(A) Lesson Context

BIG PICTURE of this UNIT:	• 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"?

(B) **Lesson Objectives:**

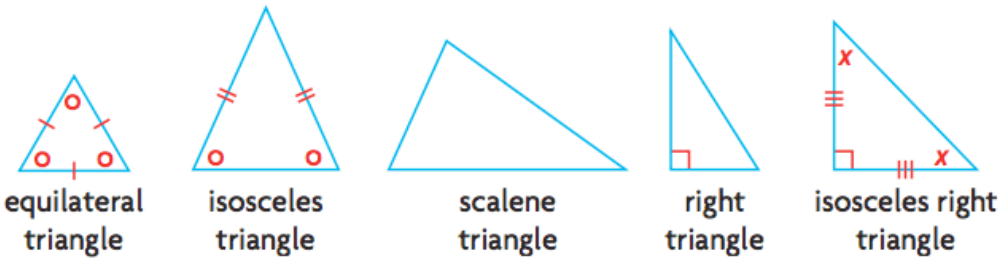
a. Use properties of lines and line segments to classify two dimensional figures using analytical geometry and dynamic geometry programs (Geogebra)

PART 1 – Skills REVIEW/EXPLORATION

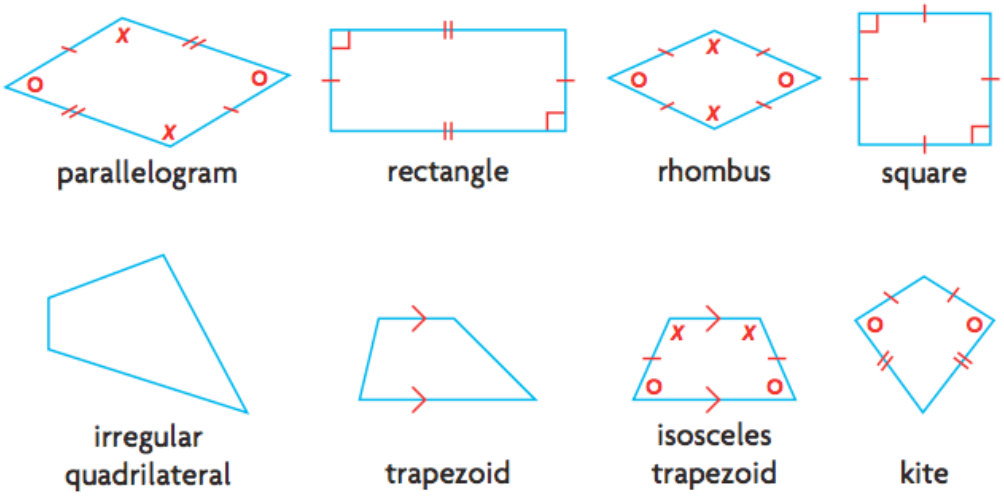
What you need to know about triangles and quadrilaterals…..

- Triangles and quadrilaterals can be classified by the relationships between their sides and their interior angles.

Triangles



Quadrilaterals



1. The following points are vertices of triangles. Use **analytical geometry** to classify the triangle as scalene, isosceles or equilateral. Verify with Geogebra

   a. A(30,30); B(-41,11), C(11,-41)
   b. A(-1,5), B(8,-2), C(-5,-1)
   c. A(3,-1); B(7,1); C(3,4)
   d. A(1,5), (8,1), C(-3,-2)

2. The following points are vertices of quadrilaterals. Use **analytical geometry** to classify the type of quadrilateral. Make sure you have provided "sufficient" evidence to justify your classification. Verify with Geogebra.

   a. A(-3,4); B(6,10), C(10,4); D(1,-2)
   b. A(2,6); B(8,10), C(18,6); D(6,-2)
   c. A(-4,6); B(-7,4), C(-6,-4); D(-2,3)

3. How can you use the distance formula to decide whether the points $P(-2,-3)$, $Q(4,1)$ and $R(2,4)$ do OR do not form a right triangle? Use your answer to show that ΔPQR is a right triangle. Verify using Geogebra.

   a. Now, on Geogebra, construct this triangle
   b. Then, use the "circle tool" to construct a circle using these three points.
   c. Determine the center of the circle.
   d. Hence, what is true about the hypotenuse of this right triangle in relation to the circle?

4. The quadrilateral *EFGH* is defined by the four vertices $E(-2,3)$, $F(2,1)$, $G(0,-3)$ and $H(-4,-1)$. Use analytical geometry to show that the diagonals of *EFGH* are perpendicular to each other. What type of quadrilateral could *EFGH* be, given that the diagonals are perpendicular to each other? Verify with Geogebra.

5. Points $P(4,12)$, $Q(9,14)$ and $R(13,4)$ are three vertices of a rectangle. Determine the coordinates of the fourth vertex, S.

PART 2 – Skills PRACTICE/Applications & GEOMETRY Contexts

1. A surveyor is marking the corners of a building lot. The corners have coordinates A(-5,4), B(4,9), C(9,0) and D(0,-5).
   a. What shape is this building lot?
   b. Find the perimeter of this building lot.
   c. Find the area of this building lot.

2. The vertices of ΔDEF are at $D(-3,-4)$, $E(-2,4)$ and $F(5,-5)$.
   a. Show that ΔDEF is isosceles
   b. Determine the length of median from vertex D.
   c. Show that this median is perpendicular to EF.

3. What type of a quadrilateral is $ABCD$ if the vertices are $A(-2,3)$, $B(-2,-2)$, $C(2,1)$ and $D(2,6)$?

4. Use the points $A(2,4)$, $B(-3,3)$, $C(-2,-5)$ and $D(4,-1)$ to show that the midpoints of the sides when joined together to make a second quadrilateral will actually form a parallelogram

Higher Level Extension Work