Using brackets in algebra

Expanding brackets
Brackets are often used in algebra. For example:
3x(a+b) means add **a** to **b** before multiplying by **3**
Usually this is written: **3(a+b)**, without the x. This avoids confusion with the letter x which is used a lot in algebra.
3(a+b) means **a+b+a+b+a+b = a+a+a +b+b+b = 3a+3b**
Working this out is called *expanding the brackets*. Actually the brackets disappear!

Examples
Expand the brackets in these expressions:
(a) 5(b+c) **(b) 3(2a-b)** **(c) a(4+a)**
(a) 5(b+c)=5b+5c
(b) 3(2a+b)=3x2a+3xb=6a+3b
(c) a(4+a)=ax4+axa=4a+a^2

Exercise 1 Expand the brackets in these expressions.

1 2(p+q)=______________________ **2** 3(c+d)=______________________
3 5(y-n)=______________________ **4** 4(t+1)=______________________
5 7(2p+2)=______________________ **6** 2(3a+2b)=______________________
7 a(b-c)=______________________ **8** d(d+2)=______________________
9 s(s-5)=______________________ **10** 2t(4r+3)=______________________
11 2c(3c+2) =______________________ **12** 3a(5a-4)=______________________

Factorising algebraic expressions
The opposite process to multiplying out brackets is called factorising.
To factorise an expression you need to find factors common to all the terms.

Example 1 *Factorise 12a+4b*
12a+4b =**4**x3a+**4**xb **4** is common to both terms:
=4( ) Place 4 outside a bracket
=4(3a+b) Work out what is missing from inside the brackets

Example 2 *Factorise $2c^2$+5c*
$2c^2$+5c =2cxc+5xc **c** is common to both terms:
=c( ) Place c outside a bracket
=c(2c+5) Work out what is missing from inside the brackets

Example 3 *Factorise $5d^2$-d*
$5d^2$-d = 5dxd-1xd d is common to both terms:
=d ( ) Place d outside a bracket
=d(5d-1) Work out what is missing from inside the brackets

Exercise 2 **Factorise**

1 2a+2b=______________________ **2** 2a+ab=______________________
3 5c+c^2=______________________ **4** 5d-5c=______________________
5 4e+2f=______________________ **6** c+3c=______________________
7 g^2+4g=______________________ **8** 2a-2b=______________________
9 s^2+s=______________________ **10** 6t+$2t^2$=______________________
11 $5m^2$+15m=______________________ **12** a^2-3a=______________________

Exercise 3

Audrey sells packets of sweets. There are three sizes of packets.

There are ***n*** sweets in the small packet.
There are twice as many sweets in the medium packet as there are in the small packet.

(a) Write down an expression, in terms of n, for the number of sweets in the medium packet.

There are 15 more sweets in the large packet than in the medium packet.

(b) Write down an expression, in terms of n, for the number of sweets in the large packet.

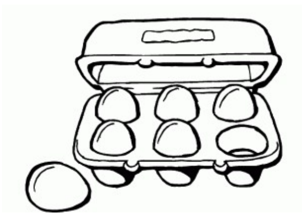
A small packet of sweets costs 10p, a medium packet costs 20p and a large one 30p.
Sebastian buys s small packets, m medium packets and l large packets of sweets.

(c) Write down an expression for the cost in pence of the sweets.

(d) Factorise the expression (the common factor is 10)

Exercise 4

Eggs are sold in boxes. A small box holds 6 eggs.



Hina buys x small boxes of eggs.

(a) Write down in terms of x, the total number of eggs in these small boxes.

A large box holds 12 eggs. Hina buys 4 less of the large boxes of eggs than the small boxes.

(b) Write down, in terms of x, the number of large boxes she buys.

(c) Find, in terms of x, the total number of eggs in the large boxes that Hina buys.

(d) Find, in terms of x, the total number of eggs that Hina buys.
Give your answer in its simplest form (expand the brackets then collect like terms)