

Rearranging Formulae

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

Make p the subject of the formula $w = 7p + 3$

Subtract 3 from both sides:

$$w - 3 = 7p$$

Divide both sides by 7:

$$p = \frac{w - 3}{7}$$

Answer: $p = \frac{w - 3}{7}$

Tip: Do not just swap the letters round ($p = 7w + 3$ is wrong). Undo each operation, and write the answer as $\frac{w - 3}{7}$, not $w - 3 \div 7$.

Marks: 1 mark for $w - 3 = 7p$. 1 mark for $p = \frac{w - 3}{7}$.

2 (2 marks)

Make q the subject of the formula $p = 6q - 7$

Add 7 to both sides:

$$p + 7 = 6q$$

Divide both sides by 6:

$$q = \frac{p+7}{6}$$

Answer: $q = \frac{p+7}{6}$

Tip: Whatever you do, do it to the *whole* of both sides. Dividing only p by 6 gives the wrong answer.

Marks: 1 mark for $p+7 = 6q$. 1 mark for $q = \frac{p+7}{6}$.

3 (3 marks)

- (a) Make n the subject of the formula $m = n + 8$

n has 8 added to it.

Subtract 8 from both sides:

$$m - 8 = n$$

Answer: $n = m - 8$

- (b) Make x the subject of the formula $y = 7x$

x is multiplied by 7.

Divide both sides by 7:

$$\frac{y}{7} = x$$

Answer: $x = \frac{y}{7}$

- (c) Make b the subject of the formula $a = \frac{b}{4}$

b is divided by 4.

Multiply both sides by 4:

$$4a = b$$

Answer: $b = 4a$

4 (2 marks)

Make x the subject of the formula $y = \frac{x+6}{5}$

Multiply both sides by 5:

$$5y = x + 6$$

Subtract 6 from both sides:

$$x = 5y - 6$$

Answer: $x = 5y - 6$

Tip: Remove the fraction first: multiply by 5, then subtract 6. Doing it in the other order gives the wrong answer $5(y - 6)$.

Marks: 1 mark for $5y = x + 6$. 1 mark for $x = 5y - 6$.

5 (2 marks)

Make h the subject of the formula $A = \frac{bh}{2}$

Multiply both sides by 2:

$$2A = bh$$

Divide both sides by b :

$$h = \frac{2A}{b}$$

Answer: $h = \frac{2A}{b}$

Marks: 1 mark for $2A = bh$. 1 mark for $h = \frac{2A}{b}$.

6 (2 marks)

Zara is trying to make g the subject of $h = 4g - 9$
Here is her working.

$$h - 9 = 4g$$

$$g = \frac{h - 9}{4}$$

Zara's answer is wrong.

(a) What mistake has Zara made?

To undo -9 you must **add** 9 to both sides.

Zara subtracted 9 instead.

Her first line should be $h + 9 = 4g$.

Answer: She subtracted 9 instead of adding 9 (the first line should be $h + 9 = 4g$).

Tip: Say exactly where the mistake is: in line 1 she did the same operation (-9) instead of the inverse operation ($+9$).

(b) Make g the subject of $h = 4g - 9$ correctly.

Add 9 to both sides: $h + 9 = 4g$

Divide both sides by 4: $g = \frac{h + 9}{4}$

Answer: $g = \frac{h + 9}{4}$

7 (2 marks)

Make d the subject of the formula $k = m^2 + 5cd$

Subtract m^2 from both sides:

$$k - m^2 = 5cd$$

Divide both sides by $5c$:

$$d = \frac{k - m^2}{5c}$$

Answer: $d = \frac{k - m^2}{5c}$

Tip: $5cd$ means $5 \times c \times d$, so divide by the whole of $5c$, not just by 5.

Marks: 1 mark for $k - m^2 = 5cd$. 1 mark for $d = \frac{k - m^2}{5c}$.

8 (2 marks)

Make x the subject of the formula $y = 5 - 2x$

Add $2x$ to both sides, so the x term is positive:

$$y + 2x = 5$$

Subtract y from both sides:

$$2x = 5 - y$$

Divide both sides by 2:

$$x = \frac{5 - y}{2}$$

Answer: $x = \frac{5 - y}{2}$

Tip: When the x term is negative, add it to both sides first. Take care with the order: $5 - y$, not $y - 5$.

Marks: 1 mark for $2x = 5 - y$ (or similar). 1 mark for $x = \frac{5 - y}{2}$.

9 (1 mark)

Make r the subject of the formula $C = 2\pi r$

r is multiplied by 2π .

Divide both sides by 2π :

$$r = \frac{C}{2\pi}$$

Answer: $r = \frac{C}{2\pi}$

10 (2 marks)

a is positive.

Make a the subject of the formula $y = 3a^2$

Divide both sides by 3:

$$\frac{y}{3} = a^2$$

Take the square root of both sides (a is positive):

$$a = \sqrt{\frac{y}{3}}$$

Answer: $a = \sqrt{\frac{y}{3}}$

Tip: Only the a is squared, so divide by 3 first, then square root the whole of $\frac{y}{3}$.

Marks: 1 mark for $\frac{y}{3} = a^2$. 1 mark for $a = \sqrt{\frac{y}{3}}$.

11 (3 marks)

(a) Make C the subject of the formula $F = 1.8C + 32$

Subtract 32 from both sides:

$$F - 32 = 1.8C$$

Divide both sides by 1.8:

$$C = \frac{F - 32}{1.8}$$

Answer: $C = \frac{F - 32}{1.8}$

Marks: 1 mark for $F - 32 = 1.8C$. 1 mark for $C = \frac{F - 32}{1.8}$.

(b) Work out the value of C when $F = 86$

Put $F = 86$ into your formula from part (a):

$$C = \frac{86 - 32}{1.8}$$

$$= \frac{54}{1.8} = 30$$

Answer: $C = 30$

12 (2 marks)

Make x the subject of the formula $w = k + mx$

Subtract k from both sides:

$$w - k = mx$$

Divide both sides by m :

$$x = \frac{w - k}{m}$$

Answer: $x = \frac{w - k}{m}$

Marks: 1 mark for $w - k = mx$. 1 mark for $x = \frac{w - k}{m}$.

13 (2 marks)

Make b the subject of the formula $P = 2(a + b)$

Divide both sides by 2:

$$\frac{P}{2} = a + b$$

Subtract a from both sides:

$$b = \frac{P}{2} - a \text{ (or } \frac{P - 2a}{2} \text{)}$$

Answer: $b = \frac{P}{2} - a$

Marks: 1 mark for $\frac{P}{2} = a + b$ or $P - 2a = 2b$. 1 mark for $b = \frac{P}{2} - a$ (or equivalent).

14 (2 marks)

Make r the subject of the formula $q = 4p + \frac{r}{2}$

Subtract $4p$ from both sides:

$$q - 4p = \frac{r}{2}$$

Multiply both sides by 2:

$$r = 2(q - 4p) \text{ (or } 2q - 8p)$$

Answer: $r = 2(q - 4p)$

Tip: Keep $q - 4p$ together in a bracket when you multiply by 2. $2q - 4p$ is a common mistake.

Marks: 1 mark for $q - 4p = \frac{r}{2}$ or $2q = 8p + r$. 1 mark for $2(q - 4p)$ or $2q - 8p$.
