1. Factorise the following expressions.

(a) $mn + mp$ **(b)** $xy - xz$
(c) $pq + 2p$ **(d)** $3r - rs$
(e) $5x + 10$ **(f)** $7a + 7$
(g) $12p - 2$ **(h)** $x^2 + x$
(i) $y + yx$ **(j)** $3ab + 9ac + 6ad$
(k) $mn + mp + mq$ **(l)** $pq + pr + p$
(m) $3xy + 4yz - 5y$ **(n)** $ab + ac + 3ad$

2. Factorise the following expressions.

(a) $3x(x + 1) + 2(x + 1)$ **(b)** $7x(x - 2) + 2(x - 2)$
(c) $6x(x + 4) + 3(x + 4)$ **(d)** $6x^2 - 10x + 9x - 15$
(e) $4x^2 - 12x + 5x - 15$ **(f)** $2x(x - 1) + x - 1$
(g) $x^2 - x - 7x + 7$ **(h)** $3x^2 - 3x - x + 1$

3. Factorise the following expressions.

(a) $ax - bx + 3ay - 3by$ **(b)** $ax + bx - 7ay - 7by$
(c) $12ab - 12ac + bd - cd$ **(d)** $8ab - 8ac - bd + cd$
(e) $4mp + 3np + 8mq + 6nq$ **(f)** $6mp - 9np - 18mq + 27nq$
(g) $15ax - 10bx - 3ay + 2by$ **(h)** $55ax + 99bx - 15ay - 27by$
(i) $40px - 15qx - 64py + 24qy$ **(j)** $144ax - 72bx - 84ay + 42by$
(k) $5ax - 6by - 10bx + 3ay$ **(l)** $2mx - 20ny - 8nx + 5my$

4. Rewrite the expressions from (a) to (l) in the form:

(i) $a^2 + 2ab + b^2$,
(ii) $a^2 - 2ab + b^2$,
(iii) $a^2 - b^2$.

e.g. $25x^2 - 30x + 9 = (5x)^2 - 2(5x)(3) + 3^2$

(a) $16x^2 - 8xy + y^2$ **(b)** $36y^2 + 12y + 1$ **(c)** $9m^2 - 4n^2$
(d) $s^2 + 6st + 9t^2$ **(e)** $9x^2 - 6x + 1$ **(f)** $4s^2 - 36t^2$
(g) $16a^2 + 8ab + b^2$ **(h)** $49m^2 - 28mn + 4n^2$ **(i)** $y^2 - 6y + 9$
(j) $25p^2 + 20pq + 4q^2$ **(k)** $4x^2 - 36$ **(l)** $16x^2 - 9b^2$

5. Factorise the expressions in No. 4.

6. Factorise the following expressions.

(a) $25a^2 - 16b^2$ **(b)** $9m^2 + 12mn + 4n^2$
(c) $16p^2 - 24p + 9$ **(d)** $x^2 + 12x + 36$
(e) $49x^2 - 42xy + 9y^2$ **(f)** $36x^2 - 49$
(g) $25u^2 - 10uv + v^2$ **(h)** $81 - 64t^2$
(i) $1 + 30w + 225w^2$ **(j)** $(x + 1)^2 - 9$
(k) $(x - 1)^2 - (x + 1)^2$ **(l)** $(3 + x)^2 + 2(3 + x) + 1$
***(m)** $x^2 + yz + xy + xz$ ***(n)** $p^2r^2 + p^2s^2 + q^2s^2 + q^2r^2$

***(o)** $ab + b^2 - a - b$ ***(p)** $1 + a + a^2 + a^3$
***(q)** $ab^2 - 1 + a - b^2$ ***(r)** $ac - a^2 + ad - cd$
***(s)** $x^2 - 1 + xy - y$ ***(t)** $p^2 - q^2 - pr + qr$
***(u)** $1 - a^2 - b - ba$ ***(v)** $3xy + yz - 9x^2 + z^2$

Exercise 2.3 *(p. 33)*

1. **(a)** $m(n + p)$ **(b)** $x(y - z)$
(c) $p(q + 2)$ **(d)** $r(3 - s)$
(e) $5(x + 2)$ **(f)** $7(a + 1)$
(g) $2(6p - 1)$ **(h)** $x(x + 1)$
(i) $y(1 + x)$ **(j)** $3a(b + 3c + 2d)$
(k) $m(n + p + q)$ **(l)** $p(q + r + 1)$
(m) $y(3x + 4z - 5)$ **(n)** $a(b + c + 3d)$

2. **(a)** $(3x + 2)(x + 1)$ **(b)** $(7x + 2)(x - 2)$
(c) $3(2x + 1)(x + 4)$ **(d)** $(2x + 3)(3x - 5)$
(e) $(x - 3)(4x + 5)$ **(f)** $(2x + 1)(x - 1)$
(g) $(x - 1)(x - 7)$ **(h)** $(3x - 1)(x - 1)$

3. **(a)** $(x + 3y)(a - b)$ **(b)** $(x - 7y)(a + b)$
(c) $(12a + d)(b - c)$ **(d)** $(8a - d)(b - c)$
(e) $(p + 2q)(4m + 3n)$ **(f)** $3(p - 3q)(2m - 3n)$
(g) $(5x - y)(3a - 2b)$ **(h)** $(11x - 3y)(5a + 9b)$
(i) $(5x - 8y)(8p - 3q)$ **(j)** $6(12x - 7y)(2a - b)$
(k) $(a - 2b)(5x + 3y)$ **(l)** $(2x + 5y)(m - 4n)$

4. **(a)** $(4x^2) - 2(4x)y + y^2$ **(b)** $(6y)^2 + 2(6y)1 + 1^2$
(c) $(3m)^2 - (2n)^2$ **(d)** $s^2 + 2s(3t) + (3t)^2$
(e) $(3x)^2 - 2(3x)1 + 1^2$ **(f)** $(2s)^2 - (6t)^2$
(g) $(4a)^2 + 2(4a)b + b^2$ **(h)** $(7m)^2 - 2(7m)2n + (2n)^2$
(i) $y^2 - 2(y)3 + 3^2$ **(j)** $(5p)^2 + 2(5p)2q + (2q)^2$
(k) $(2x)^2 - 6^2$ **(l)** $(4x)^2 - (3b)^2$

5. **(a)** $(4x - y)^2$ **(b)** $(6y + 1)^2$
(c) $(3m - 2n)(3m + 2n)$ **(d)** $(s + 3t)^2$
(e) $(3x - 1)^2$ **(f)** $4(s + 3t)(s - 3t)$
(g) $(4a + b)^2$ **(h)** $(7m - 2n)^2$
(i) $(y - 3)^2$ **(j)** $(5p + 2q)^2$
(k) $4(x + 3)(x - 3)$ **(l)** $(4x + 3b)(4x - 3b)$

6. **(a)** $(5a + 4b)(5a - 4b)$ **(b)** $(3m + 2n)^2$
(c) $(4p - 3)^2$ **(d)** $(x + 6)^2$
(e) $(7x - 3y)^2$ **(f)** $(6x + 7)(6x - 7)$
(g) $(5u - v)^2$ **(h)** $(9 + 8t)(9 - 8t)$
(i) $(1 + 15w)^2$ **(j)** $(x + 4)(x - 2)$
(k) $-4x$ **(l)** $(x + 4)^2$
(m) $(x + y)(x + z)$ **(n)** $(p^2 + q^2)(s^2 + r^2)$
(o) $(a + b)(b - 1)$ **(p)** $(a^2 + 1)(1 + a)$
(q) $(a - 1)(b^2 + 1)$ **(r)** $(a - c)(d - a)$
(s) $(x - 1)(x + y + 1)$ **(t)** $(p + q - r)(p - q)$
(u) $(1 + a)(1 - a - b)$ **(v)** $(3x + z)(y - 3x + z)$