

Inequalities and number lines

Pearson Edexcel GCSE Mathematics 1MA1 • L022
Foundation and Higher • 60 minutes • Lesson resources

REACH FOR THE STAR | GCSE MATHEMATICS

Solve linear inequalities and represent solution sets on number lines. Explain endpoint inclusion and order reversal.

Work without a calculator except where a check is invited. Write on the lines or replace them with typed answers. Attempt before reading intentional practice feedback.

Connect & Check

Inequality: comparison using $<$, $>$, $\leq$ or $\geq$. Endpoint: boundary value. Solution set: all allowed values. Strict: excludes equality. Integer: whole number, possibly negative.

R1

Which is greater: -2 or -5 ?

R2

Solve $2x+3=11$.

R3

Calculate $-6 \div -2$.

Share | In pairs, predict the first step for this problem: Adding the same number preserves order. Multiplying by a negative reverses order: $2 < 5$ becomes $-2 > -5$. A solution such as $x \geq 3$ contains many values. The filled endpoint includes 3; an arrow to the right includes larger values. Compare your reasons before using the worked model.

Present through worked examples

Adding the same number preserves order. Multiplying by a negative reverses order: $2 < 5$ becomes $-2 > -5$. A solution such as $x \geq 3$ contains many values. The filled endpoint includes 3; an arrow to the right includes larger values.

D1

Model: $x < 3$ has an open circle at 3 and points left. Describe $x \geq -1$.

D2

Model: $x + 4 < 9$ becomes $x < 5$. Now solve $x - 3 \geq 2$.

D3

Model: $2x + 1 \leq 9$ gives $2x \leq 8$, so $x \leq 4$. Now solve $3x - 2 > 10$.

D4

Model: $-2x < 6$ becomes $x > -3$. Now solve $-3x \geq 12$.

Apply with less support

Solve using balanced operations. Reverse the inequality when multiplying or dividing by a negative number. Mark the endpoint and direction, then test one value inside and one outside the set.

A1

Compare $x < 2$, $x \leq 2$, $x > 2$ and $x \geq 2$ on number lines. What changes at 2 and in the direction?

A2

Solve $4x + 3 \leq 19$, then list positive integer solutions.

A3

A £5 fee plus £3 per visit must cost at most £20. Form an inequality and find the maximum whole visits.

Optional support: Test the endpoint first.

Optional numerical check for $-3x \geq 12$: $x = -5$ gives $15 \geq 12$, while $x = 0$ gives $0 \geq 12$ false. A calculator tests selected values; it does not describe the full set.

Apply and extend reasoning

C1

A learner divides $-2x \leq 8$ by -2 and writes $x \leq -4$. Disprove it and give the correct set.

C2

List all integers satisfying $-2 < x \leq 3$. Explain why the endpoints differ.

Intentional practice feedback — read after attempting

A1: Open left; filled left; open right; filled right.

A2: $x \leq 4$; 1,2,3,4.

A3: $5 + 3v \leq 20$; $v \leq 5$; maximum 5 visits.

C1: $x=0$ fits the original but not the claim. Correct $x \geq -4$.

C2: $-1, 0, 1, 2, 3$.

Correct one response and explain your change. Stretch is available to either tier; temporary support needs do not determine entry tier.

Recall & Review through retrieval

Work without notes. Six retrieval points; this attempt does not establish mastery. Equivalent exact numeric forms are accepted. Where accuracy is requested, also state the requested form in your written work.

Q1 Boundary of $x+4<9$

Q2 Boundary of $2x+1\leq 9$

Q3 Boundary of $-3x\geq 12$

Q4 Largest integer with $x<4$

Q5 Number of integers with $-2<x\leq 3$

Q6 Maximum visits: $5+3v\leq 20$

Intentional retrieval feedback

Q1 5; Q2 4; Q3 -4 ; Q4 3; Q5 5; Q6 5. Correct and retry tomorrow, then in one week.

Prove independently and improve

P1–P2: five minutes without notes; 4 marks. Your teacher reviews explanations and method marks.
P3 has no mark.

P1

Solve $2x+5<13$ and describe its number-line representation. [2]

P2

Solve $-4x\leq 12$. Explain the sign change. [2]

P3

Explain one corrected error. Set a fresh question and a date to check it without support.

Teacher feedback: _____

Fresh question and retry date: _____

Delayed independent evidence: _____

Prepare for the next lesson

L023: Sequences and nth terms

F1

Tomorrow solve $3x-1 \leq 11$ and list non-negative integer solutions.

F2

Before L023, continue 5,8,11,14 and explain the rule.

Read and prepare

An arithmetic sequence has a constant difference. For 5,8,11,14,... the nth term is $3n+2$ when the first term is $n=1$. Check both the first term and the difference.

Digital workbook: save locally where available; export a JSON backup before closing or moving the file. Restore only this lesson/version. Printing records answers, not mastery. Live browser checks remain pending; use Word/PDF if required.

Optional extension activities

Allow 10–15 minutes for learners who have secured the main practice. Show a method, explain a check and justify your conclusion.

Stretch

Solve $3 - 2x < 11$ and show the solution in words.

Deep challenge

Why does dividing $-3x \geq 12$ by -3 reverse the sign? Give a numerical check.

Recall & Review: feedback and extension integration

Lesson L022: Inequalities and number lines

Objective: Solve linear inequalities and represent solution sets on number lines. Explain endpoint inclusion and order reversal.

Timing for a 60-minute lesson

0-7 Connect & Check; 7-14 Share; 14-25 Present/model; 25-44 Apply route choice/practice; 44-52 independent exam-style check; 52-60 Recall & Review, WWW/EBI and next step.

Recall & Review evidence

At the end of the lesson, solve a fresh question without prompts, explain one check, correct one error and record the next practice step.

What Went Well (WWW)

I represented the algebraic structure accurately, kept each transformation valid and checked the result by substitution, graph or equivalent reasoning.

Even Better If (EBI)

I will show the missing inverse operation or algebraic step, keep signs and brackets accurate and test the result in the original relationship.

Integrated stretch and deep challenge

Stretch: Solve $3 - 2x < 11$ and show the solution in words.

Deep challenge: Why does dividing $-3x \geq 12$ by -3 reverse the sign? Give a numerical check.

My next-step response
