

Algebraic Manipulation

1. Simplify the following as far as possible

a) $3ab + 2a - 3b - ab$

b) $2x^2 + 3x - 4x + 5 + 6x^2$

c) $2a \times 3a$

d) $e^2 \times 4e^3$

e) $3ab \times 2a$

f) $\frac{2x^2}{x}$

g) $\frac{6ab}{2ac}$

h) $\frac{a+b}{c-b}$

2. Multiply out the following brackets, and simplify the answer as far as possible

a) $3a(2 - b)$

b) $x(3x - 4)$

c) $-4y(2 + 5y)$

d) $-3a^2(4b - a)$

e) $(x + 2)(x - 3)$

f) $(2x - 5)(x - 7)$

g) $(1 - 4x)(2 + 7x)$

h) $(x^2 + 2)(2x + 5)$

3. Rearrange each of the following to make the letter indicated the subject

a) $s = ut + \frac{1}{2} at^2$

u

b) $F = \frac{GMm}{r^2}$

m

c) $F = \frac{GMm}{r^2}$

r

d) $I = \frac{Q}{t}$

t

e) $T = 2\pi \sqrt{\frac{L}{g}}$

L

f) $y = \frac{2-x}{3+x}$

x

g) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

R_1

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

v

4. In the following examples, the equation is given to you. Rearrange the equation for each of the other quantities. The first line shows an example of this.

Equation	First Rearrangement		Second Rearrangement	
(Power of lens) $P = \frac{1}{f}$	$1 = Pf$		$f = \frac{1}{P}$	
(Magnification of lens) $m = \frac{v}{u}$	$v =$		$u =$	
(refractive index) $n = \frac{c}{v}$	$c =$		$v =$	
(current) $I = \frac{\Delta Q}{\Delta t}$				
(electric potential) $V = \frac{\Delta E}{\Delta Q}$				
(power) $P = \frac{\Delta E}{\Delta t}$				
(power) $P = VI$				
(power) $P = I^2 R$				
(power) $P = \frac{V^2}{R}$				
(stress) $\sigma = \frac{F}{A}$	$F =$		$A =$	
(strain) $\varepsilon = \frac{x}{l}$	$x =$		$l =$	
(conductance) $G = \frac{\sigma A}{L}$				
(resistance) $R = \frac{\rho L}{A}$				
(phase angle) $\theta = 2\pi ft$	$f =$		$t =$	
(displacement) $y = a \sin \theta$	$a =$		$\theta =$	
(Young's interference) $x = \frac{\lambda L}{d}$				
(electron wavelength) $\lambda = \frac{h}{mv}$				