Expanding & Factorising

You must always collect like terms when simplifying an expression. So, for example,

$$a^2b + b + 3a^2b = 4a^2b + b.$$

Get into the habit of ordering the letters alphabetically so that it is easier to see like terms

$$3a^2b + 2ba^2 - a^2b = 3a^2b + 2a^2b - a^2b = 4a^2b.$$

1. Expand the following and collect like terms:

(a) $5(x-2y)+7(x+y)$. $12x-3y$

(b) $x(x+4)-2(2x-3)$. x^2+6

(c) $a^2(a+b)-a(ab+b)$. a^3-ab

(d) $3x(x+1)+x(2x-1)$. $5x^2+2x$

(e) $x(x^2-3x+4)+x^2(3-x)$. $4x$

(f) $x(2x+3)-(x^2+2)+x+3$. x^2+4x+1

(g) $x(x^2-3x+4)-3(x-x^2)+x^3$. $2x^3+x$

(h) $2x^2(x^2+3x+y)+3x(x-2x^2+1)$. $2x^4+2x^2y+3x^2+3x$

(i) $y(7x-2)+5x(y-2x)-12xy$. $-2y-10x^2$

(j) $a^2b(b+2)-2ab(a+1)-(ba)^2$. $-2ab$

(k) $ab-a(2b+c)+b(a+c)$. $bc-ac$

(l) $y^3(8y-1)+y^2(7y^2-2y+2)$. $15y^4-3y^3+2y^2$

(m) $2(x^3-3x^2-x+1)-x(2x^2-3x+1)+3x$. $2-3x^2$

(n) $a(b^2-2b-5)-b(a^2-8a-2)+ab(2a+7b)$. $8ab^2+a^2b+6ab-5a+2b$

2. Factorise fully the following expressions:

(a) $6x-8$. $2(3x-4)$

(b) $10z^2+5z$. $5z(2z+1)$

(c) $5x^2-20xy$. □

(d) $36x^3y+30xy^2$. □

(e) $8ab^2c-16a^2b^2c$. □

(f) $6d^3e-d^4e$. □

(g) $\pi r^3-2\pi r^2h$. □

(h) $120l^3h-100h^2l^4$. □

(i) $y(2x+4y)-6y$. □

(j) $8xy(x^2+y^2)+2x(yx^3+y^3)$. □

(k) $30d^3e^4-15d^2e^3$. □

(l) $14b^3c+28b^3c^2+7a^2b^3c$. □

(m) $6x^5y^2-8y^3x^3-10x^8y$. □

(n) $5a^{20}b^{17}+20a^{30}b^{14}-15a^{20}b^{15}$. □

3. Expand the following brackets and collect like terms:

(a) $(x+1)(x+3)$. x^2+4x+3

(b) $(2x+3)(x+5)$. $2x^2+13x+15$

(c) $(3x+1)(5x+3)$. $15x^2+14x+3$

(d) $(x+y)(x-y)$. x^2-y^2

(e) $(2a+b)(a-3b)$. $2a^2-5ab-3b^2$

(f) $(4-3x)(3-x)$. $3x^2-13x+12$

(g) $4(x-7)(2x+3)$. $8x^2-44x-84$

(h) $3x(2x-5)(6x-7)$. $36x^3-132x^2+105x$

(i) $(x+4)(x-6)+x(2x+1)$. □

(j) $(x+3)(2x+3)-(2x+7)(x-1)$. □

(k) $x^2(x-2)(3x+1)$. $3x^4-5x^3-2x^2$

(l) $(x+1)(x+4)(x+3)$. $x^3+8x^2+19x+12$

(m) $(2x-1)(x+5)(3x-1)$. $6x^3+25x^2-24x+5$

(n) $(2x-5)(x-3)(3x-4)$. $6x^3-41x^2+89x-60$

(o) $(x-1)^2(x+2)$. x^3-3x+2

(p) $(x-2)^3$. $x^3-6x^2+12x-8$