

## A. Rearranging formulae

The subject of a formula is the single variable that everything else is equal to.  
Usually the variable on the left is the subject

$$C = \pi r^2 \text{ has } C \text{ as the subject}$$

$$F = ma \text{ has } F \text{ as the subject}$$

$$v = u + at \text{ has } v \text{ as the subject}$$

We can rearrange formulae using the same methods we use to solve equations

a. Make  $y$  the subject of  $P = 4y + 7$

$$P = 4y + 7$$

$$4y + 7 = P$$

$$4y = P - 7$$

$$y = \frac{P - 7}{4}$$

It can be helpful to swap sides to get the subject onto the left

b. Make  $g$  the subject of  $T = 2g - 5h$

$$T = 2g - 5h$$

$$2g - 5h = T$$

$$2g = T + 5h$$

$$g = \frac{T + 5h}{2}$$

c. Make  $h$  the subject of  $T = 2g - 5h$

$$T = 2g - 5h$$

$$T + 5h = 2g$$

$$5h = 2g - T$$

$$h = \frac{2g - T}{5}$$

This time, as our new subject is on the right and is negative we can add it to the left

d. Make  $k$  the subject of  $V = 5(3p - 2kb)$

$$V = 5(3p - 2kb)$$

$$V = 15p - 10kb$$

$$V + 10kb = 15p$$

$$10kb = 15p - V$$

$$k = \frac{15p - V}{10b}$$

e. Make  $u$  the subject of  $v^2 = u^2 - 2as$

$$v^2 = u^2 - 2as$$

$$v^2 + 2as = u^2$$

$$\sqrt{v^2 + 2as} = u$$

$$u = \sqrt{v^2 + 2as}$$

f. Make  $s$  the subject of  $v^2 = u^2 - 2as$

$$v^2 = u^2 - 2as$$

$$v^2 + 2as = u^2$$

$$2as = u^2 - v^2$$

$$s = \frac{u^2 - v^2}{2a}$$

g. Make  $w$  the subject of  $D = \sqrt{3w - k}$

$$D = \sqrt{3w - k}$$

$$D^2 = 3w - k$$

$$3w - k = D^2$$

$$3w = D^2 + k$$

$$w = \frac{D^2 + k}{3}$$

Swapping sides

The inverse of square root is square

h. Make  $m$  the subject of  $t = \frac{H^2}{d} - m$

$$t = \frac{H^2}{d} - m$$

$$t + m = \frac{H^2}{d}$$

$$m = \frac{H^2}{d} - t$$

i. Make  $d$  the subject of  $t = \frac{H^2}{d} - m$

$$t = \frac{H^2}{d} - m$$

$$t + m = \frac{H^2}{d}$$

$$d(t + m) = H^2$$

$$d = \frac{H^2}{t + m}$$

j. Make  $H$  the subject of  $t = \frac{H^2}{d} - m$

$$t = \frac{H^2}{d} - m$$

$$t + m = \frac{H^2}{d}$$

$$d(t + m) = H^2$$

$$H^2 = d(t + m)$$

$$H = \sqrt{d(t + m)}$$

### B. Rearranging when the new subject appears more than once

If the new subject appears more than once in the original formula we will have to factorise to make it appear only once.

a. Make  $p$  the subject of  $T = 3p + 4r$

$$T = 3p + 4r$$

$$T = p(3 + 4r)$$

$$p(3 + 4r) = T$$

$$p = \frac{T}{3 + 4r}$$

Factorising isolates  $p$

b. Make  $t$  the subject of  $5 - 4t = V + tr^2$

$$5 - 4t = V + tr^2$$

$$5 = V + tr^2 + 4t$$

$$5 - V = tr^2 + 4t$$

$$5 - V = t(r^2 + 4)$$

$$\frac{5 - V}{r^2 + 4} = t \quad \text{or} \quad t = \frac{5 - V}{r^2 + 4}$$

c. Make  $x$  the subject of  $mx + b = d - px$

$$mx + b = d - px$$

$$mx + px + b = d$$

$$mx + px = d - b$$

$$x(m + p) = d - b$$

$$x = \frac{d - b}{m + p}$$

d. Make  $x$  the subject of  $F = \sqrt{\frac{2xh + a}{x}}$

$$F = \sqrt{\frac{2xh + a}{x}}$$

$$F^2 = \frac{2xh + a}{x}$$

$$xF^2 = 2xh + a$$

$$xF^2 - 2xh = a$$

$$x(F^2 - 2h) = a$$

$$x = \frac{a}{F^2 - 2h}$$