Expanding Trinomials

Ex 1

$$(x+1)(x+2)(x+3)$$

$$= \left[x^2 + x + 2x + 2\right](x+3)$$

$$= \left[x^2 + 3x + 2\right](x+3)$$

$$= \begin{array}{l} x^3 + 3x^2 + 2x \\ \quad\;\; + 3x^2 + 9x + 6 \\ \hline x^3 + 6x^2 + 11x + 6 \end{array}$$

Ex 2

$$x(x-3)(x+4)$$

$$= \left[x^2 - 3x\right](x+4)$$

$$= \begin{array}{l} x^3 - 3x^2 \\ \quad\;\; + 4x^2 - 12x \\ \hline x^3 + x^2 - 12x \end{array}$$

Ex 3

$$(2x-3)(x+4)(3x-1)$$

$$= \left[2x^2 - 3x + 8x - 12\right](3x-1)$$

$$= \left[2x^2 + 5x - 12\right](3x-1)$$

$$= 6x^3 + 15x^2 - 36x$$
$$\quad - 2x^2 - 5x + 12$$

$$= 6x^3 + 13x^2 - 41x + 12$$

Exercise Expand and Simplify

1) $(x+2)(x+2)(x+3)$

2) $x(x-1)(x+2)$

3) $(x-4)(x-3)(x-2)$

4) $(2x+1)(3x+2)(x+4)$

5) $(3x-1)(2x+1)(x+5)$

Solutions

1) $(x+2)(x+2)(x+3)$

$$\equiv [x^2+2x+2x+4](x+3)$$
$$\equiv [x^2+4x+4](x+3)$$
$$\equiv x^3+4x^2+4x$$

$$+3x^2 + 12x + 12$$

$$= x^3 + 7x^2 + 16x + 12$$

2) $x(x-1)(x+2)$

$$= [x(x-1)](x+2)$$

$$= [x^2 - x](x+2)$$

$$= x^3 - x^2$$
$$+2x^2 - 2x$$

$$= x^3 + x^2 - 2x$$

3) $(x-4)(x-3)(x-2)$

$$= [x^2 - 4x - 3x + 12](x-2)$$

$$= [x^2 - 7x + 12](x-2)$$

$$= x^3 - 7x^2 + 12x$$
$$-2x^2 + 14x - 24$$

$$= x^3 - 9x^2 + 26x - 24$$

4) $(2x+1)(3x+2)(x+4)$

$$= \left[6x^2 + 3x + 4x + 2\right](x+4)$$

$$= \left[6x^2 + 7x + 2\right](x+4)$$

$$= 6x^3 + 7x^2 + 2x$$
$$\quad + 24x^2 + 28x + 8$$

$$= 6x^3 + 31x^2 + 30x + 8$$

5) $(3x-1)(2x+1)(x+5)$

$$= \left[6x^2 - 2x + 3x - 1\right](x+5)$$

$$= \left[6x^2 + x - 1\right](x+5)$$

$$= 6x^3 + x^2 - x$$
$$\quad + 30x^2 + 5x - 5$$

$$= 6x^3 + 31x^2 + 4x - 5$$

Factorising

This is the reverse process of expanding brackets

eg $3(x+2) = 3x+6$

so $3x+6 = 3(x+2)$

Examples

1) $4+6t = 2(2+3t)$

2) $3+3y = 3(1+y)$

3) $8p+6 = 2(4p+3)$

4) $10p+15q = 5(2p+3q)$

5) $6xy+3x = 3x(2y+1)$

6) $x^2-5x = x(x-5)$

7) $y^2+yp = y(y+p)$

8) $pq+p^2+pr = p(q+p+r)$

9) $x^3-2x^2 = x^2(x-2)$

10) $pqr + qrt = qr(p + t)$

11) $15hk^2 - 10hk = 5hk(3k - 2)$

12) $tp^2 + pt^2 = tp(p + t)$

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FACTORISING ALGEBRAIC EXPRESSIONS EXERCISE

Factorise

1) $9x + 12y$
2) $5mn + 3n$
3) $4q + 6p$
4) $xp + xq$
5) $10h - 8k$
6) $3y^2 + 7y$
7) $5t^2 - 4t$
8) $8ab + 6bc$
9) $20xy - 10y$
10) $8ab + 4ac$
11) $3d^2 - 2d$
12) $9m^2 - 6mp$
13) $4abc + 6bcd$
14) $x^3 + 5x$
15) $6p + 3r + 9t$
16) $tp - tq$
17) $3x - px + qx$
18) $5x - 10xy$
19) $h^2 + 3hk$
20) $20at^2 - 12at$

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FACTORISING ALGEBRAIC EXPRESSIONS — EXERCISE

Solutions

1) $9x + 12y = 3(3x + 4y)$

2) $5mn + 3n = n(5m + 3)$

3) $4q + 6p = 2(2q + 3p)$

4) $xp + xq = x(p + q)$

5) $10h - 8k = 2(5h - 4k)$

6) $3y^2 + 7y = y(3y + 7)$

7) $5t^2 - 4t = t(5t - 4)$

8) $8ab + 6bc = 2b(4a + 3c)$

9) $20xy - 10y = 10y(2x - 1)$

10) $8ab + 4ac = 4a(2b + c)$

11) $3d^2 - 2d = d(3d - 2)$

12) $9m^2 - 6mp = 3m(3m - 2p)$

13) $4abc + 6bcd = 2bc(2a + 3d)$

14) $x^3 + 5x = x(x^2 + 5)$

15) $6p + 3r + 9t = 3(2p + r + 3t)$

16) $tp - tq = t(p - q)$

17) $3x - px + qx = x(3 - p + q)$

18) $5x - 10xy = 5x(1 - 2y)$

19) $h^2 + 3hk = h(h + 3k)$

20) $20at^2 - 12at = 4at(5t - 3)$