BREAKTHROUGH MATHS

ALGEBRA

Algebra is the most vital part of your entire Junior Cert Maths Exam!

30 to 40% of questions will be entirely algebra.
Algebra is used in every single area of maths!

1. What You Must Know.
2. What You Should know.
3. What A+ Students know.

BREAKTHROUGH MATHS

1. What You Must Know

X is just a number!

X is the most common letter you will see in Algebra, and really, it's just a number that you don't know just yet!

However, any letter could be in its place, like Y, Z, S, T or A for example, but they are all just numbers too!

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Question

(i) Write down in terms of x, the ages of Liam and Noah on the 1st of January 2020.

Liam's age:
Noah's age

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Answer

(i) Noah is 3 years younger than Liam. Write down in terms of x, the ages of Liam and Noah on the 1st of January 2020.

1. We don't know how old Liam is, so we let his age be x.

2. If Noah is 3 years younger than Liam, then we subtract 3 from x, giving us x - 3.

3. Therefore, **Liam's age is x and Noah's age is x - 3**.

Answers

(ii) Ava's age is 2 years older than Liam.

Write down in terms of x, the ages of Ava, Liam, and Noah on the 1st of January 2022.

Ava's age:
Liam's age:
Noah's age:

1. Liam was x in 2020. Two years later, he is **x + 2**
2. Ava is 2 years older than Liam. She is **x + 4**
3. Two years later, Noah is (x - 3) + 2 = **x - 1**

That's it. That's your answer.

If they say 'Leave your answer in terms of 'x''..... that's all you have to do. Don't be afraid of 'x'!

BREAKTHROUGH MATHS

1. What You Must Know

Sum

The 'sum' of two numbers means that we add them together

Product

The 'product' of two numbers means that we multiply them by each other.

Split and Repeat

Split and repeat happens when there is 2 brackets with equations in them next to each other.

Step 1: Split the first bracket

Step 2: Put the whole 2nd bracket after the bits we just split.

Step 3: Solve and tidy!

Example:

$$(x+1)(x+2)$$

$$= x(x+2)+1(x+2)$$

$$= x^2 + 2x + x + 2$$

$$= x^2 + 3x + 2$$

Note:
x^2 multiplied by $x = x^3$

BREAKTHROUGH MATHS

Sum & Product

Find the sum of 12 and 18

Find the product of 7 and 9

Calculate the difference between the sum and product of 2,4 and 8

Solution **here**

1. What You Must Know

Squaring Brackets

This happens when a bracket with an equation inside is squared.

Example: $(x + 6)^2$

This is the same thing as saying $(x + 6)(x + 6)$

So in this case, separate the brackets and use the rule of **Split and Repeat**

BREAKTHROUGH MATHS

Multiplying Brackets

Expand the following brackets using multiplication:

$(x+1)(x+4)$

$(2x+1)(x+3)$

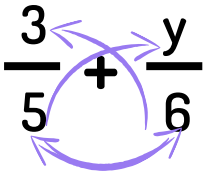
$(3x+4)^2$

Solution **here**

1. What You Should Know

Algebraic Fractions

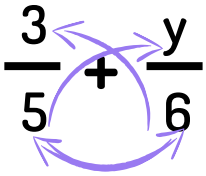
'+' or '-' in the middle



$$\frac{(3)(6)+(5)(y)}{(5)(6)}$$

$$\frac{(8)+(3x)}{12}$$

'=' in the middle



$$(3)(6)+(5)(y)$$

$$18+5y$$

1. When a number and a letter are 'stuck together'

e.g. $3x = 9$

We must divide by the number next to 'x' on both sides!

$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

2. When you're adding/subtracting a number from a letter

e.g. $m - 5 = 7$

We must bring the '-2' across the equals, and change its sign!

$$m - 5 = 7$$

$$m = 7 + 5$$

$$m = 12$$

BREAKTHROUGH MATHS

1. What You Should Know

1. $\frac{4}{5} + \frac{12}{x}$

2. $\frac{x+3}{5} - \frac{5}{10}$

3. $\frac{15}{x} = 5$

4. $x + 4 = 7$

5. $5x - 4 = 11$

6. $\frac{4t - b}{2} = c$

Note:
Any number can be put over 1,
do it with the 3 and solve as fractions!

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Algebraic Fractions

Solve & Simplify!

$$\frac{2x}{3} + \frac{1}{4}$$

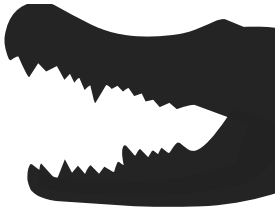
$$\frac{x+1}{2} = \frac{8x}{5}$$

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

Solution **here**

1. What Students Know

vs



Less than Greater than

Inequalities

Example 1

$$3x - 4 \geq 5$$

We solve this much like how we would solve for 'x' when there is an '=' sign, but there is 1 difference!
When we bring a number added/subtracted from 'x' to the other side, we must change the sign and turn the inequality around!

$$3x - 4 \geq 5$$

$$3x \geq 5 + 4$$

$$3x \geq 9$$

$$\frac{3x}{3} \geq 9 \div 3$$

$$x \leq 3$$

BREAKTHROUGH MATHS

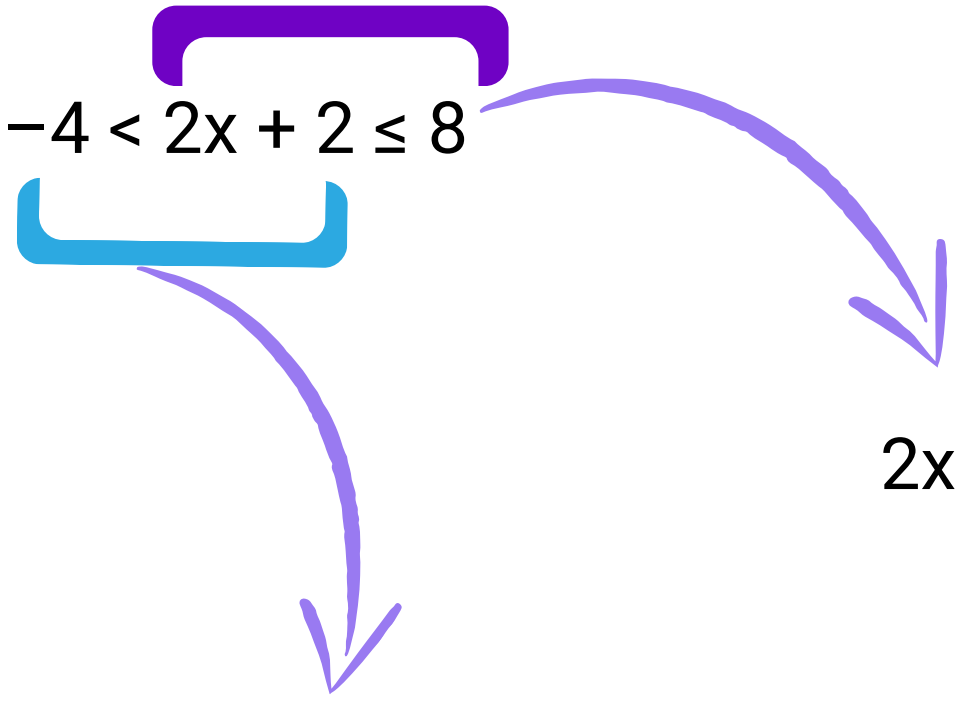
1. What You Should Know

Example 1

$$-4 < 2x + 2 \leq 8$$

THE CLAW METHOD

When there is more than one inequalities sign, use your claws to split up the equation and solve as a normal inequalities!



$$2x + 2 \leq 8$$

$$-4 < 2x + 2$$

Note

Don't forget to put it back together at the end

Solve these yourself:

BREAKTHROUGH MATHS

Inequalities

Solve the following inequalities

$2x + 3 > 15$

$8x - 6 \leqslant 7x + 12$

$-3 \leqslant 4x + 5 \leqslant 9$

Solution **here**