



THIRD SPACE
LEARNING

Diagnostic Questions

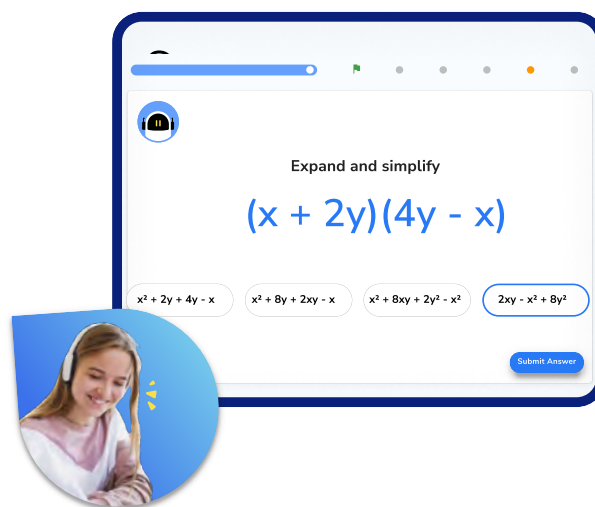
Completing The Square | Algebra

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 **Completing The Square** 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 14 multiple choice questions, each designed to assess each of the key skills required to master **completing the square**. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions.

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: Completing The Square

1. Complete the square:

$$x^2 + 8x + 16$$

A) $x(x + 8) + 16$	B) $(x + 4)^2$
C) $2(x + 4)$	D) $(x + 4)^2 + 12$

2. Complete the square:

$$x^2 - 10x + 25$$

A) $(x - 5)^2 + 20$	B) $x(x - 10) + 25$
C) $(x + 5)(x + 5)$	D) $(x - 5)^2$

3. Complete the square:

$$x^2 - 6x$$

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

Diagnostic Questions: Completing The Square

4. Complete the square:

$$x^2 + x + 1$$

A) $\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}$	B) $x(x + 1) + 1$
C) $\left(x + \frac{1}{2}\right)^2 + 1$	D) $(x + 1)^2$

5. Complete the square:

$$x^2 - 4x - 1$$

A) $x(x - 4) - 1$	B) $(x - 2)^2 + 3$
C) $(x - 2)^2$	D) $(x - 2)^2 - 5$

6. Complete the square:

$$x^2 - 7x$$

A) $\left(x - \frac{7}{2}\right)^2$	B) $x(x - 7)$
C) $\left(x - \frac{7}{2}\right)^2 - \frac{49}{4}$	D) $(x - 7)^2 - 49$

Diagnostic Questions: Completing The Square

7. Complete the square:

$$2 + 4x - x^2$$

A) $(x - 2)^2 - 6$	B) $6 - (x - 2)^2$
C) $2 + x(4 - x)$	D) $18 - (x - 4)^2$

8. Complete the square:

$$1 - 3x - x^2$$

A) $1 - x(3 + x)$	B) $\frac{13}{4} + \left(x - \frac{3}{2}\right)^2$
C) $\frac{3}{4} - \left(x + \frac{3}{2}\right)^2$	D) $\frac{13}{4} - \left(x + \frac{3}{2}\right)^2$

9. Complete the square:

$$3x^2 + 4x - 1$$

A) $3\left(x + \frac{2}{3}\right)^2 - \frac{7}{9}$	B) $3(x + 2)^2 - 15$
C) $3\left(x + \frac{2}{3}\right)^2 - \frac{7}{3}$	D) $x(3x + 4) - 1$

Diagnostic Questions: Completing The Square

10. Complete the square:

$$5x^2 - 3x$$

A) $5\left(x - \frac{3}{10}\right)^2 - \frac{9}{100}$	B) $\left(x - \frac{3}{10}\right)^2 - \frac{9}{100}$
C) $5\left(x - \frac{3}{10}\right)^2 - \frac{9}{20}$	D) $x(5x - 3)$

11. By first completing the square, find the turning point of the graph with equation:

$$y = x^2 - 8x + 3$$

A) (4, 19)	B) (-13, 4)
C) (4, 13)	D) (4, -13)

12. By first completing the square, find the turning point of the graph with the equation below, giving your answer in decimal form:

$$y = 2 - 3x - x^2$$

A) (-1.5, 4.25)	B) (1.5, 4.25)
C) (-1.5, -4.25)	D) (-3, 2.25)

Diagnostic Questions: Completing The Square

13. By first completing the square, find the solutions of the equation, giving your answer in surd form:

$$x^2 - 6x + 3 = 0$$

A) $x = 3$	B) $x = 3 \pm \sqrt{6}$
C) $x = -3$ or $x = 9$	D) $x = 6 \pm \sqrt{3}$

14. By first completing the square, find the solutions of the equation, giving your answer in surd form:

$$3 - 10x - x^2 = 0$$

A) $x = -5 \pm \sqrt{3}$	B) $x = -5 \pm \sqrt{22}$
C) $x = -5 \pm 2\sqrt{7}$	D) $x = 5 \pm 2\sqrt{7}$

Diagnostic Questions: Completing The Square Answers

1. Complete the square:

$$x^2 + 8x + 16$$

- A) $x(x + 8) + 16$ Student manipulated the variable but not the whole expression
B) $(x + 4)^2$ Correct answer
C) $2(x + 4)$ Incorrectly used a multiple of 2 instead of an index of 2
D) $(x + 4)^2 + 12$ Student subtracted 4 (rather than 16) when comparing the perfect square and the original expression

2. Complete the square:

$$x^2 - 10x + 25$$

- A) $(x - 5)^2 + 20$ Student subtracted 5 (rather than 25) when comparing the perfect square and the original expression
B) $x(x - 10) + 25$ Student dealt with variable but did not complete the square
C) $(x + 5)(x + 5)$ Student factorised (incorrectly)
D) $(x - 5)^2$ Correct answer

3. Complete the square:

$$x^2 - 6x$$

- A) $(x - 3)^2 + 9$ Student added (rather than subtracted) the corrective term
B) $x(x - 6)$ Student factorised but did not complete the square
C) $(x - 3)^2 - 9$ Correct answer
D) $(x - 3)^2$ Student did not form full expression

Diagnostic Questions: Completing The Square Answers

4. Complete the square:

$$x^2 + x + 1$$

A) $\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}$ Correct answer

B) $x(x + 1) + 1$ Student factorised part of the expression

C) $\left(x + \frac{1}{2}\right)^2 + 1$ Student found the perfect square but did not correct the constant

D) $(x + 1)^2$ Student factorised (incorrectly)

5. Complete the square:

$$x^2 - 4x - 1$$

A) $x(x - 4) - 1$ Student factorised part of the expression

B) $(x - 2)^2 + 3$ Student added on the corrective term

C) $(x - 2)^2$ Student only found the perfect square and did not adjust

D) $(x - 2)^2 - 5$ Correct answer

6. Complete the square:

$$x^2 - 7x$$

A) $\left(x - \frac{7}{2}\right)^2$ Student did not apply the corrective term

B) $x(x - 7)$ Student factorised the expression

C) $\left(x - \frac{7}{2}\right)^2 - \frac{49}{4}$ Correct answer

D) $(x - 7)^2 - 49$ Student did not find the perfect square correctly

Diagnostic Questions: Completing The Square Answers

7. Complete the square:

$$2 + 4x - x^2$$

- A) $(x - 2)^2 - 6$ Student made mistakes dealing with negative numbers
B) $6 - (x - 2)^2$ Correct answer
C) $2 + x(4 - x)$ Student factorised part of the expression
D) $18 - (x - 4)^2$ Student did not find the perfect square correctly

8. Complete the square:

$$1 - 3x - x^2$$

- A) $1 - x(3 + x)$ Student factorised part of the expression
B) $\frac{13}{4} + \left(x - \frac{3}{2}\right)^2$ Student made mistakes dealing with negative numbers
C) $\frac{3}{4} - \left(x + \frac{3}{2}\right)^2$ Student made mistakes with fraction arithmetic
D) $\frac{13}{4} - \left(x + \frac{3}{2}\right)^2$ Correct answer

9. Complete the square:

$$3x^2 + 4x - 1$$

- A) $3\left(x + \frac{2}{3}\right)^2 - \frac{7}{9}$ Student made mistakes with fraction arithmetic
B) $3(x + 2)^2 - 15$ Student did not factor the coefficient of x^2 correctly
C) $3\left(x + \frac{2}{3}\right)^2 - \frac{7}{3}$ Correct answer
D) $x(3x + 4) - 1$ Student factorised part of the expression

Diagnostic Questions: Completing The Square Answers

10. Complete the square:

$$5x^2 - 3x$$

- A) $5\left(x - \frac{3}{10}\right)^2 - \frac{9}{100}$ Student forgot to multiply corrective term by 5
- B) $\left(x - \frac{3}{10}\right)^2 - \frac{9}{100}$ Student did not use the coefficient of x^2 correctly
- C) $5\left(x - \frac{3}{10}\right)^2 - \frac{9}{20}$ Correct answer
- D) $x(5x - 3)$ Student factorised the expression

11. By first completing the square, find the turning point of the graph with equation:

$$y = x^2 - 8x + 3$$

- A) (4, 19) Student did not adjust perfect square correctly
- B) (-13, 4) Student used completed square form incorrectly to find the turning point
- C) (4, 13) Student forgot to include sign of y -value
- D) (4, -13) Correct answer

12. By first completing the square, find the turning point of the graph with the equation below, giving your answer in decimal form:

$$y = 2 - 3x - x^2$$

- A) (-1.5, 4.25) Correct answer
- B) (1.5, 4.25) Student made errors with negative numbers
- C) (-1.5, -4.25) Student made errors with negative numbers
- D) (-3, 2.25) Student made errors dealing with fractions/decimals

Diagnostic Questions: Completing The Square Answers

13. By first completing the square, find the solutions of the equation, giving your answer in surd form:

$$x^2 - 6x + 3 = 0$$

- A) $x = 3$ Student gave x -value of turning point
B) $x = 3 \pm \sqrt{6}$ Correct answer
C) $x = -3$ or $x = 9$ Student did not square root 6
D) $x = 6 \pm \sqrt{3}$ Student manipulated completed square form incorrectly

14. By first completing the square, find the solutions of the equation, giving your answer in surd form:

$$3 - 10x - x^2 = 0$$

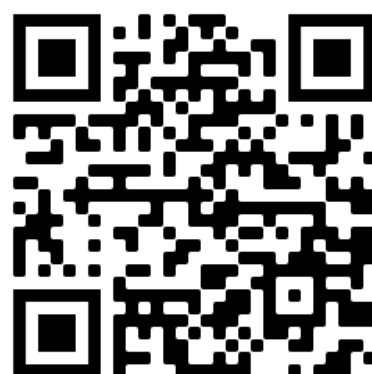
- A) $x = -5 \pm \sqrt{3}$ Student did not subtract corrective term when completing the square
B) $x = -5 \pm \sqrt{22}$ Student made errors with negative numbers
C) $x = -5 \pm 2\sqrt{7}$ Correct answer
D) $x = 5 \pm 2\sqrt{7}$ Student used wrong sign in perfect square bracket

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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