MATHEMATICS

Year 6 to 7 Algebra Challenge Booklets

Name: _____

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Algebra Skills

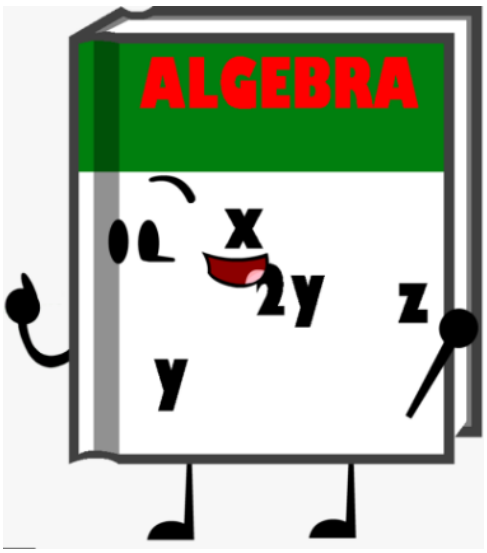
If you are already very confident using the key skills in the transition number booklet then the following topics will give you a bit of a head start for Year 7 Algebra.

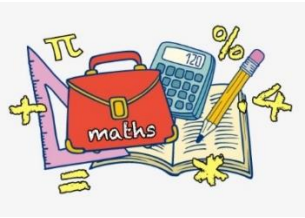
In this booklet you will find work on:

- Collecting like terms
- Multiplying terms
- Expanding single brackets
- Substituting into expressions

We have also included video links so pupils can try to teach themselves and answers so they can mark their work.

These are not the only algebra skills that you will look at during the KS3 course however, they are a good place to start!





Collecting like terms

Video Support: https://corbettmaths.com/2013/12/28/collecting-like-terms-video-9/

Example:

Collect like terms

$$4a + 5 + 2a - 3$$

$$= 6a + 2$$

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) $7y^2 + 3y^2$

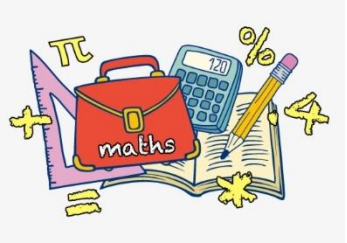
(y) $2w^2 + 4w^2 + 8w^2$ (z) $6y^2 - 2y^2 + 3y^2$

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) $4 + 3a + 2a + 8$

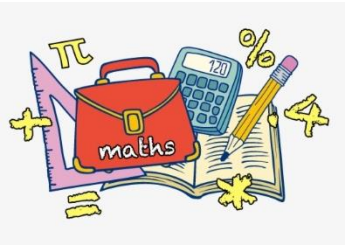
(g) $2y + 4 + 3y - 1$ (h) $8 + 3w - w - 3$ (i) $5 - 4s - 2 + 10s$

(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 Answers:



Question 1

(a) 4y (b) 5w (c) 6a (d) 3s (e) 2n

(f) 3g (g) 2y (h) 0 (i) 5y (j) 7a

(k) 14k (l) 8m (m) 35c (n) 3w (o) 8y

(p) 6t (q) 3x (r) 0 (s) 6y (t) u

(u) $2y^2$ (v) $3a^2$ (w) $5c^2$ (x) $10y^2$ (y) $14w^2$

(z) $7y^2$

Question 2

(a) -2u (b) -w (c) -3a (d) -7y (e) -5g

(f) 5f (g) -8m (h) $-2y^2$ (i) $-a^2$ (j) 3ab

Question 3:

(a) 6a + 3b (b) 12y + 4h (c) 10a + 2g (d) 15m + 10p

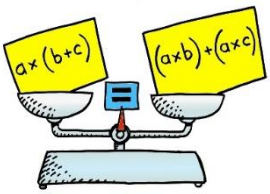
(e) 10e + 4 (f) 5a + 12 (g) 5y + 3 (h) 2w + 5

(i) 3 + 6s (j) 8x + 4y (k) 7m + 9s (l) 3a + 6b + 2

(m) 4a – 7b (n) 3y – 4x (o) -2y – 9m (p) 7p – 3q + 7r

(q) 5c – 3d

Multiplying terms



Video Support: https://corbettmaths.com/2013/03/13/multiplying-terms/

Examples:

Multiply Terms – Example One

Simplify: 7 x 5h

Steps are : Fully Expand, Reorder, then Simplify

= 7 x 5 x h

= 35 x h

= **35h** ✓

Multiply Terms – Example Two

Simplify : **7e x 5h**

7e x **5h** (First expand all terms fully)

= **7** x **e** x **5** x **h** (Group Numbers & Letters)

= **7** x **5** x **e** x **h** (Simplify and Remove x's)

= **35eh** ✓

Question 1: Simplify the following expressions.

(a) $3 \times y$ (b) $w \times 3$ (c) $7 \times x$ (d) $a \times 4$

(e) $a \times c$ (f) $f \times g$ (g) $h \times d$ (h) $a \times y \times m$

(i) $t \times t$ (j) $p \times p$ (k) $a \times a \times a$ (l) $m \times m \times m$

(m) $4 \times f \times g$ (n) $3 \times w \times y$ (o) $p \times 5 \times s$ (p) $n \times c \times 7$

(q) $t \times c \times w$ (r) $y \times x \times w$ (s) $5 \times a \times a$ (t) $y \times 3 \times y$

Question 2: Simplify the following expressions.

(a) $5 \times 3w$ (b) $4y \times 2$ (c) $3 \times 3m$ (d) $10g \times 3$

(e) $4 \times 2 \times y$ (f) $3 \times 2 \times 2p$ (g) $5 \times 2y \times 3$ (h) $9a \times 2 \times 2$

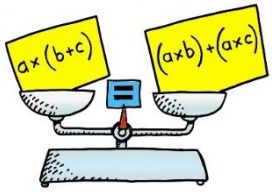
(i) $3a \times c$ (j) $4y \times z$ (k) $5c \times b$ (l) $c \times 6y$

(m) $2a \times 3y$ (n) $6c \times 3t$ (o) $9w \times 3a$ (p) $2y \times 2g$

(q) $2y \times y$ (r) $5w \times w$ (s) $m \times 3m$ (t) $x \times 2x$

(u) $4t \times 2t$ (v) $6y \times 3y$ (w) $9a \times 9a$ (x) $12y \times 10y$

(y) $2a \times 3p \times 5w$ (z) $10y \times 2p \times 3c \times m$



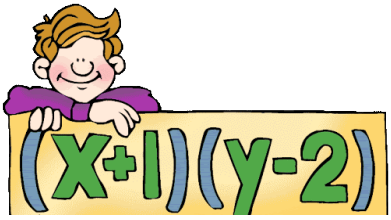
Multiplying terms Answers:

Question 1:

(a) 3y	(b) 3w	(c) 7x	(d) 4a
(e) ac	(f) fg	(g) dh	(h) amy
(i) t^2	(j) p^2	(k) a^3	(l) m^3
(m) 4fg	(n) 3wy	(o) 5ps	(p) 7cn
(q) ctw	(r) wxy	(s) $5a^2$	(t) $3y^2$

Question 2:

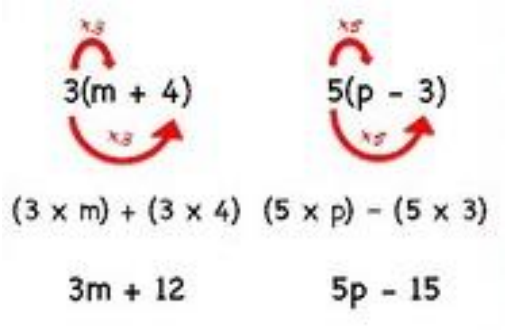
(a) 15w	(b) 8y	(c) 9m	(d) 30g
(e) 8y	(f) 12p	(g) 30y	(h) 36a
(i) 3ac	(j) 4yz	(k) 5bc	(l) 6cy
(m) 6ay	(n) 18ct	(o) 27aw	(p) 4gy
(q) $2y^2$	(r) $5w^2$	(s) $3m^2$	(t) $2x^2$
(u) $8t^2$	(v) $18y^2$	(w) $81a^2$	(x) $120y^2$
(y) 30apw	(z) 60cmpy		



Expanding Single Brackets

Video Support: https://corbettmaths.com/2013/12/23/expanding-brackets-video-13/

Example:



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) $3(9 - 2a)$

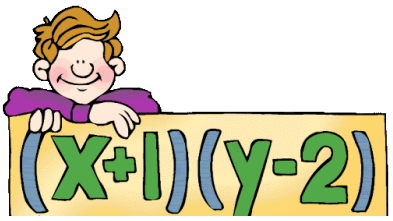
Question 2: Expand the following brackets

(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) $-4a(8x - 3)$

Expanding Single Brackets Answers:



Question 1

(a) 5y + 15 (b) 4a + 8 (c) 8w + 80 (d) 3x – 21

(e) 9s – 9 (f) 16 – 2t (g) 28 + 7h (h) 10a + 20b + 30c

(i) 12y + 8 (j) 10p -5 (k) 21a + 6 (l) 18x – 45

(m) 20 + 15t (n) 63 – 14c (o) 24w + 8 (p) 9 – 36p

(q) 22k – 55 (r) 120a + 100c (s) 45w – 21 (t) 27 – 6a

Question 2:

(a) -2w – 10 (b) -3c – 21 (c) -8c – 56 (d) -10y + 20

(e) -7g + 21 (f) -8w – 12 (g) -27w + 45 (h) -45x + 9

(i) -30 + 5c (j) -24 – 18m (k) -2 – 18c (l) -40a + 35w

Question 3:

(a) ac + 2a (b) cd – 3c (c) ab + ac (d) 8w – wy

(e) 5c + ac (f) aw – 9w (g) sy + ty (h) 2ac – 6a

(i) 5xy + 40x (j) 6ac + 27a (k) 12cg – 6g (l) 18k + 9dk

(m) 10f + 45w (n) 15py + 6y (o) 2st + 2s (p) -32ax + 12a

Substitution

Video Support: https://corbettmaths.com/2012/08/20/substitution-into-expressions/

Example:

Evaluate 3a - 2b, for a = 10 and b = 4

$3a - 2b \quad (a = 10 \quad b = 4)$

$= 3(10) - 2(4)$

$= 30 - 8$

$= 22$ ✓

Question 1: If $a = 7$ $b = 10$ $c = 3$ $d = 8$ and $e = 15$
Find the value of each expression.

(a) $a + 5$ (b) $b - 4$ (c) $c + d$ (d) $e - d$

(e) $2a$ (f) $4b$ (g) $3e$ (h) $5c$

(i) $\frac{b}{2}$ (j) $\frac{e}{5}$ (k) $\frac{d}{4}$ (l) $\frac{a}{2}$

(m) a^2 (n) b^2 (o) c^2 (p) d^2

(q) $2a + 1$ (r) $3b - 7$ (s) $9c + 11$ (t) $4e - 45$

(u) $2a + 3c$ (v) $4d - b$ (w) $5a + 2d$ (x) $e - 4c$

(y) $30 - 4a$ (z) $15 - 3c$

Question 2: If $f = 5$ $g = 6$ $h = 4$ and $i = 2$
Find the value of each expression.

(a) fg (b) hi (c) fgh (d) i^3

(e) $\sqrt{h}$ (f) $3f + 2g$ (g) $5h + 7i$ (h) $9h - 7i$

Substitution Answers:

Question 1:

(a) 12	(b) 6	(c) 11	(d) 7
(e) 14	(f) 40	(g) 45	(h) 15
(i) 5	(j) 3	(k) 2	(l) 3.5
(m) 49	(n) 100	(o) 9	(p) 64
(q) 15	(r) 23	(s) 38	(t) 15
(u) 23	(v) 22	(w) 51	(x) 3
(y) 2	(z) 6		

Question 2:

(a) 30	(b) 8	(c) 120	(d) 8
(e) 2	(f) 27	(g) 34	(h) 22