BREAKTHROUGH MATHS
PROBLEMS SOLVED

NICKS & TRICKS

LUKE'S GUIDE TO JUNIOR CERT HL MATHS

Topic 1 - Algebra

Algebra is the MOST vital part of your entire Junior Cert Maths Exam! Around 30% of questions on your exam will contain entirely algebra sections and algebra ideas will be used in every single area of maths! Learn the below nicks & tricks to help you find "x":

(i) Solving Equations
(ii) Algebraic Fractions
(iii) Roots
(iv) Indices
(v) Simultaneous Equations
(vi) Spotting the -b Formula
(vii) Factorising
(viii) Algebraic Long Division

(i) SOLVING EQUATIONS

1. All Letters to the Left, all numbers to the right.

2. Not joined by the hip, bring across equals and change sign.

3. Joined by the hip, bring under.

$$5x - 4 = 3x + 6$$
$$5x - 3x = 6 + 4$$
$$2x = 10$$
$$x = \frac{10}{2}$$
$$x = 5$$

(ii) ALGEBRAIC FRACTIONS

2 Different Types

+ or −

$$\frac{2}{3} + \frac{x}{4}$$

UP, UP, BOTTOM BOYS

$$\frac{(2)(4) + (3)(x)}{(3)(4)}$$

$$\frac{8 + 3x}{12}$$ ✓

=

$$\frac{2}{3} = \frac{x}{4}$$

UP, UP, NO BOTTOM BOYS

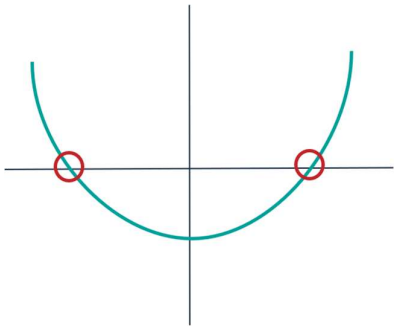
$$(2)(4) = (3)(x)$$

$$8 = 3x$$ ✓

(iii) ROOTS

A root is where the graph hits the x-axis!

2 roots here →



To find them for any function/equation:

Put the equation = 0 and solve!

(iv) INDICES

Multiplying = Add the Powers → $2^3 \times 2^2 \times 2^4 = 2^9$

Dividing = Subtract the Powers → $\frac{2^5}{2^3} = 2^2$

Brackets = Multiply the Powers → $(2^x)^2 = 2^{2x}$

The KEY to most of these questions is to rewrite everything in the question as the same number to different powers!

$$2^x = 8^4$$

$$2^x = (2^3)^4$$

$$2^x = 2^{12}$$

$$x = 12$$

(v) SIMULTANEOUS EQUATIONS

1. Label both equations

2. Multiply one or both equations so that the x's or y's are equal and opposite and then cancel!

Don't forget to sub your answer for x or y back in to get the other one!

$5x + 4y = 37$ (1)

$x + 2y = 11$ (2)

$5x + 4y = 37$ (1)

$-2x - 4y = -22$ (2) × -2

$3x = 15$

(vi) SPOTTING THE -B FORMULA

If the question says...

"Give your answer correct to two decimal places"

or

"Give your answer in surd form"

→ -b Formula!!

(vii) FACTORISING

4 Different Types

Highest Common Factor

$8x + 12x^2$

$4x(2 + 3x)$

1. Divide by biggest thing that goes into both terms
2. Write it outside a bracket!

Factorise by Grouping

$5fh - 2h^2 + 15f - 6h$

$h(5f - 2h) + 3(5f - 2h)$

$(h + 3)(5f - 2h)$

1. Do 2 Highest Common Factors.
2. Combine things outside brackets into their own bracket
3. Write down the repeating bracket once!

If your brackets don't match, try moving around some terms before you start!

Difference of 2 Squares

$16a^2 - 64$

$(4a - 8)(4a + 8)$

1. Write down:

(+)(-)

2. Put square root of the term on the left into left side of both brackets.
3. Square root of right term into right side of both brackets (ignore -)

Quadratics

$2x^2 + 8x + 8$ → $2 \times 8 = 16$

$4 + 4 = 8$

$4 \times 4 = 16$

$2x^2 + 4x + 4x + 8$

$2x(x + 2) + 4(x + 2)$

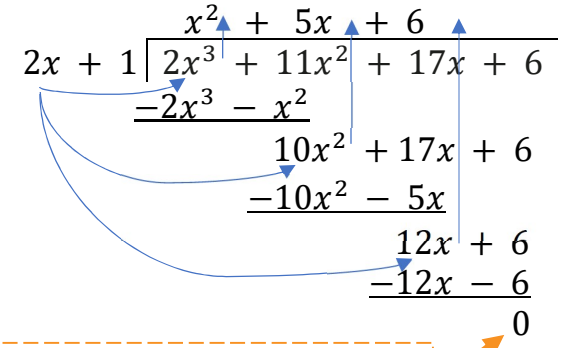
$(2x + 4)(x + 2)$

1. Multiply first and last number (ignore -).
2. Factors of this number that give you middle number?
3. Swap out middle number for these 2 numbers.
4. Do Factorising by Grouping!

(viii) ALGEBRAIC LONG DIVISION

The key to these questions is that you're only ever dividing by the number with the x in it! Never divide by the other number!

1. Divide by number with x in it.
2. Multiply answer by both numbers you are dividing by and add these underneath.
3. Swap sign for these numbers and repeat process.



Make sure you get a 0 at the end! If you don't you have gone wrong somewhere!

LUKE'S EXAM PREDICTIONS

- Algebraic Fractions has come up at least once every year for the past 5 years!
- Factorising has come up at least once every year for the past 5 years!
- The -b formula has come up 4 out of the 5 past years!
- Algebraic Long Division has come up 3 out of the past 5 years!

If you study this guide, you'll have a strong grasp of the most important part of your Junior Cert Maths Course! Understand how to tackle and start every type of question laid out here and you will notice a huge improvement in your mathematical ability!

"How do you eat an elephant? One bite at a time!"