How a Mathematics lecturer teaches...

- transposition - rearranging - solving - changing the subject of -

equations/formulae

• We **avoid** using terms "move", "cancel", "bring across equals sign", "cross-multiply" as these lead to student errors such as:

$$60 + R = 0 \Rightarrow R = 60 \qquad \times$$
$$\frac{60}{R} + 10 = 1 \qquad \Rightarrow R = 70 \qquad \times$$
$$R = \frac{\cancel{R} + 3}{2\cancel{R}} + 1 \qquad \Rightarrow R = 3 \qquad \times$$

♦ An equation says that a pair of quantities are equal. If we do the same "thing" (operation) to both "sides" of the equation we get another pair of equal quantities – another equation:

$$x = 16 x = 16 x = 16 \sqrt{x} = 16 \sqrt{x} = \sqrt{16}$$

$$\frac{x}{2} = \frac{16}{2} \sqrt{x} = \sqrt{16}$$

- We simplify formulae/equations step-by-step removing (getting rid of) things that are in the way of our subject by applying opposite/inverse operations.
- It helps to use the peeling of an onion removing outer layers before getting to the core
 as an analogy of getting to the subject in an equation.

Want to

get rid of s^2

get rid of π

get rid of the square

$$\pm \sqrt{\frac{A-s^2}{\pi}} = r$$

 $A = \pi r^2 + s^2$ $A - s^2 = \pi r^2$

 $\frac{A-s^2}{\pi} = r^2$

do to **both** sides $-s^2$ $\div \pi$ square root

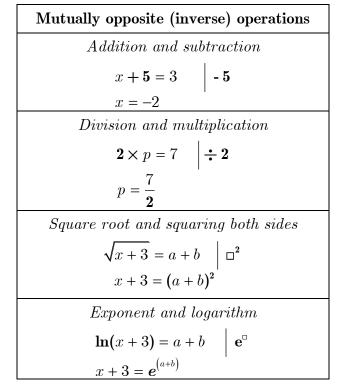


Department of Mathematics

Suggestions

how to quickly remind students about the main concepts

- 1. **Remind** the students that
 - we can do anything to an equation as long as we do the same thing to both sides;
 - we simplify/rearrange equations step by step by applying opposite/inverse operations.



2. Show 2-3 examples from your field. Perhaps one relatively easy and a harder one.

Make a the subject of
v = u + at
 $\frac{v - u}{t} = a$ do to both sidesExpress r from
 $p = \frac{r^2 + q^2}{L}$
 $pL = r^2 + q^2$
 $pL = r^2 + q^2$
 $pL = r^2 + q^2$
 $\sqrt{pL - q^2} = r^2$
 $\sqrt{pL - q^2} = r$ do to both sides
 $\times L$
 $- q^2$
square root

- **3. Emphasise** that it is OK to do many small (but correct) steps. It is also OK to think only of the next small step instead of 'having to plan the entire route in detail from the start'.
- 4. Give the students the memento with tips on transposition to keep and consult when needed. The memento can be printed on A4 paper and folded in two to look like an oversized bookmark. There is a link in the memento to a webpage with worked out examples.