

Mathematics 10D

Unit 2 – Analytic Geometry

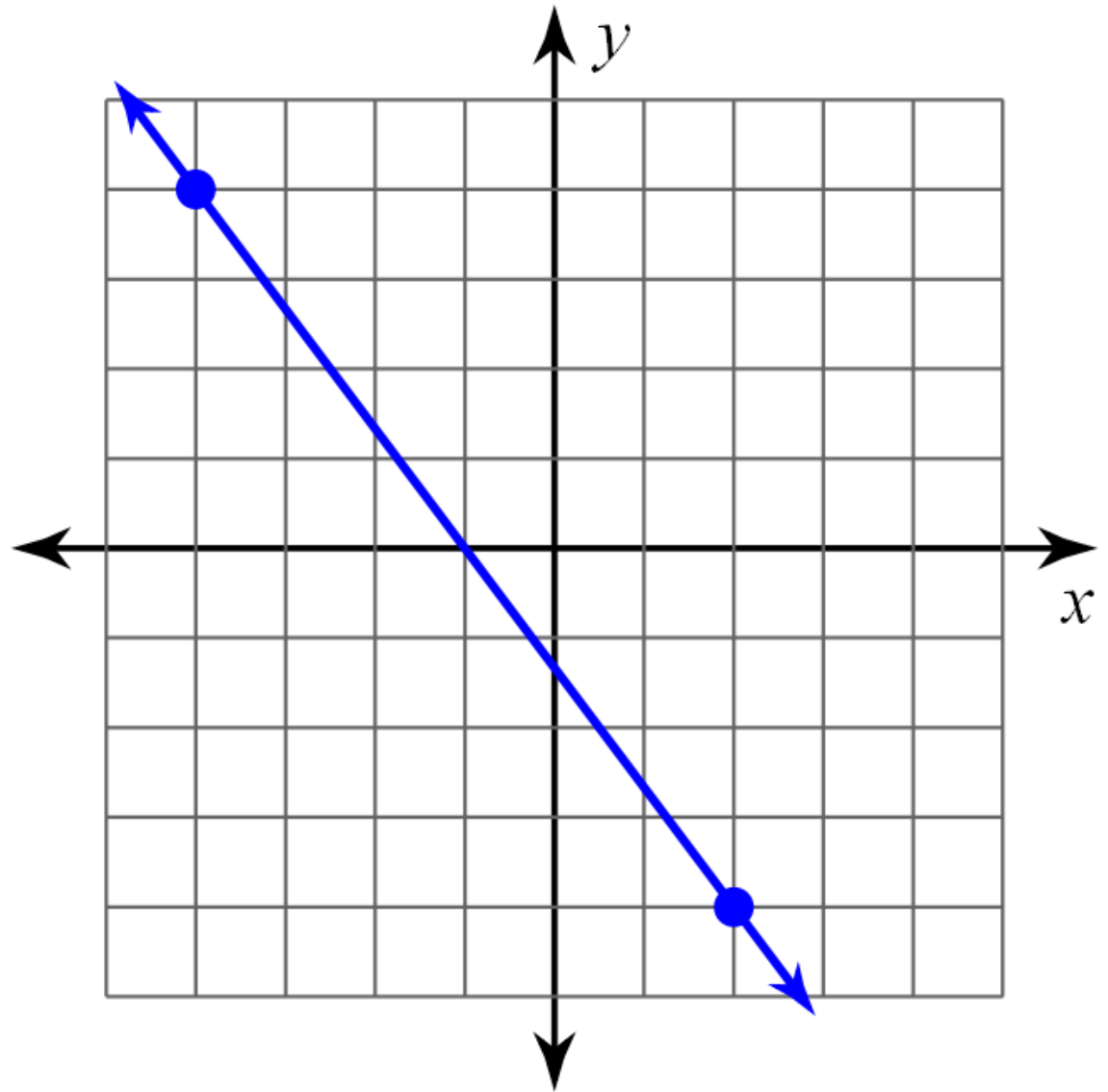
Mr. D. Hagen

Mathematics 10D 2.1 – Midpoint of a Line Segment

A **line segment** is a line that connects two points. A **midpoint**, then, is the point that represents the middle of that line segment.

Question: If you scored a 70% on a test and then an 82% on the next test, what is the average of those tests?

Find the midpoint of the line segment below:



The coordinate of the midpoint is:

$$M_{AB} \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Find the midpoint of the points:

$$(6, -9), (-2, -4)$$

$$(-655, 848), (117, 976)$$

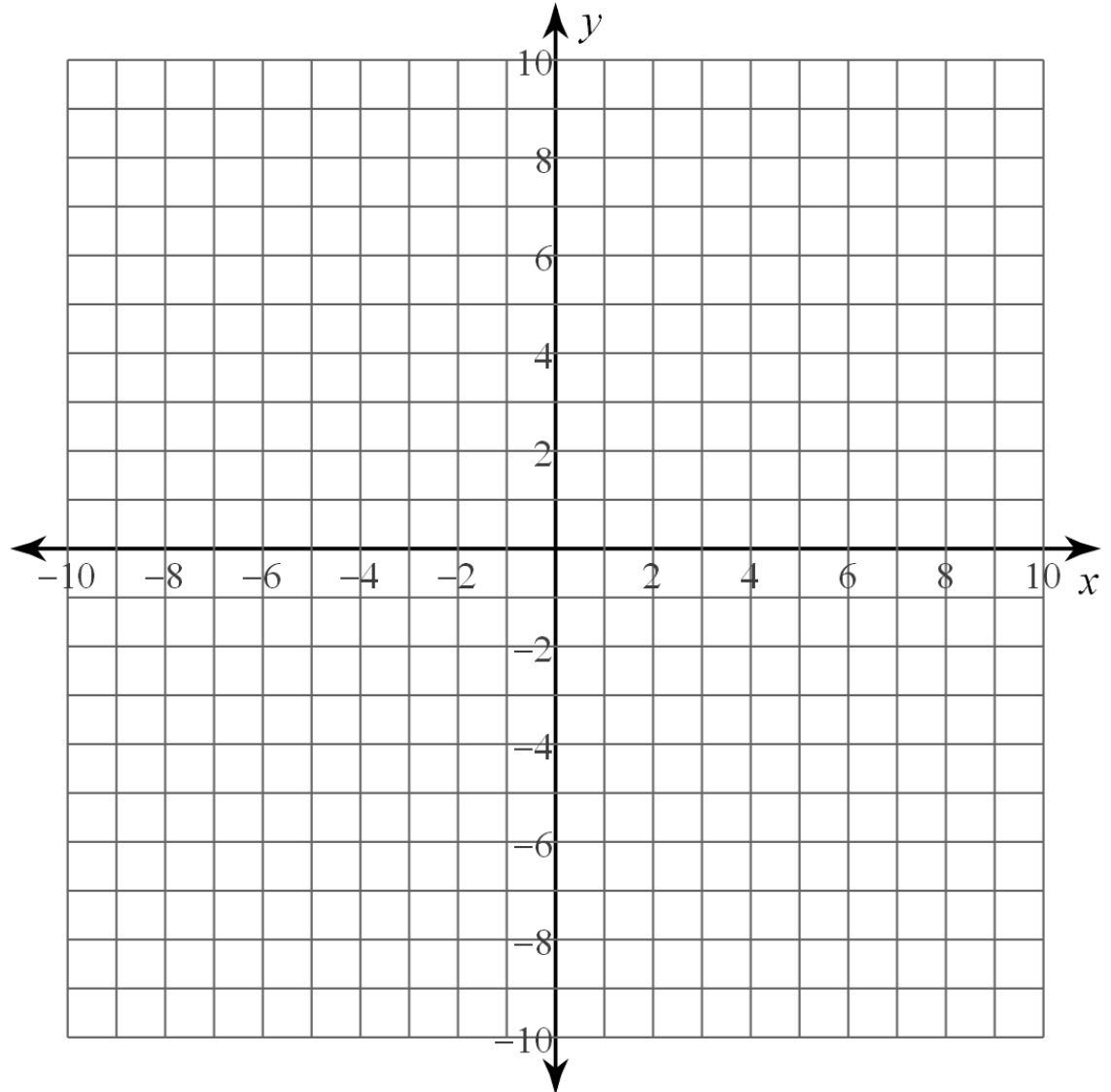
Given one endpoint and the midpoint, find the second endpoint.

Endpoint: $(-8, -6)$, midpoint: $(2, 1)$

Endpoint: $(5, 4)$, midpoint: $(27, 40)$

The Big Question: A triangle has vertices at $A(-3,1)$, $B(3,5)$ and $C(7,-3)$. Determine the equation of the **median** from vertex A.

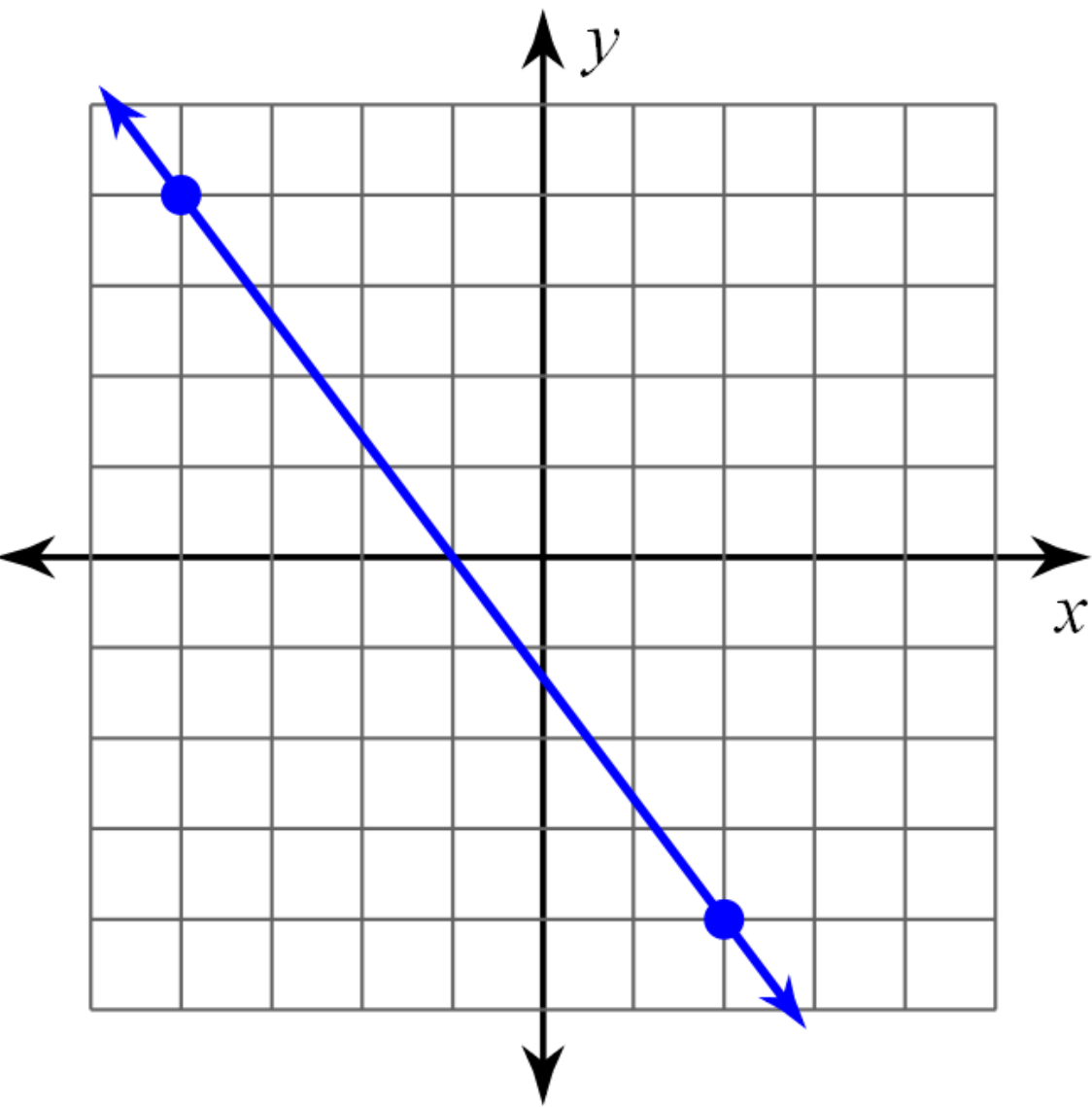
A **median** is a line segment that joins a vertex of a triangle to the midpoint of the opposite side.



Another Big Question: Find the equation of the perpendicular bisector of the points $A(-2,7)$ and $B(6,1)$.

Mathematics 10D 2.2 – Length of a Line Segment

Find the distance between the two points:



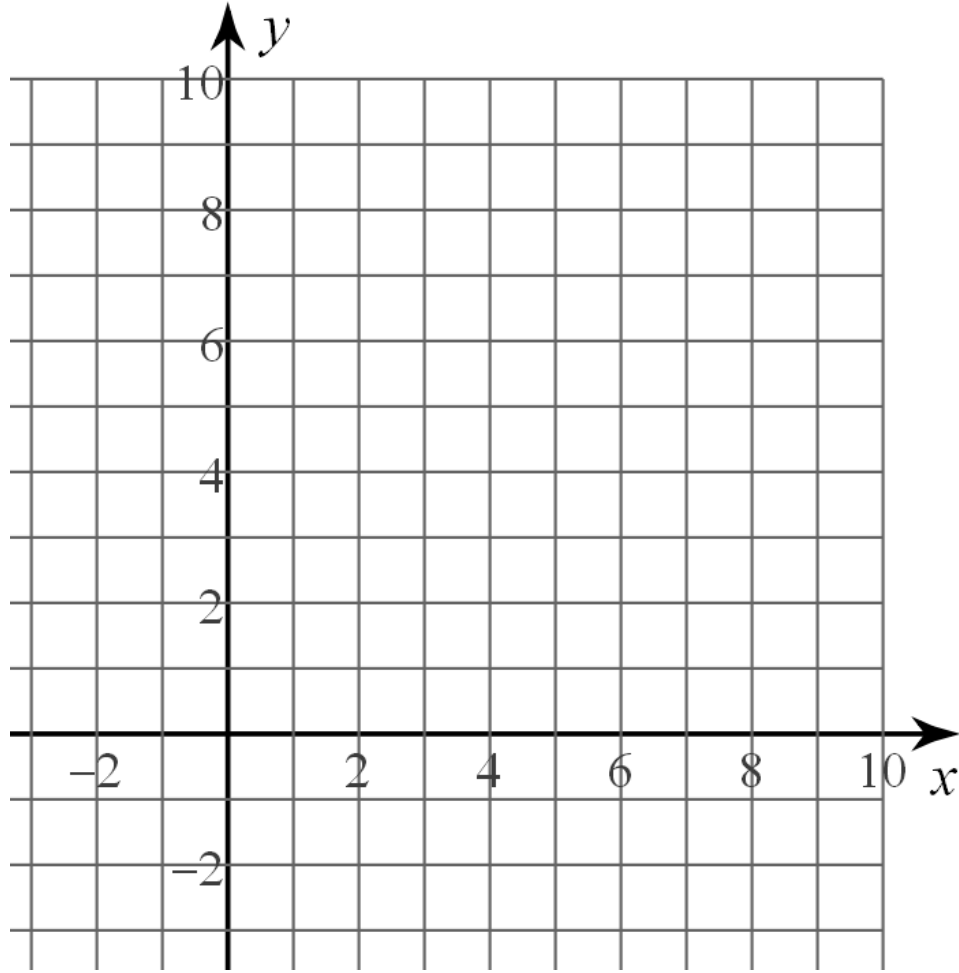
Let's derive the Distance Formula:

Find the distance between the two given points:

$$(8, 6), (-2, -7)$$

$$(18, -2), (-17, 4)$$

The Big Question: Calculate the shortest distance from point A(6,5) and the line $y=2x+3$.

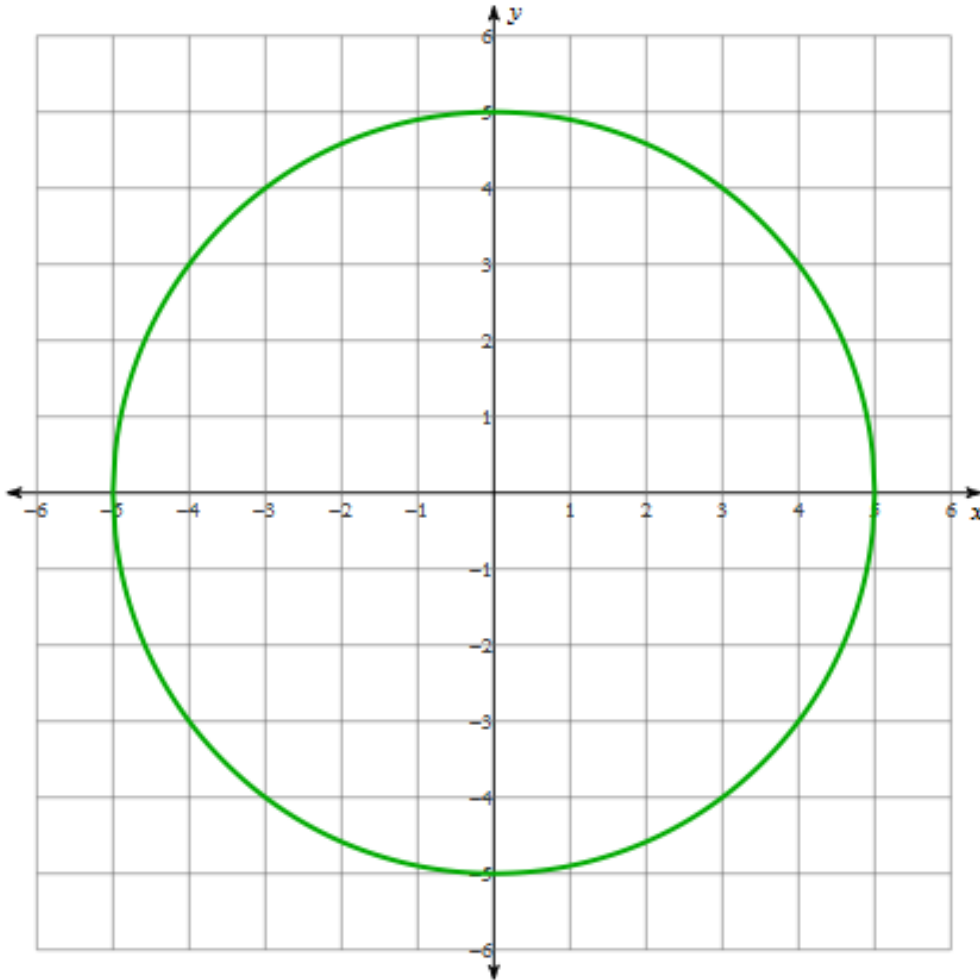


Let's Do Another!: Calculate the shortest distance from point B(-2,-3) and the line

$$y = -\frac{2}{5}x + 6$$

Mathematics 10D 2.3 – Circles

A Circle centred around origin at (0,0):



Write the equation of the circle given:

$$r = 8$$

$$(-3, 7)$$

Given the circle $x^2+y^2=80$, determine if the following points are inside, on or outside the circle:

A(2,4)

B(7,-5)

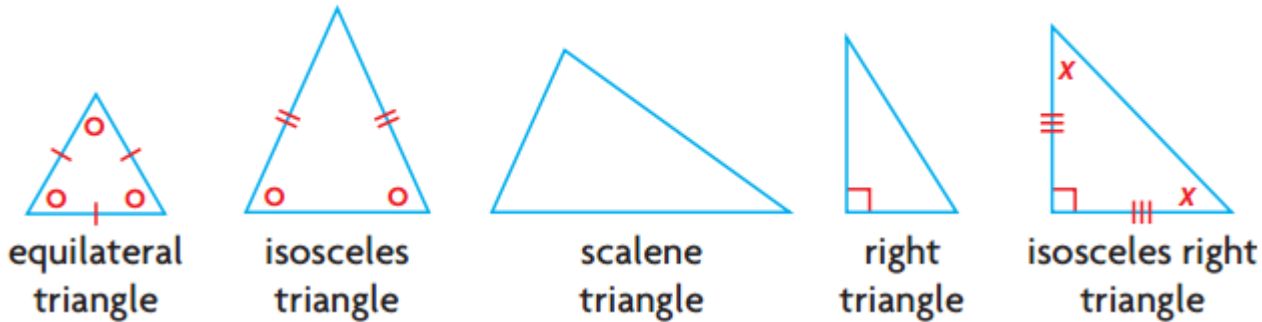
C(5,-6)

Last Question: A stone is dropped into a pond, creating a circular ripple. The radius of the ripple increases by 4cm/s. Determine an equation that models the circular ripple after 10 seconds.

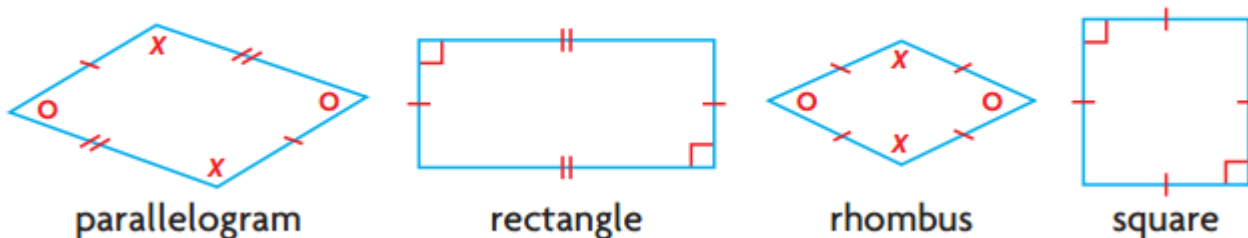
Things you must know and understand for the rest of this unit:

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



Mathematics 10D 2.4 – Classifying Figures on a Coordinate Grid

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

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.

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.

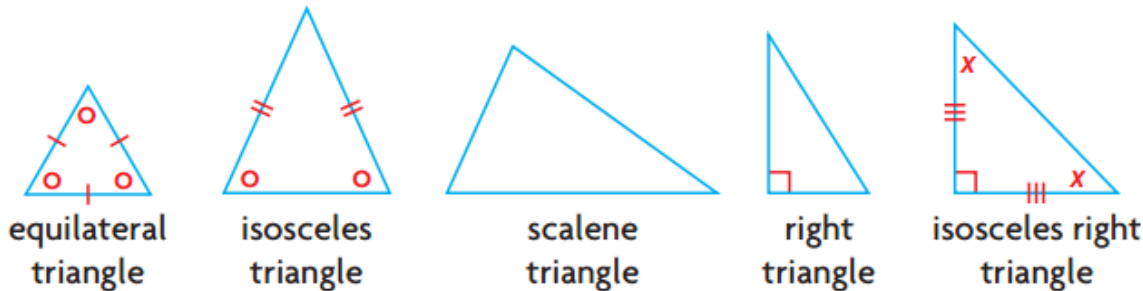
- a) Confirm that the plan shows an isosceles triangle.
- b) Calculate the area of the patio.

Mathematics 10D 2.5 – Verifying Properties of Geometric Figures

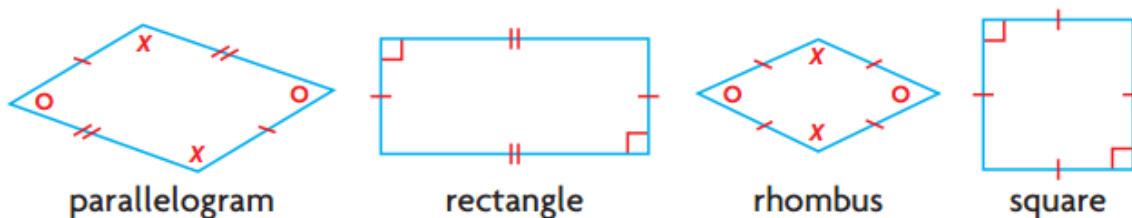
Things you must know and understand for the rest of this unit:

1. Midpoint
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6. Terms – median, vertex, line segment, midsegment, etc...
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Quadrilaterals



Example 1: Show that the midsegments of the quadrilateral, with vertices at $P(-7,9)$, $Q(9,11)$, $R(9,-1)$ and $S(1,-11)$, form a parallelogram.

Example 2: A triangle has vertices at $A(-2,2)$, $B(1,3)$ and $C(4,-1)$. Show that the midsegment joining the midpoints of AB and AC is parallel to BC and half its length.

Example 3: Show that points A(10,5) and B(2,-11) lie on the circle with equation $x^2 + y^2 = 125$. Also show that the perpendicular bisector of **chord** AB passes through the centre of the circle.

