



THIRD SPACE
LEARNING

Diagnostic Questions

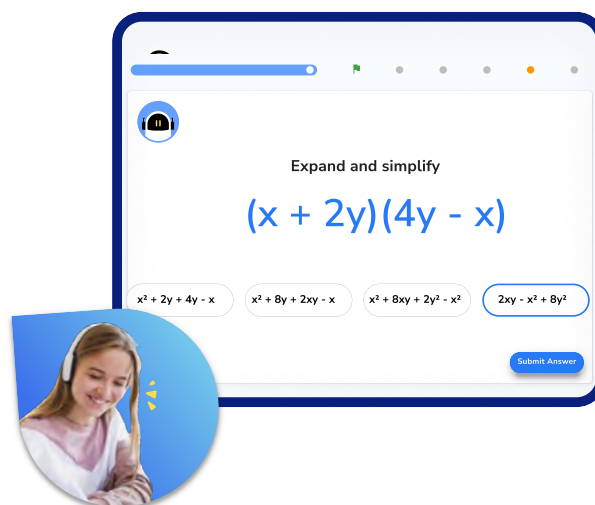
Functions in Algebra | Algebra

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 **Functions in Algebra** 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

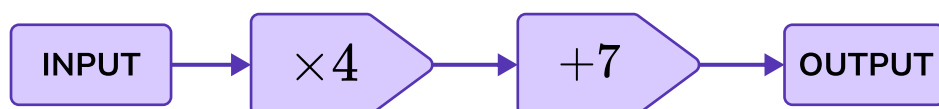
There are 18 multiple choice questions, each designed to assess each of the key skills required to master **functions in algebra**. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions.

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.

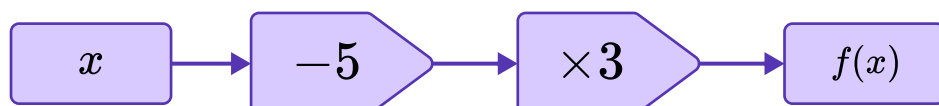
Diagnostic Questions: Functions in Algebra

1. If the input is 6, find the output:



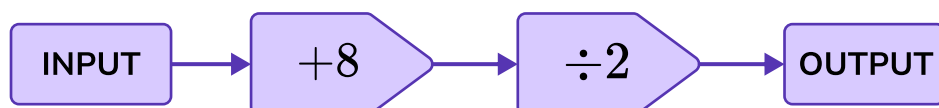
A) 52	B) 24
C) 31	D) 247

2. Find the function represented by this function machine:



A) $f(x) = 3x - 5$	B) $f(x) = x - 15$
C) $f(x) = 3(5 - x)$	D) $f(x) = 3(x - 5)$

3. If the output is 12, find the input:



A) 10	B) 14
C) 16	D) 32

Diagnostic Questions: Functions in Algebra

4. Find $f(3)$ when:

$$f(x) = 7x - 5$$

A) 68	B) 16
C) 21	D) 6

5. Find $f(-4)$ when:

$$f(y) = \frac{18 - y}{2}$$

A) 7	B) 13
C) 5	D) 11

6. Find $f(2a)$ when:

$$f(x) = 9 - 5x$$

A) $9 - 10a$	B) -1
C) $9 - 5a$	D) $8a$

Diagnostic Questions: Functions in Algebra

7. If $f(x) = 5x$ and $g(x) = 3 + x^2$ find:

$$fg(2)$$

A) 103	B) 25
C) 35	D) 70

8. If $f(x) = x - 1$ and $g(x) = 5x^2$ find:

$$gf(-1)$$

A) 0	B) -10
C) 4	D) 20

9. If $f(x) = 2x$, $g(x) = x^2 + 3$ and $h(x) = 2 - x$ find:

$$fgh(5)$$

A) -101	B) -840
C) 24	D) -12

Diagnostic Questions: Functions in Algebra

10. If $f(x) = 2 + 5x$ and $g(x) = x^2$ write an expression for:

$$fg(x)$$

A) $2 + 5x^2$	B) $2 + 5x^3$
C) $2x^2 + 5x^3$	D) $2 + 5x + x^2$

11. If $f(x) = 1 - 3x$ and $g(x) = 2 - 3x$ write an expression for:

$$gf(x)$$

A) $2 - 9x + 9x^2$	B) $9x - 5$
C) $3 - 6x$	D) $9x - 1$

12. If $f(x) = x + 1$, $g(x) = x^2 - 2$ and $h(x) = -3x$ write an expression for:

$$fgh(x)$$

A) $x^2 - 2x - 1$	B) $3 - 6x - 3x^2$
C) $9x^2 - 1$	D) $3 - 3x^2$

Diagnostic Questions: Functions in Algebra

13. Given that $g(x) = \frac{x}{5} - 2$, find:

$$g^{-1}(x)$$

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

14. Given that $f(x) = 7x + 3$, find:

$$f^{-1}(x)$$

A) $\frac{x+3}{7}$	B) $\frac{x}{7} - 3$
C) $\frac{x}{7} + 3$	D) $\frac{x-3}{7}$

15. Given that $h(x) = 3x - 8$, find the value of x that solves:

$$h(x) = 10$$

A) 6	B) 22
C) $\frac{2}{3}$	D) 18

Diagnostic Questions: Functions in Algebra

16. Given that $f(x) = 4 - 3x$ and $g(x) = \frac{3 - 7x}{2}$, find the value of x that solves:

$$f(x) = g(x)$$

A) $-\frac{1}{4}$	B) -5
C) 5	D) $\frac{1}{4}$

17. Given that $g(x) = \frac{3x - 4}{2}$, find the value of x that solves:

$$g(x) = g^{-1}(x)$$

A) -4	B) 1
C) 4	D) $\frac{2x + 4}{3}$

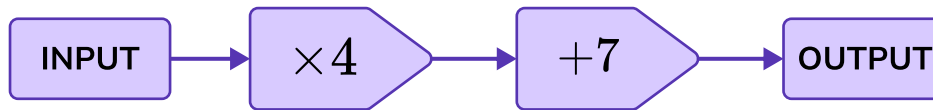
18. Given that $g(x) = x^2 + 1$ and $h(x) = 2x$ find the value of x that solves:

$$g(x) = h(x)$$

A) 0	B) -1
C) 1	D) No Solution

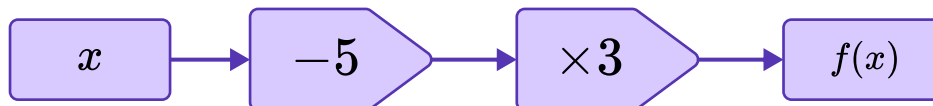
Diagnostic Questions: Functions in Algebra Answers

1. If the input is 6, find the output:



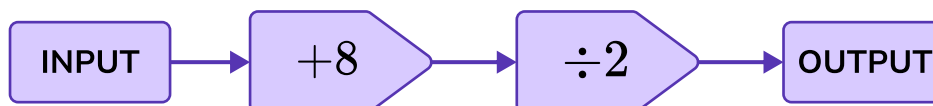
- A) 52 Student added 7 then multiplied by 4
B) 24 Student forgot to multiply by 7
C) 31 Correct answer
D) 247 Student multiplied 6 by 4, then wrote the 7 as an additional digit

2. Find the function represented by this function machine:



- A) $f(x) = 3x - 5$ Student did not multiply all terms by 3
B) $f(x) = x - 15$ Student did not multiply the variable by 3
C) $f(x) = 3(5 - x)$ Student found difference in wrong order
D) $f(x) = 3(x - 5)$ Correct answer

3. If the output is 12, find the input:



- A) 10 Student used the output as the input
B) 14 Student did not use inverse operations
C) 16 Correct answer
D) 32 Student multiplied output by 2 but added (rather than subtracted) 8

Diagnostic Questions: Functions in Algebra Answers

4. Find $f(3)$ when:

$$f(x) = 7x - 5$$

A) 68 Student composed the 7 and 3 as 73 then subtracted 5

B) 16 Correct answer

C) 21 Student did not subtract 5

D) 6 Student subtracted (5×3) from (7×3)

5. Find $f(-4)$ when:

$$f(y) = \frac{18 - y}{2}$$

A) 7 Student did not evaluate numerator correctly

B) 13 Student dealt with variable after dividing 18 by 2

C) 5 Student performed both operations incorrectly

D) 11 Correct answer

6. Find $f(2a)$ when:

$$f(x) = 9 - 5x$$

A) $9 - 10a$ Correct answer

B) -1 Student did not include the full argument in the function

C) $9 - 5a$ Student did not include the full argument in the function

D) $8a$ Student also multiplied argument by 9

Diagnostic Questions: Functions in Algebra Answers

7. If $f(x) = 5x$ and $g(x) = 3 + x^2$ find:

$$fg(2)$$

- A) 103 Student composed functions in wrong order
- B) 25 Student did not square 2 in $g(x)$
- C) 35 Correct answer
- D) 70 Student evaluated each function then multiplied

8. If $f(x) = x - 1$ and $g(x) = 5x^2$ find:

$$gf(-1)$$

- A) 0 Student evaluated $f(x)$ incorrectly
- B) -10 Student evaluated each function then multiplied
- C) 4 Student composed functions in wrong order
- D) 20 Correct answer

9. If $f(x) = 2x$, $g(x) = x^2 + 3$ and $h(x) = 2 - x$ find:

$$fgh(5)$$

- A) -101 Student composed functions in wrong order
- B) -840 Student evaluated each function then multiplied
- C) 24 Correct answer
- D) -12 Student evaluated $-x^2$ in $g(x)$

Diagnostic Questions: Functions in Algebra Answers

10. If $f(x) = 2 + 5x$ and $g(x) = x^2$ write an expression for:

$$fg(x)$$

A) $2 + 5x^2$ Correct answer

B) $2 + 5x^3$ Student substituted $g(x)$ into $f(x)$ incorrectly

C) $2x^2 + 5x^3$ Student found product of functions

D) $2 + 5x + x^2$ Student found sum of functions

11. If $f(x) = 1 - 3x$ and $g(x) = 2 - 3x$ write an expression for:

$$gf(x)$$

A) $2 - 9x + 9x^2$ Student found product of functions

B) $9x - 5$ Student composed functions in wrong order

C) $3 - 6x$ Student found sum of functions

D) $9x - 1$ Correct answer

12. If $f(x) = x + 1$, $g(x) = x^2 - 2$ and $h(x) = -3x$ write an expression for:

$$fgh(x)$$

A) $x^2 - 2x - 1$ Student found sum of functions

B) $3 - 6x - 3x^2$ Student composed functions in wrong order $[hgf(x)]$

C) $9x^2 - 1$ Correct answer

D) $3 - 3x^2$ Student composed functions in wrong order $[hfg(x)]$

Diagnostic Questions: Functions in Algebra Answers

13. Given that $g(x) = \frac{x}{5} - 2$, find:

$$g^{-1}(x)$$

A) $5(x - 2)$ Student did not invert both operations correctly

B) $5(x + 2)$ Correct answer

C) $5x + 2$ Incorrectly multiplied by 5 before adding 2

D) $5x - 2$ Student did not invert operations correctly

14. Given that $f(x) = 7x + 3$, find:

$$f^{-1}(x)$$

A) $\frac{x+3}{7}$ Student did not invert operations correctly

B) $\frac{x}{7} - 3$ Student divided by 7 before subtracting 3

C) $\frac{x}{7} + 3$ Student did not invert operations correctly

D) $\frac{x-3}{7}$ Correct answer

15. Given that $h(x) = 3x - 8$, find the value of x that solves:

$$h(x) = 10$$

A) 6 Correct answer

B) 22 Student used 10 as the function argument

C) $\frac{2}{3}$ Student subtracted 8 then divided by 3

D) 18 Student ignored coefficient of x

Diagnostic Questions: Functions in Algebra Answers

16. Given that $f(x) = 4 - 3x$ and $g(x) = \frac{3 - 7x}{2}$ find the value of x that solves:

$$f(x) = g(x)$$

A) $-\frac{1}{4}$ Student did not multiply through by two

B) -5 Correct answer

C) 5 Student did not solve equation correctly

D) $\frac{1}{4}$ Student did not solve equation correctly

17. Given that $g(x) = \frac{3x - 4}{2}$, find the value of x that solves:

$$g(x) = g^{-1}(x)$$

A) -4 Student made an arithmetic error

B) 1 Student did not find correct inverse

C) 4 Correct answer

D) $\frac{2x + 4}{3}$ Student found inverse but did not solve

18. Given that $g(x) = x^2 + 1$ and $h(x) = 2x$ find the value of x that solves:

$$g(x) = h(x)$$

A) 0 Student made an arithmetic error

B) -1 Student formed quadratic equation incorrectly

C) 1 Correct answer

D) "No solution" Student did not solve equation correctly

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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