

Polynomials

1

- A polynomial is an expression which can be written in the form $ax^n + bx^{n-1} + cx^{n-2} \dots$ when a, b, c are constants and n is a positive integer.
- The **ORDER** of the polynomial is the highest power of x in the polynomial

3

Algebraic Division

Polynomials can be divided to give a **Quotient** and **Remainder**

Divide $x^3 - x^2 + x + 15$ by $x + 2$

$$\begin{array}{r}
 \overline{) \begin{array}{r} x^3 - x^2 + x + 15 \\ x^3 + 2x^2 \\ \hline -3x^2 + x \\ -3x^2 - 6x \\ \hline 7x + 15 \\ 7x + 14 \\ \hline 1 \end{array} } \\
 \leftarrow \text{Quotient} \\
 \leftarrow \text{Remainder}
 \end{array}$$

2

Factor Theorem

The factor theorem states that if $(x-a)$ is a factor of $f(x)$ then $f(a) = 0$

Show that $(x-3)$ is a factor of $x^3 - 19x + 30 = 0$

$$f(x) = x^3 - 19x + 30$$

$$f(3) = 3^3 - 19 \times 3 + 30$$

$$= 0$$

$f(3) = 0$ so $(x-3)$ is a factor

Coordinate Geometry

1

$$y = mx + c$$

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

the line intercepts the y axis at $(0, c)$

Positive gradient

Negative gradient

Finding the equation of a line with gradient m through point (x_1, y_1)

Use the equation $(y - y_1) = m(x - x_1)$

If necessary rearrange to the required form $(ax + by = c \text{ or } y = mx + c)$

2

Parallel and Perpendicular Lines

$$y = m_1x + c_1 \quad y = m_2x + c_2$$

If $m_1 = m_2$ then the lines are **PARALLEL**

If $m_1 \times m_2 = -1$ then the lines are **PERPENDICULAR**

3

Finding mid-point of the line segment joining (a, b) and (c, d)

$$\text{Mid-point} = \left(\frac{a+c}{2}, \frac{b+d}{2} \right)$$

4

A circle with centre $(0,0)$ and radius r has the equations $x^2 + y^2 = r^2$

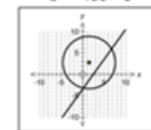
A circle with centre (a,b) and radius r is given by $(x-a)^2 + (y-b)^2 = r^2$

5

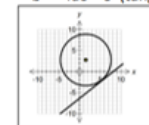
Find the equation of a tangent to a circle at (a, b)

The gradient of the tangent at (a, b) , is perpendicular to the gradient of the radius which meets at the circumference at (a, b)

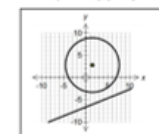
$$b^2 - 4ac > 0$$



$$b^2 - 4ac = 0 \text{ (tangent)}$$



$$b^2 - 4ac < 0$$





How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice:** Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.

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