

Changing the Subject: the Subject Appears Twice

ANSWERS

1

Make x the subject of

$$ax + b = cx + d$$

every x term	everything else
$ax - cx$	$= d - b$

factorise: take x out

$$x(a - c) = d - b$$

divide by the bracket

$$x = \frac{d - b}{a - c}$$

2

Make x the subject of

$$px - 3 = qx + 5$$

every x term	everything else
$px - qx$	$= 8$

factorise: take x out

$$x(p - q) = 8$$

divide by the bracket

$$x = \frac{8}{p - q}$$

3

Make x the subject of

$$ax + 2 = bx + 9$$

every x term	everything else
$ax - bx$	$= 7$

factorise: take x out

$$x(a - b) = 7$$

divide by the bracket

$$x = \frac{7}{a - b}$$

4

Make x the subject of

$$5x + a = bx + c$$

every x term	everything else
$5x - bx$	$= c - a$

factorise: take x out

$$x(5 - b) = c - a$$

divide by the bracket

$$x = \frac{c - a}{5 - b}$$

5

Make x the subject of

$$ax = bx + c$$

$ax - bx$	$= c$
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$$x(a - b) = c$$

$$x = \frac{c}{a - b}$$

6

Make x the subject of

$$x + a = bx$$

$bx - x$	$= a$
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$$x(b - 1) = a$$

$$x = \frac{a}{b - 1}$$

7

Make x the subject of

$$a(x + 1) = bx + c$$

$$ax - bx = c - a$$

$$x(a - b) = c - a$$

$$x = \frac{c - a}{a - b}$$

8

Make x the subject of

$$y = \frac{x + a}{x}$$

$$xy - x = a$$

$$x(y - 1) = a$$

$$x = \frac{a}{y - 1}$$

Changing the Subject: the Subject Appears Twice *further practice*

ANSWERS

9

Make x the subject of $y = \frac{2x + 1}{x - 3}$

$$y(x - 3) = 2x + 1$$

$$xy - 2x = 3y + 1$$

Answer $x = \frac{3y + 1}{y - 2}$

10

Make p the subject of $5(p - q) = r(p + 2)$

$$5p - 5q = rp + 2r$$

$$p(5 - r) = 5q + 2r$$

Answer $p = \frac{5q + 2r}{5 - r}$

11

Make x the subject of $a = \sqrt{\frac{x + b}{x}}$

$$a^2x = x + b$$

$$x(a^2 - 1) = b$$

Answer $x = \frac{b}{a^2 - 1}$

12

Taxi A charges $\text{£}c$ plus $\text{£}a$ a mile.
Taxi B charges $\text{£}b$ a mile and nothing else. Find a formula for m , the number of miles for which the two taxis cost the same.

$$c + am = bm$$

$$c = m(b - a)$$

Answer $m = \frac{c}{b - a}$

13

A drink is made from j ml of cordial and w ml of water. The fraction of the drink that is cordial is $p = \frac{j}{j + w}$.
Make j the subject. How much cordial do you need with 300 ml of water to make $p = \frac{1}{4}$?

$$pj + pw = j$$

$$pw = j(1 - p)$$

Answer $j = \frac{pw}{1 - p}$, 100 ml

14

Make y the subject of $x = \frac{y^2 + 1}{y^2 - 2}$

$$xy^2 - 2x = y^2 + 1$$

$$y^2(x - 1) = 2x + 1$$

Answer $y = \pm \sqrt{\frac{2x + 1}{x - 1}}$

15

Ria drives to a town at u km/h and back the same way at v km/h.
Her average speed for the whole trip is $s = \frac{2uv}{u + v}$ km/h. Make u the subject.
She drove back at 40 km/h and averaged 48 km/h for the whole trip. How fast did she drive there?

$$su + sv = 2uv$$

$$sv = u(2v - s)$$

Answer $u = \frac{sv}{2v - s}$, 60 km/h

16

Ava and Ben make x the subject of $xy + 3 = 2x + y$. Ava gets $x = \frac{y - 3}{y - 2}$ and Ben gets $x = \frac{3 - y}{2 - y}$. Ava says one of them must be wrong. Is she right? Explain.

Ben's top and bottom are Ava's $x - 1$

$$y = 4: \text{both give } \frac{1}{2}$$

Answer No, they are both right