MATHEMATICS · GRADES 10-12

Quadratic word problems

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you work out real questions like the biggest garden you can fence, the best price for a product, or when a thrown ball hits the ground. A gardener with a fixed length of fence wants the shape that gives the most growing space, and a shop wants the price that brings in the most money. A ball thrown in the air rises, stops, and falls, and the question of when it lands is the same kind of problem. These are all questions where the answer sits at the top or the bottom of a curve, and that is what makes them quadratic.

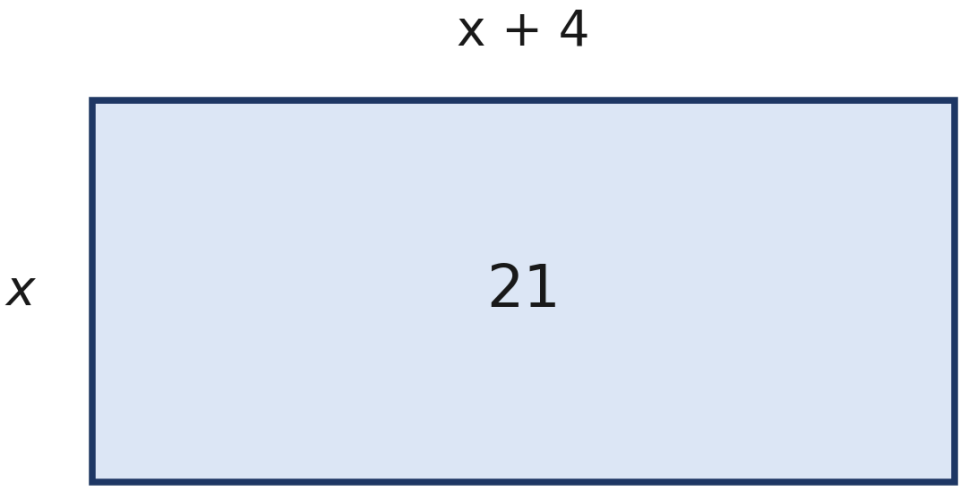


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Worked examples

EXAMPLE 1

Q A rectangle has width x and length $x + 4$, and area 21. Find x.



SOLUTION

Write the area equation: $x(x + 4) = 21$.

Expand and rearrange: $x^2 + 4x - 21 = 0$, which factors as $(x + 7)(x - 3) = 0$.

A width can't be negative, so take the positive solution, $x = 3$, so the width is 3.

EXAMPLE 2

Q Two consecutive integers have product 42. Find them.

SOLUTION

Let the integers be x and $x + 1$, so $x(x + 1) = 42$.

Expand and rearrange: $x^2 + x - 42 = 0$, which factors as $(x + 7)(x - 6) = 0$.

The positive solution is $x = 6$, so the integers are 6 and 7.

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Practice questions

1. A garden is x m wide and x + 3 m long, with area 28 m². Find x.

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2. Two house numbers in a row multiply to 56. What is the smaller number?

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3. A square patio has side x + 2 m and area 49 m². Find x.

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4 A rug is x m wide and 2x m long, with area 32 m². Find x.

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5 Two consecutive even numbers multiply to 80. What is the smaller number?

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6 A square has side x cm and area 36 cm². Find x.

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7 A score squared plus the score equals 30. What is the positive score?

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8 A number squared plus twice the number equals 48. What is the positive number?

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9 A number squared minus twice the number equals 15. What is the positive number?

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10 **Two numbers differ by 6 and multiply to 27. What is the smaller number?**

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ANSWER KEY

1. 4

2. 7

3. 5

4. 4

5. 8

6. 6

7. 5

8. 6

9. 5

10. 3

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