

Mathematics 10D

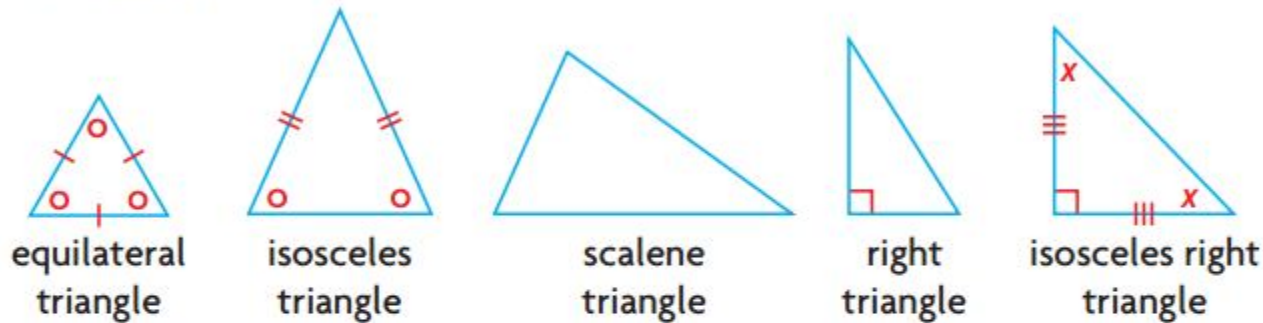
2.4 – Classifying Figures on a Coordinate Grid

Mr. D. Hagen

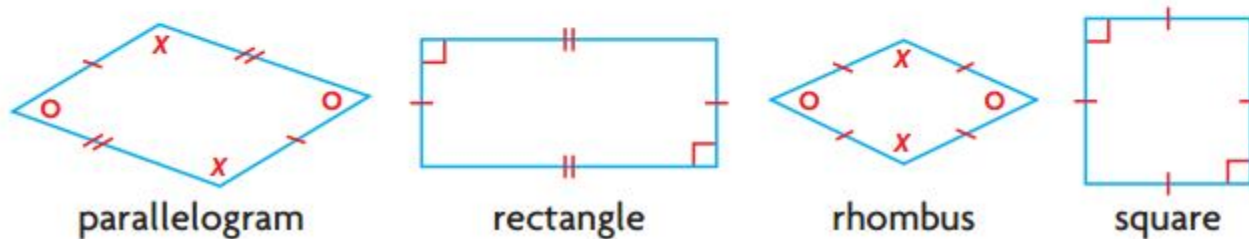
Things you must know and understand for the rest of this unit:

1. Midpoint
2. Distance
3. Slope – understand parallel and perpendicular
4. Write linear equations
5. Find point of intersection
6. Terms – median, vertex, line segment, midsegment, etc...
7. “Using **analytic geometry**” – geometry that uses an xy grid, algebra and equations to describe relations and solve problems related to geometric figures
8. Shapes

Triangles



Quadrilaterals



Example 1: Verify what type of quadrilateral is formed by the points P(-5,-5), Q(-30,10), R(-5,25) and S(20,10).

$$d_{PQ} = \sqrt{(-5 - -30)^2 + (-5 - 10)^2} = \sqrt{(25)^2 + (-15)^2} = \sqrt{850} = 29.15$$

$$d_{QR} = \sqrt{(-5 - -30)^2 + (25 - 10)^2} = \sqrt{(25)^2 + (15)^2} = \sqrt{850} = 29.15$$

$$d_{RS} = \sqrt{(20 - -5)^2 + (10 - 25)^2} = \sqrt{(25)^2 + (-15)^2} = \sqrt{850} = 29.15$$

$$d_{SP} = \sqrt{(20 - -5)^2 + (10 - -5)^2} = \sqrt{25^2 + 15^2} = \sqrt{850} = 29.15$$

$$m_{PQ} = \frac{-5 - 10}{-5 - -30} = \frac{-15}{25} = \frac{-3}{5}$$

$$m_{RS} = \frac{10 - 25}{20 - -5} = \frac{-15}{25} = \frac{-3}{5}$$

$$m_{QR} = \frac{25 - 10}{-5 - -30} = \frac{15}{25} = \frac{3}{5}$$

$$m_{SP} = \frac{10 - -5}{20 - -5} = \frac{15}{25} = \frac{3}{5}$$

$\therefore$ A rhombus

Example 2: A triangle has vertices at A(-1,-1), B(2,0) and C(1,3). Using analytic geometry, determine what type of triangle it is.

$$d_{AB} = \sqrt{(-1-2)^2 + (-1-0)^2} = \sqrt{(-3)^2 + (-1)^2} = \sqrt{10} = 3.16$$

$$d_{BC} = \sqrt{(2-1)^2 + (0-3)^2} = \sqrt{(1)^2 + (-3)^2} = \sqrt{10} = 3.16$$

$$d_{CA} = \sqrt{(1-(-1))^2 + (3-(-1))^2} = \sqrt{(2)^2 + (4)^2} = \sqrt{20} = 4.47$$

$$m_{AB} = \frac{-1-0}{-1-2} = \frac{-1}{-3} = \frac{1}{3}$$

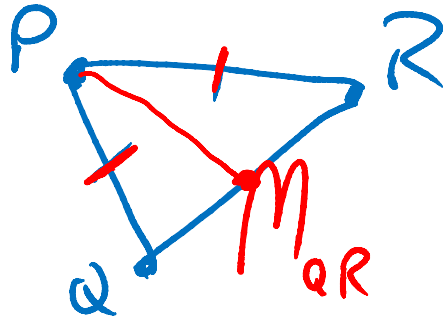
$$m_{BC} = \frac{0-3}{2-1} = \frac{-3}{1}$$

$\therefore$ isosceles right triangle!

$$\begin{aligned} a^2 + b^2 &= c^2 \\ (\sqrt{10})^2 + (\sqrt{10})^2 &= (\sqrt{20})^2 \\ 10 + 10 &= 20 \\ 20 &= 20 \\ \therefore \text{isosceles right triangle!} \end{aligned}$$

Example 3: Tony is constructing a patterned concrete patio that is in the shape of an isosceles triangle, as requested by his client. On his plan, the vertices of the triangle are at P(2,1), Q(5,7) and R(8,4). Each unit represents 1m.

- Confirm that the plan shows an isosceles triangle.
- Calculate the area of the patio.



$$a) \quad d_{PQ} = \sqrt{(2-5)^2 + (1-7)^2} = \sqrt{(-3)^2 + (-6)^2} = \sqrt{45} \checkmark$$

$$d_{QR} = \sqrt{(5-8)^2 + (7-4)^2} = \sqrt{(-3)^2 + 3^2} = \sqrt{18}$$

$$d_{RP} = \sqrt{(8-2)^2 + (4-1)^2} = \sqrt{6^2 + 3^2} = \sqrt{45} \checkmark$$

$$M_{QR} \left(\frac{5+8}{2}, \frac{7+4}{2} \right)$$

$$M_{QR} (6.5, 5.5)$$

$$d_{M_{QR}P} = \sqrt{(6.5-2)^2 + (5.5-1)^2} = \sqrt{(4.5)^2 + (4.5)^2} \\ = \sqrt{40.5} = 6.36$$

$$A = \frac{bh}{2} = \frac{(4.24)(6.36)}{2} = 13.48 \text{ m}^2$$