Year 12 Number and Algebra Skills Audit

These are all GCSE skills that you must know at the start of the A Level course. The aim of this activity is to identify what you can and cannot do, and then to practise your weaker topics. **You must show all of your working and not use a calculator.**

Bring your completed work to your first Maths lesson of year 12.

Skill	Question
Simplify an expression	**Simplify:** $4m^2n + 5mn^2 - 2m^2n + mn^2 - 3mn^2$ $(r^2 + 3t^2 + 9) - (2r^2 + 3t^2 - 4)$ $(p^3)^2 \div p^4$ $3a^4 \times 2a^5 \times a^3$
Expand brackets	**Expand and simplify:** $-3y(5 - 2y^2)$ $3x^2(2x + 1) - 5x^2(3x - 4)$
Factorise an expression	**Factorise:** $x^2 + 4x$ $x^2 - 4$ $2x^2 + 5x + 2$ $3x^4 - 26x^2 - 9$

Use the rules of indices	**Simplify:** $x^{\frac{3}{2}} \times x^{\frac{5}{2}}$ $3x^4 \times 2x^{-5}$ $(4x)^3 \div (2x^2)^2$ **Evaluate:** $25^{\frac{1}{2}}$ $(-6)^0$ $\left(\frac{8}{27}\right)^{\frac{-2}{3}}$
Simplify surds	**Simplify:** $\sqrt{80}$ $\sqrt{12} + 3\sqrt{48} + \sqrt{75}$
Rationalise the denominator of a surd	**Rationalise the denominator and simplify:** $\frac{1}{\sqrt{3}}$ $\frac{\sqrt{3}}{\sqrt{18}}$

	$\frac{1}{3+\sqrt{2}}$ $\frac{\sqrt{3}+\sqrt{5}}{\sqrt{5}-\sqrt{3}}$
Solve equations and inequalities	**Solve:** $3x-2=7x+1$ $2x^2+x=15$ $4-x<7x+5$ $3x-2y=10\ and\ 5x+4y=13$
Coordinate Geometry	Find the distance between the points (-2,7) and (4,3), leaving your answer in its simplest form. Find the equation of a line perpendicular to y=3x-7 that passes through the point (4,-1), leaving your answer in the form $ax+by+c=0$, where a b and c are integers. The points (0,1) (4,0) (a,b) and (5,4) are vertices of a square. Find the values of a and b and hence the area of the square.
Open Task 1	Pick three different integers between -4 and 4 inclusive. (0 is not allowed!) Replace the squares below with your three numbers in some order (no repeats!) $(x+\square)(\square x+\square)$

	How many different orders are there? Write down all these expressions, then... multiply them all out, then... add all the results together. Now take this sum: can you factorise it? Do you notice anything? Does it matter what the starting list of numbers is? Can you make any conjectures? Can you prove these?
Open Task 2	...1, 3, 5, 7, 9, 11.... ...-16, -5, 6, 17, 28, 39... ...78, 76, 74, 72, 70, 68... Each of the above sequences is called ARITHMETIC; the terms go up or down by a constant amount each time. Pick six consecutive terms from an arithmetic sequence, and place them in order into the squares below. (Keep the numbers as simple as you can to start with!) $\square x + \square y = \square$ $\square x + \square y = \square$ Now solve the pair of simultaneous equations you have created. What do you discover? Can you make a conjecture? Can you prove it?