

Rearranging Formulae

Solutions

For AQA GCSE Mathematics (8300) • 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 (1 mark)

Rearrange $d = h - 7$ to make h the subject.

h has 7 subtracted from it.

Undo this by adding 7 to both sides:

$$d + 7 = h$$

Answer: $h = d + 7$

Tip: Do the opposite operation to both sides. The opposite of -7 is $+7$, so $h = d + 7$, not $d - 7$.

2 (1 mark)

Rearrange $k + 9 = m$ to make k the subject.

k has 9 added to it.

Undo this by subtracting 9 from both sides:

$$k = m - 9$$

Answer: $k = m - 9$

3 (1 mark)

Rearrange $y = 5x$ to make x the subject.

x is multiplied by 5.

Undo this by dividing both sides by 5:

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

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

Tip: The answer is $\frac{y}{5}$, not $\frac{5}{y}$ or $5y$. Check: if $x = 2$, then $y = 10$, and $\frac{10}{5} = 2$ ✓

4 (2 marks)

Rearrange $t = 4s + 3$ to make s the subject.

Subtract 3 from both sides:

$$t - 3 = 4s$$

Divide both sides by 4:

$$s = \frac{t - 3}{4}$$

Answer: $s = \frac{t - 3}{4}$

Marks: 1 mark for $t - 3 = 4s$. 1 mark for $s = \frac{t - 3}{4}$.

5 (2 marks)

Rearrange $m = 6n - 11$ to make n the subject.

Add 11 to both sides:

$$m + 11 = 6n$$

Divide both sides by 6:

$$n = \frac{m + 11}{6}$$

Answer: $n = \frac{m + 11}{6}$

Tip: Deal with the -11 first, then the $\times 6$. If you divide first, you must divide the 11 as well.

Marks: 1 mark for $m + 11 = 6n$. 1 mark for $n = \frac{m + 11}{6}$.

6 (2 marks)

Rearrange $w = \frac{v - 4}{5}$ to make v the subject.

Multiply both sides by 5:

$$5w = v - 4$$

Add 4 to both sides:

$$v = 5w + 4$$

Answer: $v = 5w + 4$

Tip: Remove the fraction first by multiplying by 5. Adding 4 first would give the wrong answer $5(w + 4)$.

Marks: 1 mark for $5w = v - 4$. 1 mark for $v = 5w + 4$.

7 (2 marks)

Rearrange $g = \frac{m}{6} - 5$ to make m the subject.

Add 5 to both sides:

$$g + 5 = \frac{m}{6}$$

Multiply both sides by 6:

$$m = 6(g + 5) \text{ (or } 6g + 30\text{)}$$

Answer: $m = 6(g + 5)$

Tip: If you multiply by 6 first, multiply every term: $6g = m - 30$. Writing $6g = m - 5$ is a common mistake.

Marks: 1 mark for $g + 5 = \frac{m}{6}$. 1 mark for $6(g + 5)$ or $6g + 30$.

8 (2 marks)

Rearrange $T = r + ks$ to make s the subject.

Subtract r from both sides:

$$T - r = ks$$

Divide both sides by k :

$$s = \frac{T - r}{k}$$

Answer: $s = \frac{T - r}{k}$

Tip: The whole of $T - r$ is divided by k . Draw the fraction line under both, or write $(T - r) \div k$. $T - r \div k$ is wrong.

Marks: 1 mark for $T - r = ks$. 1 mark for $s = \frac{T - r}{k}$.

9 (1 mark)

$$A = lw$$

Circle the formula for w .

Options: $w = A - l$, $w = \frac{A}{l}$, $w = \frac{l}{A}$, $w = Al$

lw means $l \times w$.

Undo the multiplying: divide both sides by l .

$$w = \frac{A}{l}$$

Answer: $w = \frac{A}{l}$

10 (2 marks)

Sam rearranges $y = 3x + 6$ to make x the subject.

He writes $x = \frac{y}{3} - 6$

Is he correct? Tick a box.

Give a reason for your answer.

Subtract 6 from both sides: $y - 6 = 3x$

Divide both sides by 3: $x = \frac{y - 6}{3}$

Sam has divided y by 3 but not the 6.

Check with $x = 1$: $y = 3 \times 1 + 6 = 9$

Sam's formula gives $\frac{9}{3} - 6 = -3$, not 1.

Answer: No; $x = \frac{y - 6}{3}$ (or $\frac{y}{3} - 2$)

Tip: When you divide both sides by 3, divide every term. So $\frac{y - 6}{3}$, or $\frac{y}{3} - 2$.

Marks: 1 mark for No. 1 mark for a correct reason or the correct rearrangement.

11 (3 marks)

Rearrange $P = 2(l + w)$ to make l the subject.

Divide both sides by 2:

$$\frac{P}{2} = l + w$$

Subtract w from both sides:

$$l = \frac{P}{2} - w$$

Another way: expand first to get $P = 2l + 2w$.

Then $P - 2w = 2l$, so $l = \frac{P - 2w}{2}$.

Answer: $l = \frac{P}{2} - w$

Marks: 1 mark for $\frac{P}{2} = l + w$ or $P - 2w = 2l$. 1 mark for a correct second step. 1 mark for $l = \frac{P}{2} - w$ (or $\frac{P-2w}{2}$).

12 (3 marks)

Rearrange $C = \frac{5(F - 32)}{9}$ to make F the subject.

Multiply both sides by 9:

$$9C = 5(F - 32)$$

Divide both sides by 5:

$$\frac{9C}{5} = F - 32$$

Add 32 to both sides:

$$F = \frac{9C}{5} + 32$$

Answer: $F = \frac{9C}{5} + 32$

Marks: 1 mark for $9C = 5(F - 32)$. 1 mark for $\frac{9C}{5} = F - 32$. 1 mark for $F = \frac{9C}{5} + 32$ (or equivalent).

13 (2 marks)

Rearrange $A = \pi r^2$ to make r the subject.

Divide both sides by π :

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

Take the square root of both sides:

$$r = \sqrt{\frac{A}{\pi}}$$

Answer: $r = \sqrt{\frac{A}{\pi}}$

Marks: 1 mark for $\frac{A}{\pi} = r^2$. 1 mark for $r = \sqrt{\frac{A}{\pi}}$.

14 (3 marks)

The time, T minutes, to cook a turkey of weight w kg is given by

$$T = 15w + 30$$

- (a) Rearrange the formula to make w the subject.

Subtract 30 from both sides:

$$T - 30 = 15w$$

Divide both sides by 15:

$$w = \frac{T - 30}{15}$$

Answer: $w = \frac{T - 30}{15}$

Marks: 1 mark for $T - 30 = 15w$. 1 mark for $w = \frac{T - 30}{15}$.

- (b) A turkey takes 120 minutes to cook.
Work out the weight of the turkey.

Put $T = 120$ into your formula from part (a):

$$w = \frac{120 - 30}{15}$$

$$= \frac{90}{15} = 6$$

Answer: 6 kg
