MATHEMATICS · GRADES 10-12

Systems of linear inequalities

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you find all the combinations that work, like the mix of hours and wages that keeps you under budget, when the answer is a whole range instead of one exact pair. An inequality does not ask for one exact answer, it asks for everything that fits inside a limit. With two limits at once, the answer is the overlap, every combination that satisfies both. That is how you plan a budget, a schedule, or a mix of items when the rule is a limit, not a single number.



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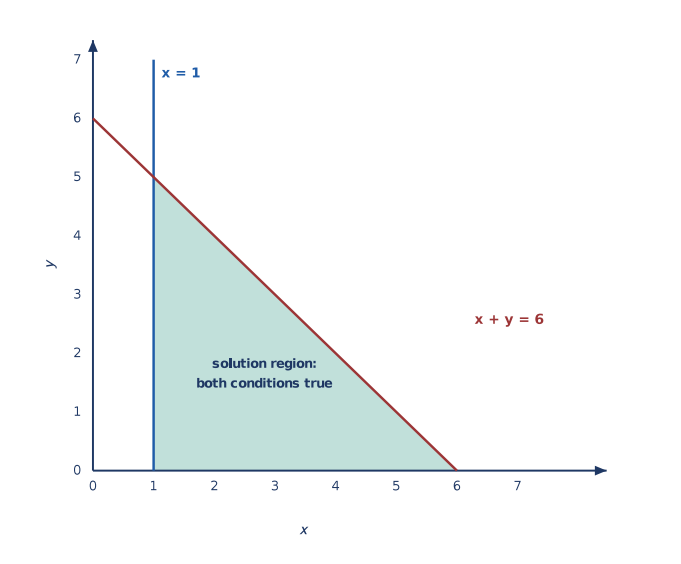
Rule

Systems of linear inequalities: a point is a solution only if it satisfies every inequality in the system.

On a graph, the solution is the overlap, the region where all the shadings meet.



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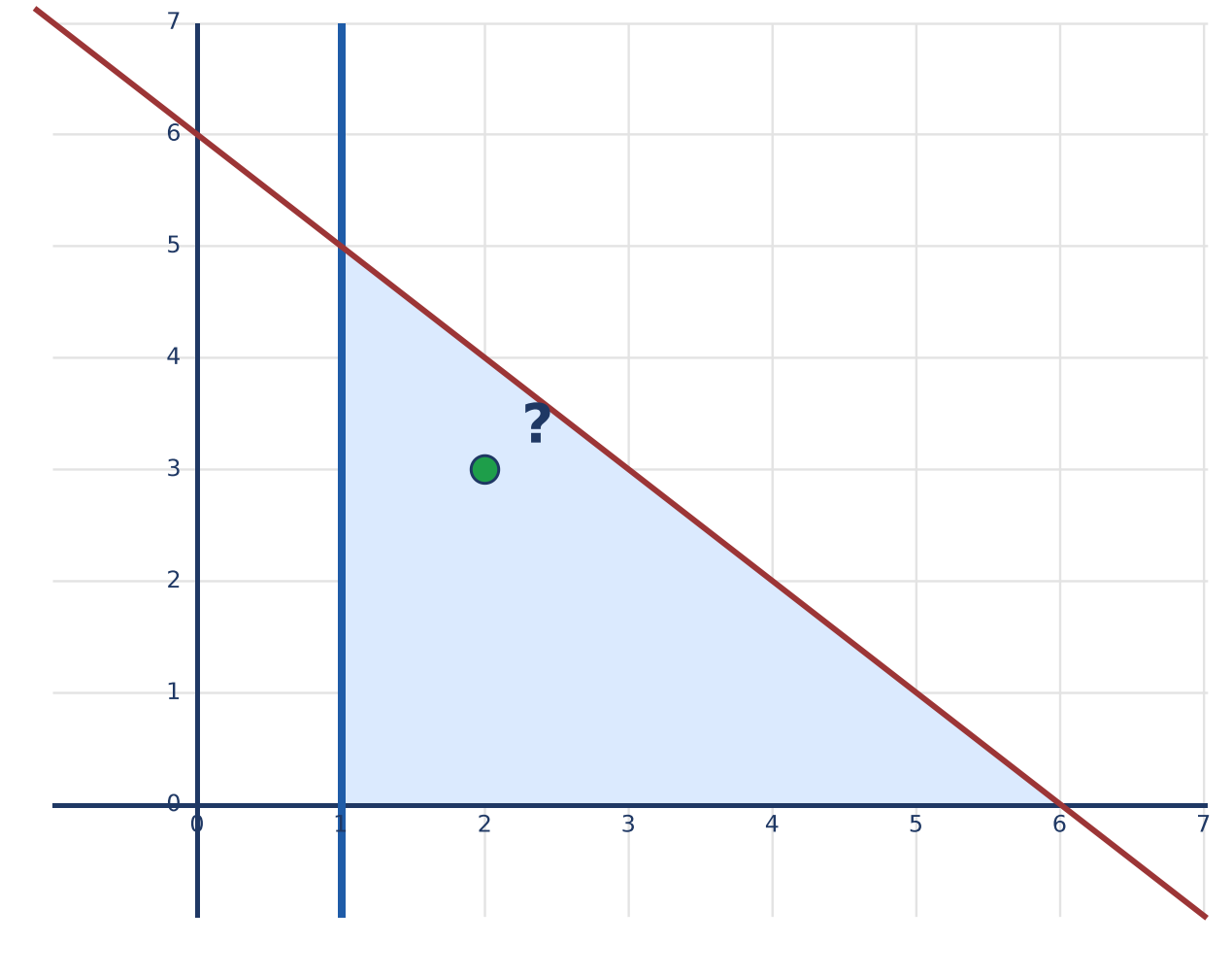
Worked examples

EXAMPLE 1

Q Is (2, 3) a solution of x + y less than 6 and x greater than 1?



SOLUTION

Check the first: 2 + 3 = 5, and 5 is less than 6, so it passes.

Check the second: 2 is greater than 1, so it passes.

It passes both, so (2, 3) is a solution.

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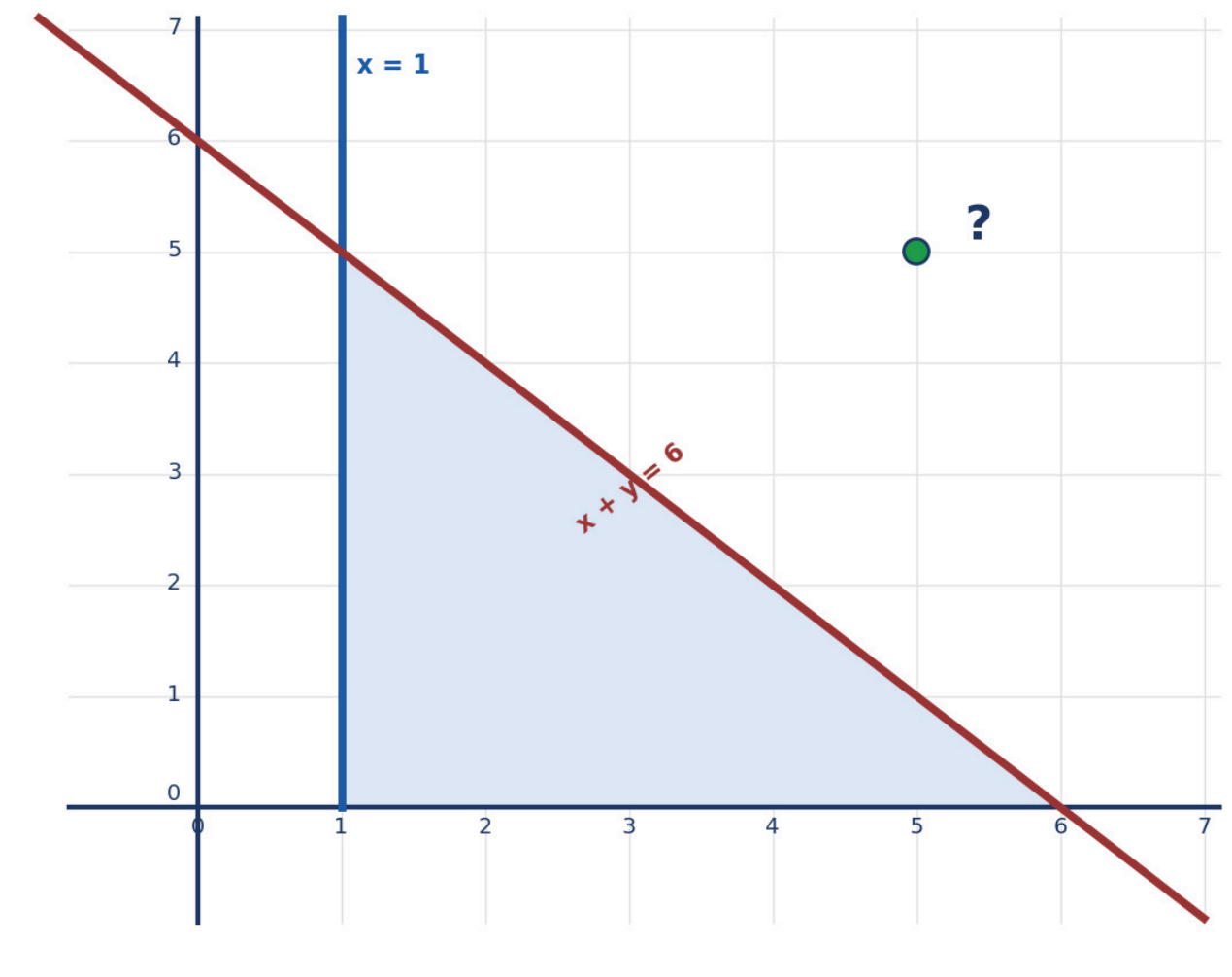
EXAMPLE 2

Q Is (5, 5) a solution of the same system?



SOLUTION

Check the first: 5 + 5 = 10, and 10 is not less than 6.

It already fails one inequality, so there is no need to check further.

So (5, 5) is not a solution.

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Practice questions

1 A parking lot holds x cars and y trucks, with x + y less than 5 and y greater than 0. Is (1, 1) a solution?

- **A** Yes
- **B** No

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2 A parking lot holds x cars and y trucks, with x + y less than 5 and y greater than 0. The point (4, 4) is not a solution. Which inequality does it fail?

- **A** x + y less than 5
- **B** y greater than 0
- **C** Both
- **D** Neither

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3 **Consider the system x + y less than 5 and y greater than 0. What does its solution look like?**

A A single point

B A region

C A single line

D No points at all

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4 **A garden plot has x greater than 2 and y less than 3. Is (3, 2) a solution?**

A Yes

B No

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5 A garden plot has x greater than 2 and y less than 3. The point (2, 2) sits exactly on the line x = 2. Is (2, 2) a solution?

- A Yes
- B No

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6 An inequality uses less than, not less than or equal to. How is its boundary line drawn?

- A With a dashed boundary line
- B With a solid boundary line
- C With no boundary line
- D With a dotted point

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7 A field has x + y greater than 1 and x less than 5. Is (0, 0) a solution?

- A Yes
- B No

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8 A field has x + y greater than 1 and x less than 5. How many of the points (0, 0), (3, 3) and (4, 4) are solutions?

- A 0
- B 1
- C 2
- D 3

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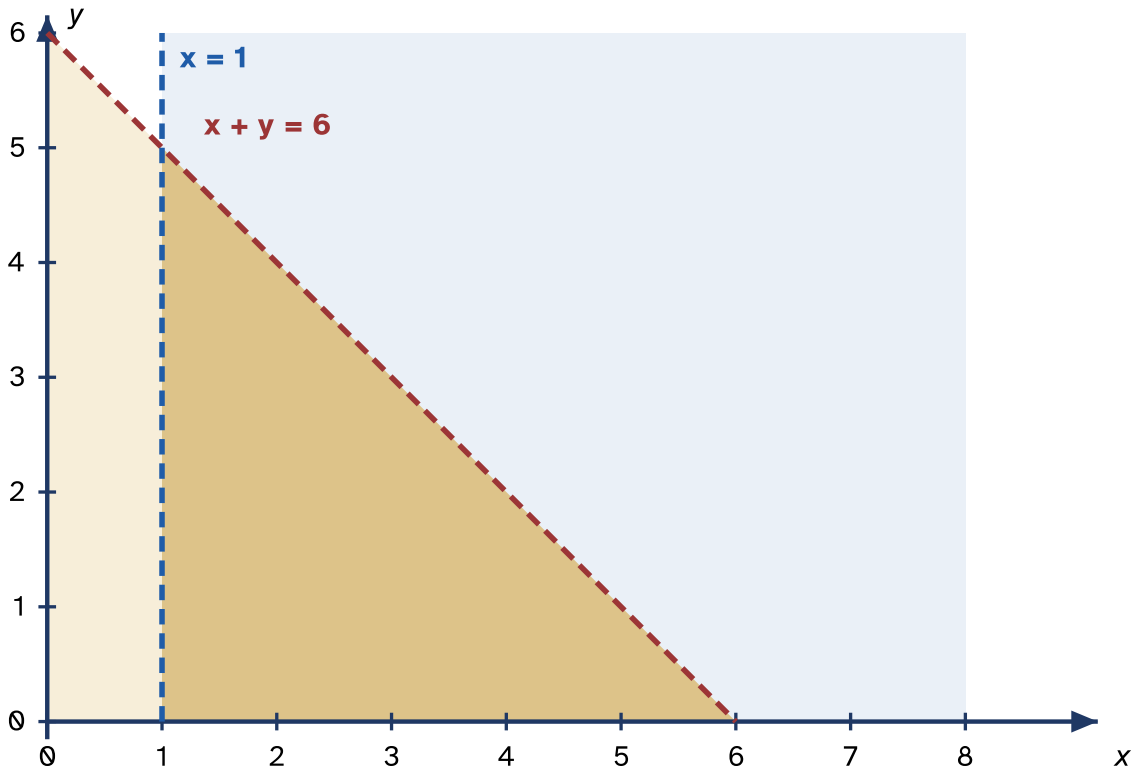
9 **Two half-planes are shaded on a graph. What part is the solution?**



A The overlapping shaded region

B The region shaded only once

C The unshaded region

D The boundary lines only

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10

A yard has y greater than x and x + y less than 6. Is (1, 4) a solution?

A Yes

B No

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ANSWER KEY

1. Yes

2. x + y less than 5

3. A region

4. Yes

5. No

6. With a dashed boundary line

7. No

8. 2

9. The overlapping shaded region

10. Yes

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