

WelTec Mathematics Series

General Mathematics – Transposing Formulas

All the above formulas started off with $P = \dots\dots\dots$. This means that P is the subject of the formula.

Sometimes you are given a formula with one letter as the subject and are asked to 'turn it round' so that another letter is the subject. This is called transposing the formula.

Example 1

Transpose the following formula so that x is the subject.

$$ax + b = c$$

In order to work this out you have to decide what has been done to x , and then undo it.

In this case x has been multiplied by a , and then b has been added. Since adding b was the last thing that was done, then the first thing you do is to take b from both sides. So,

$$ax + b - b = c - b$$

This means that the left hand side become ax , because the b 's cancel out. So,

$$ax = c - b$$

Now all you have to do is divide both sides by a , so that you get x on its own on the left hand side. So,

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

The a 's on the left hand side cancel out. So,

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

Question 1

Make x the subject of the following formulas

a) $mx + n = p$

b) $rx + s = t$

c) $ux + v = w$

d) $fx + g = h$

Answers

$\frac{f}{b-a} = x$ (d) $\frac{n}{a-m} = x$ (c) $\frac{r}{s-t} = x$ (b) $\frac{m}{u-d} = x$ (a)

Question 2

Make y the subject of the following formulas

a) $my + n = p$

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b) $ry + s = t$

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c) $uy + v = w$

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d) $fy + g = h$

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Answers

$\frac{f}{b-a} = \frac{p}{a-m}$
 $\frac{n}{a-m} = \frac{p}{a-m}$
 $\frac{r}{s-t} = \frac{p}{s-t}$
 $\frac{m}{p-n} = \frac{p}{p-n}$

Example 2

Transpose the following formula so that x is the subject.

$$ax - b = c$$

In order to work this out you have to decide what has been done to x , and then undo it.

In this case x has been multiplied by a , and then b has been taken. Since taking b was the last thing that was done, then the first thing you do is to add b to both sides. So,

$$ax - b + b = c + b$$

This means that the left hand side become ax , because the b 's cancel out. So,

$$ax = c + b$$

Now all you have to do is divide both sides by a , so that you get x on its own on the left hand side. So,

$$\frac{ax}{a} = \frac{c + b}{a}$$

The a 's on the left hand side cancel out. So,

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

Question 3

Make x the subject of the following formulas

a) $mx - n = p$

b) $rx - s = t$

c) $ux - v = w$

d) $fx - g = h$

Answers

$\frac{f}{p+n} = x$ (a) $\frac{m}{t+s} = x$ (b) $\frac{n}{w+v} = x$ (c) $\frac{f}{h+g} = x$ (d)

Question 4

Make y the subject of the following formulas

a) $my - n = p$

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b) $ry - s = t$

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c) $uy - v = w$

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d) $fy - g = h$

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Answers

4a) $y = \frac{p+n}{m}$ b) $y = \frac{t+s}{r}$ c) $y = \frac{n}{a+m}$ d) $y = \frac{h+g}{f}$

Example 3

Transpose the following formula so that x is the subject.

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

In order to work this out you have to decide what has been done to x , and then undo it.

In this case x has had b added to it and then the result has been multiplied by a . Since multiplying by a was the last thing that was done, then the first thing you do is to divide both sides by a . So,

$$\frac{a(x + b)}{a} = \frac{c}{a}$$

This means that the left hand side becomes $x+b$, because the a 's cancel out. So,

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

Now all you have to do is take b from both sides, so that you get x on its own on the left hand side. So,

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

The b 's on the left hand side cancel out. So,

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

Question 5

Make x the subject of the following formulas

a) $m(x + n) = p$

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b) $r(x + s) = t$

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c) $u(x + v) = w$

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d) $f(x + g) = h$

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Answers

5a) $x = \frac{p}{m} - n$ b) $x = \frac{t}{r} - s$ c) $x = \frac{w}{u} - v$ d) $x = \frac{h}{f} - g$

Make y the subject of the following formulas

a) $m(y + n) = p$

b) $r(y + s) = t$

c) $u(y + v) = w$

d) $f(y + g) = h$

Answers

a) $y = \frac{p}{m} - n$ b) $y = \frac{t}{r} - s$ c) $y = \frac{w}{u} - v$ d) $y = \frac{h}{f} - g$

Example 4

Transpose the following formula so that x is the subject.

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

In order to work this out you have to decide what has been done to x , and then undo it.

In this case x has had b taken from it and then the result has been multiplied by a . Since multiplying by a was the last thing that was done, then the first thing you do is to divide both sides by a . So,

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

This means that the left hand side becomes $x - b$, because the a 's cancel out. So,

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

Now all you have to do is add b to both sides, so that you get x on its own on the left hand side. So,

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

The b 's on the left hand side cancel out. So,

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

Question 7

Make x the subject of the following formulas

a) $m(x - n) = p$

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b) $r(x - s) = t$

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c) $u(x - v) = w$

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d) $f(x - g) = h$

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Answers

7a) $x = \frac{p}{m} + n$ b) $x = \frac{t}{r} + s$ c) $x = \frac{n}{m} + a$ d) $x = \frac{h}{f} + g$

Make y the subject of the following formulas

a) $m(y - n) = p$

b) $r(y - s) = t$

c) $u(y - v) = w$

d) $f(y - g) = h$

Answers

$8a) y = \frac{p}{m} + n$
 $b) y = \frac{t}{r} + s$
 $c) y = \frac{w}{u} + v$
 $d) y = \frac{h}{f} + g$