

Expansion Of Brackets

1. Expand the following sets of brackets and collect like terms.

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| (a) $(x - 3)(x + 4)$. | $x^2 + x - 12$ |
| (b) $(2x + 3)(3x - 4)$. | $6x^2 + x - 12$ |
| (c) $x(x + 4)(x - 7)$. | $x^3 - 3x^2 - 28x$ |
| (d) $ax(x - 2)(x + 4)$. | $ax^3 + 2ax^2 - 8ax$ |
| (e) $(7 - 2x)^2$. | $4x^2 - 28x + 49$ |
| (f) $(a + bc^2)^2$. | $a^2 + 2abc^2 + b^2c^4$ |
| (g) $(2x - y)(x^2 + y)$. | $2x^3 - x^2y + 2xy - y^2$ |
| (h) $2t^2(10x - \frac{1}{2})(x - \frac{3}{4})$. | $20t^2x^2 - 16t^2x + \frac{3}{4}t^2$ |
| (i) $(x + 1)^3$. | $x^3 + 3x^2 + 3x + 1$ |
| (j) $(2x - y)^3$. | $8x^3 - 12x^2y + 6xy^2 - y^3$ |
| (k) $x^n(x - 1)(x + 2)(x - 3)$. | $x^{n+3} - 2x^{n+2} - 5x^{n+1} + 6x^n$ |
| (l) $ax^5(x - 1)^2(x + 2)$. | $ax^8 - 3ax^6 + 2ax^5$ |
| (m) $(x - 1)^4$. | $x^4 - 4x^3 + 6x^2 - 4x + 1$ |
| (n) $(x + a)^5$. | $x^5 + 5x^4a + 10x^3a^2 + 10x^2a^3 + 5xa^4 + a^5$ |

Factorisation Of Monic Quadratics (sometimes in disguise!)

1. Fully factorise the following:

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|---------------------------------|--------------------------------------|
| (a) $x^2 - 3x$. | $x(x - 3)$ |
| (b) $x^2 + 4x + 3$. | $(x + 1)(x + 3)$ |
| (c) $\rho^2 + 12\rho + 20$. | $(\rho + 2)(\rho + 10)$ |
| (d) $x^2 + 11x + 28$. | $(x + 7)(x + 4)$ |
| (e) $\alpha^2 + 5\alpha - 14$. | $(\alpha - 2)(\alpha + 7)$ |
| (f) $x^2 - 9x + 8$. | $(x - 1)(x - 8)$ |
| (g) $x^2 - 4$. | $(x + 2)(x - 2)$ |
| (h) $x^2 + x + \frac{1}{4}$. | $(x + \frac{1}{2})(x + \frac{1}{2})$ |

2. Fully factorise these more fiddly expressions:

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|----------------------------------|-----------------------------|
| (a) $2x^2 + 10x + 12$. | $2(x + 2)(x + 3)$ |
| (b) $4x^2 - 8x - 12$. | $4(x + 1)(x - 3)$ |
| (c) $-\theta^2 - 9\theta - 14$. | $-(\theta + 7)(\theta + 2)$ |
| (d) $x^3 + 6x^2 + 8x$. | $x(x + 2)(x + 4)$ |
| (e) $x^3 - 11x^2 + 24x$. | $x(x - 3)(x - 8)$ |
| (f) $q^{10} + 18q^9 - 40q^8$. | $q^8(q - 2)(q + 20)$ |
| (g) $3rt^3 - 21rt^2 - 54rt$. | $3rt(t + 2)(t - 9)$ |
| (h) $-5x^4 - 5x^3 + 450x^2$. | $-5x^2(x + 10)(x - 9)$ |
| (i) $-2ax^7 + 98ax^5$. | $-2ax^5(x - 7)(x + 7)$ |

(j) $2x^9z^2 - 2x^8z^2$.

$$2x^8z^2(x-1)$$

(k) $2a^2z^{n+2} + 4a^2z^{n+1} - 6a^2z^n$.

$$2a^2z^n(z+3)(z-1)$$

3. Fully factorise these still more fiddly expressions:

(a) $x^2 + ax + bx + ab$.

$$(x+a)(x+b)$$

(b) $ac + ad - bc - bd$.

$$(a-b)(c+d)$$

(c) $x^2 - x - a + ax$.

$$(x-1)(x+a)$$

(d) $6ac - 8ad + 3bc - 4bd$.

$$(2a+b)(3c-4d)$$

(e) $x^2 - 2xz + xy - 2yz$.

$$(x+y)(x-2z)$$