

# Quick Algebra Revision<sup>1</sup>

- The equals sign '=' **really does mean equals**. Not sort of equal or kind of related, but exactly equal. Don't be sloppy when you use it.
- Suppose  $x + 3 = 10$  and we want to find  $x$ .
  - We want to isolate  $x$ , so subtract 3 from the LHS. But also need to subtract 3 from the RHS or else the '=' no longer holds
  - $x + 3 - 3 = 10 - 3$  i.e.  $x = 7$
  - NB: can always verify the answer. Substitute  $x = 7$  into  $x + 3 = 10$  to get  $7 + 3 = 10$ .
- Suppose  $3x = 10$  and we want to find  $x$ .
  - Again, we want to isolate  $x$ . Divide LHS by 3, but also need to divide RHS by 3 so that '=' is still true
  - $3x/3 = 10/3$  i.e./  $x = 10/3$ .
  - Verify answer.
- Here's the fundamental rule of algebra: **if you do something (add, subtract, multiply, divide etc) to one side of the equation you must do the same thing to the other side too**. Always, every time ! You won't go wrong if you stick to this rule.

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<sup>1</sup>See e.g.

## Quick Algebra Revision<sup>2</sup>

- What about brackets e.g.  $4(8 + 3)$  ?
- First way: add  $8+3$  then multiply by 4 i.e.  $4(8 + 3) = 4 \times 11 = 44$
- Second way (using distributive property):  
 $4(8 + 3) = 4 \times 8 + 4 \times 3 = 32 + 12 = 44$
- Same rule holds when use variables rather than numbers e.g.  
 $2(x + y) = 2x + 2y$
- Also  $0.5(x + y) = 0.5x + 0.5y$  and  $(x + y)/2 = x/2 + y/2$
- Holds for any number of terms in the brackets  
 $(x + y + z)/2 = x/2 + y/2 + z/2$

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<sup>2</sup>See e.g. <https://www.khanacademy.org/math/pre-algebra/pre-algebra-arith-prop/pre-algebra-distributive-property>

# Quick Algebra Revision

Putting things together ...

- $5(x + 1) = 10$
- $5(x + 1) + 3 = 10$
- $5(2x + 1) + 3 = 10$