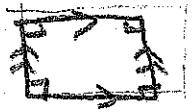
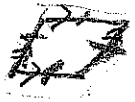
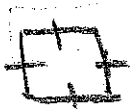
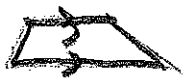
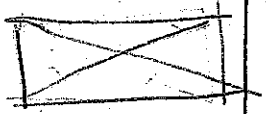
B) Classifying Quadrilaterals

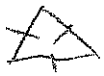
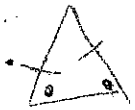
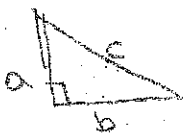
* a quadrilateral is a 4-sided, 2-dimensional figure

	Parallelogram	Rectangle	Rhombus	Square	Trapezoid	Kite
diagram						
lengths of sides	opposite sides are equal	opposite sides are equal	All sides are equal	All sides are equal	No sides are equal	2 pairs of equal sides
slopes of sides	opposite sides are parallel (same slopes)	opposite sides are parallel (same slopes), adjacent sides are at 90°	Opposite sides are parallel (same slopes)	Opposite sides are parallel (same slope, adjacent sides are at 90°	one pair of sides equal (same slope)	No sides parallel, more have same slopes
characteristics of diagonals	Diagonals bisect each ~~other~~? other 	Diagonals are equal and bisect each other 	Diagonals are ~~perpendicular~~? and bisect each other. 	Diagonals are equal, perpendicular and bisect each other 	No special properties (advanced: ratios of the segments)	Diagonals are perpendicular, one is bisected by the other

MPM 2D

(2.4) **Classifying Figures on a Coordinate Grid**

A) Classifying Triangles

	Scalene	Equilateral	Isosceles	Right	Right Isosceles
diagram					
lengths of sides	all different	all same	2 same	N/A $c^2=a^2+b^2$	2 same
angle measures	all different	all same 60	2 same	one is 90°	one at 90° and 2 at 45°

TO "VERIFY" or "PROVE":

1) sides are the same length:

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

2) sides are **parallel** } same ***slopes***

perpendicular } slopes are ***negative reciprocals***

↓

right angle } ~~slopes are negative reciprocals~~

(2.4) Classifying Figures on a Coordinate Grid

When you are given the coordinates of the vertices of a geometric figure, you can determine the slopes and lengths of the line segments of the geometric figure to verify its type.

Ex. 1. Determine if the triangle shown below is isosceles.

$d_{ab} = \sqrt{(5-2)^2 + (8-1)^2}$

$d_{ab} = \sqrt{3^2 + 7^2}$

$d_{ab} = \sqrt{58}$

$d_{bc} = \sqrt{(5-6)^2 + (8-1)^2}$

$d_{bc} = \sqrt{(-1)^2 + 7^2}$

$d_{bc} = \sqrt{1+49}$

$d_{bc} = \sqrt{50}$

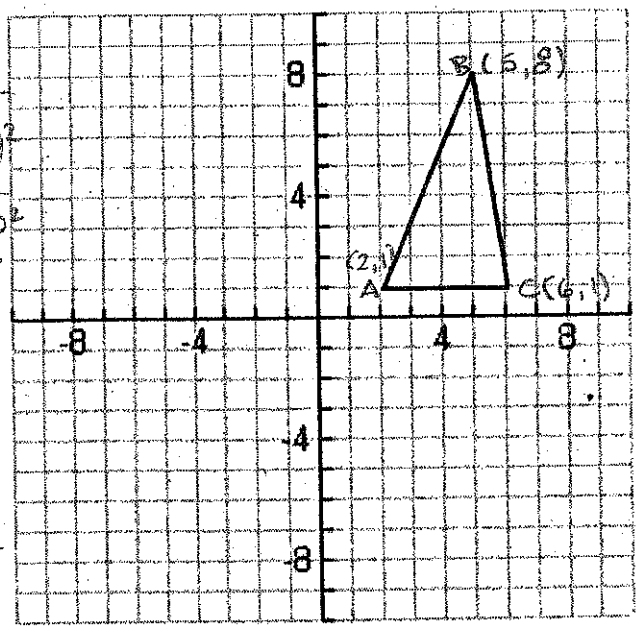
$d_{ac} = \sqrt{(6-2)^2 + (1-1)^2}$

$d_{ac} = \sqrt{4^2 + 0^2}$

$d_{ac} = \sqrt{16}$

$d_{ac} = 4$

∴ no sides have equal length, the triangle is not isosceles.



Ex. 2. A quadrilateral has vertices at A(-4, 0), B(1, 5), C(8, 6), and D(3, 1). What type of quadrilateral is ABCD? AB BC CD AD

* find slopes

$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$

$m_{AB} = \frac{5-0}{1-(-4)}$

$m_{AB} = \frac{5}{5}$

$m_{AB} = 1$

$m_{bc} = \frac{6-5}{8-1} = \frac{1}{7}$

$m_{cd} = \frac{6-1}{8-3}$

$m_{cd} = \frac{5}{5}$

$m_{cd} = 1$

$m_{ad} = \frac{1-0}{3-(-4)}$

$m_{ad} = \frac{1}{7}$

$m_{ab} = m_{cd}$

$m_{bc} = m_{ad}$

$l_{ab} = l_{bc} = l_{cd} = l_{ad}$

∴ the quadrilateral is a rhombus

$d_{ab} = \sqrt{(1-(-4))^2 + (5-0)^2}$

$d_{ab} = \sqrt{(5)^2 + 5^2}$

$d_{ab} = \sqrt{50}$

$d_{bc} = \sqrt{(8-1)^2 + (6-5)^2}$

$d_{bc} = \sqrt{(7)^2 + (1)^2}$

$d_{bc} = \sqrt{50}$

$d_{cd} = \sqrt{(8-3)^2 + (6-1)^2}$

$d_{cd} = \sqrt{(5^2) - (5)^2}$

$d_{cd} = \sqrt{50}$

$d_{ad} = \sqrt{(3-(-4))^2 + (1-0)}$

$d_{ad} = \sqrt{7^2 + 1^2}$

$d_{ad} = \sqrt{50}$