

PROJECT MATHS

Text & Tests

Leaving

3

Certificate

Algebra 2: Quadratic Equations

chapter

2

Section 2.1 Factorising quadratic expressions

Notes

An expression of the form $ax^2 + bx + c$, where a , b and c are numbers and $a \neq 0$, is called a **quadratic expression**.

Since $(x + 5)(x + 2) = x^2 + 7x + 10$, we say that $(x + 5)$ and $(x + 2)$ are the factors of $x^2 + 7x + 10$.

We factorise a quadratic expression by 'trial and error' to find numbers such that the product of the outside terms added to the product of the inside terms gives the middle term of the quadratic expression.

$$(x + 5)(x + 2)$$

outside terms

inside terms

Example 1

Factorise $3x^2 + 13x + 4$

Example 2

Factorise (i) $3x^2 + 10x + 8$

(ii) $8x^2 + 10x - 3$

Expressions of the form $ax^2 + bx$

To factorise $x^2 - 5x$, we divide each term by the highest common factor, i.e. x .

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

Similarly (i) $3x^2 - 6x = 3x(x - 2)$ (ii) $9x^2 - 15x = 3x(3x - 5)$.

Difference of two squares

Numbers such as 1, 4, 9, 16, ... are called **perfect squares**.

$$1 = 1^2, 4 = 2^2, 9 = 3^2, 16 = 4^2, \dots$$

Similarly $9x^2$ and $16y^2$ are **squares** since $9x^2 = (3x)^2$ and $16y^2 = (4y)^2$.

An expression such as $9x^2 - 16y^2$ is called **the difference of two squares**.

If we multiply $(x + y)(x - y)$ we get $x^2 - y^2$.

Thus the factors of $x^2 - y^2 = (x + y)(x - y)$.

$$x^2 - y^2 = (x + y)(x - y)$$

Example 3

Factorise (i) $2x^2 - 3x$

(iii) $9x^2 - 16y^2$

(ii) $x^2 - 25$

Exercise 2.1

Answer: $(x + 6)(x + 1)$

Factorise each of the following:

1. $x^2 + 7x + 6$

Exercise 2.1

Answer: $(x + 3)(x + 4)$

Factorise each of the following:

2. $x^2 + 7x + 12$

Exercise 2.1

Answer: $(2x + 1)(x + 2)$

Factorise each of the following:

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

Exercise 2.1

Answer: $(2x + 1)(x + 4)$

Factorise each of the following:

4. $2x^2 + 9x + 4$

Exercise 2.1

Answer: $(2x + 1)(x + 7)$

Factorise each of the following:

5. $2x^2 + 15x + 7$

Exercise 2.1

Answer: $(3x + 2)(x + 2)$

Factorise each of the following:

6. $3x^2 + 8x + 4$

Exercise 2.1

Answer: $(3x + 4)(x + 1)$

Factorise each of the following:

7. $3x^2 + 7x + 4$

Exercise 2.1

Answer: $(5x + 2)(x + 3)$

Factorise each of the following:

8. $5x^2 + 17x + 6$

Exercise 2.1

Answer: $(2k + 1)(2k + 3)$

Factorise each of the following:

9. $4k^2 + 8k + 3$

Exercise 2.1

Answer: $(4x + 1)(x + 3)$

Factorise each of the following:

10. $4x^2 + 13x + 3$

Exercise 2.1

Answer: $(10x + 7)(x + 1)$

Factorise each of the following:

11. $10x^2 + 17x + 7$

Exercise 2.1

Answer: $(3x + 10)(2x + 1)$

Factorise each of the following:

12. $6x^2 + 23x + 10$

Exercise 2.1

Answer: $(x - 3)(x - 4)$

Factorise each of the following:

13. $x^2 - 7x + 12$

Exercise 2.1

Answer: $(x - 4)(x - 9)$

Factorise each of the following:

14. $x^2 - 13x + 36$

Exercise 2.1

Answer: $(2x - 1)(x - 3)$

Factorise each of the following:

15. $2x^2 - 7x + 3$

Exercise 2.1

Answer: $(2x - 1)(x - 9)$

Factorise each of the following:

16. $2x^2 - 19x + 9$

Exercise 2.1

Answer: $(2x + 3)(x - 5)$

Factorise each of the following:

17. $2x^2 - 7x - 15$

Exercise 2.1

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

Factorise each of the following:

18. $8x^2 + 10x - 3$

Exercise 2.1

Answer: $(3x - 1)(2x - 3)$

Factorise each of the following:

19. $6x^2 - 11x + 3$

Exercise 2.1

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

Factorise each of the following:

20. $8x^2 - 10x - 3$

Exercise 2.1

Answer: $(4x - 1)(2x - 3)$

Factorise each of the following:

21. $8x^2 - 14x + 3$

Exercise 2.1

Answer: $(3x - 2)(x + 5)$

Factorise each of the following:

22. $3x^2 + 13x - 10$

Exercise 2.1

Answer: $(2x - 9)(x - 6)$

Factorise each of the following:

23. $2x^2 - 21x + 54$

Exercise 2.1

Answer: $(6x - 11)(x + 2)$

Factorise each of the following:

24. $6x^2 + x - 22$

Exercise 2.1

Answer: $(6x - 5)(4x + 3)$

Factorise each of the following:

25. $24x^2 - 2x - 15$

Exercise 2.1

Answer: $(6x - 1)(x - 3)$

Factorise each of the following:

26. $6x^2 - 19x + 3$

Exercise 2.1

Answer: $(5x + 2)(3x - 4)$

Factorise each of the following:

27. $15x^2 - 14x - 8$

Exercise 2.1

Answer: $x(x - 4)$

Factorise each of the following:

28. $x^2 - 4x$

Exercise 2.1

Answer: $x(x + 8)$

Factorise each of the following:

29. $x^2 + 8x$

Exercise 2.1

Answer: $x(2x - 3)$

Factorise each of the following:

30. $2x^2 - 3x$

Exercise 2.1

Answer: $(x - y)(x + y)$

Factorise each of the following:

31. $x^2 - y^2$

Exercise 2.1

Answer: $(x - 5y)(x + 5y)$

Factorise each of the following:

32. $x^2 - 25y^2$

Exercise 2.1

Answer: $(4x - 1)(4x + 1)$

Factorise each of the following:

33. $16x^2 - 1$

Exercise 2.1

Answer: $(4x - 5y)(4x + 5y)$

Factorise each of the following:

34. $16x^2 - 25y^2$

Exercise 2.1

Answer: $(7x - 10)(7x + 10)$

Factorise each of the following:

35. $49x^2 - 100$

Exercise 2.1

Answer: $(6x - 7y)(6x + 7y)$

Factorise each of the following:

36. $36x^2 - 49y^2$

Exercise 2.2 Answers

1. $(x + 6)(x + 1)$
2. $(x + 3)(x + 4)$
3. $(2x + 1)(x + 2)$
4. $(2x + 1)(x + 4)$
5. $(2x + 1)(x + 7)$
6. $(3x + 2)(x + 2)$
7. $(3x + 4)(x + 1)$
8. $(5x + 2)(x + 3)$
9. $(2k + 1)(2k + 3)$
10. $(4x + 1)(x + 3)$
11. $(10x + 7)(x + 1)$
12. $(3x + 10)(2x + 1)$
13. $(x - 3)(x - 4)$
14. $(x - 4)(x - 9)$
15. $(2x - 1)(x - 3)$
16. $(2x - 1)(x - 9)$
17. $(2x + 3)(x - 5)$
18. $(4x - 1)(2x + 3)$
19. $(3x - 1)(2x - 3)$
20. $(4x + 1)(2x - 3)$
21. $(4x - 1)(2x - 3)$
22. $(3x - 2)(x + 5)$
23. $(2x - 9)(x - 6)$
24. $(6x - 11)(x + 2)$
25. $(6x - 5)(4x + 3)$
26. $(6x - 1)(x - 3)$
27. $(5x + 2)(3x - 4)$
28. $x(x - 4)$
29. $x(x + 8)$
30. $x(2x - 3)$
31. $(x - y)(x + y)$
32. $(x - 5y)(x + 5y)$
33. $(4x - 1)(4x + 1)$
34. $(4x - 5y)(4x + 5y)$
35. $(7x - 10)(7x + 10)$
36. $(6x - 7y)(6x + 7y)$

Answers