3. Coordinate Geometry (2 dimensions only)

3.1	Know and use the definition of a gradient	

Covered in N5.

3.2	Know the relationship between the gradients of parallel and perpendicular lines	Show that *A* (0, 2), *B* (4, 6) and *C* (10, 0) form a right-angled triangle

If lines are **parallel** then they have the **same gradient**.

If a line has gradient $m = \frac{p}{q}$ then **perpendicular** line has gradient $m_{\perp} = -\frac{q}{p}$

To show lines (gradients m_1, m_2) are perpendicular show $m_1 \times m_2 = -1$

3.3	Use Pythagoras' theorem to calculate the distance between two points	

Draw a right-angled triangle or use distance = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

3.4	Use ratio to find the coordinates of a point on a line given the coordinates of two other points.	Including midpoint

Given points (x_1, y_1) and (x_2, y_2) midpoint = $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Use a **sketch** for finding a point that divides in a ratio.
e.g. If C divides line AB in ratio 2:3 it lies $\frac{2}{5}$ of the way from A to B

3.5	The equation of a straight line $y = mx + c$ and $y - y_1 = m(x - x_1)$ and other forms	Including interpretation of the gradient and y-intercept from the equation

Second equation also known as $y - b = m(x - a)$ where (a, b) is **any** point that lies on the line. $y = mx + c$ is best when y-intercept is known.

Rearrange to $y = \ldots$ if the gradient and y-intercept are needed, as in N5.

3.6	Draw a straight line from given information	

As in N5.

3.7	Understand that $x^2 + y^2 = r^2$ is the equation of a circle with centre (0, 0) and radius r	Including writing down the equation of a circle given centre (0, 0) and radius The application of circle geometry facts where appropriate: the angle in a semi-circle is 90°; the perpendicular from the centre to a chord bisects the chord; the angle between tangent and radius is 90°; tangents from an external point are equal in length.

Circle geometry as in N5 plus "angle at the centre is double" and opposite angles of a quadrilateral with vertices on a circle add to $180°$

Circle equation follows from below, stated in formula sheet(?)

3.8	Understand that $(x-a)^2 + (y-b)^2 = r^2$ is the equation of a circle with centre (a, b) and radius r	Including writing down the equation of any circle given centre and radius

Often requires distance between two points, e.g. to calculate radius.

Midpoint of either end of a diameter gives centre, plus general problem solving skills.

3.9	The equation of a tangent at a point on a circle	

Differentiation can be used to find the equations of tangents to curves, covered elsewhere. But this is **not the approach to use for tangents to circles**, because the form of the equation is not ideal for differentiation.

Instead, calculate the gradient of the radius to that point (point to centre), and then remember that tangents to circles meet radii at a right-angle, so find the perpendicular gradient and use that.