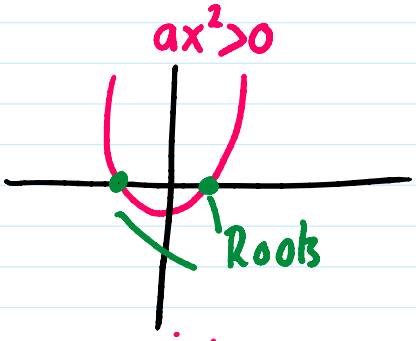
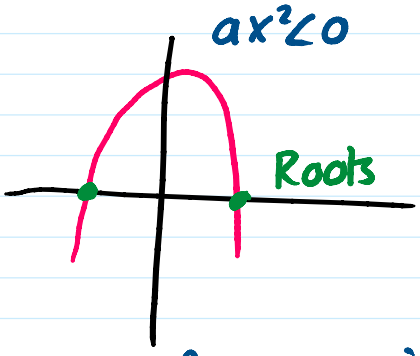
Quadratics

10 January 2020 17:09

will be in the form ax^2+bx+c, where $a, b, c \in Z$



positive



$-x^2$ negative.

Eg 1) Factorize x^2+5x+6 Use brackets.

$x^2 < {x \atop x}$ } 1st

$(x+2)(x+3)$

$6 < {+2 \atop +3}$

$+5$

Method

1) Factorize the 1st term x^2
2) Factorize the constant the last term the factors must add or subtract to give you the middle term.

Eg2) Factorize $x^2+8x+12$ (constant)

$x^2 < {x \atop x}$

$(x+6)(x+2)$

$12 < {+6 \atop +2}$

$+8$

Eg 3) $2x^2+5x+2$

Eg 3) $2x^2 + 5x + 2$

$2 = 2 \times 1$

$x^2 = x \times x$

$2 = 2 \times 1$

$(2x + 1)(x + 2)$

$+4x$
$+1x$
$+5x$

Eg 4) $3x^2 + 7x + 4$

$4 = 4 \times 1$
$4 = 2 \times 2$

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

$+3x$
$+4x$
$+7x$

Pg 26 Q 4 → 9


T&T3 2.1

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PROJECT MATHS

Text & Tests

Leaving 3 Certificate

Algebra 2: Quadratic Equations

chapter 2

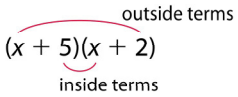
Section 2.1 Factorising quadratic expressions

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.



Example 1

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

Example 2

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

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

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Notes

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) $9x^2 - 15x = 3x(3x - 5)$.

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Notes

Difference of two squares

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

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

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

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Exercise 2.1

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

Factorise each of the following:

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

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

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Exercise 2.1

Answer: $x(x - 4)$

Factorise each of the following:

28. $x^2 - 4x$

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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. $(6x - 7y)(6x + 7y)$