

TEACHER AND STUDENT RESOURCE

Inequalities: regions of solutions



NC Math 1 • NC.M1.A-REI.12

Reasoning with Equations and Inequalities

Seven instructional sections with 30 multiple-choice and 30 open or performance tasks, teaching scripts, original mathematical visuals, generous workspaces, and worked keys.

Free sample | Contents

NC.M1.A-REI.12 | NC Math 1 mathematics

This sample contains 19 complete selected pages from the 106-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 29-30, 59, 74-75

Representative activities

M01: sample PDF page(s) 15; original page(s) 14

M02: sample PDF page(s) 15; original page(s) 14

O01: sample PDF page(s) 16; original page(s) 29

O02: sample PDF page(s) 17; original page(s) 30

Selected teacher prompts and keys: original page(s) 59, 74-75

Using this sample

Read the preparation and access guidance before using a selected activity.

Keep teacher keys and private preparation pages separate from student copies.

Use the original resource contents to see the scope of the complete packet.

Complete paid download

The complete resource includes the full PDF task bank and teaching materials.

ALIGNMENT

Standard and learning targets

Represent the solutions of a linear inequality or a system of linear inequalities graphically as a region of the plane.

T1 Choose boundary inclusion and half-plane.

T2 Verify points in a solution region.

T3 Graph intersections of half-planes.

T4 Interpret feasible and empty regions.

Each item names its own target. The bank supports multiple sessions; do not assign all 60 tasks in one sitting.

NAVIGATION

Choose evidence deliberately

Warm-up: M01-M04 and O01-O04**I Do: M05-M08 and O05-O08****We Do: M09-M13 and O09-O13****Collaborative practice: M14-M18 and O14-O18****Independent practice: M19-M23 and O19-O23****Small-group reteach: M24-M27 and O24-O27****Exit ticket: M28-M30 and O28-O30**

T1: M01, M07, M13, M19, M25, O01, O07, O13, O19, O25

T2: M02, M08, M14, M20, M26, O02, O08, O14, O20, O26

T3: M03, M04, M09, M10, M15, M16, M21, M22, M27, M28, O03, O04, O09, O10, O15, O16, O21, O22, O27, O28

T4: M05, M06, M11, M12, M17, M18, M23, M24, M29, M30, O05, O06, O11, O12, O17, O18, O23, O24, O29, O30

PLANNING

Materials, access and pacing

Materials

Pencils, erasers, straightedge, student pages, and optional graph paper. A calculator may support arithmetic after a learner states the intended relationship. No device or paid software is required.

Prerequisites

Evaluate expressions, plot ordered pairs, use signed numbers, and distinguish an equality from an inequality. Revisit these skills with an unscored example before collecting evidence.

Pacing

Use a short diagnostic warm-up, a model and shared task in one session; collaborative and independent reasoning in later sessions; then targeted reteaching and an exit task. Select two to four tasks at a time based on evidence. Each section's full bank is reusable, not mandatory in one lesson.

Neutral access

Read directions aloud without interpreting the graph, enlarge a page, supply a writing or pointing response method, and allow a learner to dictate an explanation. Keep axes, units, data and mathematical demand unchanged.

Separate instruction from evidence

Keep the learner's first response. Record answer-supplying cues separately from access supports. A completed teacher graph or worked key is for discussion after independent work, never a student construction template.

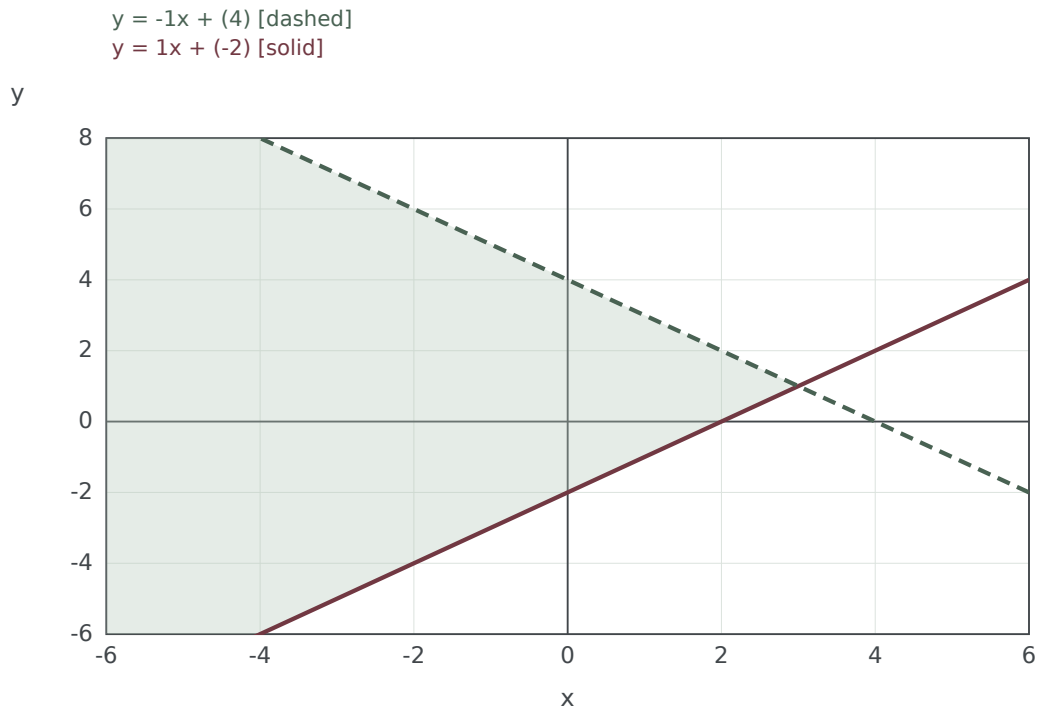
Review convention

Unless a task restricts the domain, variables are real numbers. Grids show a viewing window, not the entire solution set. Extend lines and curves beyond the window when discussing all solutions. Label curves with their equations; explain any rounded values.

TEACHER MODEL

Both conditions must hold

Graph $y \geq x - 2$ and $y < -x + 4$. Explain the overlap.



Draw $y = x - 2$ solid and $y = -x + 4$ dashed. Shade above the first and below the second. The boundaries meet at $(3, 1)$, but this vertex is excluded by the strict inequality. The wedge to the left is the overlap. Point $(0, 0)$ satisfies $0 \geq -2$ and $0 < 4$. Point $(4, 0)$ fails the first. The graph is a region, not just its two edges.

REUSABLE REASONING GUIDE

Represent, justify, interpret

Name: _____ Date: _____

Givens, quantities and restrictions**Representation and calculation****Justification or check****Conclusion, domain and units**

WARM-UP

Teaching script

Core: 001 • T1: Choose boundary inclusion and half-plane.

Optional bank: M01–M04; O01–O04. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 5–8 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O01, including its graph when present. Invite a first independent response before discussion. Ask, “What do the symbols represent? What evidence supports your claim?”

Core task

Graph $y > 1x - 1$. Label two boundary points, show whether the boundary is included, and test a point off it.

Teacher solution and discussion

Use boundary $y = 1x - 1$, drawn dashed because equality is excluded. Shade above the line. Test $(0, 0)$: $0 > -1$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do not. Boundary points include $(0, -1)$ and $(1, 0)$. Graph markers: $P = (0, -1)$; $Q = (1, 0)$; $R = (0, 0)$. Filled markers satisfy the equation or entire system; open markers do not.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M01 to compare all alternatives after evidence is collected.

I DO

Teaching script

Core: 005 • T4: Interpret feasible and empty regions.

Optional bank: M05–M08; 005–008. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–12 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page 005, including its graph when present. Think aloud through the core task. Say, “I will identify the quantities first, then build a representation and check it against the stated domain.” Hide the worked key until after predictions.

Core task

Graph the system $y > 1x + 0$ and $y \leq 1x - 1$. State whether there is any overlap. Justify using the inequalities and your graph.

Teacher solution and discussion

The first requires $y - 1x > 0$; the second requires $y - 1x \leq -1$. These conditions conflict, so the solution region is empty. Show both boundaries but no shaded overlap.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M05 to compare all alternatives after evidence is collected.

WE DO

Teaching script

Core: 009 • T3: Graph intersections of half-planes.

Optional bank: M09–M13; O09–O13. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–15 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O09, including its graph when present. Have learners propose the next step, then ask a partner to verify it using the original representation. Record more than one valid explanation.

Core task

Graph the system $y \geq -1x + 0$ and $y \leq -1x + 4$. Label both boundaries and clearly mark the common region. Check an interior point and one point outside.

Teacher solution and discussion

Graph $y = -1x + 0$ as solid and $y = -1x + 4$ as solid. Shade above the lower line AND below the upper line. Their overlap is a strip. The lower boundary is included; the upper is included. For example (0,1) satisfies both. The point (0,5) fails the upper inequality. Graph markers: $P = (0,1)$; $Q = (0,5)$. Filled markers satisfy the equation or entire system; open markers do not.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M09 to compare all alternatives after evidence is collected.

COLLABORATIVE PRACTICE

Teaching script

Core: O14 • T2: Verify points in a solution region.

Optional bank: M14–M18; O14–O18. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 15–20 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O14, including its graph when present. Assign reader, representer, checker and explainer roles. Each learner first makes a private prediction; compare reasoning and resolve differences with the data.

Core task

Graph $y < 2x + 1$. Mark and label one solution, one nonsolution, and one boundary point. Verify all three by substitution.

Teacher solution and discussion

Use boundary $y=2x + 1$, drawn dashed because equality is excluded. Shade below the line. Test $(0, 0)$: $0 < 1$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do not. A nonsolution is $(0, 2)$. Boundary $(0,1)$ is excluded. Graph markers: $P=(0,1)$; $Q=(1,3)$; $R=(0,0)$; $S=(0,2)$. Filled markers satisfy the equation or entire system; open markers do not.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M14 to compare all alternatives after evidence is collected.

INDEPENDENT PRACTICE

Teaching script

Core: O19 • T1: Choose boundary inclusion and half-plane.

Optional bank: M19–M23; O19–O23. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 15–20 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O19, including its graph when present. Provide the printed task and neutral access supports. Preserve the first independent response; do not point to the requested answer or select a method for the learner.

Core task

Graph $y < -2x + 2$. Label two boundary points, show whether the boundary is included, and test a point off it.

Teacher solution and discussion

Use boundary $y = -2x + 2$, drawn dashed because equality is excluded. Shade below the line. Test $(0, 1)$: $1 < 2$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do not. Boundary points include $(0, 2)$ and $(1, 0)$. Graph markers: $P = (0, 2)$; $Q = (1, 0)$; $R = (0, 1)$. Filled markers satisfy the equation or entire system; open markers do not.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M19 to compare all alternatives after evidence is collected.

SMALL-GROUP RETEACH

Teaching script

Core: O24 • T4: Interpret feasible and empty regions.

Optional bank: M24–M27; O24–O27. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–15 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O24, including its graph when present. Start with the learner's prior evidence. Rebuild one representation with explicit terms and operations, then use a fresh item to check transfer without the prior cue.

Core task

A workshop has 15 liters of paint. A small project uses 1 liter and a large project uses 2 liters. Let x and y be nonnegative real quantities of small and large projects (fractional project amounts are allowed). Write the inequalities, graph their common region, label its vertices, and interpret a boundary point and an interior point.

Teacher solution and discussion

The constraints are $x \geq 0$, $y \geq 0$, and $x + 2y \leq 15$. Draw all boundaries solid and shade the first-quadrant triangle on or below $y = (15 - x)/2$. Vertices: $(0,0)$, $(15,0)$, $(0,7.5)$. Points on the sloping paint-budget boundary use all paint; axis-boundary points can leave paint unused. Negative quantities are excluded. Boundary example $(15,0)$ uses all paint; interior example $(1,1)$ uses 3 liters, below the supply. Graph markers: $P=(0,0)$; $Q=(15,0)$; $R=(0,7.5)$; $S=(1,1)$. Filled markers satisfy the equation or entire system; open markers do not.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M24 to compare all alternatives after evidence is collected.

EXIT TICKET

Teaching script

Core: 028 • T3: Graph intersections of half-planes.

Optional bank: M28–M30; O28–O30. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 5–8 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O28, including its graph when present. Ask for a concise claim supported by the representation. Collect the response before sharing a solution; use it to choose the next instructional step.

Core task

Graph $y \geq 1x + 3$ and $y \leq -1x + 7$. Label the vertex exactly, shade the overlap, and verify one point in the overlap.

Teacher solution and discussion

Draw both boundary lines solid. Solve their equality: $2x=4$, giving vertex $(2, 5)$. Shade above the first AND below the second. At $x=0$, $y=4$ meets both conditions. The common wedge lies to the left of the vertex; both edges are included. Graph markers: $P=(2,5)$; $Q=(0,4)$. Filled markers satisfy the equation or entire system; open markers do not.

Evidence and response

Look for a claim tied to specific equations, substitutions, operations or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If a sign or operation is mishandled, reconstruct that step with a numerical analogy, then collect a fresh response. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M28 to compare all alternatives after evidence is collected.

MULTIPLE-CHOICE BANK

M01 / M02 • Select and justify**M01 | Warm-up | T1****How should the solution set of $y > 1x - 2$ be graphed?**

- A. Solid boundary; shade above.
- B. Solid boundary; shade below.
- C. Dashed boundary; shade below.
- D. Dashed boundary; shade above.

Reasoning: _____

M02 | Warm-up | T2**Which point belongs to the solution region of $y \leq 1x - 2$?**

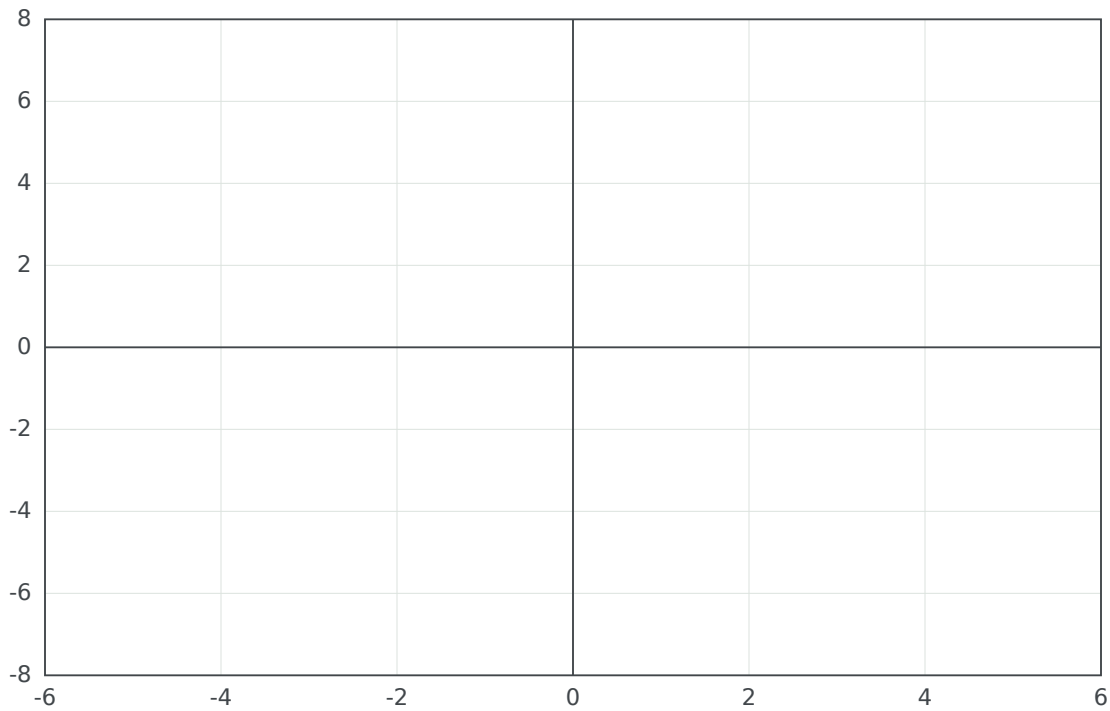
- A. (0, -1)
- B. (0, -3)
- C. (1, 0)
- D. (-1, -1)

Reasoning: _____

WARM-UP

001 • Show your reasoning**T1: Choose boundary inclusion and half-plane.****Graph $y > 1x - 1$. Label two boundary points, show whether the boundary is included, and test a point off it.**

vertical axis: _____



horizontal axis: _____

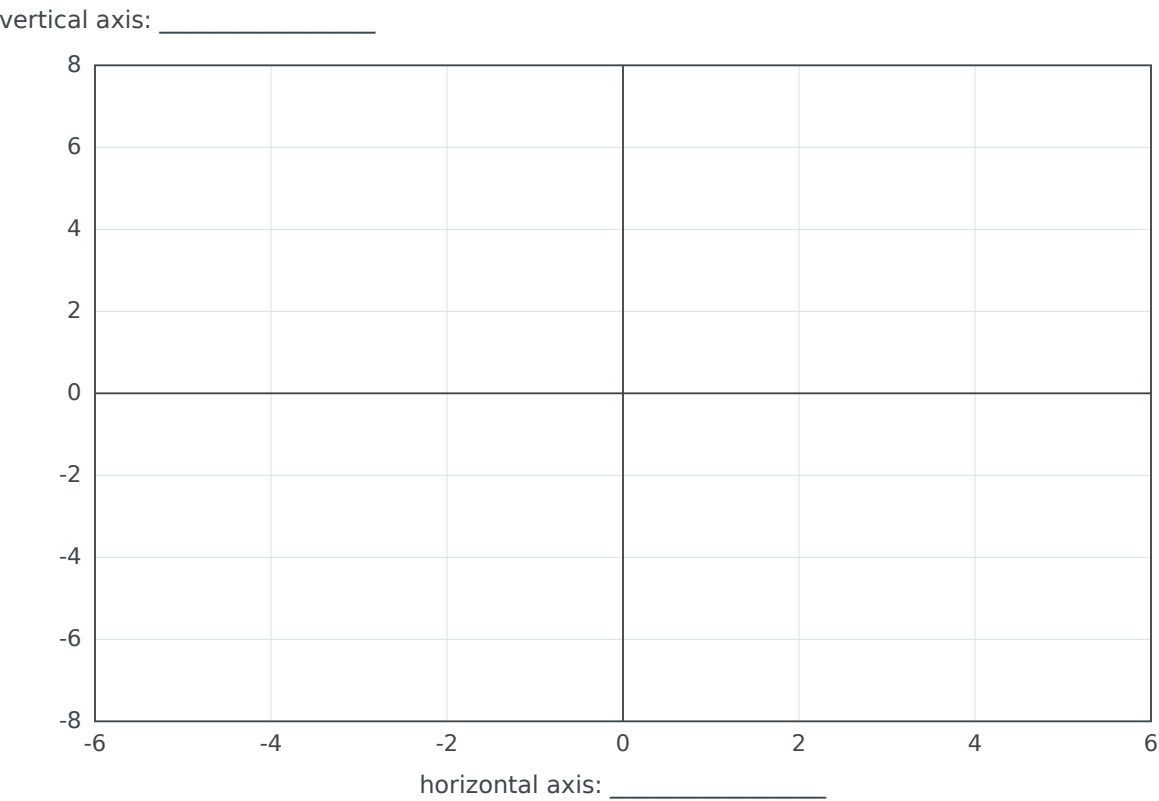
Explanation and check

WARM-UP

002 • Show your reasoning

T2: Verify points in a solution region.

Graph $y \leq 1x - 1$. Mark and label one solution, one nonsolution, and one boundary point. Verify all three by substitution.



Explanation and check

WORKED TEACHER KEYS

M01 / M02**M01 • T1: Choose boundary inclusion and half-plane.****Answer: D. Dashed boundary; shade above.**

Use boundary $y=1x - 2$, drawn dashed because equality is excluded. Shade above the line. Test $(0, -1)$: $-1 > -2$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do not.

Check each alternative

- A. The boundary inclusion is reversed.
- B. Both boundary inclusion and half-plane are reversed.
- C. The half-plane is reversed.
- D. Both inclusion and side agree with the inequality.

M02 • T2: Verify points in a solution region.**Answer: B. $(0, -3)$**

Use boundary $y=1x - 2$, drawn solid because equality is included. Shade below the line. Test $(0, -3)$: $-3 \leq -2$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do.

Check each alternative

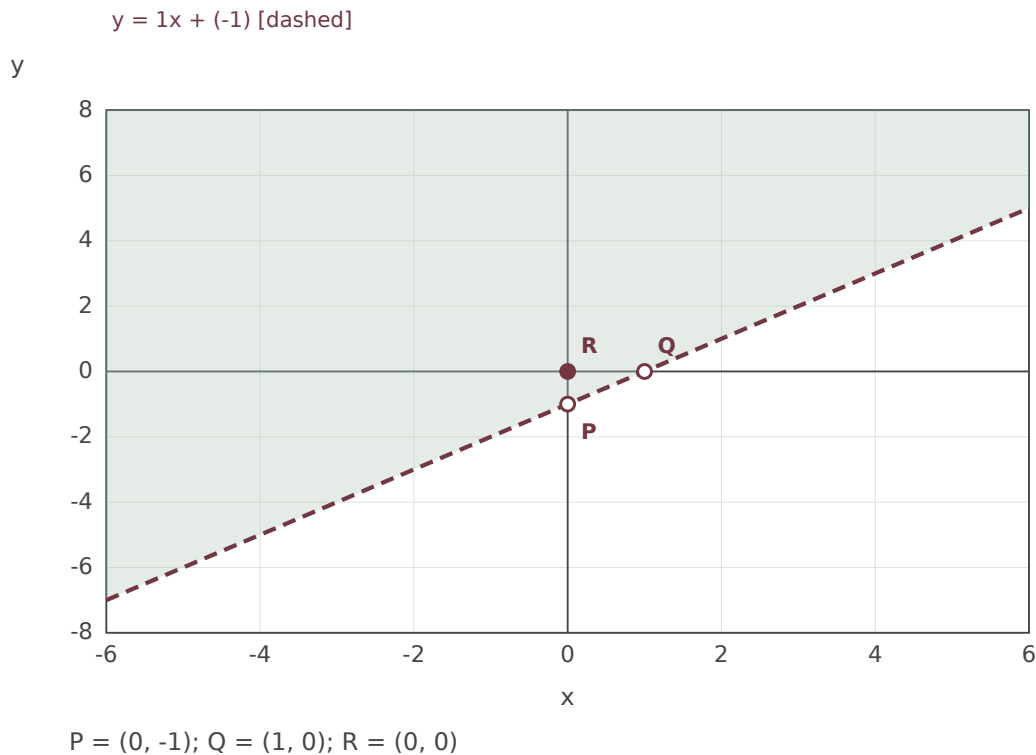
- A. Boundary output at $x=0$ is -2 ; $y=-1$ fails the required $\leq$ comparison.
- B. Boundary output at $x=0$ is -2 ; $y=-3$ satisfies the required $\leq$ comparison.
- C. Boundary output at $x=1$ is -1 ; $y=0$ fails the required $\leq$ comparison.
- D. Boundary output at $x=-1$ is -3 ; $y=-1$ fails the required $\leq$ comparison.

WORKED TEACHER KEYS

001

001 • T1: Choose boundary inclusion and half-plane.

Use boundary $y = 1x - 1$, drawn dashed because equality is excluded. Shade above the line. Test $(0, 0)$: $0 > -1$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do not. Boundary points include $(0, -1)$ and $(1, 0)$. Graph markers: $P = (0, -1)$; $Q = (1, 0)$; $R = (0, 0)$. Filled markers satisfy the equation or entire system; open markers do not.

**Evidence to assess**

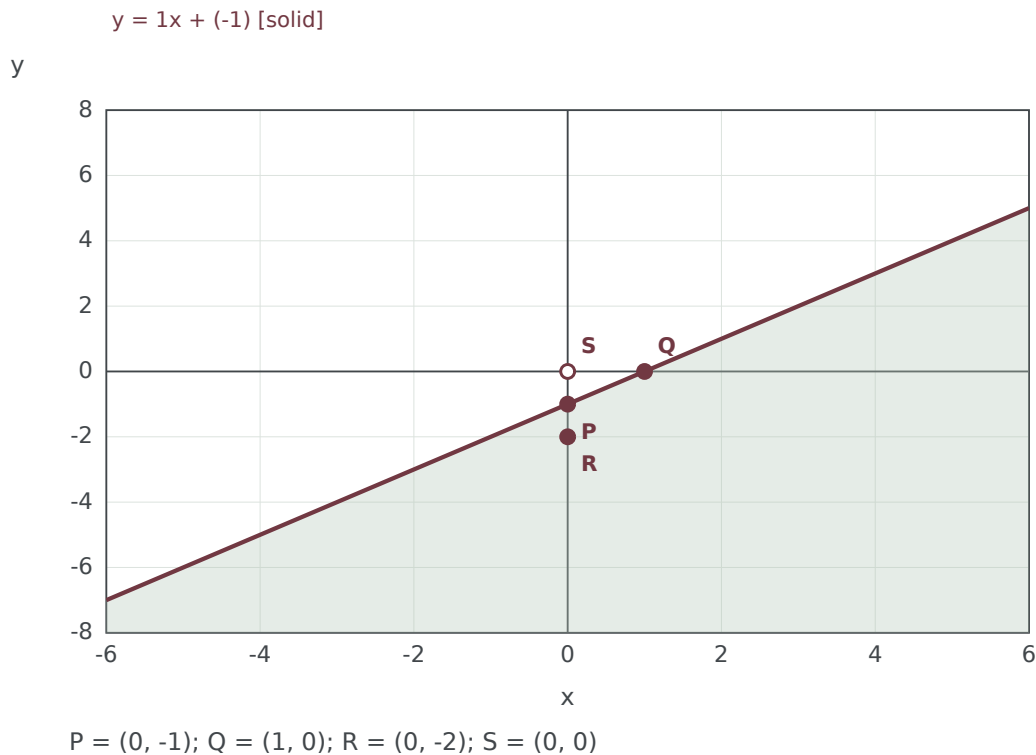
Assess accurate representation, a valid justification, and a conclusion consistent with the domain and units. Accept equivalent reasoning or another construction meeting every condition. An answer alone does not establish a unique misconception.

WORKED TEACHER KEYS

002

002 • T2: Verify points in a solution region.

Use boundary $y = 1x - 1$, drawn solid because equality is included. Shade below the line. Test $(0, -2)$: $-2 \leq -1$ is true. Every point in the selected half-plane satisfies the inequality; boundary points do. A nonsolution is $(0, 0)$. Boundary $(0, -1)$ is included. Graph markers: $P = (0, -1)$; $Q = (1, 0)$; $R = (0, -2)$; $S = (0, 0)$. Filled markers satisfy the equation or entire system; open markers do not.



Evidence to assess

Assess accurate representation, a valid justification, and a conclusion consistent with the domain and units. Accept equivalent reasoning or another construction meeting every condition. An answer alone does not establish a unique misconception.