Changing the Subject of a Formula

Practice Worksheet (Foundation · Target Grade 5)

I Do

Make r the subject of the formula $v = kr - h$.

$r =$ .....

(Total for Question is 2 marks)

We Do

Make x the subject of the formula $y = mx - c$.

$x =$ .....

(Total for Question is 2 marks)

You Do 1

Make t the subject of the formula $v = u + at$.

$t =$ .....

(Total for Question is 2 marks)

You Do 2

Make p the subject of the formula

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

$p =$ .....

(Total for Question is 2 marks)

You Do 3

Make m the subject of the formula

$$T = \frac{5m + n}{4}$$

$m =$ .....

(Total for Question is 2 marks)

Challenge 1

Make r the subject of the formula $P = kr^2 - h$, where $r > 0$.
Show all of your algebraic working clearly.

$r =$ .....

(Total for Question is 3 marks)

Challenge 2

Make x the subject of the formula

$$y = \sqrt{\frac{ax + b}{c}}$$

Show all of your algebraic working clearly.

$x =$ .....

(Total for Question is 3 marks)

Extreme Challenge

Make r the subject of the formula

$$v = \frac{kr - h}{r + m}$$

You must show all of your algebraic working clearly.

$r =$ .....

(Total for Question is 4 marks)

Worked Answers

I Do
Add h to both sides: $v + h = kr$.
Divide both sides by k: $\mathbf{r} = \dfrac{\mathbf{v + h}}{\mathbf{k}}$.

We Do
Add c to both sides: $y + c = mx$.
Divide both sides by m: $\mathbf{x} = \dfrac{\mathbf{y + c}}{\mathbf{m}}$.

You Do 1
Subtract u from both sides: $v - u = at$.
Divide both sides by a: $\mathbf{t} = \dfrac{\mathbf{v - u}}{\mathbf{a}}$.

You Do 2
Multiply both sides by k: $kw = p - 3$.
Add 3 to both sides: $\mathbf{p} = \mathbf{kw + 3}$.

You Do 3
Multiply both sides by 4: $4T = 5m + n$.
Subtract n from both sides: $4T - n = 5m$.
Divide both sides by 5: $\mathbf{m} = \dfrac{\mathbf{4T - n}}{\mathbf{5}}$.

Challenge 1
1. Add h to both sides: $P + h = kr^2$.
2. Divide both sides by k: $r^2 = \dfrac{P + h}{k}$.
3. Take the positive square root (since $r > 0$): $\mathbf{r} = \sqrt{\dfrac{\mathbf{P + h}}{\mathbf{k}}}$.

Challenge 2
1. Square both sides to remove the square root: $y^2 = \dfrac{ax + b}{c}$.
2. Multiply both sides by c: $cy^2 = ax + b$.
3. Subtract b from both sides: $cy^2 - b = ax$.
4. Divide both sides by a: $\mathbf{x} = \dfrac{\mathbf{cy^2 - b}}{\mathbf{a}}$.

Extreme Challenge
1. Multiply both sides by $(r + m)$:
$v(r + m) = kr - h$
2. Expand the bracket:
$vr + vm = kr - h$
3. Collect all terms containing r on one side and all other terms on the other side:
$vm + h = kr - vr$
4. Factorise r out of the right-hand side:
$vm + h = r(k - v)$
5. Divide both sides by $(k - v)$:

$\mathbf{r} = \dfrac{\mathbf{vm} + \mathbf{h}}{\mathbf{k} - \mathbf{v}}$ *(or equivalently* $\mathbf{r} = \dfrac{-\mathbf{vm} - \mathbf{h}}{\mathbf{v} - \mathbf{k}}$*).*