



THIRD SPACE
LEARNING

Diagnostic Questions

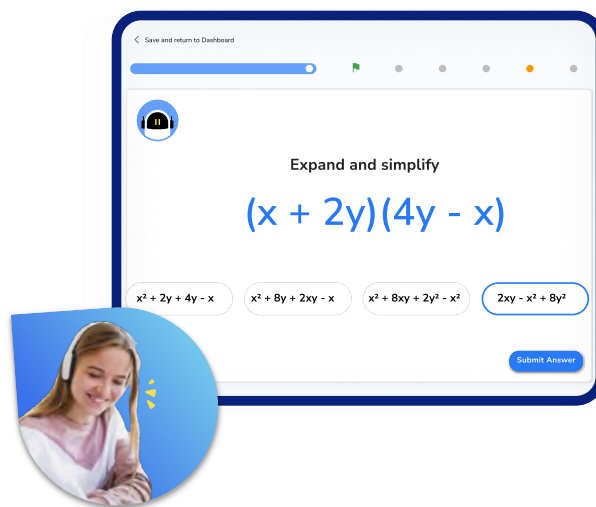
Inequalities | Algebra

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 **Inequalities** 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

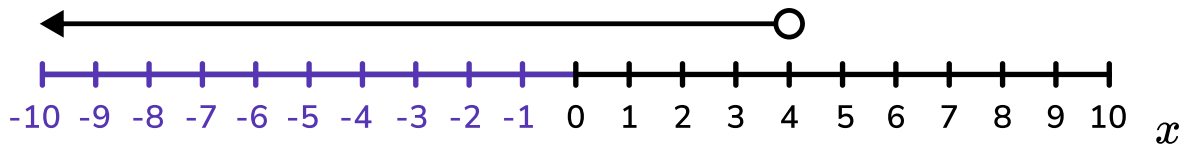
There are 26 multiple choice questions, each designed to assess each of the key skills required to master **inequalities**. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Inequality symbols and notation, Changing the subject, Negative numbers and Inverse operations**.

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.

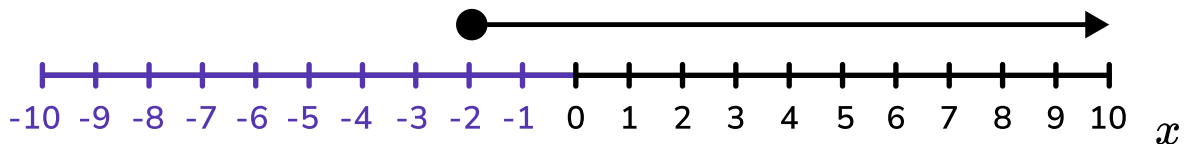
Diagnostic Questions: Inequalities

1. Use an inequality to represent this information:



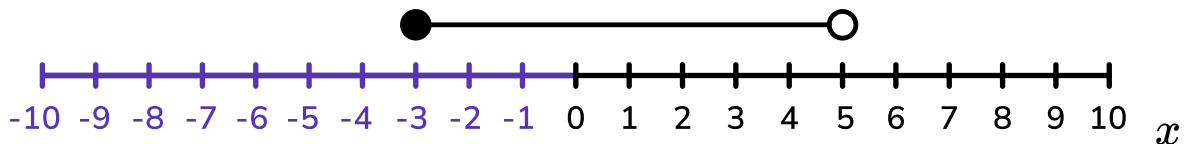
A) $x > 4$	B) $x < 4$
C) $x \leq 4$	D) $x \geq 4$

2. Use an inequality to represent this information:



A) $x \leq -2$	B) $x \geq 2$
C) $x > -2$	D) $x \geq -2$

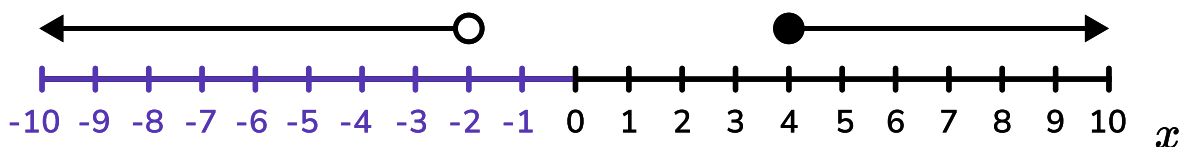
3. Use an inequality to represent this information:



A) $-3 < x < 5$	B) $-3 \leq x > 5$
C) $-3 \leq x < 5$	D) $-3 \geq x > 5$

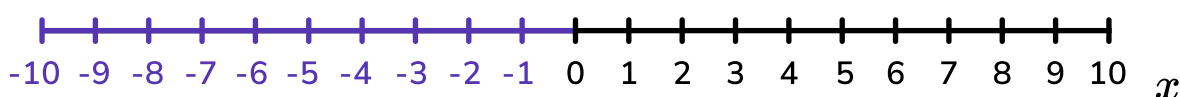
Diagnostic Questions: Inequalities

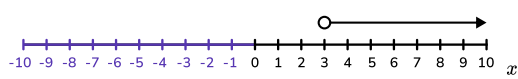
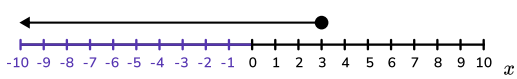
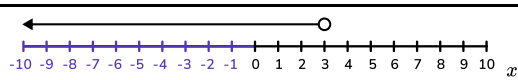
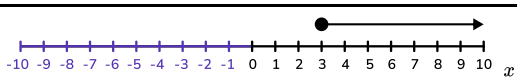
4. Use an inequality to represent this information:



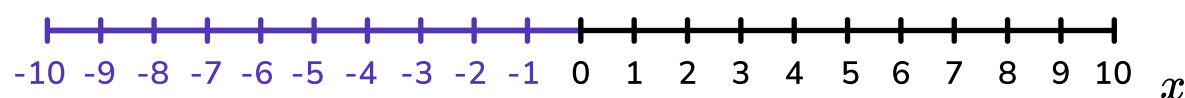
A) $x < -2$ and $x \geq 4$	B) $-2 < x \leq 4$
C) $x < -2$ and $x > 4$	D) $x \leq -2$ and $x > 4$



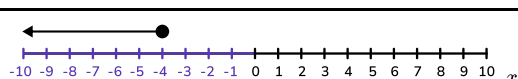
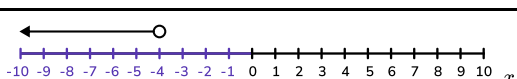
5. Represent the inequality $x > 3$ on the number line:



A) 	B) 
C) 	D) 

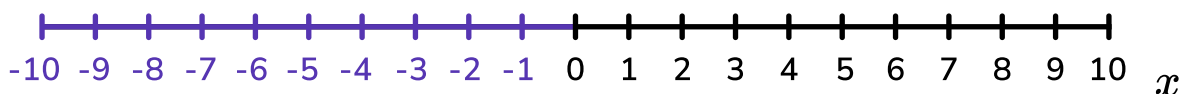
6. Represent the inequality $x \leq -4$ on the number line:

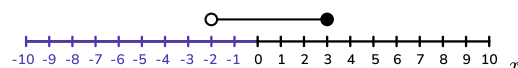
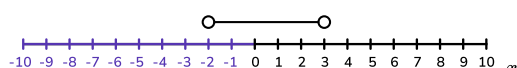
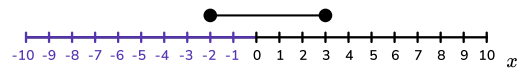
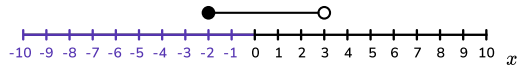


A) 	B) 
C) 	D) 

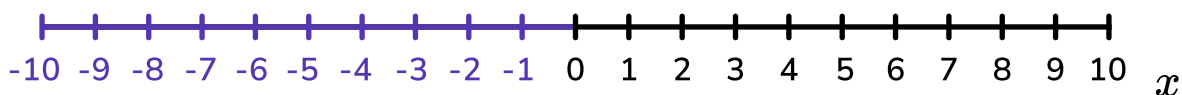
Diagnostic Questions: Inequalities



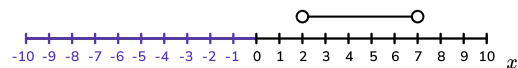
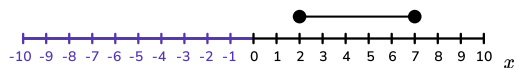
7. Represent the inequality $-2 < x < 3$ on the number line:



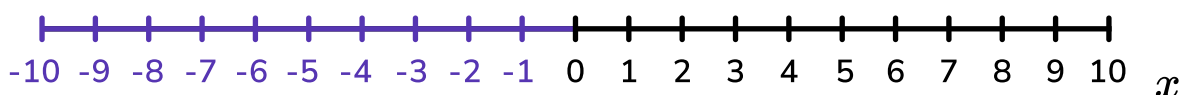
<p>A) </p>	<p>B) </p>
<p>C) </p>	<p>D) </p>

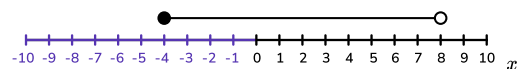
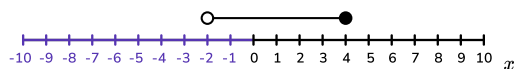


8. Represent the inequality $2 < x < 7$ on the number line:



<p>A) </p>	<p>B) </p>
<p>C) </p>	<p>D) </p>

9. Represent the inequality $-4 \leq 2x < 8$ on the number line:



<p>A) </p>	<p>B) </p>
<p>C) </p>	<p>D) </p>

Diagnostic Questions: Inequalities

10. List the integers that satisfy the inequality:

$$3 < x < 7$$

A) 4, 5, 6	B) 3, 4, 5, 6, 7
C) 4, 5, 6, 7	D) 3, 4, 5, 6

11. List the integers that satisfy the inequality:

$$-2 \leq x < 2$$

A) -1, 0, 1	B) -2, -1, 0, 1, 2
C) -2, -1, 0, 1	D) -1, 0, 1, 2

12. List the integers that satisfy the inequality:

$$0 < x < 2.5$$

A) 0, 1, 2	B) 1, 2
C) 0, 1, 2, 3	D) 1, 2, 3

Diagnostic Questions: Inequalities

13. List the integers that satisfy the inequality:

$$-0.4 \leq x \leq 4$$

A) -0.4, 0, 1, 2, 3, 4	B) 0, 1, 2, 3
C) 1, 2, 3, 4	D) 0, 1, 2, 3, 4

14. Solve the inequality:

$$x + 5 > 8$$

A) $x > -3$	B) $x < 3$
C) $x > 3$	D) $x = 3$

15. Solve the inequality:

$$x - 7 \leq 9$$

A) $x \leq 16$	B) $x \leq 2$
C) $x = 2$	D) $x < 16$

Diagnostic Questions: Inequalities

16. Solve the inequality:

$$3x - 8 \geq 7$$

A) $x \leq 5$	B) $x > 5$
C) $x = 5$	D) $x \geq 5$

17. Solve the inequality:

$$11 < 2x + 5$$

A) $x < 8$	B) $x = 3$
C) $x > 3$	D) $x < 3$

18. Solve the inequality:

$$27 \leq 2 - 5x$$

A) $x < -5$	B) $x \leq -5$
C) $x \leq 5$	D) $x \geq -5$

Diagnostic Questions: Inequalities

19. Solve the inequality:

$$-4 \leq x + 3 \leq 9$$

A) $-7 \leq x$	B) $-7 < x < 6$
C) $x \leq 10$	D) $-7 \leq x \leq 6$

20. Solve the inequality:

$$1 < 2x - 5 < 7$$

A) $-2 < x < 1$	B) $3 \leq x \leq 6$
C) $3 < x < 6$	D) $x = 3$ or $x = 6$

21. Solve the inequality:

$$9 < 1 - 4x < 17$$

A) $-3 < x < -2$	B) $-4 > x > -2$
C) $2 < x < 4$	D) $x < 16$

Diagnostic Questions: Inequalities

22. List the integers that satisfy the inequality:

$$-4 \leq 2x \leq 10$$

A) -2, -1, 0, 1, 2, 3, 4	B) -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
C) -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	D) -2, -1, 0, 1, 2, 3, 4, 5

23. List the integers that satisfy the inequality:

$$1 < 3x - 2 \leq 13$$

A) 1, 2, 3, 4, 5	B) 2, 3, 4, 5
C) 2, 3, 4	D) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

24. List the integers that satisfy the inequality:

$$5 < 2x + 5 < 16$$

A) 0, 1, 2, 3, 4, 5	B) 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
C) 1, 2, 3, 4, 5	D) 1, 2, 3, 4, 5, 6

Diagnostic Questions: Inequalities

25. Solve the quadratic inequality:

$$x^2 - 9 < 0$$

A) $x < 9$	B) $-3 < x < 3$
C) $x < 3$	D) $0 < x < 9$

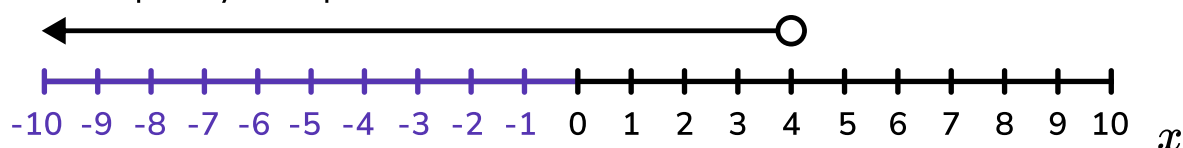
26. Solve the quadratic inequality:

$$x^2 + 4x > 0$$

A) $x > 0$	B) $-4 < x < 0$
C) $x = 0, x = -4$	D) $x < -4, x > 0$

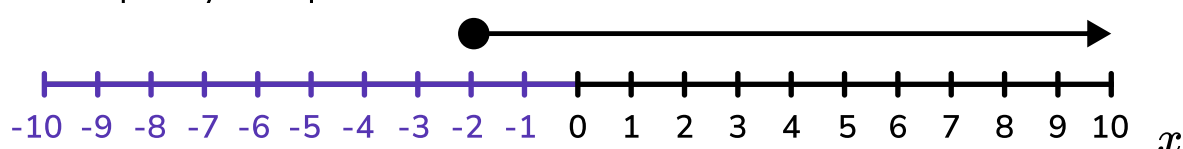
Diagnostic Questions: Inequalities Answers

1. Use an inequality to represent this information:



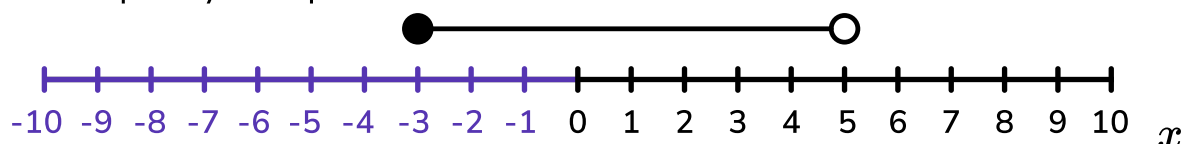
- A) $x > 4$ Student wrote the inequality in the wrong direction
- B) $x < 4$ Correct answer
- C) $x \leq 4$ Student incorrectly included equality for an open circle
- D) $x \geq 4$ Student does not understand inequality notation

2. Use an inequality to represent this information:



- A) $x \leq -2$ Student wrote the inequality in the wrong direction
- B) $x \geq 2$ Student did not include the sign of 2
- C) $x > -2$ Student incorrectly excluded equality for solid circle
- D) $x \geq -2$ Correct answer

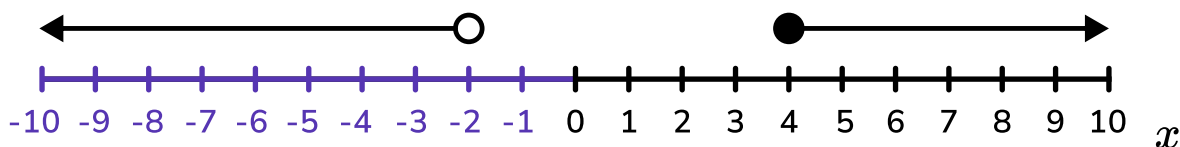
3. Use an inequality to represent this information:



- A) $-3 < x < 5$ Student excluded equality at -3
- B) $-3 \leq x > 5$ Student misrepresented the relation between x and 5
- C) $-3 \leq x < 5$ Correct answer
- D) $-3 \geq x > 5$ Student reversed inequality symbols

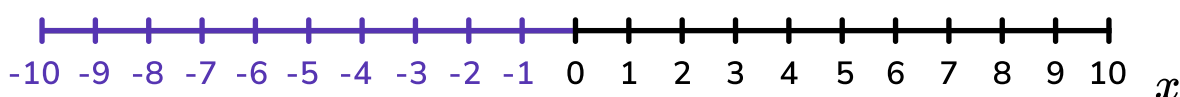
Diagnostic Questions: Inequalities Answers

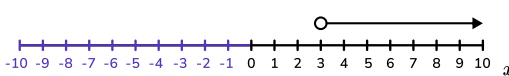
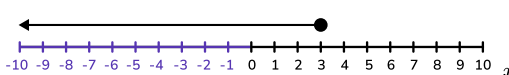
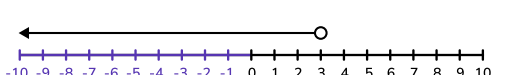
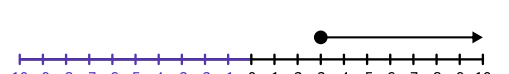
4. Use an inequality to represent this information:



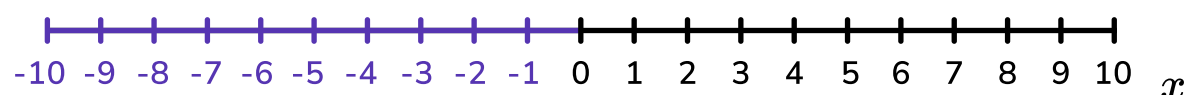
- A) $x < -2$ and $x \geq 4$ Correct answer
 B) $-2 < x \leq 4$ Student considered the wrong region of the number line
 C) $x < -2$ and $x > 4$ Student used incorrect relation at 4
 D) $x \leq -2$ and $x > 4$ Student doesn't understand which symbol the circles on the number line represent

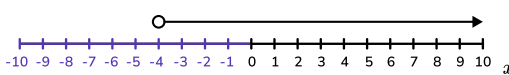
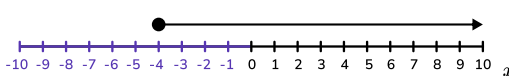
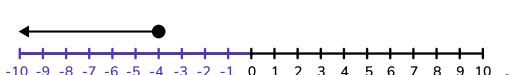
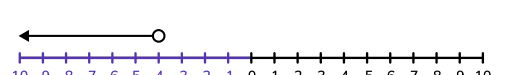
5. Represent the inequality $x > 3$ on the number line:



- A)  Correct answer
 B)  Student does not understand inequality notation
 C)  Student does not understand inequality notation
 D)  Student used incorrect relation at 3

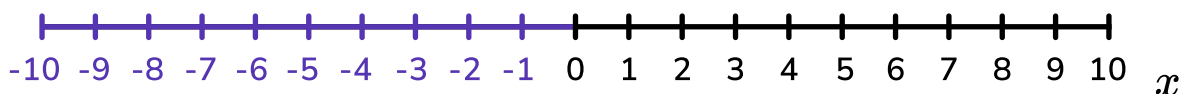
6. Represent the inequality $x \leq -4$ on the number line:





- A)  Student does not understand inequality notation
 B)  Student does not understand inequality notation
 C)  Correct answer
 D)  Student used the incorrect relation at -4

Diagnostic Questions: Inequalities Answers

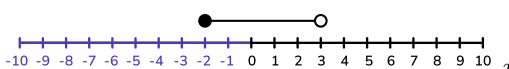
7. Represent the inequality $-2 < x < 3$ on the number line:



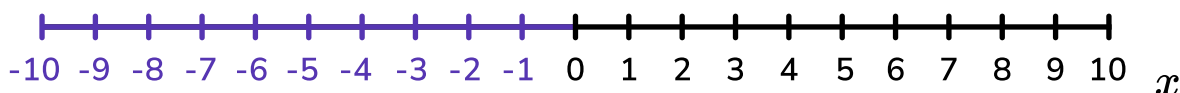
A)  Student used the incorrect relation at 3


B)  Correct answer


C)  Student confused inequality symbols

D)  Student used the incorrect relation at -2

8. Represent the inequality $2 \leq x < 7$ on the number line:



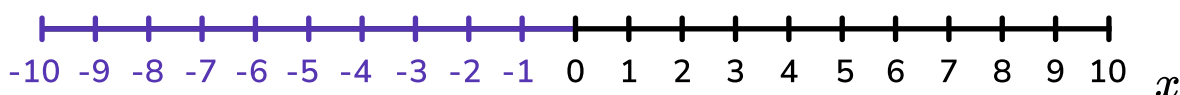
A)  Correct answer

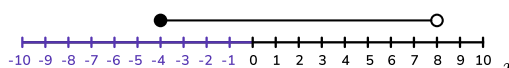
B)  Student confused inequality symbols

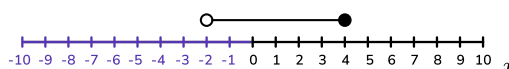
C)  Student used the incorrect relation at 2

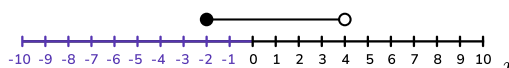
D)  Student used the incorrect relation at 7


9. Represent the inequality $-4 \leq 2x < 8$ on the number line:



A)  Student did not divide by 2 for x

B)  Student confused inequality symbols

C)  Correct answer

D)  Student did not divide by 2 for x and used incorrect relations

Diagnostic Questions: Inequalities Answers

10. List the integers that satisfy the inequality:

$$3 < x < 7$$

A) 4, 5, 6 Correct answer

B) 3, 4, 5, 6, 7 Student incorrectly included both integer endpoints

C) 4, 5, 6, 7 Student incorrectly included integer at upper endpoint

D) 3, 4, 5, 6 Student incorrectly included integer at lower endpoint

11. List the integers that satisfy the inequality:

$$-2 \leq x < 2$$

A) -1, 0, 1 Student did not include integer at lower endpoint

B) -2, -1, 0, 1, 2 Student incorrectly included integer at upper endpoint

C) -2, -1, 0, 1 Correct answer

D) -1, 0, 1, 2 Student confused the meaning of the inequality symbols

12. List the integers that satisfy the inequality:

$$0 < x < 2.5$$

A) 0, 1, 2 Student incorrectly included integer at lower endpoint

B) 1, 2 Correct answer

C) 0, 1, 2, 3 Student does not understand inequalities

D) 1, 2, 3 Student included rounded integer at upper endpoint

Diagnostic Questions: Inequalities Answers

13. List the integers that satisfy the inequality:

$$-0.4 \leq x \leq 4$$

- A) -0.4, 0, 1, 2, 3, 4 Student included a number that is not an integer
- B) 0, 1, 2, 3 Student did not include integer at upper endpoint
- C) 1, 2, 3, 4 Student did not include 0
- D) 0, 1, 2, 3, 4 Correct answer

14. Solve the inequality:

$$x + 5 > 8$$

- A) $x > -3$ Student subtracted 5 from 8 incorrectly
- B) $x < 3$ Student used incorrect inequality symbol
- C) $x > 3$ Correct answer
- D) $x = 3$ Student solved the inequality as an equation

15. Solve the inequality:

$$x - 7 \leq 9$$

- A) $x \leq 16$ Correct answer
- B) $x \leq 2$ Student found difference between 9 and 7
- C) $x = 2$ Student solved the inequality as an equation
- D) $x < 16$ Student used incorrect inequality symbol

Diagnostic Questions: Inequalities Answers

16. Solve the inequality:

$$3x - 8 \geq 7$$

- A) $x \leq 5$ Student used incorrect direction for the inequality
- B) $x > 5$ Student used incorrect inequality symbol
- C) $x = 5$ Student solved the inequality as an equation
- D) $x \geq 5$ Correct answer

17. Solve the inequality:

$$11 < 2x + 5$$

- A) $x < 8$ Student used incorrect inverse operation
- B) $x = 3$ Student solved the inequality as an equation
- C) $x > 3$ Correct answer
- D) $x < 3$ Student used incorrect inequality symbol

18. Solve the inequality:

$$27 \leq 2 - 5x$$

- A) $x < -5$ Student used incorrect inequality symbol
- B) $x \leq -5$ Correct answer
- C) $x \leq 5$ Student made an error dealing with a negative number
- D) $x \geq -5$ Student used incorrect direction of inequality

Diagnostic Questions: Inequalities Answers

19. Solve the inequality:

$$-4 \leq x + 3 \leq 9$$

- A) $-7 \leq x$ Student did not consider the full inequality
- B) $-7 < x < 6$ Student used incorrect inequality symbols
- C) $x \leq 10$ Student combined all constants into one term
- D) $-7 \leq x \leq 6$ Correct answer

20. Solve the inequality:

$$1 < 2x - 5 < 7$$

- A) $-2 < x < 1$ Student used incorrect inverse operation
- B) $3 \leq x \leq 6$ Student used incorrect inequality symbols
- C) $3 < x < 6$ Correct answer
- D) $x = 3$ or $x = 6$ Student tried to solve the inequality as an equation

21. Solve the inequality:

$$9 < 1 - 4x < 17$$

- A) $-3 < x < -2$ Correct answer
- B) $-4 > x > -2$ Student did not reverse inequality when dividing by a negative number
- C) $2 < x < 4$ Student used incorrect inverse operation
- D) $x < 16$ Student has made several misconceptions

Diagnostic Questions: Inequalities Answers

22. List the integers that satisfy the inequality:

$$-4 \leq 2x \leq 10$$

- A) -2, -1, 0, 1, 2, 3, 4 Student did not include upper endpoint
- B) -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 Student did not divide by 2 and missed the end points
- C) -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Student did not divide by 2 before listing integers
- D) -2, -1, 0, 1, 2, 3, 4, 5 Correct answer

23. List the integers that satisfy the inequality:

$$1 < 3x - 2 \leq 13$$

- A) 1, 2, 3, 4, 5 Student incorrectly included integer at lower endpoint
- B) 2, 3, 4, 5 Correct answer
- C) 2, 3, 4 Student did not include integer at upper endpoint
- D) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 Student does not understand how to solve an inequality

24. List the integers that satisfy the inequality:

$$5 < 2x + 5 < 16$$

- A) 0, 1, 2, 3, 4, 5 Student incorrectly included integer at lower endpoint
- B) 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 Student does not understand how to solve an inequality
- C) 1, 2, 3, 4, 5 Correct answer
- D) 1, 2, 3, 4, 5, 6 Student rounded upper value to create an integer endpoint

Diagnostic Questions: Inequalities Answers

25. Solve the quadratic inequality:

$$x^2 - 9 < 0$$

- A) $x < 9$ Student does not understand quadratic inequalities
- B) $-3 < x < 3$ Correct answer
- C) $x < 3$ Student only found part of the inequality
- D) $0 < x < 9$ Student made several misconceptions

26. Solve the quadratic inequality:

$$x^2 + 4x > 0$$

- A) $x > 0$ Student did not consider the full inequality
- B) $-4 < x < 0$ Student used incorrect inequality symbols
- C) $x = 0, x = -4$ Student solved the inequality as an equation
- D) $x < -4, x > 0$ Correct answer

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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