## Exercise 5(B)

**Factorize:**

**1. $a^2 + 10a + 24$**

**Solution:**

We have, $a^2 + 10a + 24$
By splitting the middle term, we get
$= a^2 + 6a + 4a + 24$
$= a(a + 6) + 4(a + 6)$
$= (a + 4)(a + 6)$

**2. $a^2 - 3a - 40$**

**Solution:**

We have, $a^2 - 3a - 40$
By splitting the middle term, we get
$= a^2 - 8a + 5a - 40$
$= a(a - 8) + 5(a - 8)$
$= (a + 5)(a - 8)$

**3. $1 - 2a - 3a^2$**

**Solution:**

We have, $1 - 2a - 3a^2$
By splitting the middle term, we get
$= 1 - 3a + a - 3a^2$
$= 1(1 - 3a) + a(1 - 3a)$
$= (1 + a)(1 - 3a)$

**4. $x^2 - 3ax - 88a^2$**

**Solution:**

We have, $x^2 - 3ax - 88a^2$
By splitting the middle term, we get
$= x^2 - 11ax + 8ax - 88a^2$
$= x(x - 11a) + 8a(x - 11a)$
$= (x + 8a)(x - 11a)$

**5. $6a^2 - a - 15$**

**Solution:**

We have, $6a^2 - a - 15$
By splitting the middle term, we get
$= 6a^2 + 9a - 10a - 15$
$= 3a(2a + 3) - 5(2a + 3)$
$= (3a - 5)(2a + 3)$

**6. $24a^3 + 37a^2 - 5a$**
**Solution:**

We have, $24a^3 + 37a^2 - 5a$
Taking 'a' common from all
$= a(24a^2 + 37a - 5)$
$= a(24a^2 + 40a - 3a - 5)$ {By splitting the middle term}
$= a[8a(3a + 5) - 1(3a + 5)]$
$= a[(8a - 1)(3a + 5)]$
$= a(8a - 1)(3a + 5)$

**7. $a(3a - 2) - 1$**
**Solution:**

We have, $a(3a - 2) - 1$
On expanding,
$= 3a^2 - 2a - 1$
By splitting the middle term, we get
$= 3a^2 - 3a + a - 1$
$= 3a(a - 1) + 1(a - 1)$
$= (3a + 1)(a - 1)$

**8. $a^2b^2 + 8ab - 9$**
**Solution:**

We have, $a^2b^2 + 8ab - 9$
By splitting the middle term, we get
$= a^2b^2 + 9ab - ab - 9$
$= ab(ab + 9) - 1(ab + 9)$
$= (ab - 1)(ab + 9)$

**9. $3 - a(4 + 7a)$**
**Solution:**

We have, $3 - a(4 + 7a)$
On expanding,
$= 3 - 4a - 7a^2$
By splitting the middle term, we get
$= 3 + 3a - 7a - 7a^2$
$= 3(1 + a) - 7a(1 + a)$
$= (1 + a)(3 - 7a)$

**10. $(2a + b)^2 - 6a - 3b - 4$**
**Solution:**

We have, $(2a + b)^2 - 6a - 3b - 4$
$= (2a + b)^2 - 3(2a + b) - 4$
Let's assume that $(2a + b) = x$
So, the expression becomes
$= x^2 - 3x - 4$
By splitting the middle term, we get
$= x^2 - 4x + x - 4$
$= x(x - 4) + 1(x - 4)$
$= (x - 4)(x + 1)$
Resubstituting the value of x, we get
$= (2a + b - 4)(2a + b + 1)$

**11. $1 - 2(a+ b) - 3(a + b)^2$**
**Solution:**

We have, $1 - 2(a+ b) - 3(a + b)^2$
Let's assume $(a + b) = x$
Then, the expression becomes
$= 1 - 2x - 3x^2$
By splitting the middle term, we get
$= 1 - 3x + x - 3x^2$
$= 1(1 - 3x) + x(1 - 3x)$
$= (1 - 3x)(1 + x)$
Resubstituting the value of x, we get
$= [1 - 3(a + b)][1 + (a + b)]$
$= (1 - 3a - 3b)(1 + a + b)$

**12. $3a^2 - 1 - 2a$**
**Solution:**

We have, $3a^2 - 1 - 2a$
Rearranging,
$= 3a^2 - 2a - 1$
By splitting the middle term, we get
$= 3a^2 - 3a + a - 1$
$= 3a(a - 1) + 1(a - 1)$
$= (3a + 1)(a - 1)$

**13. $x^2 + 3x + 2 + ax + 2a$**
**Solution:**

We have, $x^2 + 3x + 2 + ax + 2a$
By splitting the middle term, we get
$= (x^2 + 2x + x + 2) + ax + 2a$
$= x(x + 2) + 1(x + 2) + a(x + 2)$

$= (x + 2)(x + a + 1)$

**14. $(3x - 2y)^2 + 3(3x - 2y) - 10$**
**Solution:**

We know, $(3x - 2y)^2 + 3(3x - 2y) - 10$
Let's assume that $(3x - 2y) = a$
So, the expression becomes
$= a^2 + 3a - 10$
By splitting the middle term, we get
$= a^2 + 5a - 2a - 10$
$= a(a + 5) - 2(a + 5)$
$= (a - 2)(a + 5)$
$= (3x - 2y + 5)(3x - 2y - 2)$

**15. $5 - (3a^2 - 2a)(6 - 3a^2 + 2a)$**
**Solution:**

Given, $5 - (3a^2 - 2a)(6 - 3a^2 + 2a)$
$= 5 - (3a^2 - 2a)[6 - (3a^2 - 2a)]$
Let's substitute $(3a^2 - 2a) = x$
And, the expression becomes,
$= 5 - x(6 - x)$
$= 5 - 6x - x^2$
$= 5 - 5x - x - x^2$
$= 5(1 - x) - x(1 - x)$
$= (1 - x)(5 - x)$
$= (x - 1)(x - 5)$
$= (3a^2 - 2a - 1)(3a^2 - 2a - 5)$
Now,
$= (3a^2 - 3a + a - 1)(3a^2 + 3a - 5a - 5)$ {By splitting the middle term}
$= [3a(a - 1) + 1(a - 1)][3a(a + 1) - 5(a + 1)]$
$= [(3a + 1)(a - 1)][(3a - 5)(a + 1)]$
$= (3a + 1)(3a - 5)(a + 1)(a - 1)$

**16. $1/35 + 12a/35 + a^2$**
**Solution:**

We have, $1/35 + 12a/35 + a^2$
Taking common,
$= 1/35(1 + 12a + 35a^2)$
$= 1/35(35a^2 + 12a + 1)$
$= 1/35(35a^2 + 7a + 5a + 1)$ {By splitting the middle term}
$= 1/35[7a(5a + 1) + 1(5a + 1)]$
$= 1/35[(7a + 1)(5a + 1)]$

= [(7a + 1) (5a + 1)]/ 35

**17. $(x^2 - 3x)(x^2 - 3x - 1) - 20$.**
**Solution:**

We have, $(x^2 - 3x)(x^2 - 3x - 1) - 20$
$= (x^2 - 3x)[(x^2 - 3x) - 1] – 20$
Let's
$= a[a - 1] - 20$ ….(Taking $x^2 - 3x = a$)
$= a^2 - a - 20$
$= a^2 - 5a + 4a - 20$
$= a(a - 5) + 4(a - 5)$
$= (a - 5)(a + 4)$
$= (x^2 - 3x - 5)(x^2 - 3x + 4)$

**18. Find each trinomial (quadratic expression), given below, find whether it is factorisable or not. Factorise, if possible.**
**(i) $x^2 - 3x - 54$**
**(ii) $2x^2 - 7x - 15$**
**(iii) $2x^2 + 2x - 75$**
**(iv) $3x^2 + 4x - 10$**
**(v) $x(2x - 1) - 1$**
**Solution:**

(i) Given, $x^2 - 3x - 54$
On comparing with the general form $ax^2 + bx + c$, we get
a = 1, b = -3 and c = -54
So, $b^2 – 4ac = (-3)^2 – 4(1)(-54) = 9 + 216 = 225$
225 is a perfect square
Thus, $x^2 - 3x – 54$ is factorisable
Now,
$x^2 - 3x – 54 = x^2 - 9x + 6x – 54$
$= x(x - 9) + 6(x – 9)$
$= (x + 6)(x - 9)$

(ii) Given, $2x^2 - 7x - 15$
On comparing with the general form $ax^2 + bx + c$, we get
a = 2, b = -7 and c = -15
So, $b^2 – 4ac = (-7)^2 – 4(2)(-15) = 49 + 120 = 169$
169 is a perfect square
Thus, $2x^2 - 7x - 15$ is factorisable
Now,
$2x^2 - 7x - 15 = 2x^2 - 10x + 3x – 15$
$= 2x(x - 5) + 3(x - 5)$
$= (2x + 3)(x - 5)$

(iii) Given, $2x^2 + 2x - 75$
On comparing with the general form $ax^2 + bx + c$, we get
a = 2, b = 2 and c = -75
So, $b^2 - 4ac = (2)^2 - 4(2)(-75) = 4 + 600 = 604$
604 is not a perfect square
Thus, $2x^2 + 2x - 75$ is not factorizable

(iv) Given, $3x^2 + 4x - 10$
On comparing with the general form $ax^2 + bx + c$, we get
a = 3, b = 4 and c = -10
So, $b^2 - 4ac = (4)^2 - 4(3)(-10) = 16 + 120 = 136$
136 is a not perfect square
Thus, $3x^2 + 4x - 10$ is not factorizable

(v) Given, x(2x - 1) - 1
$= 2x^2 - x - 1$
On comparing with the general form $ax^2 + bx + c$, we get
a = 2, b = -1 and c = -1
So, $b^2 - 4ac = (-1)^2 - 4(2)(-1) = 1 + 8 = 9$
9 is a perfect square
Thus, x(2x - 1) - 1 is factorisable
Now,
$x(2x - 1) - 1 = 2x^2 - x - 1$
$= 2x^2 - 2x + x - 1$
$= 2x(x - 1) + 1(x - 1)$
$= (2x + 1)(x - 1)$

**19. Factorise:**
**(i) $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$**
**(ii) $7\sqrt{2}x^2 - 10x - 4\sqrt{2}$**
**Solution:**

(i) We have, $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$
By splitting the middle term, we get
$= 4\sqrt{3}x^2 + 8x - 3x - 2\sqrt{3}$
$= 4x(\sqrt{3}x + 2) - \sqrt{3}(\sqrt{3}x + 2)$
$= (4x - \sqrt{3})(\sqrt{3}x + 2)$

(ii) We have, $7\sqrt{2}x^2 - 10x - 4\sqrt{2}$
By splitting the middle term, we get
$= 7\sqrt{2}x^2 - 14x + 4x - 4\sqrt{2}$
$= 7\sqrt{2}x(x - \sqrt{2}) + 4(x - \sqrt{2})$
$= (7\sqrt{2}x + 4)(x - \sqrt{2})$

**20. Give possible expressions for the length and the breadth of the rectangle whose area is $12x^2 - 35x + 25$.**

**Solution:**

We have, $12x^2 - 35x + 25$
By splitting the middle term, we get
$= 12x^2 - 20x - 15x + 25$
$= 4x(3x - 5) - 5(3x - 5)$
$= (3x - 5)(4x - 5)$

Hence,
Length = $(3x - 5)$ and breadth = $(4x - 5)$ or,
Length = $(4x - 5)$ and breadth = $(3x - 5)$