

### Exercise 18: Changing the subject of a formula

1. Change the subject of each formula to  $x$ .

(a) $y = x + 3$	(b) $y = x - 5$	(c) $y = x + a$	(d) $y = x - b$
(e) $y = 3x$	(f) $y = 10x$	(g) $y = kx$	(h) $y = ax$
(i) $y = 3p + x$	(j) $y = x - 5t$	(k) $y = 2x + 1$	(l) $y = 3x - 7$
(m) $y = 7x + 4a$	(n) $y = 3b + 4x$	(o) $y = 8 + 10x$	(p) $y = ax + b$
(q) $y = mx + c$	(r) $t = sx - r$	(s) $p = qx + 2r$	(t) $m = fx - 3n$
(u) $a = b + cx$	(v) $k = h - mx$	(w) $d = 3b + cx$	(x) $g = kc - hx$

2. Make  $a$  the subject of each formula.

(a) $b = 4 - a$	(b) $d = 12 - a$	(c) $y = 5x - a$	(d) $m = 2 - 2a$
(e) $q = 7 - 5a$	(f) $c = 20 - 3a$	(g) $r = s - 2a$	(h) $t = d - 4a$
(i) $z = 4b - 5a$	(j) $k = 2h - 7a$	(k) $p = 6q - 11a$	(l) $g = 2x - 9a$

3. Change the subject of each formula to the letter shown in brackets.

(a) $P = 4l$	(l)	(b) $V = IR$	(l)	(c) $S = DT$	(T)
(d) $A = lb$	(b)	(e) $C = \pi d$	(d)	(f) $G = UT$	(U)
(g) $v = u + at$	(t)	(h) $P = 2l + 2b$	(l)	(i) $H = xy + 5m$	(y)

4. Change the subject of each formula to  $c$ .

(a) $b = \frac{1}{2}c$	(b) $x = \frac{1}{5}c$	(c) $y = \frac{1}{4}c$	(d) $m = \frac{1}{6}c$
(e) $k = \frac{1}{9}c$	(f) $b = \frac{1}{10}c$	(g) $a = \frac{1}{2}c + 2$	(h) $h = \frac{1}{3}c - 5$
(i) $p = \frac{1}{4}c + q$	(j) $y = \frac{1}{10}c - x$	(k) $t = \frac{1}{8}c + 2s$	(l) $r = \frac{1}{5}c - 3q$

5. Change the subject of each formula to  $x$ .

(a) $y = \frac{3}{x}$	(b) $d = \frac{c}{x}$	(c) $m = \frac{y}{x}$	(d) $s = \frac{a+2}{x}$
(e) $w = \frac{z-1}{x}$	(f) $a = \frac{b+c}{x}$	(g) $a = \frac{x+8}{9}$	(h) $k = \frac{x-5}{2}$
(i) $p = \frac{3-x}{4}$	(j) $y = \frac{2}{x} + 1$	(k) $z = \frac{6}{x} - 7$	(l) $h = \frac{m}{x} + k$

6. Change the subject of each formula to  $k$ .

(a)  $y = \sqrt{k}$       (b)  $x = \sqrt{k}$       (c)  $m = \sqrt{k}$       (d)  $a = \sqrt{\frac{k}{b}}$   
 (e)  $s = \sqrt{\frac{t}{k}}$       (f)  $r = k^2$       (g)  $ab = k^2$       (h)  $\frac{p}{q} = k^2$   
 (i)  $y = x + k^2$       (j)  $c = k^2 - d$       (k)  $x = 3k^2 - 1$       (l)

7. Change the subject of each formula to the letter shown in {brackets}.

(a)  $v^2 = u^2 + 2as$  {s}      (b)  $v^2 = u^2 + 2as$  {u}      (c)  $V = \pi r^2 h$  {h}  
 (d)  $V = \pi r^2 h$  {r}      (e)  $r = \sqrt{\frac{A}{\pi}}$  {A}      (f)  $L = 3 + \sqrt{6a}$  {a}  
 (g)  $2k = \sqrt{(p+4)}$  {p}      (h)  $x^2 = \frac{4yz}{t}$  {y}      (i)  $ar = \frac{1}{2}\sqrt{\frac{x}{b}}$  {b}  
 (j)  $st = A^2(x - 3y)$  {A}      (k)  $R = A^2(x - 3y)$  {x}      (l)  $na = \sqrt{(1 - n^2)}$  {n}  
 (m)  $d = \frac{t(n-1)}{n}$  {n}      (n)  $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$  {R}      (o)  $d = \frac{a^2(x+b)}{4}$  {a}

### Answers

#### Exercise 18, page 32

1. (a)  $x = y - 3$       (b)  $x = y + 5$       (c)  $x = y - a$       (d)  $x = y + b$   
 (e)  $x = \frac{y}{3}$       (f)  $x = \frac{y}{10}$       (g)  $x = \frac{y}{k}$       (h)  
 $x = \frac{y}{a}$   
 (i)  $x = y - 3p$       (j)  $x = y + 5t$       (k)  $x = \frac{y-1}{2}$       (l)  $x = \frac{y+7}{3}$   
 (m)  $x = \frac{y-4a}{7}$       (n)  $x = \frac{y-38}{4}$       (o)  $x = \frac{y-8}{10}$       (p)  $x = \frac{y-b}{a}$   
 (q)  $x = \frac{y-c}{m}$       (r)  $x = \frac{t+r}{s}$       (s)  $x = \frac{p-2r}{q}$       (t)  
 $x = \frac{m+3n}{f}$   
 (u)  $x = \frac{a-b}{c}$       (v)  $x = \frac{h-k}{m}$       (w)  $x = \frac{d-3b}{c}$       (x)  $x = \frac{kc-g}{h}$

2. (a)  $a = 4 - b$  (b)  $a = 12 - d$  (c)  $a = 5x - y$  (d)  $a = \frac{2-m}{2}$   
 (e)  $a = \frac{7-q}{5}$  (f)  $a = \frac{20-c}{3}$  (g)  $a = \frac{s-r}{2}$  (h)  
 $a = \frac{d-t}{4}$  (i)  $a = \frac{4b-z}{5}$  (j)  $a = \frac{2h-k}{7}$  (k)  
 $a = \frac{6p-q}{11}$  (l)  $a = \frac{2x-g}{9}$
3. (a)  $l = \frac{P}{4}$  (b)  $I = \frac{V}{R}$  (c)  $T = \frac{S}{D}$  (d)  $b = \frac{A}{l}$   
 (e)  $d = \frac{C}{\pi}$  (f)  $U = \frac{G}{T}$  (g)  $t = \frac{v-u}{a}$  (h)  $l = \frac{P-2b}{2}$   
 (i)  $y = \frac{H-5m}{x}$
4. (a)  $c = 2b$  (b)  $c = 5x$  (c)  $c = 4y$  (d)  $c = 6m$   
 (e)  $c = 9k$  (f)  $c = 10d$  (g)  $c = 2a - 4$  (h)  
 $c = 3h + 15$  (i)  $c = 4p - 4q$  (j)  $c = 10y + 10x$  (k)  
 $c = 8t - 16s$  (l)  $c = 5r + 15q$
5. (a)  $x = \frac{3}{y}$  (b)  $x = \frac{c}{d}$  (c)  $x = \frac{y}{m}$  (d)  $x = \frac{a+2}{s}$   
 (e)  $x = \frac{z-1}{w}$  (f)  $x = \frac{b+c}{a}$  (g)  $x = 9a - 8$  (h)  $x = 2k + 5$   
 (i)  $x = 3 - 4p$  (j)  $x = \frac{2}{y-1}$  (k)  $x = \frac{6}{z-7}$  (l)  
 $x = \frac{m}{h-k}$
6. (a)  $k = y^2$  (b)  $k = x^2$  (c)  $k = m^2$  (d)  $k = a^2b$   
 (e)  $k = \frac{t}{s^2}$  (f)  $k = \sqrt{r}$  (g)  $k = \sqrt{ab}$  (h)  
 $k = \sqrt{\frac{p}{q}}$   
 (i)  $k = \sqrt{y-x}$  (j)  $k = \sqrt{c+d}$  (k)  $k = \sqrt{\frac{x+1}{3}}$
7. (a)  $s = \frac{v^2 - u^2}{2a}$  (b)  $u = \sqrt{v^2 - 2as}$  (c)  $h = \frac{V}{\pi r^2}$  (d)  $r = \sqrt{\frac{V}{\pi h}}$   
 (e)  $A = \pi r^2$  (f)  $a = \frac{(L-3)^2}{6}$  (g)  $p = 4k^2 - 4$  (h)  $y = \frac{tx^2}{4z}$

$$(i) \quad b = \frac{x}{4a^2r^2} \quad (j) \quad A = \sqrt{\frac{st}{x-3y}} \quad (k) \quad x = \frac{R+3A^2y}{A^2} \quad (l) \quad n = \sqrt{\frac{1}{a^2+1}}$$

$$(m) \quad n = \frac{t}{t-d} \quad (n) \quad R = \frac{r_1r_2}{r_2+r_1} \quad (o) \quad a = \sqrt{\frac{4d}{x+b}}$$