Solutions by
Kenneth Stafford
MATHS TUTOR
ken@kennethstafford.co.uk

GCSE (9-1) Grade 7

Re-arranging Harder Formulae



Instructions

Use **black** ink or ball-point pen.
Fill in the boxes at the top of this page with your name.
Answer **all** questions.
Answer the questions in the spaces provided
- there may be more space than you need.

Show all your working out

Information

The marks for **each** question are shown in brackets.
use this as a guide as to how much time to spend on each question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed

Advice

Read each question carefully before you start to answer it
Attempt every question
Check your answers if you have time at the end

1. Rearrange $a(q - c) = d$ to make q the subject.

$aq - ac = d$

$aq = d + ac$

$q = \frac{d+ac}{a}$ or $q = \frac{d}{a} + c$

q = ...

(3)

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$m = 5n - 21$

$m + 21 = 5n$

$n = \frac{m+21}{5}$

n = ...

(2)

(b) Make p the subject of the formula $\mathbf{4(p - 2q) = 3p + 2}$

$$4(p-2q) = 3p+2$$

$$4p - 8q = 3p + 2$$

$$p - 8q = 2$$

$$p = 2 + 8q$$

$p =$ .....

(3)

(Total 5 marks)

3. $\boldsymbol{P = \pi r + 2r + 2a}$

Make r the subject of the formula

$$\pi r + 2r + 2a = P$$

$$\pi r + 2r = P - 2a$$

$$r(\pi + 2) = P - 2a$$

$$r = \frac{P - 2a}{\pi + 2}$$

$r =$ .....

(Total 3 marks)

4. Make a the subject of the formula

$$2(3a - c) = 5c + 1$$

$6a - 2c = 5c + 1$

$6a = 7c + 1$

$a = \frac{7c + 1}{6}$

.....

(Total 3 marks)

5. Make m the subject of the formula $2(2p + m) = 3 - 5m$

$2(2p + m) = 3 - 5m$

$4p + 2m = 3 - 5m$

$4p + 7m = 3$

$7m = 3 - 4p$

$m = \frac{3 - 4p}{7}$

$m =$ .....

(Total 3 marks)

6. Make x the subject of

$$5(x - 3) = y(4 - 3x)$$

$5x - 15 = 4y - 3xy$

$5x + 3xy - 15 = 4y$

$5x + 3xy = 4y + 15$

$x(5 + 3y) = 4y + 15$

$x = \dfrac{4y + 15}{5 + 3y}$

$x =$ .....

(Total 4 marks)

7. When you are h feet above sea level, you can see d miles to the horizon, where

$$d = \sqrt{\frac{3h}{2}}$$

Make h the subject of the formula

$d = \sqrt{\dfrac{3h}{2}}$

$d^2 = \dfrac{3h}{2}$

$2d^2 = 3h$

$h =$ .....

(Total 4 marks)

$\dfrac{2d^2}{3} = h$

8. $y = \dfrac{2pt}{p-t}$

Rearrange the formula to make t the subject.

$y = \dfrac{2pt}{p-t}$

$y(p-t) = 2pt$

$yp - yt = 2pt$

$yp = 2pt + yt$

$yp = t(2p+y)$

$\dfrac{yp}{2p+y} = t$

$t =$ .....

(Total 4 marks)

9. Make b the subject of the formula $a = \dfrac{2-7b}{b-5}$

$a(b-5) = 2-7b$

$ab - 5a = 2 - 7b$

$ab + 7b - 5a = 2$

$ab + 7b = 2 + 5a$

$b(a+7) = 2 + 5a$

$b = \dfrac{2+5a}{a+7}$

.....

(Total 4 marks)

10. $P = \dfrac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$P(n+a) = n^2 + a$

$Pn + Pa = n^2 + a$

$Pn + Pa - a = n^2$

$Pa - a = n^2 - Pn$

$a(P-1) = n^2 - Pn$

$a = \dfrac{n^2 - Pn}{P-1}$

$a =$.....

(Total 4 marks)

11. $\dfrac{x}{x+c} = \dfrac{p}{q}$

Make x the subject of the formula.

$\dfrac{x}{x+c} = \dfrac{p}{q}$

$xq = p(x+c)$

$xq = px + pc$

$xq - px = pc$

$x(q-p) = pc$

$x = \dfrac{pc}{q-p}$

$x =$.....

(Total 4 marks)

12. Rearrange $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$$

$$\frac{uvf}{u}+\frac{uvf}{v}=\frac{uvf}{f}$$

$$vf+uf=uv$$

$$vf=uv-uf$$

$$vf=u(v-f)$$

$$\frac{vf}{v-f}=u$$

.....

(Total 5 marks)

13. Make c the subject of $a = \sqrt{b + \frac{c}{2}}$

$$a = \sqrt{b + \frac{c}{2}}$$

$$a^2 = b + \frac{c}{2}$$

$$2a^2 = 2b + c$$

$$2a^2 - 2b = c$$

.....

(Total 3 marks)

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14. Make c the subject of $a = \sqrt{b + \frac{c^2}{2}}$

$$a = \sqrt{b + \frac{c^2}{2}}$$

$$a^2 = b + \frac{c^2}{2}$$

$$2a^2 = 2b + c^2$$

$$2a^2 - 2b = c^2$$

$$\sqrt{2a^2 - 2b} = c$$

.....

(Total 3 marks)

15. Make p the subject of $t = \sqrt{\frac{p^2+1}{4}}$

$t = \sqrt{\frac{p^2+1}{4}}$

$t^2 = \frac{p^2+1}{4}$

$4t^2 = p^2 + 1$

$4t^2 - 1 = p^2$

$p = \sqrt{4t^2 - 1}$

.....

(Total 3 marks)

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16. Make p the subject of $t = \sqrt{\frac{p^3-3}{4}}$

$t = \sqrt{\frac{p^3-3}{4}}$

$t^2 = \frac{p^3-3}{4}$

$4t^2 = p^3 - 3$

$4t^2 + 3 = p^3$

$p = \sqrt[3]{4t^2 + 3}$

.....

(Total 3 marks)