IM2 Problem Set 1.5 - Geometric Figures on a Coordinate Grid

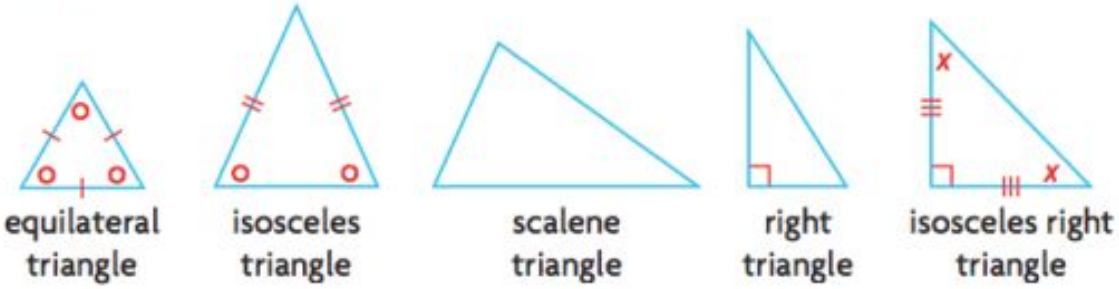
BIG PICTURE of this UNIT:	• mastery with linear algebraic skills to be used in our work with coordinate geometry (midpoint, length, slope) • understanding various geometric properties of quadrilaterals, triangles & circles • how do you really "prove" that something is "true"? • introduction to working with 3D shapes

Part 1 - Concepts Review

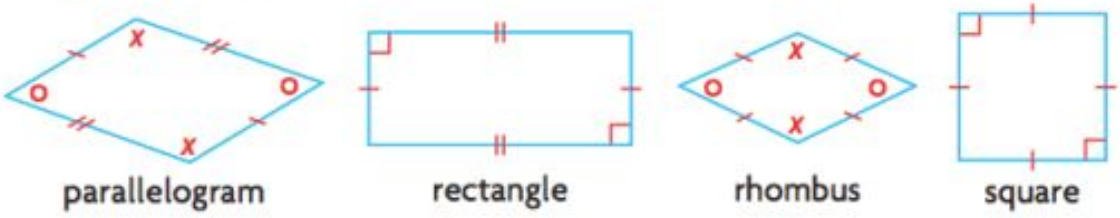
What you need to know about triangles and quadrilaterals…..

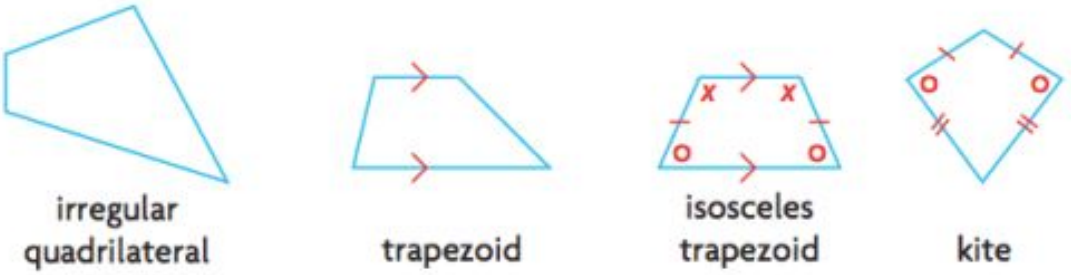
- Triangles and quadrilaterals can be classified by the relationships between their sides and their interior angles.

Triangles



Quadrilaterals





Part 2 - Skills Review

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 PQR is a right triangle. Verify using Geogebra.

4. **CHALLENGE Q**: Use Geogebra to construct this triangle defined by the points P(-2,-3), Q(4,1) and R(2,4)

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

5. 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.

Part 3 – 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 if one unit on the grid is 12 m.
    c. Find the area of this building lot if one unit on the grid is 12 m.

2. The vertices of DEF are at D(-3,-4), E(-2,4) and F(5,-5).

    a. Show that DEF 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.

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.