

## Topic: Rearranging formulas

### Introduction:

Rearranging formulas means rewriting them in different ways such that the variable requested (subject) is left on one side of the equation. Rearranging formulas is an important skill in mathematics, particularly in solving equations.

### Refresher Video:

[https://youtu.be/cbKc\\_qilgzA](https://youtu.be/cbKc_qilgzA)

### Summary:

Rearranging formulas or changing the subject of a formula is exactly the same as solving an equation. The key thing to remember is that 'whatever you do to one side of the formula you must do to the other side'. To rearrange a formula you may:

- Add or subtract the same quantity to or from both sides

*Tip: This is equivalent to moving a quantity from one side to another with a different sign.*

- Multiply or divide both sides by the same quantity

*Tip: This is equivalent to moving a quantity from one side to another with the opposite operation ; i.e. move it as division if it was originally multiplication, and move it as multiplication if it was originally division.*

### Example a:

**Q:** Make  $x$  the subject of the formula  $a + x = y + z$

**A:**  $x = y + z - a$  (moved  $a$  to the other side as  $-a$ )

### Example b:

**Q:** Make  $x$  the subject of the formula  $a + 3x = y + z$

**A:**  $3x = y + z - a$  (moved  $a$  to the other side as  $-a$ )

$$x = \frac{y+z-a}{3}$$

(the 3 which is multiplied by  $x$  was moved as division)

**Example c:**

**Q:** Make  $x$  the subject of the formula  $\sqrt{x} - 3 = y$

**A:**  $\sqrt{x} = y + 3$  (moved  $-3$  to the other side as  $+3$ )

$x = (y + 3)^2$  (squared both sides to get rid of the  $\sqrt{\quad}$ )

**Tip:** To get rid of a power ( $n$ ), you take the  $n^{\text{th}}$  root. For example, if  $x^3 = a$ , then  $x = \sqrt[3]{a}$ .

**Questions:**

Make  $x$  the subject of these equations. Simplify your answers as much as possible.

- 1)  $x + 3y = 2v$
- 2)  $6v + x = w$
- 3)  $x^2 - v = w$
- 4)  $\frac{x^2}{5} = w + y$
- 5)  $\frac{x^2 - 4}{w} = y$
- 6)  $\frac{x}{y+4} = v$

**Answers:**

- 1)  $x = 2v - 3y$
- 2)  $x = w - 6v$
- 3)  $x = \sqrt{w + v}$
- 4)  $x = \sqrt{5(w + y)}$  or  $x = \sqrt{5w + 5y}$
- 5)  $x = \sqrt{yw + 4}$
- 6)  $x = v(y + 4)$  or  $x = yv + 4v$