Basic Algebra Revision

Grouping Terms: Collect like terms together (simplify - tidy up - write in shorter form)

p + p	**2p**	2 x p	**2p**
c + c + c	**3c**	p x p	**p^2**
m + m + m + m	**4m**	c x c x c	**c^3**
p + p + r	**2p + r**	m x m x m x m	**m^4**
m + m + 4	**2m + 4**	p x p x r	**p^2r**
n + 2n + 5	**3n + 5**	4 x m x m	**$4m^2$**
8m + 2n - 3m	**5m + 2n**	5n x 2n	**$10n^2$**

Note: **p + p + p** **3p** **3 x p** are all equivalent

Remember **BODMAS** multiplication before addition or subtraction

e.g. 12p - 4 x 2p = 12p - 8p = 4p

More examples:

1.	y + y - 1	**2y - 1**	11.	y + y + z + z	**2y + 2z**	21.	y x 2y x 3y	**$6y^3$**
2.	x + 2 + 3 + x	**2x + 5**	12.	5 + 3x -2 - 2x	**3 + x**	22.	a x a x 2a x 3a	**$6a^4$**
3.	y + 4 - 1 + y	**2y + 3**	13.	p x p	**p^2**	23.	b x 5 - 1	**5b - 1**
4.	5a - 2a + 4 + 5a	**8a + 4**	14.	v x v x v	**v^3**	24.	3u + 2 x u	**5u**
5.	p + 2 + p + 1	**2p + 3**	15.	4 x 2 x c	**8c**	25.	5v - 4 x v	**v**
6.	5w - w + t + 4t	**4w + 5t**	16.	2p x 3p	**$6p^2$**	26.	3a + 5 + 2a	**5a + 5**
7.	x - 7 + 8 - x	**1**	17.	3p x 2r	**6pr**	27.	2s + 1 - s	**s + 1**
8.	3u - 3v + 5 - u	**2u - 3v + 5**	18.	$p^2 + p^2$	**$2p^2$**	28.	9n - 3 x 3n	**0**
9.	c + 7d + 2e - c - 7d	**2e**	19.	3p x 2p x 3r	**$18p^2r$**	29,	$7z^2 - z^2$	**$6z^2$**
10.	s - 1 - t + 4	**s - t + 3**	20.	3a x 5a x 2a	**$30a^3$**	30.	$3pn^2$ x 2p	**$6p^2n^2$**

Breaking brackets - (multiplying out - removing brackets)

2c means 2 x c or c + c

so 2(n + 4) means 2 x (n + 4) or n + 4 + n + 4 or 2n + 8

RULE: Multiply everything in the bracket by the number outside the bracket.

Examples:

3 (t + 2)	**3t + 6**	2 (3 t + 4)	**6t + 8**
5 (p - 2)	**5p - 10**	3 (3f - 2)	**9f - 6**
-2 (p + 3)	**-2p - 6**	-2 (5t + 3)	**-10t - 6**
-4 (m - 5)	**-4m +20**	-4 (2 m - 5)	**-8m +20**

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p (2p + 1)	**$2p^2 + p$**	p (2p + 1)	**$2p^2 + p$**
3m(m - 2)	**$3m^2 - 6m$**	3m(m - 2)	**$3m^2 - 6m$**
-2t (3t + 3)	**$-6t^2 - 6t$**	-2t (3t + 3)	**$-6t^2 - 6t$**
-4x (3x - 5)	**$-12x^2 +20$**	-4x (3x - 5)	**$-12x^2 +20$**

More simplification

example: Simplify 2(3p + 2r) - 3p

RULE: First, break the brackets then collect like terms (tidy up)

6p + 4r - 3p
3p + 4r

Simplify:

1.	5(3x + 2y) - 4x	**15x + 10y - 4x**	**11x + 10y**
2.	2a + 3(4a - 5)	**2a + 12a - 15**	**14a - 15**
3.	x(x + 2) + 3x	**x^2 + 2x + 3x**	**x^2 + 5x**
4.	a(a + b) - ab	**a^2 + ab - ab**	**a^2**
5.	3(2c + 1) + 2(3c - 1)	**6c + 3 + 6c - 2**	**12c + 1**
6.	3(2t - 3s) - 5s	**6t - 9s - 5s**	**6t - 14s**
7.	5d - 3(2d + 1)	**5d - 6d - 3**	**-d - 3**
8	4f - 2(3 - 4f)	**4f - 6 + 8f**	**12f - 6**

Factorising

example: Factorise 12 + 8a

RULE: Look for common factors in all the terms
Take common factors outside brackets
What is left goes inside the bracket
Check by multiplying out the brackets

Common factor 4
Take outside 4 (? + ?)
We need 4 x 3 to get 12 and 4 x 2a to get 8a
4 (3 + 2a) *multiplying out gives 12 + 8a*

Factorise:

1.	15 - 10x	**5 (3 - 2x)**
2.	12ab - 8c	**4(3ab - 2c)**
3.	15w + 6st	**3(5w + 2st)**
4.	8a - 12b	**4(2a - 3b)**
5.	3pr - 6p	**3p(r - 2)**
6.	6ab - 12bc	**6b(a - 2c)**
7.	4pqr - 8pr	**4pr(q - 2)**
8.	10ab - 5ac	**5a(2b - c)**
9.	12ac - 18cd	**6c(2a - 3d)**
10.	xyz + 2xy	**xy(z + 2)**

Factorise: ***(more difficult ones)***

11.	3pqr + 6pq - 9pr	**3p(qr + 2q - 3r)**
12.	p^2 + p	**p (p + 1)**
13.	c^2 + 3c	**c (c + 3)**
14.	$6c^2$ + 12c	**6c(c + 2)**
15.	$3mn^2$ + $6m^2n$	**3mn(n + 2m)**
16.	$3p^2qr$ + $6pq^2r$	**3pqr(p + 2q)**
17.	$3x^2y$ + $6x^2yz$	**$3x^2y$(1 + 2z)**
18.	12abc - 3ac	**3ac(4b - 1)**
19.	16pq - 12q	**4q(4p - 3)**
20.	$8p^2$ - $18q^2$	**2(p^2 - $9q^2$)**

Solving equations

Example: $8 + 3x = 17$

You want to end up with the letters on one side and the numbers on the other

RULE: **Change Side - Change Sign**

Example:
$$8 + 3x = 17$$
$$3x = 17 - 8$$
$$3x = 9$$
$$x = 3$$

Example:
$$7x + 3 = 2x + 8$$
$$7x - 2x = 8 - 3$$
$$5x = 5$$
$$x = 1$$

More examples to try:

$5x = 15$
$x = 3$

$8x = 32$
$x = 4$

$3x = 24$
$x = 8$

$6 + x = 11$
$x = 11 - 6$
$x = 5$

$7 + 3x = 13$
$3x = 13 - 7$
$3x = 6$
$x = 2$

$9p = 2p + 49$
$9p - 2p = 49$
$7p = 49$
$p = 7$

$12 = 18 - 2y$
$12 + 2y = 18$
$2y = 18 - 12$
$2y = 6$
$y = 3$

$2x + 3 = x + 7$
$2x - x = 7 - 3$
$x = 4$

$5m + 1 = 13 - m$
$5m + m = 13 - 1$
$6m = 12$
$m = 2$

$3n - 2 = 6 - n$
$3n + n = 6 + 2$
$4n = 8$
$n = 2$

$8 + 2x = 5x - 4$
$8 + 4 = 5x - 2x$
$12 = 3x$
$4 = x$

$6k + 10 = 8k - 2$
$10 + 2 = 8k - 6k$
$12 = 2k$
$6 = k$

$7 - m = 3m - 1$
$7 + 1 = 3m + m$
$8 = 4m$
$2 = m$

$7x + 3 = 2x + 15$
$7x - 2x = 15 - 3$
$5x = 12$
$x = 2.4$

$4x - 3 = x + 5$
$4x - x = 5 + 3$
$3x = 8$
$x = 2.67$

$9 + 5x = 17$
$5x = 17 - 8$
$5x = 9$
$x = 1.8$

More Equations - only the answers are given.

Solve the following equations

1.	$6x = 36$	**$x = 6$**
2.	$4 + x = 12$	**$x = 8$**
3.	$5 + 3x = 11$	**$x = 2$**
4.	$18 - 2x = 8$	**$x = 5$**
5.	$6x - 2 = 4$	**$x = 1$**
6.	$10 - 3x = 1$	**$x = 3$**
7.	$8p - 7 = 33$	**$p = 5$**
8.	$4q + 11 = 51$	**$q = 10$**
9.	$3x - 5 = 13$	**$x = 6$**
10.	$4m + 2 = 22$	**$m = 5$**
11.	$5x - 4 = 20$	**$x = 4.8$ or $4^4/_5$**
12.	$8x + 3 = 17$	**$x = 1.75$ or $1^3/_4$**
13.	$3y - 1 = 0$	**$y = 0.33$ or $^1/_3$**
14.	$3x - 2 = 0$	**$x = 0.67$ or $^2/_3$**
15.	$8 - 3x = 11$	**$x = -1$**
16.	$4x + 8 = -4$	**$x = -3$**
17.	$7 - 8p = 15$	**$p = -1$**
18.	$6 - 8n = 10$	**$n = -0.5$ or $-^1/_2$**
19.	$14 - 4x = 3x$	**$x = 2$**
20.	$6x - 20 = 10x$	**$x = -5$**

21.	$3x + 2 = 2x + 5$	**$x = 3$**
22.	$5x - 1 = 3x + 3$	**$x = 2$**
23.	$3 - 2x = 2x - 1$	**$x = 1$**
24.	$3p - 2 = 5p - 6$	**$p = 2$**
25.	$y - 1 = 2y - 1$	**$y = 0$**
26.	$5x - 3 = 7x + 3$	**$x = -3$**
27.	$3n + 2 = 5n + 4$	**$n = -1$**
28.	$6n - 2 = 8n - 1$	**$n = -0.5$ or $-^1/_2$**
29.	$2x - 3 = 3x - 2$	**$x = -1$**
30.	$5 - 2x = 6 + x$	**$x = -0.33$ or $-^1/_3$**
31.	$2(x + 3) = 8$	**$x = 1$**
32.	$7(n + 2) = 21$	**$n = 1$**
33.	$8(k - 3) = 40$	**$k = 8$**
34.	$7(w + 2) = 14$	**$w = 0$**
35.	$4(3 - t) = 4$	**$t = 2$**
36.	$2(x + 3) - 4 = 6$	**$x = 2$**
37.	$5(3t - 1) + 5 = 15$	**$t = 1$**
38.	$3(2p + 1) + 2 = 23$	**$p = 3$**
39.	$5(w + 4) = 50$	**$w = 6$**
40.	$5(2t + 1) - 2(3t + 2) = 9$	**$t = 2$**

Evaluate: (find the value of an expression when you are given numbers for the letters)

If $x = 3$ and $y = 2$

What is the value of:

i)	**$x + y$**	ii)	**$x - y$**	iii)	**$5x - 3y$**	iv)	**$x^2 - y^2$**
	$3 + 2$		$3 - 2$		$15 - 6$		$9 - 4$
	5		1		9		5

if $a = 5$, $b = 3$ and $c = -1$ what is the value of each of these expressions:

1.	$2a - 3b$	**1**
2	$3a - c$	**16**
3.	$a + b + c$	**7**
4.	$a^2 + 2b$	**31**
5.	$2(a + b)$	**16**
6.	$3a(b + c)$	**30**
7.	$2a(b - c)$	**40**
8.	c^2	**1**
9.	$2ab$	**30**
10	$3bc$	**-9**
11.	$b^2 - c^2$	**8**
12.	$b^2 + c^2$	**10**
13.	$(a^2 + b^2)$	**6**
14.	$(ab + 1)$	**4**
15.	$-2ac$	**10**
16.	$-c^2$	**-1**