MATHEMATICS · GRADES 10-12

Vector notation

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you write a quantity that has both size and direction, like a wind blowing north east at 20 kilometres an hour, in a form a plain number cannot carry. A plain number can say 20, but it cannot say north east, so a vector needs a notation that holds both pieces. That notation keeps the size and the direction together, so the quantity is fully described in one short form. That is how wind, velocity, and force are written down, so anyone reading them knows both how much and which way.



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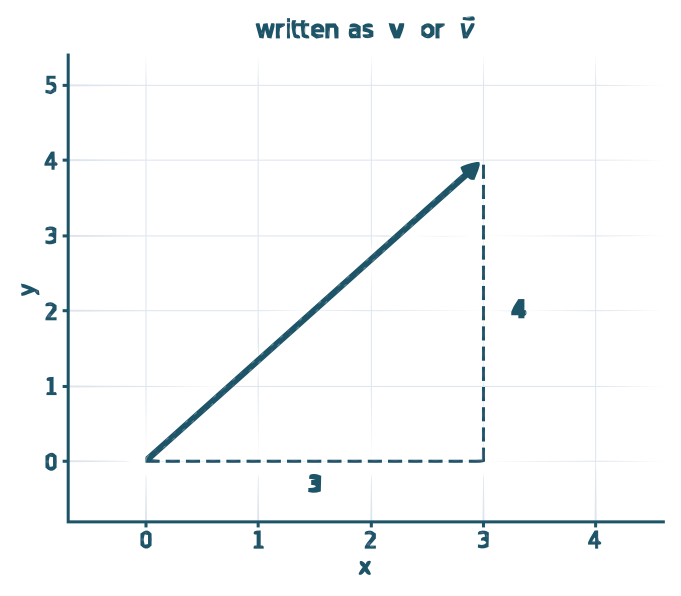
Rule

Vector notation: a vector is written as a pair of components (x, y), where the first number is the step in the x direction and the second is the step in the y direction.

A vector carries both size and direction, while a plain number carries size alone.



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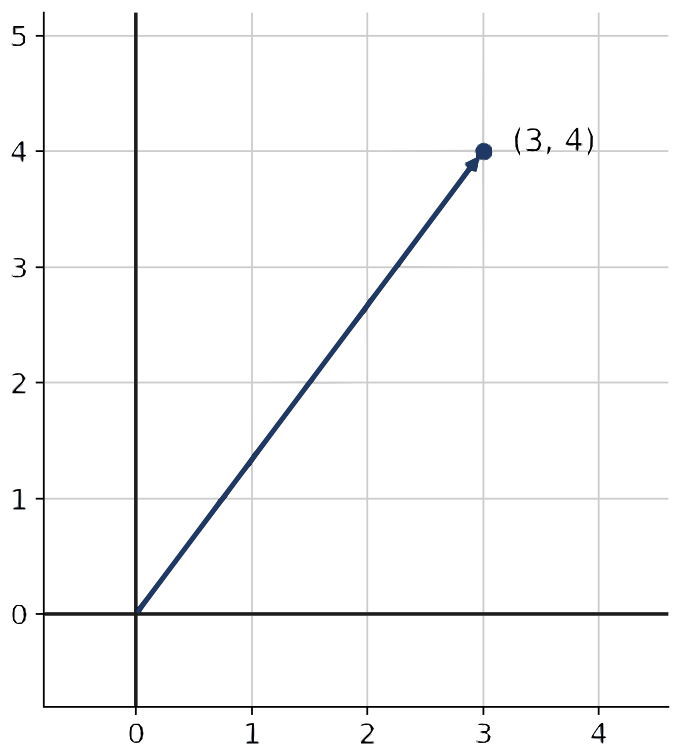
Worked examples

EXAMPLE 1

Q Write the vector from (0, 0) to (3, 4) in component form.



SOLUTION

The x change is 3 - 0 = 3

The y change is 4 - 0 = 4

Component form: ⟨3, 4⟩

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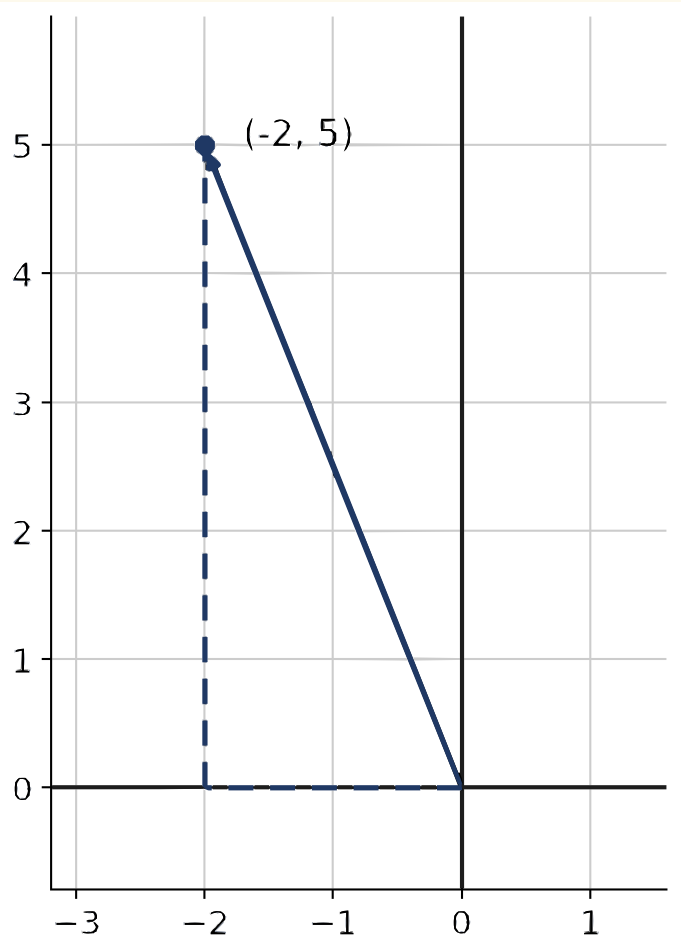
EXAMPLE 2

Q What does the vector (-2, 5) mean?



SOLUTION

The first component is the x step: 2 units left.

The second component is the y step: 5 units up.

So it moves 2 left and 5 up.

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Practice questions

1 A drone flies from the origin to point B on the grid, 6 steps across and 2 steps up. What is that flight as a vector in component form?

- **A** (6, 2)
- **B** (2, 6)
- **C** (6, 0)
- **D** (0, 2)

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2 A courier cycles from point A (1, 1) to point B (4, 5). What is the vector AB in component form?

- **A** (4, 3)
- **B** (3, 4)
- **C** (5, 6)
- **D** (3, 5)

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3 What does the first component of a vector tell you?

A The x step

B The y step

C The length

D The speed

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4 What does the second component of a vector tell you?

A The x step

B The y step

C The length

D The speed

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5 Vector (0, 7) starts at the origin. What movement does it describe?

- **A** 7 units up, 0 across
- **B** 7 units across, 0 up
- **C** 0 units up, 7 across
- **D** 7 units down, 0 across

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6 A climber goes from point A (2, 3) straight up to point B (2, 9). Give the vector from (2, 3) to (2, 9) in component form.

- **A** (0, 6)
- **B** (6, 0)
- **C** (2, 6)
- **D** (0, 3)

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7 Why does a wind of 20 km/h north east need a vector, not just the number 20?

- A It has direction as well as size
- B It blows faster than 20 km/h
- C It has no size, only direction
- D It changes direction every hour

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8 Vector (-3, -1) starts at the origin. What movement does it describe?

- A 3 left and 1 down
- B 3 right and 1 up
- C 1 left and 3 down
- D 3 down and 1 left

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9 A token sits on point A (5, 5) and does not move. Give the vector from (5, 5) to (5, 5) in component form.

- **A** (5, 5)
- **B** (5, 0)
- **C** (0, 5)
- **D** (0, 0)

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10 A student says the number 6 and the vector (6, 0) mean the same thing. What is the difference?

- **A** A vector also carries direction
- **B** The vector means 6 twice
- **C** The number 6 has direction too
- **D** There is no difference

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ANSWER KEY

1. (6, 2)

2. (3, 4)

3. The x step

4. The y step

5. 7 units up, 0 across

6. (0, 6)

7. It has direction as well as size

8. 3 left and 1 down

9. (0, 0)

10. A vector also carries direction

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