St Andrew's Academy

Mathematics Department

S1 BLOCK 3

Algebra

Solving Equations (Revision from Block 1)

1. Solve to find the value of x :- (*Use the method shown to you by your teacher*)

a	$x + 1 = 3$	**b**	$x + 5 = 9$	**c**	$x + 7 = 15$
d	$x + 8 = 20$	**e**	$x - 1 = 3$	**f**	$x - 2 = 18$
g	$x - 10 = 0$	**h**	$x - 40 = 50$	**i**	$x + 5 = 5$
j	$x - 4 = 0$	**k**	$x + 17 = 18$	**l**	$x - 100 = 100$
m	$4 - x = 1$	**n**	$3 + x = 7$	**o**	$6 - x = 0$
p	$37 + x = 100$	**q**	$12 - x = 7$	**r**	$50 + x = 50.$

When solving an equation it is possible to have a fractional solution:

2. Find the value of each letter in the following equations :-

a	$2x = 12$	**b**	$3m = 24$	**c**	$5p = 35$
d	$8q = 40$	**e**	$6t = 18$	**f**	$9a = 90$
g	$4b = 32$	**h**	$7d = 21$	**i**	$2x = 7$
j	$2p = 11$	**k**	$4p = 14$	**l**	$6m = 21$
m	$10x = 105$	**n**	$8t = 20$	**o**	$12p = 30$
p	$10b = 45$	**q**	$4c = 15$	**r**	$4n = 21.$

3.

Find the value of each letter :-

(a)	$2x = 14$	(b)	$3y = 27$	(o)	$12h = 18$	(p)	$10t = 55$
(c)	$5k = 40$	(d)	$8a = 56$	(q)	$4x = 9$	(r)	$4n = 29$
(e)	$6g = 24$	(f)	$9p = 72$	(s)	$5p = 11$	(t)	$5q = 21$
(g)	$4c = 36$	(h)	$7n = 28$	(u)	$2g = 101$	(v)	$2y = 59$
(i)	$2x = 9$	(j)	$2p = 13$	(w)	$10e = 11$	(x)	$10w = 33$
(k)	$4k = 18$	(l)	$6d = 9$	(y)	$\frac{1}{2}x = 4$ (not 2 !)	(z)	$\frac{1}{2}x = 100.$
(m)	$10x = 75$	(n)	$8u = 28$				

Further Practice Questions – Revision from Block 1

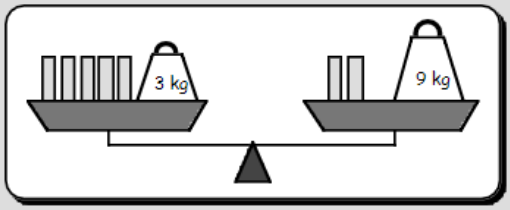
1. Find the value of x by solving these equations :-
(*Use the method shown to you by your teacher and set down your working carefully.*)

a	$2x + 1 = 7$	b	$2x + 4 = 14$	c	$3x + 5 = 11$
d	$5x + 1 = 36$	e	$2x - 1 = 5$	f	$2x - 3 = 7$
g	$4x - 4 = 24$	h	$3x - 5 = 16$	i	$6x - 1 = 47$
j	$7x - 3 = 53$	k	$8x + 5 = 29$	l	$9x - 4 = 41$
m	$3x - 8 = 1$	n	$4x + 10 = 14$	o	$5x + 10 = 10$
p	$3x - 3 = 63$	q	$4x - 4 = 0$	r	$2x - 1 = 0$
s	$6x - 3 = 12$	t	$8x + 5 = 25$	u	$6x - 11 = 25.$

Solving Equations with Letters on both sides

This diagram shows a set of balanced scales.

- 5 blocks and a 3 kg weight on the left
- 2 blocks and a 9 kg weight on the right.

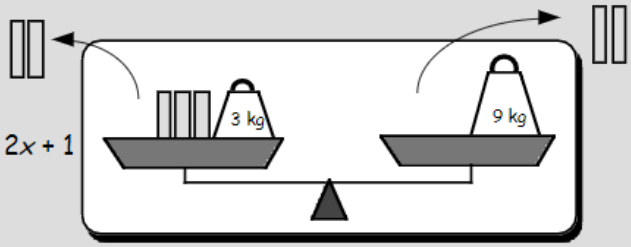


If each block weighs x kg, then the equivalent equation for this is :-

$5x + 3 = 2x + 9,$ - to be solved.

To simplify the situation, remove 2 blocks ($2x$) from both sides.

This leaves a much simpler equation, which you already know how to solve.

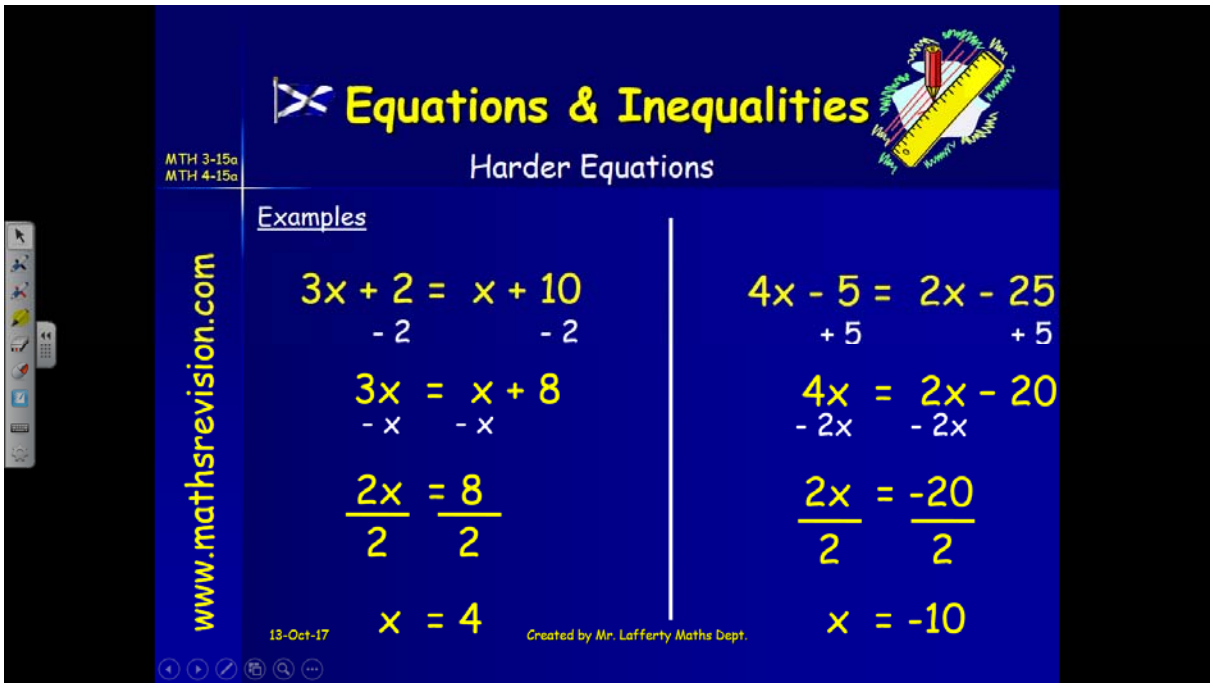


remove $2x$ from both sides

$$5x + 3 = 2x + 9$$
$$\Rightarrow \quad 3x + 3 = 9$$
$$\Rightarrow \quad 3x = 9 - 3 = 6$$
$$\Rightarrow \quad x = 2$$

=> 1 block must weigh 2 kg.

* your teacher may show you an alternative method



Solving Equations with Letters on both sides

Further Examples :-

Take $2x$ from both sides.

Move the +1 to the other side and change to −1

move the × 4 to the other side and change to ÷ 4

$6x + 1 = 2x + 21$

(take "$2x$" from each side)

=> $4x + 1 = 21$

=> $4x = 21 - 1$

=> $4x = 20$

=> $x = 5$

$8x - 2 = 3x + 28$

(take "$3x$" from each side)

=> $5x - 2 = 28$

=> $5x = 28 + 2$

=> $5x = 30$

=> $x = 6$

$10x + 9 = 4x + 30$

(take "$4x$" from each side)

=> $6x + 9 = 30$

=> $6x = 30 - 9$

=> $6x = 21$

=> $x = 21 \div 6 = 3\frac{1}{2}$

Practice Questions:

1. Copy and complete

(a) $7x + 2 = 4x + 17$

=> $3x + 2 = ...$

take "$4x$" from each side => $3x = ...$

=> $x = ...$

(b) $4x - 3 = x + 18$

=> $3x - ... = ...$

take "$1x$" from each side => $3x = ...$

=> $x = ...$

2. Solve these equations by removing an appropriate number of x's from each side first :-

(a) $4x + 1 = 2x + 7$ (b) $3x + 5 = x + 15$ (c) $6x + 7 = 5x + 13$

(d) $10x - 6 = 7x + 9$ (e) $5x - 1 = 2x + 11$ (f) $6x - 1 = x + 19$

(g) $12x - 4 = 8x + 24$ (h) $10x - 1 = 8x + 6$ (i) $4x + 4 = x + 12$

(j) $6x + 3 = 2x + 10$ (k) $9x - 2 = 4x + 19$ (l) $7x - 7 = x + 1$

3. These equations look a little "different". Solve them in the same way as shown above :-

(a) $3x = 2x + 6$ (b) $5x = x + 20$ (c) $7x = 4x + 30$

(d) $9x = 8x + 6$ (e) $3x = x + 13$ (f) $5x - 12 = 3x$

(g) $4x - 15 = x$ (h) $3x + 6 = x$ (i) $10x - 21 = 7x$

Question 4

(a) $3x + 1 = x + 7$ (b) $4x + 5 = 2x + 15$ (c) $6x + 1 = 3x + 13$

(d) $7x - 6 = 3x + 22$ (e) $8x - 1 = 2x + 29$ (f) $10x - 2 = 6x + 24$

(g) $9x - 1 = 7x + 14$ (h) $10x - 2 = 5x + 29$ (i) $12x - 12 = 2x + 11$

Practice Questions:

Solve:

Q1) $4x + 6 = 7x - 3$

Q2) $9x - 20 = 8x - 10$

Q3) $9x - 26 = 7x - 8$

Q4) $8x - 9 = 7x - 3$

Q5) $4x + 27 = 9x + 2$

Q6) $3x - 10 = 2x - 4$

Q7) $7x - 38 = 2x - 8$

Q8) $2x + 39 = 7x - 6$

Solve:

Q1) $9x - 12 = 7x + 6$

Q2) $7x + 9 = 8x + 6$

Q3) $10x - 2 = 9x + 8$

Q4) $3x + 13 = 5x + 7$

Q5) $9x - 24 = 5x + 8$

Q6) $3x + 22 = 8x - 3$

Q7) $4x + 4 = 6x - 10$

Q8) $6x - 9 = 5x - 4$

Equations: Letters on Both Sides

Video 113 on www.corbettmaths.com

Workout

Question 1: Solve the following equations

(a) $4x + 1 = 2x + 7$ (b) $5x + 4 = 3x + 16$ (c) $2x + 8 = x + 12$

(d) $7x + 1 = 2x + 46$ (e) $6x - 3 = 2x + 13$ (f) $9x - 10 = 7x + 24$

(g) $2x + 21 = 4x + 5$ (h) $x + 2 = 5x - 2$ (i) $6x - 9 = 4x - 1$

(j) $5x + 2 = 16 - 2x$ (k) $3x - 1 = 23 - x$ (l) $6x + 8 = 38 - 4x$

(m) $80 - x = 8x - 1$ (n) $2x + 7 = 17 - 8x$ (o) $15 - x = 27 - 3x$

(p) $12x - 20 = 15x - 38$ (q) $35x + 10 = 20x + 175$ (r) $14x = 2x + 60$

Question 2: Solve the following equations

(a) $3x + 3 = x + 8$ (b) $9x + 10 = 7x + 39$ (c) $3x + 1 = 7x - 17$

(d) $x + 4 = 13 - x$ (e) $16x + 3 = 6x + 24$ (f) $9x + 12 = 6x + 14$

(g) $7x + 24 = 12x - 12$ (h) $2x + 9 = 48 - 6x$ (i) $34 - 12x = 28x - 36$

Question 3: Solve the following equations

(a) $4x + 15 = x + 3$ (b) $8x + 40 = 3x + 5$ (c) $9x + 7 = 11x + 20$

(d) $7x + 9 = 2x - 16$ (e) $9x - 70 = 2x - 91$ (f) $4 - 5x = 3x + 28$

(g) $10x + 136 = -8 - 2x$ (h) $-6x + 2 = -4x + 10$ (i) $-11x - 4 = -3x + 60$

Equations: Letters on Both Sides

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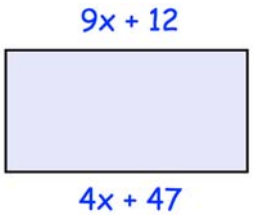
Apply

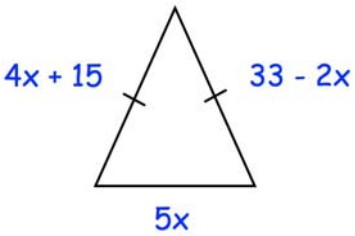
Question 1: Shown is a rectangle



(a) Explain why $9x + 12 = 4x + 47$

(b) Find x

Question 2: Shown is an isosceles triangle



(a) Explain why $4x + 15 = 33 - 2x$

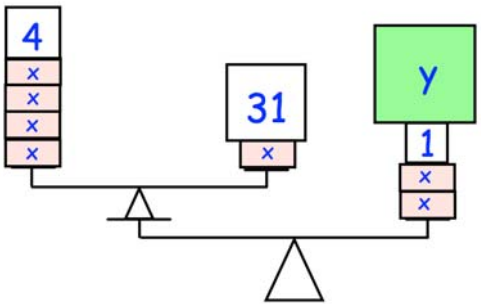
(b) Find x

(c) Find the perimeter of the isosceles triangle

Question 3: Explain why $8x + 3 = 2(4x + 1)$ has no solution.

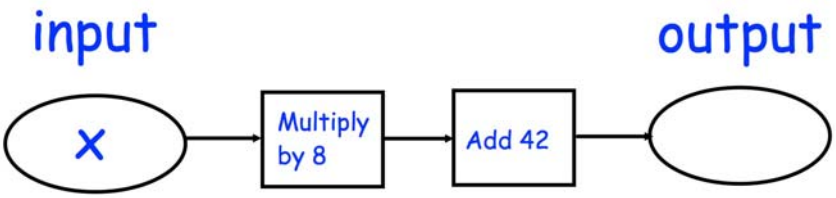
Question 4: (a) Find the value of x

(b) Find the value of y



* The mass of the balances are very small, so may be ignored

Question 5: Shown below is a function machine.
The input and output have the same value.



(a) Write an equation in terms of x.

(b) Solve the equation to find the value of x.

Question 6: Toby has completed his homework.
Can you spot any mistakes?

(a)

Solve $7x - 5 = 5x + 23$

$-5x \quad -5x$

$2x - 5 = 23$

$-5 \quad -5$

$2x = 18$

$\div 2 \quad \div 2$

$x = 9$

(b)

Solve $3x + 11 = 41 - 2x$

$-2x \quad -2x$

$x + 11 = 41$

$-11 \quad -11$

$x = 30$

Further Practice Questions:

Gold

Solve:

Q1) $7x - 39 = 2x + 6$

Q2) $6x - 12 = 4x + 2$

Q3) $2x + 13 = 5x - 5$

Q4) $8x - 32 = 5x - 5$

Q5) $9x - 2 = 8x + 7$

Q6) $5x + 10 = 9x - 10$

Q7) $8x - 5 = 7x + 3$

Q8) $7x + 12 = 8x + 6$

Gold

Solve:

Q1) $3x + 48 = 10x - 8$

Q2) $5x + 11 = 7x - 7$

Q3) $7x - 20 = 4x - 8$

Q4) $4x - 11 = 3x - 3$

Q5) $7x + 18 = 8x + 9$

Q6) $7x + 13 = 8x + 7$

Q7) $8x - 27 = 3x + 3$

Q8) $10x - 37 = 3x - 2$

Solving Equations (Four Terms)

1). $4x + 3 = 2x + 11$	2). $5x + 7 = 3x + 11$	3). $2x - 4 = 5x - 19$	4). $6x - 2 = 3x + 10$
5). $7x + 4 = 10x - 20$	6). $9x + 7 = 15x + 1$	7). $8x + 3 = 2x + 21$	8). $3x - 6 = 10 - x$
9). $2x - 3 = 3 - 4x$	10). $3x + 4 = 18 - 4x$	11). $10 - 4x = 3x + 3$	12). $9x - 3 = 19 - 2x$
13). $5x - 4 = 3x + 6$	14). $4 - 5x = 2x - 10$	15). $4x - 20 = 70 - 5x$	16). $24 - 2x = 14x - 24$
17). $5x - 2 = 2x + 4$	18). $5x - 22 = 8 - 10x$	19). $x + 13 = 1 + 5x$	20). $14x - 11 = 10x - 3$
21). $4 - 3x = 10 - 5x$	22). $2x - 25 = 2 - 7x$	23). $3x - 2 = 5x - 10$	24). $2 - 7x = 17 - 12x$
25). $5x - 10 = 3x + 2$	26). $3x + 2 = x + 12$	27). $4x - 10 = x + 5$	28). $4x + 3 = 10x - 21$
29). $12x - 25 = 5x - 4$	30). $7x - 42 = 2x - 7$	31). $16 + 7x = 41 + 2x$	32). $16x + 20 = 22x + 8$
33). $6 - 2x = 11 - 7x$	34). $1 - x = 9 - 9x$	35). $7 - 3x = 9 - 4x$	36). $15x - 7 = 7x + 25$
37). $-3x - 5 = x + 15$	38). $14x - 4 = 10x - 20$	39). $8 - 4x = 2 - 7x$	40). $11x + 3 = 17x + 39$

The answers are now fractions or mixed numbers

41). $11x - 12 = 4x - 4$	42). $9x - 1 = x + 11$	43). $15x - 3 = 3x + 5$	44). $11x - 21 = 7x - 16$
45). $2 + 3x = 12 - 5x$	46). $3x + 4 = 7 - 3x$	47). $7 - 2x = 15 - 5x$	48). $3 + 6x = 2x + 14$
49). $7t - 12 = 3t - 5$	50). $4 + 5f = 7 + 3f$	51). $10p - 2 = 4p + 7$	52). $12x - 1 = 3 + 5x$

Solving Equations – Unknowns on both sides

1) $7n + 3 = 3n + 27$	2) $7n + 5 = 5n + 25$	3) $10n + 2 = 7n + 14$
4) $5n + 4 = 2n + 22$	5) $6n + 8 = 2n + 36$	6) $7n - 3 = 4n + 12$
7) $5n - 2 = n + 10$	8) $9n - 7 = 5n + 13$	9) $11n - 9 = 5n + 27$
10) $5n - 10 = 3n + 50$	11) $8n - 3 = 2n + 39$	12) $9n + 14 = 6n + 29$
13) $10n + 17 = 3n + 52$	14) $5n - 16 = n + 20$	15) $3n + 3 = 2n + 8$
16) $6n + 5 = 4n + 18$	17) $9n + 1 = 6n + 9$	18) $5n - 5 = n + 10$

Equations: Forming and Solving

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Workout

Question 1: I think of a number.
I multiply the number by 3 and then add 5.
The answer is 29.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 2: I think of a number.
I multiply the number by 5 and then subtract 2.
The answer is 58.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 3: I think of a number.
I divide the number by 2 and then add 1.
The answer is 7.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 4: Gregory is x years old.
Daisy is 2 years older than Gregory
The sum of their ages is 40.

(a) Form an equation in terms of x
(b) Solve the equation and work out Gregory's and Daisy's ages.

Question 5: Robert is x years old.
Hannah is 7 years younger than Robert
The sum of their ages is 61.

(a) Form an equation in terms of x
(b) Solve the equation and work out Robert's and Hannah's ages.

Equations: Forming and Solving

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Question 6: Michael is x years old.
Jenny is twice as old as Michael
The sum of their ages is 57.

(a) Form an equation in terms of x
(b) Solve the equation and work out Michael's and Jenny's ages.

Question 7: Fiona is x years old.
Thomas is 3 years older than Fiona.
Cara is twice as old as Fiona.
The sum of their ages is 51.

(a) Form an equation in terms of x
(b) Solve the equation and work out Fiona's, Thomas's and Cara's ages.

Question 8: Alan is x years old.
Barry is ten years younger than Alan.
Kevin is double Alan's age.
The sum of their ages is 54.

(a) Form an equation in terms of x
(b) Solve the equation and work out Alan's, Barry's and Kevin's ages.

Question 9: Rebecca is x years old.
Mary is 8 years older than Rebecca.
Jill is three times older than Mary.
The sum of their ages is 67.

(a) Form an equation in terms of x
(b) Solve the equation and work out Rebecca's, Mary's and Jill's ages.

Question 10: Andy has x pence.
Kelly has 7 pence more than Andy.
Georgia has 9 pence less than Andy.
The total amount of money they have is £1.48

(a) Form an equation in terms of x
(b) Solve the equation and work out how much money each has.

Equations: Forming and Solving

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Question 11: Billy has x pounds.
Liam has twice as much money as Billy.
Nicola has three times as much money as Liam.
The total amount of money they have is £180

(a) Form an equation in terms of x
(b) Solve the equation and work out how much money each has.

Question 12: Farmer Jones has x sheep
Farmer Smith has 100 more sheep than Farmer Jones.
Farmer White has twice as many sheep as Farmer Jones.
In total there are 2500 sheep.

(a) Form an equation in terms of x
(b) Solve the equation and work out how many sheep each farmer has.

Question 13: The cost of a TV is £x
The cost of a DVD player is £45 less than a TV.
The total cost of the TV and DVD player is £235

(a) Form an equation in terms of x
(b) Find the cost of a TV

Question 14: The sum of three consecutive numbers is 51.

(a) Form an equation in terms of x
(b) Solve the equation and work out each number.

Question 15: The sum of five consecutive numbers is 110.

(a) Form an equation in terms of x
(b) Solve the equation and work out each number.

Question 16: A rectangular field is 7 metres longer than wide.
The perimeter of the field is 106m.

(a) Find the dimensions of the field.
(b) Find the area of the field.

Question 17: A rectangular field is 20 metres longer than wide.
The perimeter of the field is 280m.

(a) Find the dimensions of the field.
(b) Find the area of the field.

Forming and Solving Algebraic Equations.

1). A gardener is planting flowers. He plants **t** tulips.
   a). He plants 10 more daisies than he does tulips. Write down an expression for the number of daisies planted.
   b). He actually planted 37 daisies. Use this information to form an equation.
   c). Solve this equation to find out the number of tulips planted.

2). Sally makes a tower out of lego blocks **f** blocks high.
   a). Brian makes a tower 6 blocks **smaller**. Write down an expression for the number of blocks in his tower.
   b). Brian used 18 blocks of lego. Use this information to form an equation.
   c). Solve this equation to find out the number of lego blocks Sally used.

3). In an examination Eric got **p** marks.
   a). Steven got three times as many marks as Eric. Write down an expression for the number of marks Steven got.
   b). Steven actually got 72 marks. Use this information to form an equation.
   c). Solve this equation to find out the number of marks Eric got in his exam.

4). Tara and Samantha went shopping. Tara brought home **y** parcels.
   a). Samantha brought home a third of the number of parcels that Tara brought home. Write down an expression for the number of parcels Samantha brought home.
   b). Samantha brought home 12 parcels. Use this information to form an equation.
   c). Solve this equation to find out the number of parcels Tara brought home.

5). In a wood the Forest Warden planted **h** Beech trees. He planted 5 fewer Oak trees and 12 more Elm trees than Beech trees.
   a). Write down an expression for the number of
      i). Oak trees planted, ii). Elm trees planted.
   b). The Forest Warden actually planted 16 Oak trees. Use this information to form an equation.
   c). Solve this equation to find out the number of
      i). Beech trees planted, ii). Elm trees planted.

6). In Marbles R Us, they sell marbles in three bag sizes. The middle size bag holds **u** marbles, the big bag holds 5 times as many as the middle bag, and the small size bag holds a third as many of the middle bag.
   a). Write down an expression for the number of
      i). marbles in the big bag, ii). marbles in the small bag.
   b). In the big bag are 120 marbles. Use this information to form an equation.
   c). Solve this equation to find out the number of marbles in
      i). the middle bag, ii). the small bag.

7). A normal bus will carry **x** passengers. The Super-bus will carry 27 more than the normal bus and the Town-bus will carry 8 less passengers than the normal bus.
   a). Write down an expression for the number of passengers the
      i). Super-bus will carry, ii). Town-bus will carry.
   b). The Super-bus will carry 69 passengers. Use this information to form an equation.
   c). Solve this equation to find out how many passengers the
      i). normal bus will carry, ii). Town-bus will carry.

8). On the front at Brighton three companies hire out deck chairs for the day. Big-Lie charge £ **f** to hire them for the day, Easy-Lie charge three times as much as Big-Lie to hire them, and Long-Lie charge a quarter of the price of Big-Lie.

a). Write down an expression for the price
   i). Easy-Lie charge, ii). Long-Lie charge.

b). Long-Lie charge £2 for the day. Use this information to form an equation.

c). Solve this equation to find out how much
   i). Big-Lie charge, ii). Easy-Lie charge.

9). A normal bus holds **d** people. Two new types of bus are developed, the Mini-bus holds 12 less people then the Normal bus, and the Major-bus which holds **26** more people.

a). Write down an expression for the number of people a
   i). Mini-bus holds, ii). Major-bus holds.

b). The Major-bus holds 68 people. Use this information to form an equation.

c). Solve this equation to find out how much a
   i). normal bus holds, ii). a Mini-bus holds.

<u>Harder Questions.</u>

10). A cucumber farmer plants **p** cucumber seeds in a row. He plants **p** rows of these cucumber seeds.

a). Write down an expression for the number of cucumbers he plants.

b). When he counts up the cucumbers at the end of the year he finds he has 49. Use this information to form an equation.

c). Solve this equation to find out how many rows of cucumbers he planted.

11). Marion has a bag of marbles containing **h** marbles. She is given another identical bag. She then plays and loses 3 marbles.

a). Write down an expression for the number of marbles she has at the end of the game.

b). When she counts up the marbles at the end of the game she finds she has 25. Use this information to form an equation.

c). Solve this equation to find out how many marbles are in each bag.

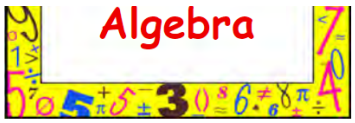
Simplifying Expressions – Revision from Block 2

Tidying up terms

It is possible to "tidy up" expressions by :-

adding all **like** terms.

See the 3 examples shown opposite.



$5x + 2x - 4x$
$= 3x$

$7a + 3 + 5a - 1$
$= 12a + 2$

$6v + w + v$
$= 7v + w$

1. **Copy** each of the following and then give a simplified answer below each one :-

a	$4x + 6x$	b	$9x - 3x$	c	$8x + x$
d	$5x - x$	e	$7x + 2x + 5x$	f	$8x + 3x + x$
g	$x + x + x$	h	$3x + 7x - 9x$	i	$10p + 6p - 13p$
j	$8v + 5v - v$	k	$20s - 10s + 6s$	l	$30h - 20h - h$
m	$e + e - e$	n	$2w + 7w - 9w$	o	$9n - 3n - 4n$
p	$15y - y - 11y$	q	$9g - g - 3g$	r	$2k - k + 7k$
s	$m + m + m + m$	t	$p + p + p - p$	u	$3x + 6x - 8x + 5x$

2. **Copy** each of the following and then give a simplified answer below each one :-

a	$4x + 6x + 3x - 4x$	b	$7a - a + 3a - 5a$	c	$4v + 2 + 9v$
d	$5x + 7x + 3$	e	$4w - 1 + 9w$	f	$5z + 6 + z + 8$
g	$5r + 5 - r - 5$	h	$6d + 7 - 5d - 7$	i	$3e + 2f + 7e + 6f$
j	$2a + 3b + 9a + 8b$	k	$6x + 4y - 3x - y$	l	$6v + w - v + 7w$
m	$a + a + a + 6b$	n	$4x + 7x + 1 + 2x$	o	$7g + 3h + 7g$

p $2a + b + 5a + b + a + 2b$

q $9x + 3y - 8x - 2y + 5x + 6y$

r $5p + 6q + 4 - 3p - q + 12$

s $3x^2 + 7x^2 + 2y^2 - 9x^2 - y^2$

Simplifying Expressions

(Leaving Negative coefficients)

Simplify: Q1) $4s + 3r + 8s - 6r$	Simplify: Q2) $7g - 5q + 8g - 7q$
Simplify: Q3) $2h - 4g + 8h - 2g$	Simplify: Q4) $9y - 5b + 5y - 9b$
Simplify: Q5) $7c - 6y + 5c - 8y$	Simplify: Q6) $8x + 6g + 4x - 8g$
Simplify: Q7) $9t - 3b + 5t - 5b$	Simplify: Q8) $8e + 3w + 2e - 8w$

Simplifying Expressions

(Leaving Negative coefficients)

Simplify: Q1) $9y - 3u + 3y + 7u$	Simplify: Q2) $4m - 8c + 3m + 4c$
Simplify: Q3) $8l - 7z + 3l - 4z$	Simplify: Q4) $4q - 3c + 9q + 7c$
Simplify: Q5) $6e - 6t + 8e - 8t$	Simplify: Q6) $4h - 7u + 8h - 5u$
Simplify: Q7) $7r - 4p + 3r - 5p$	Simplify: Q8) $8i - 8m + 6i + 4m$

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Examples

Workout

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Question 1: Simplify each of the following

(a) $y + y + y + y$ (b) $w + w + w + w + w$ (c) $a + a + a + a + a + a$ (d) $s + s + s$

(e) $n + n$ (f) $g + g + g + g - g$ (g) $y + y + y + y - y - y$ (h) $p + p - p - p$

(i) $3y + 2y$ (j) $4a + 3a$ (k) $9k + 5k$ (l) $7m + m$

(m) $15c + 20c$ (n) $6w - 3w$ (o) $10y + 3y - 5y$ (p) $20t - 14t$

(q) $7x - 3x - x$ (r) $8k - 8k$ (s) $7y - 2y + y$ (t) $5u - 4u$

(u) $y^2 + y^2$ (v) $a^2 + a^2 + a^2$ (w) $c^2 + c^2 + c^2 + c^2 + c^2$ (x) $7y^2 + 3y^2$

(y) $2w^2 + 4w^2 + 8w^2$ (z) $6y^2 - 2y^2 + 3y^2$

Question 2: Simplify the following expressions

(a) $4u - 6u$ (b) $8w - 9w$ (c) $4a + 2a - 9a$ (d) $2y - 9y$

(e) $-3g - 2g$ (f) $-4f + 9f$ (g) $-m - 7m$ (h) $5y^2 - 7y^2$

(i) $6a^2 + 2a^2 - 9a^2$ (j) $ab + ab + ab$

Question 3: Simplify the following expressions

(a) $3a + 2b + 4a + b$ (b) $7y + 5y + 2h + 2h$ (c) $g + 8a + 2a + g$

(d) $7m + 7p + 8m + p + 2p$ (e) $9e + 2 + e + 2$ (f) $4 + 3a + 2a + 8$

(g) $2y + 4 + 3y - 1$ (h) $8 + 3w - w - 3$ (i) $5 - 4s - 2 + 10s$

(j) $3x + 6y + 5x - 2y$ (k) $6m - 2s + 11s + m$ (l) $2a + 3b - 2 + a + 3b + 4$

(m) $3a - 2b + a - 5b$ (n) $2x - 2y - 6x + 5y$ (o) $y - 4m - 3y - 5m$

(p) $7p - 2q - q + 3r + 4r$ (q) $11c + 8d - 6c - 11d$

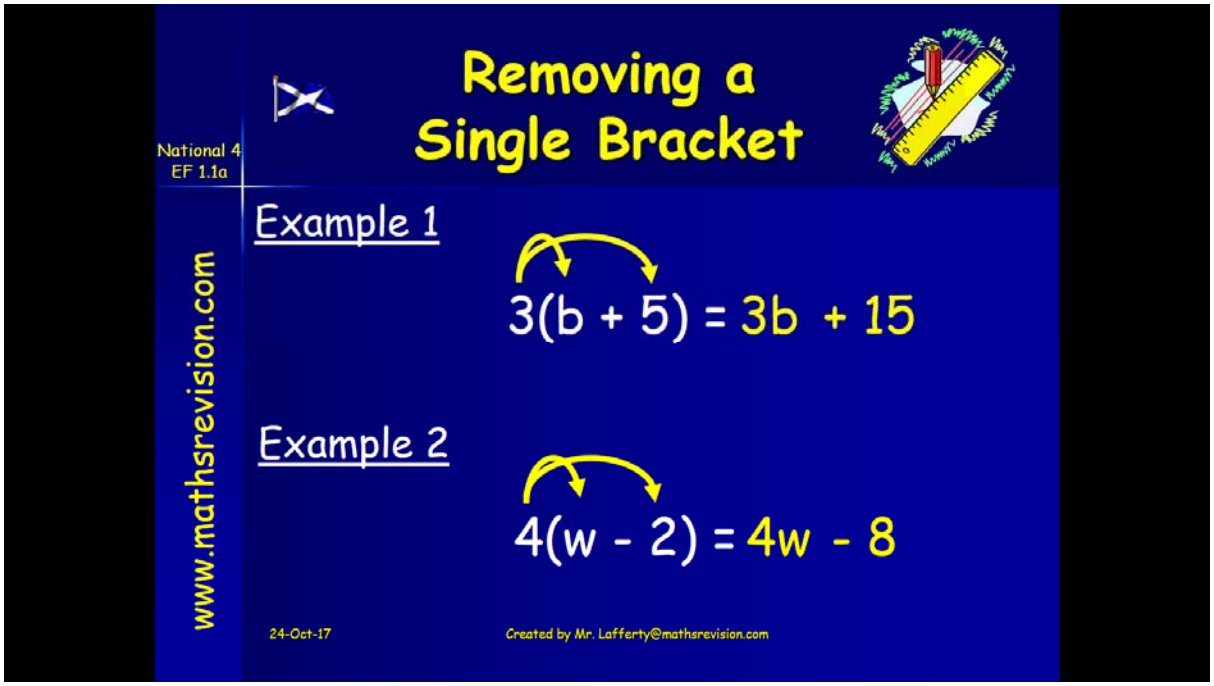
Collecting Like Terms (Mixed Questions)

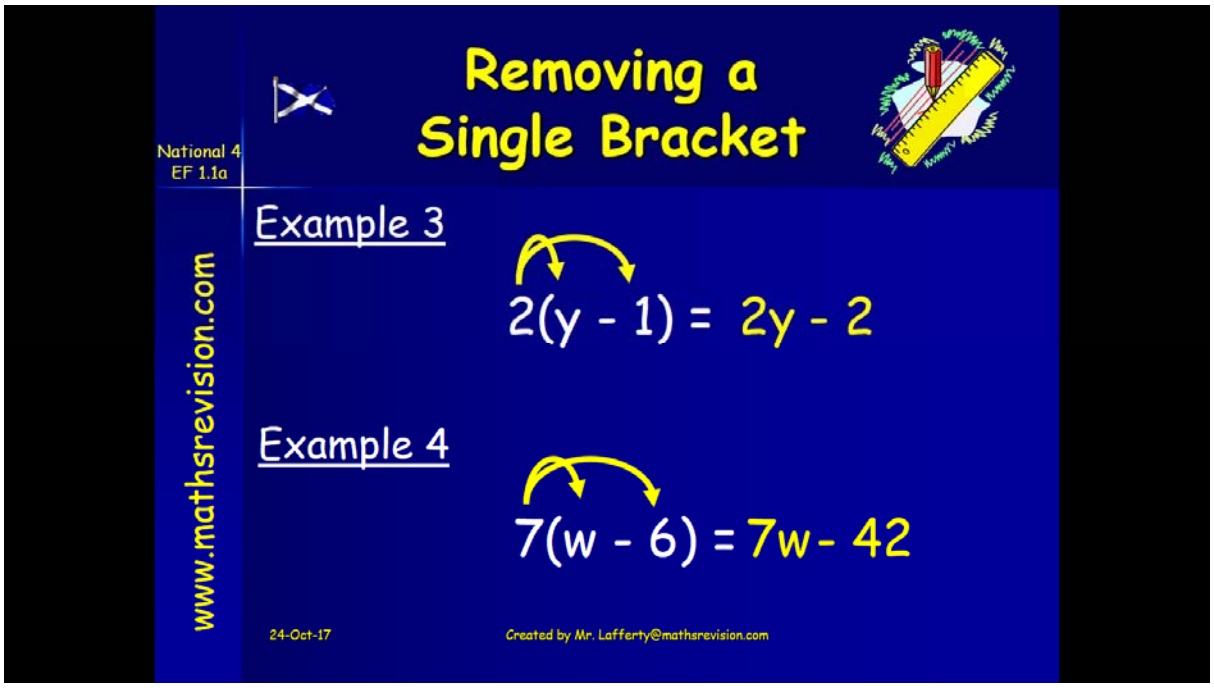
Bronze	Silver	Gold
Simplify:	Simplify:	Simplify:
Q1) $3v + 5x + 5v + 2x$	Q1) $7b - 9d + 6b + 2d$	Q1) $4q^2 - 3q + 3q^2 - 8q$
Q2) $2d + 2n + 3d + 3n$	Q2) $6u - 8d + 6u + 2d$	Q2) $5v^2 - 2v - 7v^2 - 6v$
Q3) $3n + 3j + 3n + 7j$	Q3) $7d - 8q + 9d - 4q$	Q3) $4l^2 + 7l + 5l^2 + 7l$
Q4) $4b + 8g + 8b + 6g$	Q4) $5w - 7d + 8w - 8d$	Q4) $7r^2 - 4r + 2r^2 - 4r$
Q5) $9u + 4h + 4u + 6h$	Q5) $2v - 3f + 9v + 5f$	Q5) $8e^2 + 4e + 8e^2 + 4e$
Q6) $9g + 3c + 8g + 5c$	Q6) $6h + 5n + 7h - 7n$	Q6) $8u^2 - 5u - 6u^2 - 3u$
Q7) $8b + 3w + 5b + 2w$	Q7) $8j - 9u + 5j + 4u$	Q7) $3h^2 - 8h + 5h^2 - 4h$
Q8) $4q + 8u + 4q + 2u$	Q8) $5s - 5a + 6s - 2a$	Q8) $7l^2 + 6l + 4l^2 + 5l$

Collecting Like Terms (Mixed Questions)

Bronze	Silver	Gold
Simplify:	Simplify:	Simplify:
Q1) $6h + 6k + 7h + 3k$	Q1) $6n - 6w + 7n - 5w$	Q1) $4a^2 - 4a + 8a^2 + 7a$
Q2) $7d + 3s + 6d + 3s$	Q2) $5u - 6x + 3u - 5x$	Q2) $5l^2 + 2l - 6l^2 + 5l$
Q3) $3t + 4v + 9t + 4v$	Q3) $4e - 7t + 2e - 5t$	Q3) $3j^2 - 8j + 7j^2 - 7j$
Q4) $7j + 8l + 8j + 9l$	Q4) $8w + 8v + 6w - 5v$	Q4) $5s^2 - 8s + 6s^2 + 4s$
Q5) $2l + 6h + 8l + 6h$	Q5) $3t - 3l + 8t - 9l$	Q5) $5d^2 - 6d + 5d^2 + 8d$
Q6) $6w + 7d + 3w + 5d$	Q6) $6p + 3f + 4p - 6f$	Q6) $5v^2 - 5v - 3v^2 + 8v$
Q7) $3r + 3e + 3r + 6e$	Q7) $6h - 3i + 5h + 6i$	Q7) $8q^2 - 7q + 7q^2 + 6q$
Q8) $3t + 3d + 2t + 8d$	Q8) $4u + 8j + 6u - 5j$	Q8) $5a^2 - 8a - 3a^2 - 9a$

Removing Brackets





Practice Questions

Question 1:

Remove the brackets :-

(a) $2(d + 4)$	(b) $3(c + 1)$	(c) $4(e + 5)$	(d) $5(g + 8)$
(e) $6(h + 7)$	(f) $2(n - 3)$	(g) $4(a - 2)$	(h) $5(t - 1)$
(i) $2(b - 3)$	(j) $7(k - 6)$	(k) $5(n - 9)$	(l) $9(1 + x)$
(m) $4(3 + y)$	(n) $8(1 + m)$	(o) $2(1 - p)$	(p) $4(4 - q)$
(q) $6(a + b)$	(r) $2(f + g)$	(s) $7(g - k)$	(t) $10(d - 100)$
(u) $12(3 + b)$	(v) $15(r + 2)$	(w) $20(a - 5)$	(x) $50(g - 4)$

Question 2:

Remove the brackets :-

(a) $2(a + 3)$	(b) $3(b + 2)$
(c) $4(c + 6)$	(d) $5(d + 8)$
(e) $6(e + 9)$	(f) $2(f - 1)$
(g) $5(g - 3)$	(h) $4(h - 6)$
(i) $2(i - 10)$	(j) $8(j - 7)$
(k) $6(k - 8)$	(l) $10(1 + p)$
(m) $7(2 + m)$	(n) $20(3 + n)$
(o) $2(1 - v)$	(p) $5(5 - p)$
(q) $2(v - w)$	(r) $2(a + m)$
(s) $12(a - b)$	(t) $20(d + e)$
(u) $9(p - q)$	(v) $50(w - 10)$.

Question 3:

Multiply out the brackets :-

(a) $2(x + 1)$	(b) $3(x - 2)$	(c) $4(x + 7)$
(d) $5(x - 3)$	(e) $7(y - 1)$	(f) $9(t - 2)$
(g) $10(a + 7)$	(h) $20(w + 5)$	(i) $17(y + 1)$
(j) $3(x - y)$	(k) $5(a + b)$	(l) $2(p - q)$
(m) $8(g + h)$	(n) $2(x + y + 2)$	(o) $6(x + y + 1)$
(p) $5(x - y - 2)$	(q) $3(2x + 1)$	(r) $6(3a - 2)$
(s) $2(6p - 4)$	(t) $7(2t + 5)$	(u) $4(5q - 1)$
(v) $100(5v - 2)$	(w) $3(2x + 3y + 1)$	(x) $2(4x - y + 5)$

Removing Brackets with a Negative Multiplier

Question 1:

Watch the negatives when working out these brackets :-

(a) $-2(a + 1)$	(b) $-3(b + 4)$
(c) $-4(c + 2)$	(d) $-7(d + 5)$
(e) $-9(2e + 1)$	(f) $-5(3f + 2)$
(g) $-6(2 + 3g)$	(h) $-2(h + 2x)$
(i) $-5(i - 1)$	(j) $-3(j - 5)$
(k) $-4(k - 7)$	(l) $-8(w - 3)$
(m) $-2(3m - 2p)$	(n) $-5(4 - 10n)$

Question 2:

Remove these brackets :-

(a) $-2(a + 1)$	(b) $-3(x - 2)$	(c) $-5(3 + d)$	(d) $-4(5 - c)$
(e) $-(p + q)$	(f) $-(p - q)$	(g) $-6(d + e)$	(h) $-5(d - e)$
(i) $-p(p + 4)$	(j) $-h(h - 1)$	(k) $-x(1 + x)$	(l) $-2m(m + 3)$
(m) $-a(4a - 1)$	(n) $-h(5h + 4k)$	(o) $-x(5y - 4x)$	(p) $-2x(x - 3k)$

Removing Brackets – Mixed Questions

Expand:

Q1) $7(7e-9)$

Q2) $2(6h-2)$

Q3) $3(2b+8)$

Q4) $4(4f-8)$

Q5) $2(7u-9)$

Q6) $7(7m+2)$

Q7) $6(4s+5)$

Q8) $4(6l+8)$

Expand:

Q1) $5k(2k+3)$

Q2) $4l(8l-8)$

Q3) $3x(6x-8)$

Q4) $4r(8r-3)$

Q5) $6p(2p-6)$

Q6) $2h(9h+8)$

Q7) $4m(7m+5)$

Q8) $2b(6b-7)$

Removing Brackets – Mixed Questions

Expand:

Q1) $7(6u+9)$

Q2) $5(4d-8)$

Q3) $4(6q+8)$

Q4) $8(7m-3)$

Q5) $6(8q+2)$

Q6) $3(8n+9)$

Q7) $3(3v-5)$

Q8) $4(4q-7)$

Expand:

Q1) $3m(4m+6)$

Q2) $7t(6t+3)$

Q3) $2u(5u+3)$

Q4) $9p(4p-2)$

Q5) $9q(6q-8)$

Q6) $7s(2s+6)$

Q7) $8j(4j-5)$

Q8) $5t(9t-7)$

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Expanding Brackets

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Examples

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Workout

Question 1: Expand the following brackets

(a) $5(y + 3)$ (b) $4(a + 2)$ (c) $8(w + 10)$ (d) $3(x - 7)$

(e) $9(s - 1)$ (f) $2(8 - t)$ (g) $7(4 + h)$ (h) $10(a + 2b + 3c)$

(i) $4(3y + 2)$ (j) $5(2p - 1)$ (k) $3(7a + 2)$ (l) $9(2x - 5)$

(m) $5(4 + 3t)$ (n) $7(9 - 2c)$ (o) $8(3w + 1)$ (p) $9(1 - 4p)$

(q) $11(2k - 5)$ (r) $20(6a + 5c)$ (s) $3(15w - 7)$ (t) $3(9 - 2a)$

Question 2: Expand the following brackets

(a) $-2(w + 5)$ (b) $-3(c + 7)$ (c) $-8(c + 7)$ (d) $-10(y - 2)$

(e) $-7(g - 3)$ (f) $-4(2w + 3)$ (g) $-9(3w - 5)$ (h) $-9(5x - 1)$

(i) $-5(6 - c)$ (j) $-6(4 + 3m)$ (k) $-2(1 + 9c)$ (l) $-5(8a - 7w)$

Question 3: Expand the following brackets

(a) $a(c + 2)$ (b) $c(d - 3)$ (c) $a(b + c)$ (d) $w(8 - y)$

(e) $c(5 + a)$ (f) $w(a - 9)$ (g) $y(s + t)$ (h) $2a(c - 3)$

(i) $5x(y + 8)$ (j) $3a(2c + 9)$ (k) $6g(2c - 1)$ (l) $9k(2 + d)$

(m) $5(2f + 9w)$ (n) $3y(5p + 2)$ (o) $2s(t + 1)$ (p) $-4a(8x - 3)$

Question 4: Expand the following brackets

(a) $a(a + 2)$ (b) $y(y - 5)$ (c) $w(a + w)$ (d) $c(9 - c)$

(e) $p(2p + 5)$ (f) $2w(3w - 1)$ (g) $9y(2y + 3)$ (h) $4c(2a + 5c)$

1. Expand $4(y + 2)$

.....
(1)

---

2. Expand $2(3w - 5y)$

.....
(1)

---

3. Expand $3(2y - 1)$

.....
(1)

---

4. Expand $y(3y + 5)$

.....
(1)

5. Expand $4(2m - 3p)$

.....
(1)

---

6. Multiply out $x(x + 3)$

.....
(1)

---

7. Expand $5y(2y + 1)$

.....
(2)

---

8. Expand $2(h - 4)$

.....
(1)

9. Expand $a(a - 9)$

.....
(1)

---

10. Expand $3(10 - 3y)$

.....
(1)

---

11. Expand $-3(y + 2)$

.....
(1)

---

12. Expand $-2(y - 4)$

.....
(1)

13. Expand $y(y^2 + 3)$

.....
(1)

---

14. Expand $2w(3w^2 - 5)$

.....
(2)

---

15. Expand $y^2(8 - 2y)$

.....
(2)

---

16. Expand $a(3a + 2ac)$

.....
(2)

Removing Brackets – Extension work

Removing Brackets containing 3 terms:

Rewrite the following without brackets :-

(a) $2(3a + 4b + 1)$ (b) $3(5x + 2y + 3)$ (c) $5(7c + 2d + 6)$ (d) $4(2k + 3j + 4f)$

(e) $6(2v + 4w + 5z)$ (f) $10(p + q - 2r)$ (g) $2(5a - 2b - 4c)$ (h) $6(3p - 5q - 7)$

(i) $5(2x - 3y - 5t)$ (j) $8(a - 2b - 5c)$ (k) $9(5 - 4f - 3g)$ (l) $a(a - b - 4c)$

Rewrite the following without brackets :-

(a) $2(a + 4b + 1)$ (b) $3(4c + d + 3)$

(c) $2(e - 2f + 6)$ (d) $5(g - 3h - 4)$

(e) $10(j + k + 10)$ (f) $20(m - n - 1)$

(g) $2(3p + 5q + 1)$ (h) $3(3r + 2s + 2)$

(i) $2(3t + 7u + 9)$ (j) $2(4v + 2w + 5)$

(k) $5(7x + 2y + 1)$ (l) $4(2a + 3b + 4)$

(m) $7(2c + 4e + 6)$ (n) $9(d + g + 2k)$

(o) $2(5w - 2x - 4)$ (p) $4(3y + 5p - 8)$

(q) $6(2g - 5c - 7)$ (r) $7(2b - 3m - 5n)$

(s) $2(10p - 2t + 4q)$ (t) $5(4a + 2b - 8c)$

(u) $10(3g - 2h - 8k)$ (v) $20(p - y - 5)$

(w) $-2(m + 2n + 1)$ (x) $-5(2s + 3e + 2)$

(y) $-2(3a + 5b + 1)$ (z) $-4(3x - 2y - 5)$.

Removing brackets and collecting like terms:

Multiply out the brackets and collect like terms :-

1. (a) $2(x + 1) + 4$ (b) $3(a + 2) + 5$ (c) $4(b + 5) + 1$
   (d) $2(c + 6) - 8$ (e) $7(w + 1) - 6$ (f) $4(n + 3) - 12$
   (g) $2(y + 1) + 4y$ (h) $5(x + 2) + 4x$ (i) $3(m + 5) - 2m$
   (j) $8(p + 2) - 5p$ (k) $9(4 + h) - 8h$ (l) $3x + 3(x + 3)$
   (m) $2a + 5(a - 1)$ (n) $4p + 2(3p + 1)$ (o) $6q + 3(2q - 4)$
   (p) $10v + (v - 2)$ (q) $2a + 6(a + b)$ (r) $x + 3(2x + 5y)$
   (s) $4x + 2(3x - 11y)$ (t) $50p + 10(5p + q)$ (u) $7 + 2(h + 1)$ work out bracket first
   (v) $3(4x - 2y) - 10x$ (w) $14w + 2(3w + 4v)$ (x) $5 + 2(p - 5)$.

2. (a) $2(x + 3) + 3(x + 1)$ (b) $4(a + 2) + 5(a + 1)$ (c) $3(d + 2) + 7(d + 1)$
   (d) $2(m - 1) + 5(m + 2)$ (e) $8(c - 2) + 2(c + 8)$ (f) $2(n - 4) + 9(n + 1)$
   (g) $5(2 + 2v) + 7(1 - v)$ (h) $3(1 - x) + 5(1 + x)$ (i) $9(2q + 1) + (2q - 8)$
   (j) $2(5d - 3) + 3(2d + 4)$ (k) $9(2 - 2h) + 10(1 + 2h)$ (l) $2(6v + 4w) + 2(4w - 2v)$.

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Expanding Brackets

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(i) $2u(3 - u)$ (j) $m(m^2 + 3)$ (k) $y(y^2 - 7)$ (l) $g^2(g - 8)$

(m) $2w(w^2 + 6)$ (n) $4a(2a^2 - 3)$ (o) $5c(3c^2 - a)$ (p) $8w(3w^2 + 3y)$

(q) $x^2(x^2 + 4)$ (r) $3w^2(7 + 2w^2)$

Question 5: Expand and simplify

(a) $5(y + 3) + 2(y + 7)$ (b) $6(2w + 5) + 9(w + 2)$ (c) $3(y - 2) + 4(2y + 5)$

(d) $7(2g + 3) - 5(g+ 2)$ (e) $6(x - 2) - 4(x - 8)$ (f) $2(3y - 8) - 5(2y - 1)$

(g) $8(5 + 2m) + 3(5 - 3m)$ (h) $4(w + 7) - 2(2w + 1)$ (i) $9(1 + 2y) + 3(3 - y)$

Question 6: Expand and simplify

(a) $w(w + 5) + w(w + 7)$ (b) $2g(4g + 3) + g(g - 7)$ (c) $n(n - 4) - n(5 - n)$

(d) $2e(4e + 3) - 3e(e - 5)$ (e) $a(3 + c) + c(a + 2)$ (f) $m(a + 7) - a(4 - 3m)$

(g) $8c(8 - 3a) + 3(4 - c)$ (h) $5y(3y + z) - 2y(4y - 3z)$ (i) $4c(3c - c^2) - 2c^2(4 - 5c)$

Apply

Question 1: Can you spot any mistakes in the questions below.

Expand $3(2y - 1)$

$6y - 1$

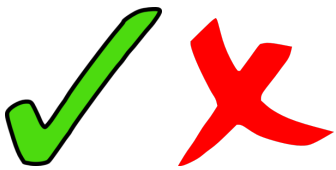
Multiply out $x(x + 3)$

$2x + 3x = 5x$

Expand and simplify $6(w + 3) - 2(w - 5)$

$6w + 18 - 2w - 10$
$= 4w + 8$

Answers



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