

Worksheet 6E

Manipulation of algebraic formulae

1. In each of the following, make the letter in the square brackets the subject of the formula.

(a) $y = 7p + 4q$

[p]

(b) $ax + by = c$

[y]

(c) $hk = abc$

[b]

(d) $pq^3 = \frac{3}{4}mn$

[m]

(e) $x = \frac{4p-5q}{8}$

[p]

(f) $y = \frac{ab}{x-c}$

[x]

(g) $S = \frac{n}{2}(2a+l)$

[l]

(h) $D = b^2 - 4ac$

[a]

(i) $v^2 = u^2 + 2gs$

[u]

(j) $L = \frac{gT^2}{4\pi^2}$

[T]

(k) $y = \sqrt{ax^2 + b}$

[a]

(l) $x + y = \sqrt[3]{6p+q}$

[p]

(m) $hx = kx + c$

[x]

(n) $V - r^3 = \frac{4}{3}\pi r^3$

[r]

(o) $xy = a(x - 6)$

[x]

(p) $\pi(a + b) = \frac{b}{kc}$

[b]

(q) $x = \frac{a(b-3)}{3+b}$

[b]

(r) $h = \frac{2k^2}{h-k^2}$

[k]

(s) $\frac{m}{n} = \frac{an+bn}{m}$

[n]

(t) $\frac{1}{4p} + \frac{2}{5q} = \frac{3}{r}$

[q]

(u) $a\sqrt{x} + b = p\sqrt{x} + q$

[x]

(v) $\sqrt[3]{\frac{m}{n} - \frac{an^3}{m^3}} = b$

[a]

(w) $x^2 + 2xy = 1 - y^2$

[y]

(x) $\frac{c}{x} - \frac{b^2y^2}{ax} = \frac{1}{9}ax(a^2x^2 - 6by)$

[b]

2. The total surface area, A units², of a solid is given by $A = 3\pi a(6a + b)$.
Make b the subject of the formula.
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3. It is given that $h = \frac{1}{4}k(a^2 - b^2)$.
- (i) Find h when $a = 8$, $b = -6$ and $k = 5$.
 - (ii) Express b in terms of a , h and k .
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4. It is given that $s = ut - \frac{1}{2}gt^2$.
- (i) Find s when $u = 4$, $t = 1$ and $g = 10$.
 - (ii) Express g in terms of s , u and t .
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5. Rearrange the formula $y = \frac{x^2 + a}{x^2 - b}$ to make x the subject.
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6. Rearrange the formula $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$ to make b the subject.

7. The time, T s, taken by a pendulum for one complete oscillation is given by $T = 2\pi\sqrt{\frac{L+r}{g}}$, where L is the length of the pendulum, r is the radius of the small metal ball attached and g is a constant. Express L in terms of π , g , r and T .

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8. The equation of a circle is $(x - a)^2 + (y - b)^2 = r^2$, where r is the radius and (a, b) are the coordinates of the centre of the circle.
- Write down the equation of a circle with centre at the origin and radius 6 units.
 - Express y in terms of a , b , r and x .

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9. The interest, $\$I$, charged by a bank for a renovation loan is calculated using the formula $I = P\left(1 + \frac{R}{100}\right)^n - P$, where $\$P$ is the amount borrowed, R is the interest rate per year and n is the number of years the loan is in force.
- Find the interest charged if \$30 000 is borrowed at an interest rate of 4% per year for 5 years.
 - Rearrange the formula $I = P\left(1 + \frac{R}{100}\right)^n - P$ to make P the subject.
 - Using your answer in part (ii), find the amount borrowed for 2 years at an interest rate of 2.5% per year if the total interest charged is \$1460, giving your answer to the nearest \$100.



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10. The equation of a straight line is $y = mx + c$, where m is the gradient and c is the y -intercept.
- Express m in terms of x , y and c .
 - Using the fact that the gradient of a line is the ratio of the vertical change to the horizontal change, show how the answer in part (i) may be obtained.