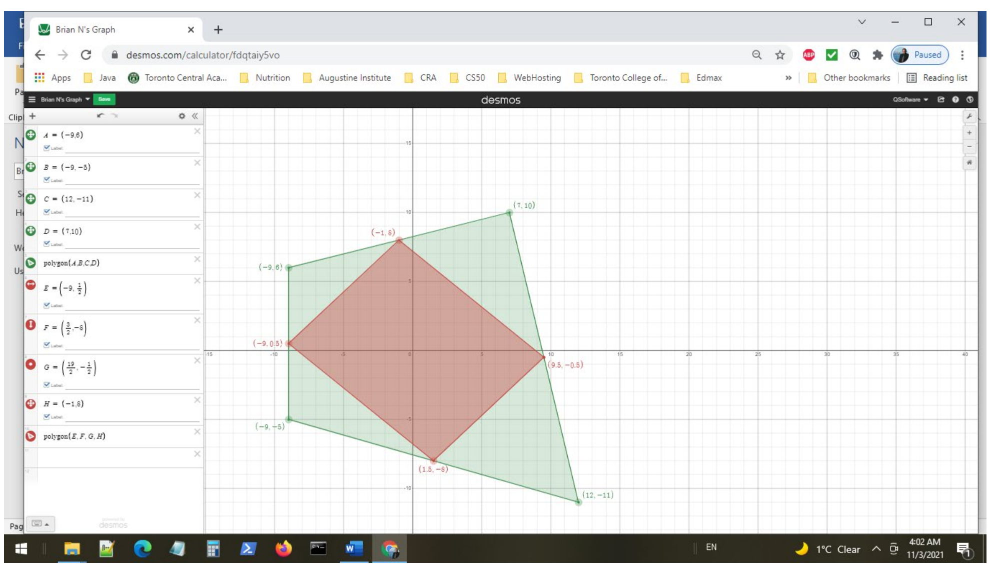
Original Points	Midpoints:
A(-9, 6) B(-9, -5) C(12, -11) D(7, 10)	E$(-9, \frac{1}{2})$, F$(\frac{3}{2}, -8)$, G$(\frac{19}{2}, \frac{-1}{2})$, H(-1, 8)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(8 - \frac{1}{2})}{(-1-(-9))} = \frac{\frac{15}{2}}{\frac{16}{2}} = (\frac{15}{16})$	$M_{EF} = \frac{\left(-8 - \frac{1}{2}\right)}{(\frac{3}{2} - (-9\_)} = \frac{\frac{-17}{2}}{(\frac{21}{2})} = (\frac{-17}{21})$
$M_{FG} = \frac{(\frac{-1}{2} - (-8))}{(\frac{19}{2} - \frac{3}{2})} = \frac{(\frac{15}{2})}{(\frac{16}{2})} = (\frac{15}{16})$	$M_{HG} = \frac{(\frac{-1}{2} - 8)}{(\frac{19}{2} - (-1))} = \frac{(\frac{-17}{2})}{(\frac{21}{2})} = (\frac{-17}{21})$

$M_{EH} = M_{FG} = (\frac{15}{16})$

$M_{EF} = M_{HG} = (\frac{-17}{21})$

∴ The inner quadrilateral is a parallelogram



Henry T./ Roy

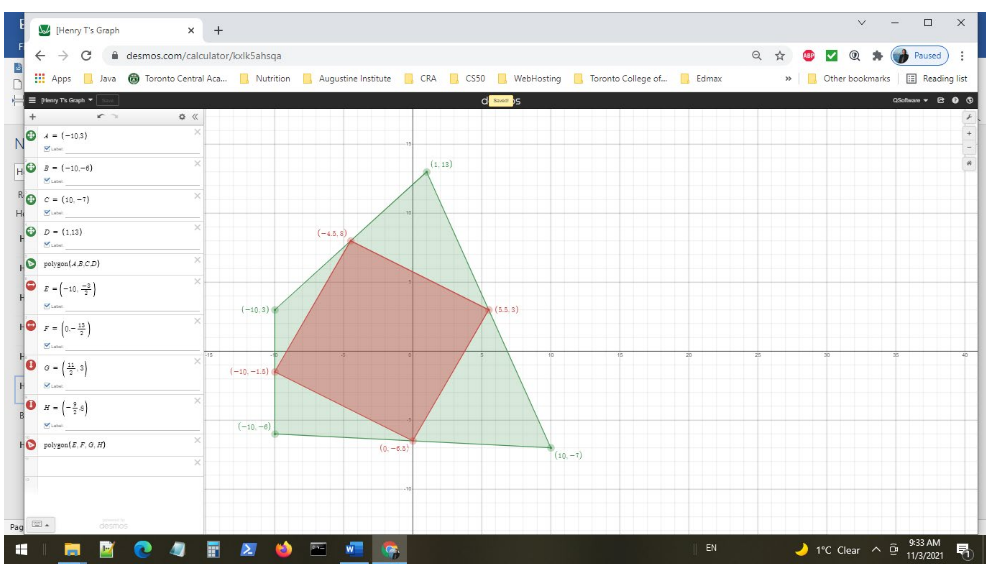
Original Points	Midpoints:
A(-10, 3) **B(-10, -6)** **C(10, -7)** **D(1, 13)**	E$(-10, \frac{-3}{2})$, F$(0, \frac{-13}{2})$, G$(\frac{11}{2}, 3)$, H$(\frac{-9}{2}, 8)$

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(8-(\frac{-3}{2}))}{(\frac{-9}{2}-(-10))} = \frac{\frac{19}{2}}{\frac{11}{2}} = (\frac{19}{11})$	$M_{EF} = \frac{(\frac{-13}{2}-(\frac{-3}{2}))}{(0-(-10))} = \frac{\frac{-10}{2}}{(\frac{20}{2})} = (\frac{-1}{2})$
$M_{FG} = \frac{(3-(\frac{-13}{2}))}{(\frac{11}{2}-0)} = \frac{(\frac{19}{2})}{(\frac{11}{2})} = (\frac{19}{11})$	$M_{HG} = \frac{(3-8)}{(\frac{11}{2}-(\frac{-9}{2}))} = \frac{(\frac{-10}{2})}{(\frac{20}{2})} = (\frac{-1}{2})$

$M_{EH} = M_{FG} = (\frac{19}{11})$

$M_{EF} = M_{HG} = (\frac{-1}{2})$

∴ The inner quadrilateral is a parallelogram



THE ERINDALE ACADEMY

Roy / Kyle

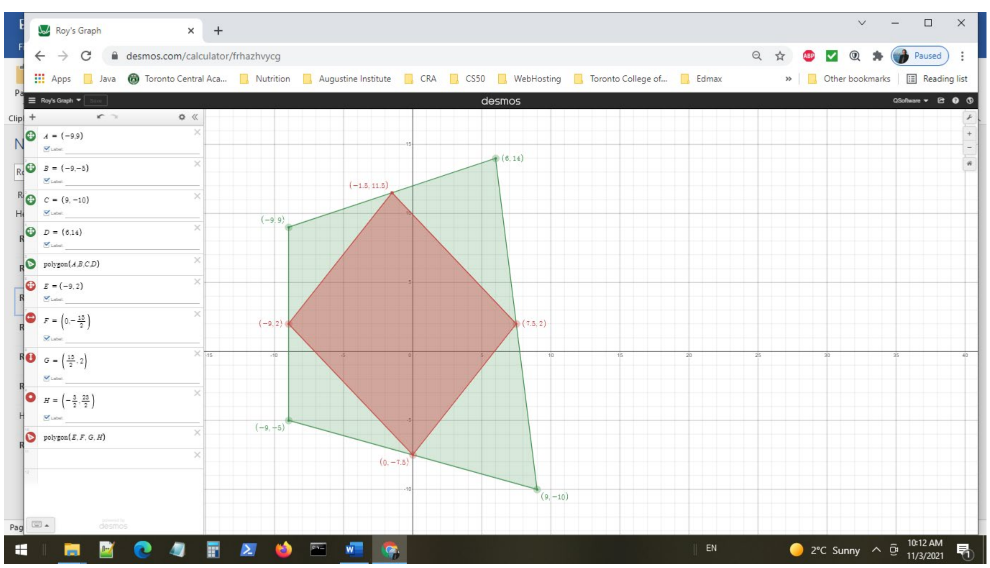
Original Points	Midpoints:
A(-9,9) **B(-9, -5)** **C(9, -10)** **D(6, 14)**	E(-9, 2), F$(0, \frac{-15}{2})$, G$(\frac{15}{2}, 2)$, H$(\frac{-3}{2}, \frac{23}{2})$

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \dfrac{(\frac{23}{2} - (\frac{4}{2})}{(\frac{-3}{2} - (-9))} = \dfrac{\frac{19}{2}}{\frac{15}{2}} = (\frac{19}{15})$	$M_{EF} = \dfrac{\left(\frac{-15}{2} - (\frac{4}{2})\right)}{(0 - (-9)} = \dfrac{\frac{-19}{2}}{(\frac{18}{2})} = (\frac{-19}{18})$
$M_{FG} = \dfrac{(\frac{4}{2} - (\frac{-15}{2})}{(\frac{15}{2} - 0\,)} = \dfrac{(\frac{19}{2})}{(\frac{15}{2})} = (\frac{19}{15})$	$M_{HG} = \dfrac{(2 - (\frac{23}{2}))}{(\frac{15}{2} - (\frac{-3}{2}))} = \dfrac{(\frac{-19}{2})}{(\frac{18}{2})} = (\frac{-19}{(18)})$

$M_{EH} = M_{FG} = (\frac{19}{15})$

$M_{EF} = M_{HG} = (\frac{-19}{18})$

∴ The inner quadrilateral is a parallelogram



Kyle /

Henry N.

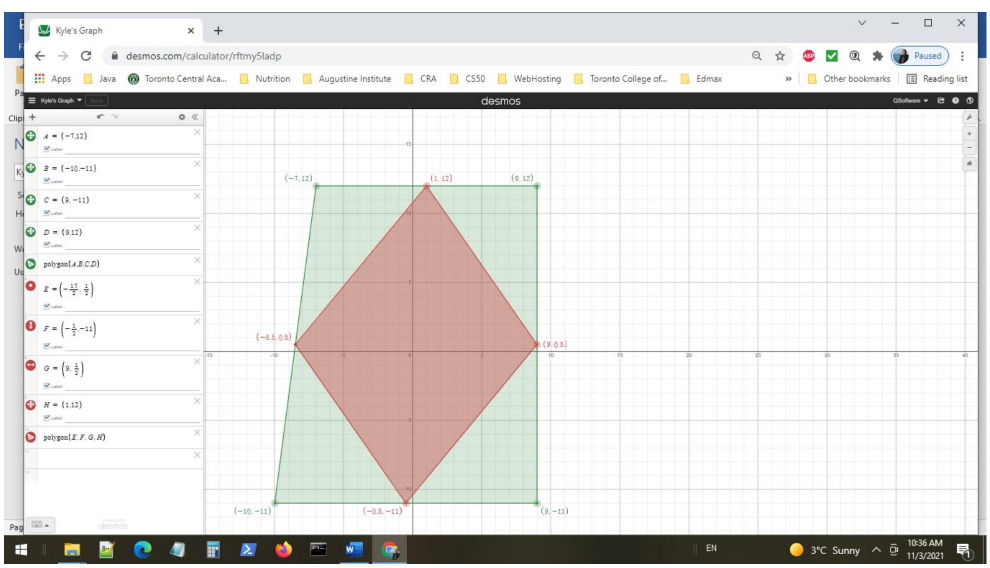
Original Points	Midpoints:
A(-7,12) **B(-10, -11)** **C(9, -11)** **D(9, 12)**	E$(\frac{-17}{2}, \frac{1}{2})$, F$(\frac{-1}{2}$, **-11)**, G$(9, \frac{1}{2})$, H**(1, 12)**

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(12-(\frac{1}{2}))}{(\frac{2}{2}-(\frac{-17}{2}))} = \frac{\frac{23}{2}}{\frac{19}{2}} = (\frac{23}{19})$	$M_{EF} = \frac{(-11-(\frac{1}{2}))}{(\frac{-1}{2}-(\frac{-17}{2}))} = \frac{\frac{-23}{2}}{(\frac{16}{2})} = (\frac{-23}{16})$
$M_{FG} = \frac{(\frac{1}{2}-(-11))}{(9-(\frac{-1}{2}))} = \frac{(\frac{23}{2})}{(\frac{19}{2})} = (\frac{23}{19})$	$M_{HG} = \frac{(\frac{1}{2}-12)}{(9-1)} = \frac{(\frac{-23}{2})}{16} = (\frac{-23}{16})$

$M_{EH} = M_{FG} = (\frac{23}{19})$

$M_{EF} = M_{HG} = (\frac{-23}{16})$

∴ The inner quadrilateral is a parallelogram



Henry N. / Lavinia

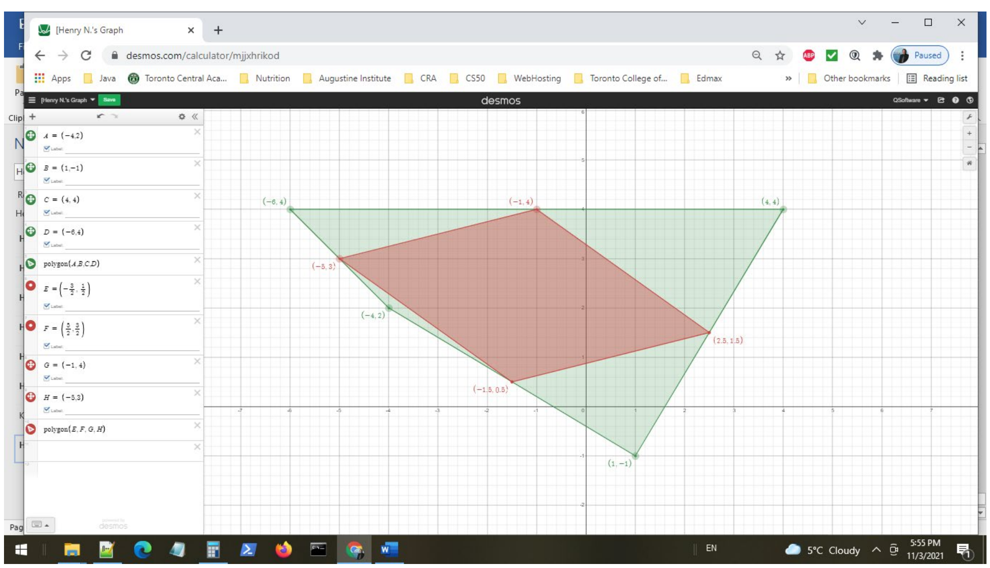
Original Points	Midpoints:
A(-4, -2) B(1,-1) C(4,4) D(-6,4)	E$(\frac{-3}{2}, \frac{-3}{2})$ F$(\frac{5}{2}, \frac{3}{2})$, G(-1, 4), H(-5, 1)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(1-(\frac{-3}{2})}{(-5-(\frac{-3}{2}))} = \frac{\frac{5}{2}}{\frac{-7}{2}} = (\frac{-5}{7})$	$M_{EF} = \frac{(\frac{3}{2}-(\frac{-3}{2}))}{(\frac{5}{2}-(\frac{-3}{2}))} = \frac{\frac{6}{2}}{(\frac{8}{2})} = (\frac{3}{4})$
$M_{FG} = \frac{(4-(\frac{3}{2}))}{(-1-(\frac{5}{2}))} = \frac{(\frac{5}{2})}{(\frac{-7}{2})} = (\frac{-5}{7})$	$M_{HG} = \frac{(4-1)}{(-1-(-5))} = \frac{3}{4} = (\frac{3}{4})$

$M_{EH} = M_{FG} = (\frac{-5}{7})$

$M_{EF} = M_{HG} = (\frac{3}{4})$

∴ The inner quadrilateral is a parallelogram



Lavinia / Jason

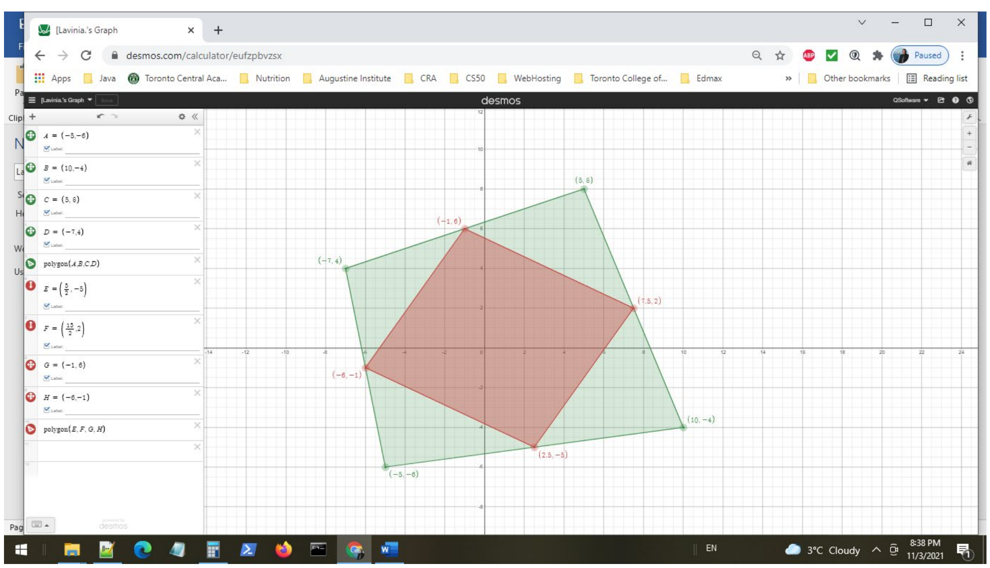
Original Points	Midpoints:
A(-5,-6) **B(10,-4)** **C(5,8)** **D(-7,4)**	$E(\frac{5}{2}, -5)$, $F(\frac{15}{2}, 2)$, $G(-1, 6)$, $H(-6, -1)$

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(-1-(-5))}{(-6-(\frac{5}{2}))} = \frac{\frac{8}{2}}{\frac{-17}{2}} = (\frac{-8}{17})$	$M_{EF} = \frac{(2-(-5))}{(\frac{15}{2}-(\frac{5}{2}))} = \frac{\frac{14}{2}}{(\frac{10}{2})} = \frac{7}{5}$
$M_{FG} = \frac{(6-2)}{(-1-(\frac{15}{2}))} = \frac{(\frac{8}{2})}{(\frac{-17}{2})} = (\frac{-8}{17})$	$M_{HG} = \frac{(6-(-1))}{(-1-(-6))} = \frac{7}{5}$

$M_{EH} = M_{FG} = \frac{-8}{17}$

$M_{EF} = M_{HG} = \frac{7}{5}$

∴ The inner quadrilateral is a parallelogram



Jason / Alex

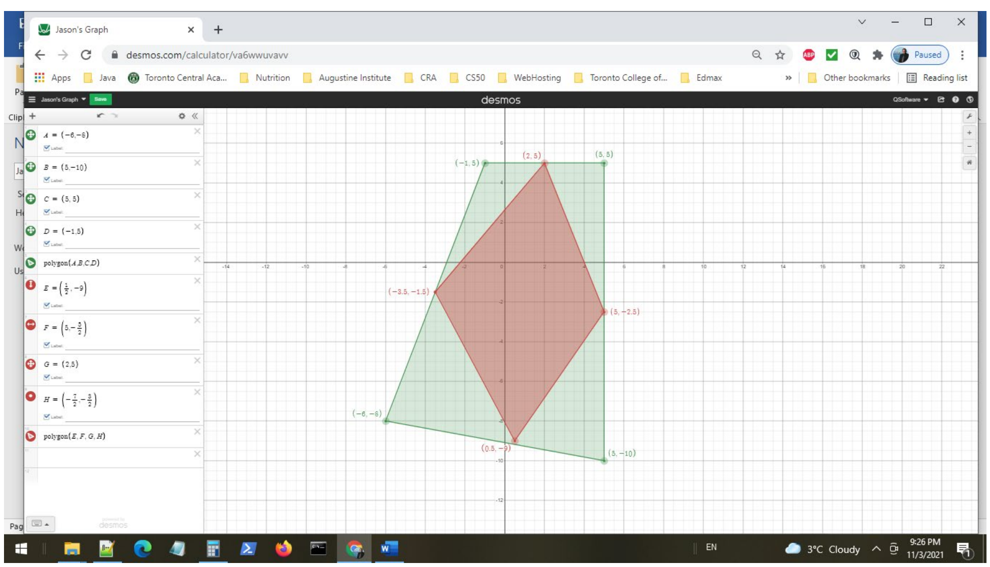
Original Points	Midpoints:
A(-6, -8) **B(5,-10)** **C(5, 5)** **D(-1, 5)**	E($\frac{-1}{2}$, -9), F(**5,** $\frac{-5}{2}$**),** G(2, 5**),** H**(**$\frac{-7}{2}$**,** $\frac{-3}{2}$)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(\frac{-3}{2} - (-9))}{(\frac{-7}{2} - (\frac{-1}{2}))} = \frac{\frac{15}{2}}{\frac{-6}{2}} = (\frac{-15}{6})$ $M_{FG} = \frac{(5 - (\frac{-5}{2}))}{(2 - (5))} = \frac{(\frac{15}{2})}{(\frac{-6}{2})} = (\frac{-15}{6})$	$M_{EF} = \frac{(\frac{-5}{2} - (-9))}{(5 - (\frac{-1}{2}))} = \frac{\frac{13}{2}}{(\frac{11}{2})} = \frac{13}{11}$ $M_{HG} = \frac{(5 - (\frac{-3}{2}))}{(2 - (\frac{-7}{2}))} = \frac{13}{11}$

$M_{EH} = M_{FG} = \frac{-15}{6}$

$M_{EF} = M_{HG} = \frac{13}{11}$

∴ The inner quadrilateral is a parallelogram



Alex / Joanna

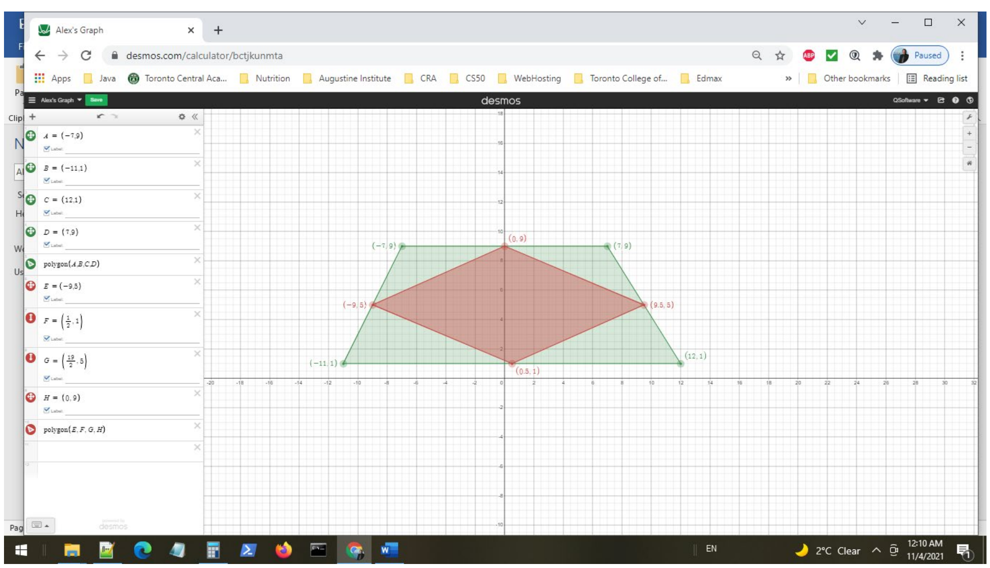
Original Points	Midpoints:
A(-7, 9) B(-11, 1) C(12, 1) D(7, 9)	E(-9, 5), F($\frac{1}{2}$, 1), G($\frac{19}{2}$, 5), H(0, 9)

Slopes (M) = (EH, FG)	Slopes (M) = (EF, HG)
$M_{EH} = \frac{(9-5)}{(0-(-9))} = \frac{4}{9} = \frac{4}{9}$ $M_{FG} = \frac{(5-1)}{(\frac{19}{2}-\frac{1}{2})} = \frac{(4)}{(\frac{18}{2})} = \frac{4}{9}$	$M_{EF} = \frac{(1-5)}{(\frac{1}{2}-(-9))} = \frac{(\frac{-8}{2})}{(\frac{19}{2})} = \frac{-8}{19}$ $M_{HG} = \frac{(5-9)}{(\frac{19}{2}-(0))} = \frac{(\frac{-8}{2})}{(\frac{19}{2})} = \frac{-8}{19}$

$M_{EH} = M_{FG} = \frac{4}{9}$

$M_{EF} = M_{HG} = \frac{-8}{19}$

∴ The inner quadrilateral is a parallelogram



In conclusion, when obtaining all the midpoints of a 4-sided polygon, by joining all the midpoints, gives a parallelogram all the time. **These are referred to Varignon parallelograms.**