



THIRD SPACE  
LEARNING

# Diagnostic Questions

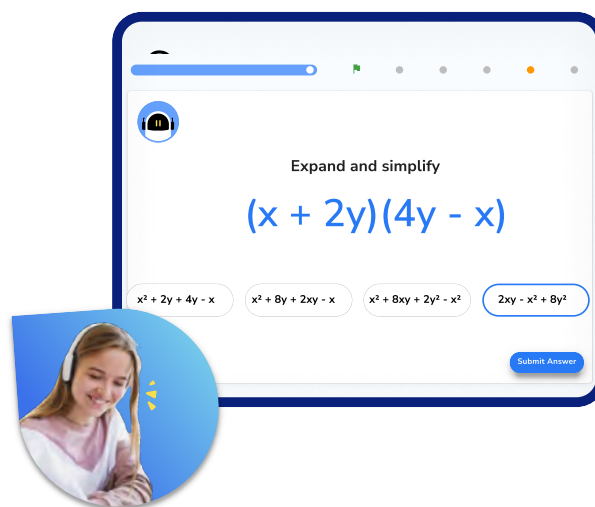
Factorising | Algebra

## This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **factorising** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

## How to use the questions in this resource

There are 20 multiple choice questions, each designed to assess each of the key skills required to master **factorising**. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Collecting like terms**, **Laws of indices**, **Negative numbers**, and **Highest common factors**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

## Diagnostic Questions: Factorising

1. Fully factorise:

$$5x + 10$$

A) $5(x + 10)$	B) $5x(x + 2)$
C) $5(x + 2)$	D) $x(5 + 10)$

2. Fully factorise:

$$8 - 2y$$

A) $2(4 - y)$	B) $2(4 + y)$
C) $2y(4 - y)$	D) $8(1 - 2y)$

3. Fully factorise:

$$18 - 6y + 15x$$

A) $3xy(6 - 2y + 5x)$	B) $3(6 - 2y + 5x)$
C) $18(1 - 2y + 5x)$	D) $3(6 + 2y + 5x)$

## Diagnostic Questions: Factorising

4. Fully factorise:

$$18x^2 - 12x$$

A) $3x(6x - 4)$	B) $6(3x^2 - 2x)$
C) $3(6x^2 - 4x)$	D) $6x(3x - 2)$

5. Fully factorise:

$$20y^2 + 16xy$$

A) $4y(5y - 4x)$	B) $y(20y - 16x)$
C) $2y(10y - 8x)$	D) $4xy(5y - 4x)$

6. Fully factorise:

$$12y - 9x^2y + 6y^2$$

A) $12y(1 - 3x^2 + 2y)$	B) $3y(4 + 3x^2 + 2y)$
C) $3y(4 - 3x^2 + 2y)$	D) $3y(4 - 3x^2 - 2y)$

## Diagnostic Questions: Factorising

7. Fully factorise:

$$x^2 + 5x + 6$$

A) $(x + 5)(x + 1)$	B) $(x + 3)(x + 2)$
C) $(x + 1)(x + 6)$	D) $(x + 3)(x + 3)$

8. Fully factorise:

$$x^2 + 10x + 21$$

A) $(x + 3)(x + 7)$	B) $(x + 1)(x + 21)$
C) $(x + 4)(x + 6)$	D) $(x + 1)(x + 10)$

9. Fully factorise:

$$x^2 - x - 12$$

A) $(x - 4)(x + 3)$	B) $(x + 4)(x - 3)$
C) $(x - 1)(x + 12)$	D) $(x - 1)(x - 12)$

## Diagnostic Questions: Factorising

10. Fully factorise:

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

A) $(2x + 1)(x + 3)$	B) $(2x + 3)(x + 1)$
C) $(2x + 2)(x + 3)$	D) $(2x + 1)(x + 2)$

11. Fully factorise

$$2x^2 + x - 6$$

A) $(2x - 3)(x + 2)$	B) $(2x + 3)(x + 2)$
C) $(2x + 3)(x - 2)$	D) $(2x - 1)(x + 6)$

12. Fully factorise:

$$3x^2 - 7x - 6$$

A) $(3x + 3)(x - 2)$	B) $(3x - 2)(x + 3)$
C) $(3x + 2)(x - 3)$	D) $(x + 2)(3x - 3)$

## Diagnostic Questions: Factorising

13. Fully factorise:

$$4x^2 - 18x + 8$$

A) $(4x + 2)(x - 4)$	B) $(4x - 2)(x + 4)$
C) $2(2x - 1)(x - 4)$	D) $(4x - 2)(x + 4)$

14. Fully factorise:

$$x^2 - 25$$

A) $(x - 5)(x - 5)$	B) $(x + 5)(x - 5)$
C) $(x + 1)(x - 25)$	D) $(x - 1)(x + 25)$

15. Fully factorise:

$$y^2 - 81$$

A) $(y + 9)(y - 9)$	B) $(y - 9)(y - 9)$
C) $y(y - 81)$	D) $(y - 1)(y + 81)$

## Diagnostic Questions: Factorising

16. Fully factorise:

$$16x^2 - 100$$

A) $(4x + 10)(4x - 10)$	B) $(4x - 10)(4x - 10)$
C) $4(4x^2 - 25)$	D) $4(2x + 5)(2x - 5)$

17. Fully factorise:

$$49m^2 - 9y^2$$

A) $(7m - 3y)(7m - 3y)$	B) $(7m + 3y)(7m - 3y)$
C) $(49m + y)(m - 9y)$	D) $(3y + 7m)(3y - 7m)$

18. Fully factorise:

$$4x^3 - 36x$$

A) $4x(x^2 - 9)$	B) $x(2x + 6)(2x - 6)$
C) $4x(x + 3)(x - 3)$	D) $4(x^2 - 3)(x + 3)$



## Diagnostic Questions: Factorising

19. Fully factorise:

$$(2x + 1)^2 - 3(2x + 1)$$

A) $4x^2 - 2x - 2$	B) $(2x + 1)(2x - 2)$
C) $2(2x^2 - x - 1)$	D) $2(2x + 1)(x - 1)$

20. Fully factorise:

$$10x^2 - 7xy - 12y^2$$

A) $(5x - 4y)(2x + 3y)$	B) $(5x + 4y)(2x - 3y)$
C) $(5x - 4y)(2x - 3y)$	D) $(5x + 4y)(2x + 3y)$

## Diagnostic Questions: Factorising Answers

1. Fully Factorise:

$$5x + 10$$

- A)  $5(x + 10)$  Student has forgotten to factor 5 from 10
- B)  $5x(x + 2)$  Student has factored an extra  $x$  out
- C)  $5(x + 2)$  Correct answer
- D)  $x(5 + 10)$  Student does not understand the concept of factorising

2. Fully factorise:

$$8 - 2y$$

- A)  $2(4 - y)$  Correct answer
- B)  $2(4 + y)$  Student has an incorrect sign in the brackets
- C)  $2y(4 - y)$  Student has factored an extra  $y$  out
- D)  $8(1 - 2y)$  Student does not understand the concept of factorising

3. Fully factorise:

$$18 - 6y + 15x$$

- A)  $3xy(6 - 2y + 5x)$  Student has factored an extra  $x$  and  $y$  out
- B)  $3(6 - 2y + 5x)$  Correct answer
- C)  $18(1 - 2y + 5x)$  Student does not understand the concept of factorising
- D)  $3(6 + 2y + 5x)$  Student has an incorrect sign

## Diagnostic Questions: Factorising Answers

4. Fully factorise:

$$18x^2 - 12x$$

- A)  $3x(6x - 4)$  Student has not fully factorised
- B)  $6(3x^2 - 2x)$  Student has not fully factorised
- C)  $3(6x^2 - 4x)$  Student has not fully factorised
- D)  $6x(3x - 2)$  Correct answer

5. Fully factorise:

$$20y^2 + 16xy$$

- A)  $4y(5y - 4x)$  Correct answer
- B)  $y(20y - 16x)$  Student has not fully factorised
- C)  $2y(10y - 8x)$  Student has not fully factorised
- D)  $4xy(5y - 4x)$  Student has incorrectly factored out an  $x$

6. Fully factorise:

$$12y - 9x^2y + 6y^2$$

- A)  $12y(1 - 3x^2 + 2y)$  Student does not understand the concept of factorising
- B)  $3y(4 + 3x^2 + 2y)$  Student has an incorrect sign
- C)  $3y(4 - 3x^2 + 2y)$  Correct answer
- D)  $3y(4 - 3x^2 - 2y)$  Student has an incorrect sign

## Diagnostic Questions: Factorising Answers

7. Fully factorise:

$$x^2 + 5x + 6$$

- A)  $(x + 5)(x + 1)$  Student has confused the terms that are the sum and product  
B)  $(x + 3)(x + 2)$  Correct answer  
C)  $(x + 1)(x + 6)$  Student has only found numbers which multiply to 6  
D)  $(x + 3)(x + 3)$  Student has only found numbers which add to 6 and confused the terms that are the sum and product

8. Fully factorise:

$$x^2 + 10x + 21$$

- A)  $(x + 3)(x + 7)$  Correct answer  
B)  $(x + 1)(x + 21)$  Student has only found numbers which multiply to 21  
C)  $(x + 4)(x + 6)$  Student has only found numbers which sum to 10  
D)  $(x + 1)(x + 10)$  Student has only found numbers which multiply to 10 and confused the terms that are the sum and product

9. Fully factorise:

$$x^2 - x - 12$$

- A)  $(x - 4)(x + 3)$  Correct answer  
B)  $(x + 4)(x - 3)$  Student has inverted the signs  
C)  $(x - 1)(x + 12)$  Student has only found numbers which multiply to -12  
D)  $(x - 1)(x - 12)$  Student has used the coefficient of  $x$  and the constant term inside the brackets

## Diagnostic Questions: Factorising Answers

10. Fully factorise:

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

- A)  $(2x + 1)(x + 3)$  Student has found correct values for brackets but placed them with wrong terms
- B)  $(2x + 3)(x + 1)$  Correct answer
- C)  $(2x + 2)(x + 3)$  Student only found numbers which add to 5
- D)  $(2x + 1)(x + 2)$  Student has found values to give correct  $x$  coefficient only

11. Fully factorise

$$2x^2 + x - 6$$

- A)  $(2x - 3)(x + 2)$  Correct answer
- B)  $(2x + 3)(x + 2)$  Student has incorrect sign
- C)  $(2x + 3)(x - 2)$  Student has inverted the signs
- D)  $(2x - 1)(x + 6)$  Student has only found values with correct product

12. Fully factorise:

$$3x^2 - 7x - 6$$

- A)  $(3x + 3)(x - 2)$  Student only has a correct product
- B)  $(3x - 2)(x + 3)$  Student has inverted the signs
- C)  $(3x + 2)(x - 3)$  Correct answer
- D)  $(x + 2)(3x - 3)$  Student only has a correct product

## Diagnostic Questions: Factorising Answers

13. Fully factorise:

$$4x^2 - 18x + 8$$

- A)  $(4x + 2)(x - 4)$  Student has incorrect sign and not factored out 2
- B)  $(4x - 2)(x + 4)$  Student has incorrect sign and not factored out 2
- C)  $2(2x - 1)(x - 4)$  Correct answer
- D)  $(4x - 2)(x + 4)$  Student has not factored out 2

14. Fully factorise:

$$x^2 - 25$$

- A)  $(x - 5)(x - 5)$  Student has incorrect sign in one bracket
- B)  $(x + 5)(x - 5)$  Correct answer
- C)  $(x + 1)(x - 25)$  Student has only found values that multiply to -25
- D)  $(x - 1)(x + 25)$  Student has only found values that multiply to -25

15. Fully factorise:

$$y^2 - 81$$

- A)  $(y + 9)(y - 9)$  Correct answer
- B)  $(y - 9)(y - 9)$  Student has incorrect sign in one bracket
- C)  $y(y - 81)$  Student has incorrectly thought the second term had a  $y$
- D)  $(y - 1)(y + 81)$  Student has only found values that multiply to  $-81$

## Diagnostic Questions: Factorising Answers

16. Fully factorise:

$$16x^2 - 100$$

- A)  $(4x + 10)(4x - 10)$  Student has forgotten to factor out 2 from each bracket
- B)  $(4x - 10)(4x - 10)$  Student has not factored out 4 and has an incorrect sign
- C)  $4(4x^2 - 25)$  Student has not factorised fully
- D)  $4(2x + 5)(2x - 5)$  Correct answer

17. Fully factorise:

$$49m^2 - 9y^2$$

- A)  $(7m - 3y)(7m - 3y)$  Student has incorrect sign in one bracket
- B)  $(7m + 3y)(7m - 3y)$  Correct answer
- C)  $(49m + y)(m - 9y)$  Student has split each term into factors which are not common
- D)  $(3y + 7m)(3y - 7m)$  Student has inverted the terms

18. Fully factorise:

$$4x^3 - 36x$$

- A)  $4x(x^2 - 9)$  Student has not factorised fully
- B)  $x(2x + 6)(2x - 6)$  Student has not factorised fully
- C)  $4x(x + 3)(x - 3)$  Correct answer
- D)  $4(x^2 - 3)(x + 3)$  Student has incorrectly factorised  $x^2 - 9$

## Diagnostic Questions: Factorising Answers

19. Fully factorise:

$$(2x + 1)^2 - 3(2x + 1)$$

- A)  $4x^2 - 2x - 2$  Student has expanded the brackets and then not factorised
- B)  $(2x + 1)(2x - 2)$  Student has not factored out 2
- C)  $2(2x^2 - x - 1)$  Student has not factorised the quadratic
- D)  $2(2x + 1)(x - 1)$  Correct answer

20. Fully factorise:

$$10x^2 - 7xy - 12y^2$$

- A)  $(5x - 4y)(2x + 3y)$  Student has inverted the signs
- B)  $(5x + 4y)(2x - 3y)$  Correct answer
- C)  $(5x - 4y)(2x - 3y)$  Student has incorrect signs
- D)  $(5x + 4y)(2x + 3y)$  Student has incorrect signs



# Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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