Equations Inequalities and Relationships

Lesson 9 Endpoints and Infinite Solutions

Standards 6.EE.B.8

Learning target I can write and graph a constraint using an inequality.

Materials Balance models, number lines, coordinate grids, rulers.

Lesson Flow 50 Minutes

0–5 Activate prior knowledge. Read the learning target. Ask students what they already know about endpoints and infinite solutions. Use a quick model or estimate to make their starting ideas visible.

5–17 Teach and model. Use > or < for a strict bound and ≥ or ≤ when the endpoint is included. Graph a strict bound with an open circle; use a closed circle for an included endpoint. Shade the direction of all solutions. Work through the two examples on the attached instruction page. Have students name the first step before showing it.

17–22 Guided practice. Revisit worked Example 2 with its solution covered. Students propose the next step and explain why it is valid; uncover and compare with the worked solution.

22–45 Independent classwork. Assign the attached 10 questions in order. Check items 1–3 for entry-level understanding, 4–6 for connected procedures, 7–8 for representation and explanation, and 9–10 for application or justification. Ask students to use the instruction-page notes area or extra grids for longer work.

45–50 Check understanding. Use classwork question 10 as an exit discussion: A museum group must have at least 20 participants. Let p be the participant count. Write an inequality and graph its real-number solution set. State which solutions make sense as participant counts. Compare the result with the answer key and ask a student to defend the method.

Support and Extension

Support Model item 1 together with the listed tools, then have students attempt item 2 independently. Watch inverse operations, equality on both sides, open versus closed endpoints, and input/output order.

Extension Ask students to solve a final item another way, draw a second representation, or create a related problem with a checked answer.

Next step Record which students can explain the target independently. Begin the next teaching session with a brief correction for any recurring error.

Name _____ Date _____

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Learning target I can write and graph a constraint using an inequality.

Learn and Discuss

Use > or < for a strict bound and ≥ or ≤ when the endpoint is included. Graph a strict bound with an open circle; use a closed circle for an included endpoint. Shade the direction of all solutions.

Example 1 Let x be any real number. Write and graph: x is more than 18. Label the endpoint and shade the solution ray.
Solution x > 18; open circle at 18, shade right. “more than” means >; exclude the endpoint.
Example 2 Let x be any real number. Write and graph: x is at least 10. Give one included value and explain whether the endpoint is included.
Solution x ≥ 10; closed circle at 10, shade right. “at least” means ≥; include the endpoint. Example solution: 11.

Classwork Show Your Work

Complete the 10 problems on the following page. Refer to the examples, draw models, and check your results.

My Notes or Second Method

Lesson 9 Endpoints and Infinite Solutions

Name _____ Show calculations, models, and units.

1. Let x be any real number. Write and graph: x is more than 21. Label the endpoint and shade the solution ray.

2. Let x be any real number. Write and graph: x is at least 28. Label the endpoint and shade the solution ray.

3. Let x be any real number. Write and graph: x is at least 16. Label the endpoint and shade the solution ray.

4. Let x be any real number. Write and graph: x is less than 21. Label the endpoint and shade the solution ray.

5. Let x be any real number. Write and graph: x is less than 15. Label the endpoint and shade the solution ray.

6. Let x be any real number. Write and graph: x is at least 20. Label the endpoint and shade the solution ray.

7. Let x be any real number. Write and graph: x is at most 15. Give one included value and explain whether the endpoint is included.

8. Let x be any real number. Write and graph: x is at most 18. Give one included value and explain whether the endpoint is included.

9. A museum group must have more than 10 participants. Let p be the participant count. Write an inequality and graph its real-number solution set. State which solutions make sense as participant counts.

10. A museum group must have at least 20 participants. Let p be the participant count. Write an inequality and graph its real-number solution set. State which solutions make sense as participant counts.

Endpoints and Infinite Solutions

Equations Inequalities and Relationships

1. x > 21; open circle at 21, shade right
Reasoning “more than” means >; exclude the endpoint.

2. x ≥ 28; closed circle at 28, shade right
Reasoning “at least” means ≥; include the endpoint.

3. x ≥ 16; closed circle at 16, shade right
Reasoning “at least” means ≥; include the endpoint.

4. x < 21; open circle at 21, shade left
Reasoning “less than” means <; exclude the endpoint.

5. x < 15; open circle at 15, shade left
Reasoning “less than” means <; exclude the endpoint.

6. x ≥ 20; closed circle at 20, shade right
Reasoning “at least” means ≥; include the endpoint.

7. x ≤ 15; closed circle at 15, shade left
Reasoning “at most” means ≤; include the endpoint. Example solution: 14.

8. x ≤ 18; closed circle at 18, shade left
Reasoning “at most” means ≤; include the endpoint. Example solution: 17.

9. p > 10; open circle at 10, shade right; participant counts are whole numbers 11, 12, …
Reasoning “more than” means >. The real-number ray has infinitely many solutions, but participant counts must be whole numbers.

10. p ≥ 20; closed circle at 20, shade right; participant counts are whole numbers 20, 21, …
Reasoning “at least” means ≥. The real-number ray has infinitely many solutions, but participant counts must be whole numbers.