Year 11 Higher Term 1 – Knowledge Organiser

Circle Theorems

You need to remember all the keywords in here to be able to describe them -

KEYWORDS
Tangent, Chord, Circumference, Diameter, Angle, Cyclic, Radius

Simultaneous Equations
the harder ones!!

$x^2 + y^2 = 25$ (1)
$y = x + 1$ (2)

Sub (2) into (1)
$x^2 + (x + 1)^2 = 25$
$x^2 + (x + 1)(x + 1) = 25$
$x^2 + x^2 + x + x + 1 = 25$
$2x^2 + 2x + 1 = 25$
$2x^2 + 2x - 24 = 0$

Divide equation by 2
$x^2 + x - 12 = 0$

Factorise
$(x + 4)(x - 3) = 0$

Solve
$x + 4 = 0$ $x - 3 = 0$
$x = -4$ $x = 3$

Sub x values into (2) to find y
$y = -4 + 1$ $y = 3 + 1$
$y = -3$ $y = 4$

Answers
$x = -4, y = -3$
$x = 3, y = 4$

Set Notation – {This is where we use those wiggly brackets}

Set Notation

List them!
{1,3,5,7,9,11,13}

Describe them!
{the odd natural numbers greater than 0 and less than 14}

More formal notation (set-builder notation)
$\{x \in \mathbb{N} \mid 0 < x < 14, x \text{ is odd}\}$

all the numbers   that are in   the natural numbers   such that

These could come up with Venn diagrams as-well.
Keywords
Set Notation

Algebraic Fractions … 3 things to be able to do

1. Simplify – factorise top and bottom and cancel out like terms and brackets

2. Manipulate - +, x, /, - Process the fractions the same way you would numerical fractions

3. Solve – Find the value for x…. these are the hardest, you will need to move around the algebra from side to side, then prob have to factorise aswell at the end…..

Iteration
Repeat- repeat - repeat

Fixed Point Iteration

$x^2 - x - 1 = 0$
$x_{n+1} = 1 + \frac{1}{x_n}$
Pick $x_1 = 2$
$x_2 = 1 + \frac{1}{2} = 1.5$
$x_3 = 1 + \frac{1}{1.5} = 1.666$
$x_4 = 1 + \frac{1}{1.666} = 1.6$

Remember to use your ans button on your calculator to help you out here.
Keywords – Iteration; converging, diverging, oscillating sequences

Vectors – You are going to have to…..
1. Manipulate - +, x, /, - them
2. Draw them
3. Use them in geometry
4. Find the magnitude (length) of them.
1.

2.

$\overrightarrow{OA} = (2,3)$

3.

4.

If a = $\binom{x}{y}$ then the magnitude
$|a| = \sqrt{(x^2 + y^2)}$
[by Pythagoras Theorem]

Note – parallel vectors are a scalar product of each other.
KEYWORDS
Vector, Magnitude, Parallel, perpendicular, Direction

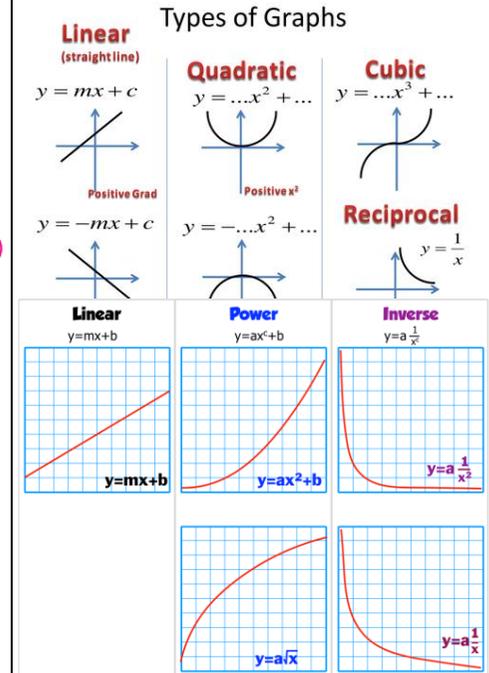|			
Circles and their Tangents Here you need to find the equation of the tangent, remember it is perpendicular to the radius. KEYWORDS Tangent, Radius, Gradient, Co-ordinates, Perpendicular	**Completing the Square…** this has lots of uses!!! 1. Shows the transformation of $y=x^2$ 2. Shows the turning point of the graph 3. Gives the line of symmetry of the graph. 4. when solved gives the points of intersection with the X axis. How cool is that!!! [2. The turning point of the one on the right is (2, 5) 3. Making the line of symmetry x=2]	How to do it… **Completing the Square** $x^2 - 4x + 9 = 0$ (original equation) $x^2 - 4x = -9$ (subtract 9 from both sides) $x^2 - 4x + 4 = 5$ (take half of b, then square it and add that value to both sides of the equation) $(x - 2)^2 = 5$ (break your perfect square into its binomials, made up of x, the sign in front of b, and the square root of your new c) $x - 2 = \sqrt{5}$ or $-\sqrt{5}$ (take the square root of both sides) $x = 2 + \sqrt{5}$ or $2 - \sqrt{5}$ (add 2 to both sides)	**Graph Recognition**
Plotting Graphs Any graph can be plotted the same way… 1. Draw a table of values for x 2. Substitute these values into the graph you have been given, to find values for y. 3. Plot on an axis, if you are lucky they will provide an axis, if not then make sure your scale is accurate.	**Algebraic Proof** **WHY OH WHY DO WE DO THIS…..I hear you asking..** **Well it can be used to prove pretty much everything in maths.** Processes: 1. Manipulate the algebra they have given you and factorise it to prove what they have asked	2. You may need to allocate your own algebra… Remember - n, n+1, n+2, n+3…. Are consecutive numbers. 2n is an even number 2n-1 is always an odd number.	