Quick Algebra Revision\(^1\)

- 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.

\(^1\)See e.g. https://www.khanacademy.org/math/algebra/one-variable-linear-equations
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• 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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2See e.g. https://www.khanacademy.org/math/pre-algebra/pre-algebra-arith-prop#pre-algebra-distributive-property
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Putting things together ...

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