

EXERCISE 7.8

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Resolve each of the following quadratic trinomials into factors:

1. $2x^2 + 5x + 3$

Solution:

We have,

$$2x^2 + 5x + 3$$

The coefficient of x^2 is 2The coefficient of x is 5

Constant term is 3

We shall split up the center term i.e., 5 into two parts such that their sum $p+q$ is 5 and product $pq = 2 \times 3$ is 6So, we express the middle term $5x$ as $2x + 3x$

$$\begin{aligned} 2x^2 + 5x + 3 &= 2x^2 + 2x + 3x + 3 \\ &= 2x(x + 1) + 3(x + 1) \\ &= (2x + 3)(x + 1) \end{aligned}$$

2. $2x^2 - 3x - 2$

Solution:

We have,

$$2x^2 - 3x - 2$$

The coefficient of x^2 is 2The coefficient of x is -3

Constant term is -2

So, we express the middle term $-3x$ as $-4x + x$

$$\begin{aligned} 2x^2 - 3x - 2 &= 2x^2 - 4x + x - 2 \\ &= 2x(x - 2) + 1(x - 2) \\ &= (x - 2)(2x + 1) \end{aligned}$$

3. $3x^2 + 10x + 3$

Solution:

We have,

$$3x^2 + 10x + 3$$

The coefficient of x^2 is 3The coefficient of x is 10

Constant term is 3

So, we express the middle term $10x$ as $9x + x$

$$\begin{aligned} 3x^2 + 10x + 3 &= 3x^2 + 9x + x + 3 \\ &= 3x(x + 3) + 1(x + 3) \end{aligned}$$

$$= (3x + 1)(x + 3)$$

4. $7x - 6 - 2x^2$

Solution:

We have,

$$\begin{aligned} 7x - 6 - 2x^2 \\ - 2x^2 + 7x - 6 \\ 2x^2 - 7x + 6 \end{aligned}$$

The coefficient of x^2 is 2The coefficient of x is -7

Constant term is 6

So, we express the middle term $-7x$ as $-4x - 3x$

$$\begin{aligned} 2x^2 - 7x + 6 &= 2x^2 - 4x - 3x + 6 \\ &= 2x(x - 2) - 3(x - 2) \\ &= (x - 2)(2x - 3) \end{aligned}$$

5. $7x^2 - 19x - 6$

Solution:

We have,

$$7x^2 - 19x - 6$$

The coefficient of x^2 is 7The coefficient of x is -19

Constant term is -6

So, we express the middle term $-19x$ as $2x - 21x$

$$\begin{aligned} 7x^2 - 19x - 6 &= 7x^2 + 2x - 21x - 6 \\ &= x(7x + 2) - 3(7x + 2) \\ &= (7x + 2)(x - 3) \end{aligned}$$

6. $28 - 31x - 5x^2$

Solution:

We have,

$$\begin{aligned} 28 - 31x - 5x^2 \\ - 5x^2 - 31x + 28 \\ 5x^2 + 31x - 28 \end{aligned}$$

The coefficient of x^2 is 5The coefficient of x is 31

Constant term is -28

So, we express the middle term $31x$ as $-4x + 35x$

$$5x^2 + 31x - 28 = 5x^2 - 4x + 35x - 28$$

$$\begin{aligned} &= x(5x - 4) + 7(5x - 4) \\ &= (x + 7)(5x - 4) \end{aligned}$$

7. $3 + 23y - 8y^2$ **Solution:**

We have,

$$\begin{aligned} &3 + 23y - 8y^2 \\ &- 8y^2 + 23y + 3 \\ &8y^2 - 23y - 3 \end{aligned}$$

The coefficient of y^2 is 8The coefficient of y is -23

Constant term is -3

So, we express the middle term $-23y$ as $-24y + y$

$$\begin{aligned} 8y^2 - 23y - 3 &= 8y^2 - 24y + y - 3 \\ &= 8y(y - 3) + 1(y - 3) \\ &= (8y + 1)(y - 3) \end{aligned}$$

8. $11x^2 - 54x + 63$ **Solution:**

We have,

$$11x^2 - 54x + 63$$

The coefficient of x^2 is 11The coefficient of x is -54

Constant term is 63

So, we express the middle term $-54x$ as $-33x - 21x$

$$\begin{aligned} 11x^2 - 54x + 63 &= 11x^2 - 33x - 21x + 63 \\ &= 11x(x - 3) - 21(x - 3) \\ &= (11x - 21)(x - 3) \end{aligned}$$

9. $7x - 6x^2 + 20$ **Solution:**

We have,

$$\begin{aligned} &7x - 6x^2 + 20 \\ &- 6x^2 + 7x + 20 \\ &6x^2 - 7x - 20 \end{aligned}$$

The coefficient of x^2 is 6The coefficient of x is -7

Constant term is -20

So, we express the middle term $-7x$ as $-15x + 8x$

$$\begin{aligned}6x^2 - 7x - 20 &= 6x^2 - 15x + 8x - 20 \\ &= 3x(2x - 5) + 4(2x - 5) \\ &= (3x + 4)(2x - 5)\end{aligned}$$

10. $3x^2 + 22x + 35$ **Solution:**

We have,

$$3x^2 + 22x + 35$$

The coefficient of x^2 is 3The coefficient of x is 22

Constant term is 35

So, we express the middle term $22x$ as $15x + 7x$

$$\begin{aligned}3x^2 + 22x + 35 &= 3x^2 + 15x + 7x + 35 \\ &= 3x(x + 5) + 7(x + 5) \\ &= (3x + 7)(x + 5)\end{aligned}$$

11. $12x^2 - 17xy + 6y^2$ **Solution:**

We have,

$$12x^2 - 17xy + 6y^2$$

The coefficient of x^2 is 12The coefficient of x is $-17y$ Constant term is $6y^2$ So, we express the middle term $-17xy$ as $-9xy - 8xy$

$$\begin{aligned}12x^2 - 17xy + 6y^2 &= 12x^2 - 9xy - 8xy + 6y^2 \\ &= 3x(4x - 3y) - 2y(4x - 3y) \\ &= (3x - 2y)(4x - 3y)\end{aligned}$$

12. $6x^2 - 5xy - 6y^2$ **Solution:**

We have,

$$6x^2 - 5xy - 6y^2$$

The coefficient of x^2 is 6The coefficient of x is $-5y$ Constant term is $-6y^2$ So, we express the middle term $-5xy$ as $4xy - 9xy$

$$\begin{aligned}6x^2 - 5xy - 6y^2 &= 6x^2 + 4xy - 9xy - 6y^2 \\ &= 2x(3x + 2y) - 3y(3x + 2y) \\ &= (2x - 3y)(3x + 2y)\end{aligned}$$

13. $6x^2 - 13xy + 2y^2$

Solution:

We have,

$$6x^2 - 13xy + 2y^2$$

The coefficient of x^2 is 6The coefficient of x is $-13y$ Constant term is $2y^2$ So, we express the middle term $-13xy$ as $-12xy - xy$

$$\begin{aligned}6x^2 - 13xy + 2y^2 &= 6x^2 - 12xy - xy + 2y^2 \\ &= 6x(x - 2y) - y(x - 2y) \\ &= (6x - y)(x - 2y)\end{aligned}$$

14. $14x^2 + 11xy - 15y^2$

Solution:

We have,

$$14x^2 + 11xy - 15y^2$$

The coefficient of x^2 is 14The coefficient of x is $11y$ Constant term is $-15y^2$ So, we express the middle term $11xy$ as $21xy - 10xy$

$$\begin{aligned}14x^2 + 11xy - 15y^2 &= 14x^2 + 21xy - 10xy - 15y^2 \\ &= 2x(7x - 5y) + 3y(7x - 5y) \\ &= (2x + 3y)(7x - 5y)\end{aligned}$$

15. $6a^2 + 17ab - 3b^2$

Solution:

We have,

$$6a^2 + 17ab - 3b^2$$

The coefficient of a^2 is 6The coefficient of a is $17b$ Constant term is $-3b^2$ So, we express the middle term $17ab$ as $18ab - ab$

$$\begin{aligned}6a^2 + 17ab - 3b^2 &= 6a^2 + 18ab - ab - 3b^2 \\ &= 6a(a + 3b) - b(a + 3b) \\ &= (6a - b)(a + 3b)\end{aligned}$$

16. $36a^2 + 12abc - 15b^2c^2$

Solution:

We have,

$$36a^2 + 12abc - 15b^2c^2$$

The coefficient of a^2 is 36

The coefficient of a is $12bc$

Constant term is $-15b^2c^2$

So, we express the middle term $12abc$ as $30abc - 18abc$

$$\begin{aligned} 36a^2 - 12abc - 15b^2c^2 &= 36a^2 + 30abc - 18abc - 15b^2c^2 \\ &= 6a(6a + 5bc) - 3bc(6a + 5bc) \\ &= (6a + 5bc)(6a - 3bc) \\ &= (6a + 5bc)3(2a - bc) \end{aligned}$$

17. $15x^2 - 16xyz - 15y^2z^2$

Solution:

We have,

$$15x^2 - 16xyz - 15y^2z^2$$

The coefficient of x^2 is 15

The coefficient of x is $-16yz$

Constant term is $-15y^2z^2$

So, we express the middle term $-16xyz$ as $-25xyz + 9xyz$

$$\begin{aligned} 15x^2 - 16xyz - 15y^2z^2 &= 15x^2 - 25xyz + 9xyz - 15y^2z^2 \\ &= 5x(3x - 5yz) + 3yz(3x - 5yz) \\ &= (5x + 3yz)(3x - 5yz) \end{aligned}$$

18. $(x - 2y)^2 - 5(x - 2y) + 6$

Solution:

We have,

$$(x - 2y)^2 - 5(x - 2y) + 6$$

The coefficient of $(x - 2y)^2$ is 1

The coefficient of $(x - 2y)$ is -5

Constant term is 6

So, we express the middle term $-5(x - 2y)$ as $-2(x - 2y) - 3(x - 2y)$

$$\begin{aligned} (x - 2y)^2 - 5(x - 2y) + 6 &= (x - 2y)^2 - 2(x - 2y) - 3(x - 2y) + 6 \\ &= (x - 2y - 2)(x - 2y - 3) \end{aligned}$$

19. $(2a - b)^2 + 2(2a - b) - 8$

Solution:

We have,

$$(2a - b)^2 + 2(2a - b) - 8$$

The coefficient of $(2a - b)^2$ is 1

The coefficient of $(2a-b)$ is 2

Constant term is -8

So, we express the middle term $2(2a - b)$ as $4(2a - b) - 2(2a - b)$

$$\begin{aligned}(2a - b)^2 + 2(2a - b) - 8 &= (2a - b)^2 + 4(2a - b) - 2(2a - b) - 8 \\ &= (2a - b)(2a - b + 4) - 2(2a - b + 4) \\ &= (2a - b + 4)(2a - b - 2)\end{aligned}$$

