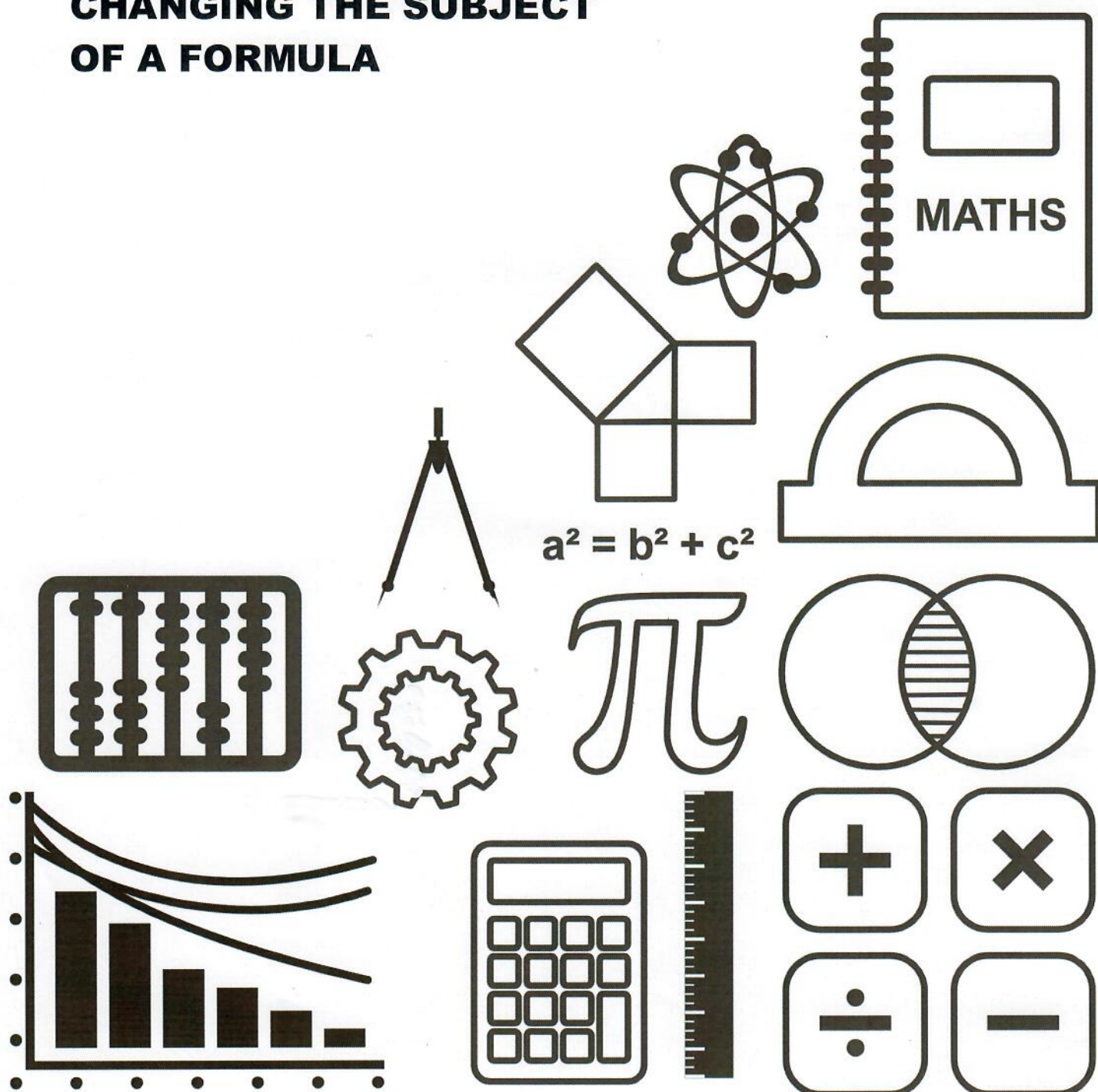


MATHSDIY

GCSE TOPIC BOOKLET CHANGING THE SUBJECT OF A FORMULA

SOLUTIONS



1. a) Make p the subject of the formula

$$4(t + 3p) = 6 - 3t$$

(expand)

$$4t + 12p = 6 - 3t$$

(-4t)

$$12p = 6 - 3t - 4t$$

$$12p = 6 - 7t$$

(÷12)

$$p = \frac{6 - 7t}{12}$$

[3]

- b) Make w the subject of the following formula.

$$4(w + 5) = 3(g + 2)$$

(expand)

$$4w + 20 = 3g + 6$$

(-20)

$$4w = 3g + 6 - 20$$

$$4w = 3g - 14$$

(÷4)

$$w = \frac{3g - 14}{4}$$

[3]

- c) Make t the subject of the following formula.

$$s(t - r) = 2r - 3$$

(expand)

$$st - sr = 2r - 3$$

(+sr)

$$st = 2r + sr - 3$$

(÷s)

$$t = \frac{2r + sr - 3}{s}$$

[3]

- d) Make r the subject of the formula

$$3t + 7 = 5(t - 2r)$$

(expand)

$$3t + 7 = 5t - 10r$$

(+10r)

$$10r + 3t + 7 = 5t$$

subtract

(3t+7)

$$10r = 5t - 3t - 7$$

$$10r = 2t - 7$$

(÷10)

$$r = \frac{2t - 7}{10}$$

[3]

2.

Given that

$$\frac{w}{4} - 7 = x \quad (+7)$$

find w in terms of x .

$$\frac{w}{4} = x + 7 \quad (\times 4)$$

[2]

$$w = 4(x + 7)$$

or $w = 4x + 28$

3.

Make x the subject of the following formula.

[4]

$$a(x - b) = x(c - d) \quad (\text{expand})$$

$$ax - ab = xc - xd \quad (+xcd)$$

$$ax + xd - ab = xc \quad (-xc)$$

$$ax + xd - xc - ab = 0 \quad (+ab)$$

$$ax + xd - xc = ab \quad (\text{factorise})$$

$$x(a + d - c) = ab \quad \div (a + d - c)$$

$$x = \frac{ab}{a + d - c}$$

4.

(a) Make g the subject of the following formula.

[2]

$$tg^2 = m \quad (\div t)$$

$$g^2 = \frac{m}{t} \quad (\text{square root})$$

$$g = \pm \sqrt{\frac{m}{t}}$$

(b) Make q the subject of the following formula.

[3]

$$hq - c = yq + f$$

($-yq$)

$$hq - yq - c = f$$

($+c$)

$$hq - yq = f + c$$

(factorise)

$$q(h - y) = f + c$$

$\div (h - y)$

$$q = \frac{f + c}{h - y}$$

5.

Make p the subject of the following formula.

[3]

$$t + 6p = 5 - pq$$

($+pq$)

$$t + 6p + pq = 5$$

($-t$)

$$6p + pq = 5 - t$$

(factorise)

$$p(6 + q) = 5 - t$$

$\div (6 + q)$

$$p = \frac{5 - t}{6 + q}$$

6.

Make g the subject of the following formula.

You must simplify your answer.

[3]

$$\sqrt{3g + f} = h^2$$

(square)

$$3g + f = h^4$$

($-f$)

$$3g = h^4 - f$$

($\div 3$)

$$g = \frac{h^4 - f}{3}$$

7.

Rearrange the following formula to make w the subject.

[3]

$$3w - 7t = x + tw$$

($-tw$)

$$3w - tw - 7t = x \quad (+7t)$$

$$3w - tw = x + 7t \quad (\text{factorise})$$

$$w(3 - t) = x + 7t \quad \div (3 - t)$$

$$w = \frac{x + 7t}{3 - t}$$

$$3 - t$$

8.

Rearrange the following to make r the subject of the formula

$$A = \frac{4\pi r^2}{3}$$

($\times 3$)

$$3A = 4\pi r^2 \quad (\div 4\pi)$$

$$\frac{3A}{4\pi} = r^2 \quad (\text{square root})$$

$$r = \pm \sqrt{\frac{3A}{4\pi}}$$

[3]

9.

Rearrange the following formula to make c the subject.

$$4c - d = 2a + bc$$

$(-bc)$

[3]

$$4c - bc - d = 2a \quad (+d)$$

$$4c - bc = 2a + d \quad (\text{factorise})$$

$$c(4 - b) = 2a + d \quad \div (4 - b)$$

$$c = \frac{2a + d}{4 - b}$$

10.

Rearrange the following formulae to make y the subject.

(a) $y^2 - t = g \quad (+t)$

$$y^2 = g + t \quad (\text{square root})$$

$$y = \pm \sqrt{g + t}$$

[2]

(b) $\frac{3y + w}{2y + 3} = 5 \quad \times (2y + 3)$

$$3y + w = 5(2y + 3)$$

$$3y + w = 10y + 15 \quad (-10y)$$

$$3y - 10y + w = 15$$

$$-7y + w = 15 \quad (-w)$$

$$-7y = 15 - w \quad (\div -7)$$

$$y = \frac{15 - w}{-7} \quad (\times \text{top and bottom of fraction by } -1)$$

$$y = \frac{w - 15}{7}$$

[4]

11.

Rearrange the following formulae to make w the subject.

(a) $t + 5w = h$ $(-t)$

$5w = h - t$ $(\div 5)$

[2]

$$w = \frac{h - t}{5}$$

(b) $aw + 3 = 4(bw + 5)$ (expand)

$aw + 3 = 4bw + 20$ $(-4bw)$

[4]

$aw - 4bw + 3 = 20$ (-3)

$aw - 4bw = 20 - 3$

$aw - 4bw = 17$ (factorise)

$w(a - 4b) = 17$ $(\div w)$

$$w = \frac{17}{a - 4b}$$

12.

(a) Rearrange the following formula to make k the subject.

[2]

$3k^2 = m$ $(\div 3)$

$k^2 = \frac{m}{3}$ (square root)

$$k = \pm \sqrt{\frac{m}{3}}$$

(b) Rearrange the following formula to make g the subject.

[2]

$eg + fg = h$ (factorise)

$g(e + f) = h$ $(\div (e + f))$

$$g = \frac{h}{e + f}$$

13.

Rearrange to make b the subject of the following formula.

[3]

$$\begin{aligned}
 ab &= bc + e && (-bc) \\
 ab - bc &= e && (\text{factorise}) \\
 b(a - c) &= e && \div (a - c) \\
 \underline{\underline{b}} &= \underline{\underline{\frac{e}{a - c}}}
 \end{aligned}$$

14.

(a)

Rearrange to make m the subject of the following formula.

[3]

$$\begin{aligned}
 w &= \frac{3m^2}{d} && (\times d) \\
 wd &= 3m^2 && (\div 3) \\
 \frac{wd}{3} &= m^2 && (\text{square root}) \\
 \underline{\underline{\pm \sqrt{\frac{wd}{3}} = m}} &, && m = \underline{\underline{\pm \sqrt{\frac{wd}{3}}}}
 \end{aligned}$$

(b) Make x the subject of the formula $gx + t = fx + d$.

(-fx)
(-t)

[3]

$$\begin{aligned}
 gx - fx + t &= d \\
 gx - fx &= d - t && (\text{factorise}) \\
 x(g - f) &= d - t && \div (g - f) \\
 \underline{\underline{x}} &= \underline{\underline{\frac{d - t}{g - f}}}
 \end{aligned}$$

15.

(a) Make m the subject of the formula $y = 6m + 7$.

[2]

$$\begin{aligned} y - 7 &= 6m & (-7) \\ \frac{y - 7}{6} &= m & (\div 6) \\ m &= \frac{y - 7}{6} \end{aligned}$$

(b) Factorise $6x^2 - 12x$.

[2]

$$6x(x - 2)$$

16.

(a) Make q the subject of the following formula.

$$\begin{aligned} 3q + h^2 &= m & (-h^2) \\ 3q &= m - h^2 & (\div 3) \end{aligned}$$

$$q = \frac{m - h^2}{3}$$

[2]

(b) Solve $\frac{3x}{2} = 15$.

($\times 2$)

$$3x = 30 \quad (\div 3)$$

$$x = 10$$

[2]

(c) Make w the subject of the following formula.

[3]

$$\frac{w^2 + x^2}{4} = 1$$

($\times 4$)

$$w^2 + x^2 = 4 \quad (-x^2)$$

$$w^2 = 4 - x^2 \quad (\text{square root})$$

$$w = \pm \sqrt{4 - x^2}$$

17.

(a) Make e the subject of the following formula.

[2]

$$h = 5e - 4$$

($+4$)

$$h + 4 = 5e$$

($\div 5$)

$$\frac{h + 4}{5} = e$$

$$e = \frac{h + 4}{5}$$