Lesson Plan

Grade 10 Academic Math **Lesson: 3 - 6**

Unit: Analytic Geometry **Topic: Verifying Properties of Figures**

- ***homework check:*** **FM 10 p. 21 # 1 –7**

- ***note:*** **Verifying Properties of Geometric Figures**

When asked to verify properties, you must prove that the requirements are true. This usually involves showing that line segments are equal in length, parallel to one another or perpendicular to one another. Sometimes it may involve verifying that a shape holds the properties that define it (definitions on p. 101 of text). For example, if we were asked to prove that a triangle was isosceles, we would have to show that two sides of the triangle were equal in length. If we were asked to show that a shape was indeed a square, we would have to show that all four sides were equal in length and that the sides were perpendicular to one another. Some important definitions might include:

Vertex (vertices) – point at which two sides of any polygon meet
Median – line segment joining the vertex to the midpoint of the opposite side
Perpendicular (right) bisector – line segment that meets the midpoint at 90 degrees
Altitude – aka height of a triangle, joins vertex to opposite side at 90 degrees
Diagonal – line segment joining two non-adjacent vertices
Chord – line segment joining two points on a curve
Quadrilateral – any polygon with four sides
Parallelogram – quadrilateral with opposite sides parallel
Rhombus – quadrilateral with all sides equal and opposite sides parallel
Trapezoid – quadrilateral with one pair of opposite sides parallel
Centroid – point of intersection of three medians of a triangle
Circumcentre – point of intersection of three perpendicular bisectors of a triangle, the centre of a circumcircle on which all three points of the triangle lie
Orthocentre - point of intersection of three altitudes of a triangle

Example)

a) A triangle has vertices A(- 5, - 4) and B(3, 0) and C(- 3, 4). Verify that the midsegment that joins the midpoints of AB and AC is parallel to BC.

STEP 1: Find the midpoints of AB and AC

AB:

$$\left(\frac{-5+3}{2},\frac{-4+0}{2}\right)=\left(\frac{-2}{2},\frac{-4}{2}\right)$$

$$D=(-1,-2)$$

AC:

$$\left(\frac{-5+(-3)}{2},\frac{-4+4}{2}\right)=\left(\frac{-8}{2},\frac{0}{2}\right)$$

$$E=(-4,0)$$

STEP 2: find slopes of lines DE and BC

mDE: $\dfrac{-2-0}{-1-(-4)}=\dfrac{-2}{3}$

mBC: $\dfrac{0-4}{3-(-3)}=\dfrac{-4}{6}=\dfrac{-2}{3}$

STEP 3: Write a conclusion

Line BC is parallel to the midsegment joining the midpoint of AB and AC.

b) The sides of parallelogram ABCD are defined by the equations:

$y=2x+9$

$y=\dfrac{1}{3}x+4$

$y=2x-1$

$y=\dfrac{1}{3}x-1$

Verify that the diagonals intersect at the point E (- 1 , 1).

STEP 1: Find the points of intersection to define the vertices.

$y=2x+9$	$y=\dfrac{1}{3}x+4$	$y=2x-1$	$y=2x+9$
$y=\dfrac{1}{3}x+4$	$y=2x-1$	$y=\dfrac{1}{3}x-1$	$y=\dfrac{1}{3}x-1$
$2x+9=\dfrac{1}{3}x+4$	$\dfrac{1}{3}x+4=2x-1$	$2x-1=\dfrac{1}{3}x-1$	$2x+9=\dfrac{1}{3}x-1$
$6x+27=x+12$	$x+12=6x-3$	$6x-3=x-3$	$6x+27=x-3$
$5x=-15$	$-5x=-15$	$5x=0$	$5x=-30$
$x=-3$	$x=3$	$x=0$	$x=-6$
$y=2(-3)+9$	$y=2(3)-1$	$y=2(0)-1$	$y=2(-6)+9$
$y=3$	$y=5$	$y=-1$	$y=-3$
$POI=(-3,3)$	$POI=(3,5)$	$POI=(0,-1)$	$POI(-6,-3)$

STEP 2: * diagonals of a parallelogram bisect each other therefore, find the midpoint of each diagonal.

Midpoint AC:

$$\left(\frac{-3+0}{2},\frac{3-1}{2}\right)=\left(\frac{-3}{2},1\right)$$

Midpoint BD:

$$\left(\frac{3+(-6)}{2},\frac{5+(-3)}{2}\right)=\left(\frac{-3}{2},1\right)$$

STEP 3: make your conclusion

The diagonals do not intersect a point E.

- ***homework assignment:*** **<u>Principles of Mathematics 10</u> p. 102 # 7, 10, 11**
  p. 110 # 4, 8, 12, 15