MATHEMATICS · GRADES 10-12

Finding common ratios

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you spot the steady multiplier in a pattern. Money growing by the same percentage each year multiplies by the same factor each time, and so does a population growing by a set share. Spotting that multiplier lets you predict what comes next. It is the pattern behind compound interest, population growth, and anything that grows by a percentage at a time.



Rule

Common ratio: in a geometric sequence, every term is the last term times the same fixed number.

Find it by dividing any term by the one before it: $r = \frac{\text{next term}}{\text{previous term}}$.

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Worked examples

EXAMPLE 1

Q Find the common ratio of 6, 18, 54.

SOLUTION

Pick any two neighbours, for example 18 and 6.

Divide: $\frac{18}{6} = 3$

The common ratio is 3

EXAMPLE 2

Q Find the common ratio of 64, 16, 4.

SOLUTION

Divide neighbours: $\frac{16}{64} = \frac{1}{4}$

Check: $\frac{4}{16} = \frac{1}{4}$

The common ratio is $\frac{1}{4}$

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Practice questions

1 A bacteria colony grows 5, 15, 45 over three hours. What is the common ratio?

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2 A sample decays 20, 10, 5 g over three days. What is the common ratio?

A) 2

B) $\frac{1}{2}$

C) $\frac{1}{4}$

D) $\frac{1}{5}$

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3 **A population grows 2, 6, 18 over three years. What will it be in the fourth year?**

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4 **A price falls 100, ?, 4 dollars over three weeks. What is the missing middle price?**

A 10

B 20

C 25

D 50

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5 A score stays 7, 7, 7 over three rounds. What is the common ratio?

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6 A temperature changes 2, -4, 8 degrees. What is the common ratio?

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7 Which of these sequences has a common ratio?

- A 2, 4, 8
- B 2, 4, 7
- C 3, 6, 10
- D 5, 10, 15

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8

A sequence has a common ratio. How do you find it?

A Divide any term by the term before it

B Subtract any term from the term after it

C Add any two terms together

D Multiply the first term by the number of terms

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9

A colony has 3 cells on day 1 and doubles each day. How many cells are there on day 3?

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10

A medicine decays by half each day. On day 3 there are 6 mg. How much was there on day 1?

A 12

B 24

C 3

D 18

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ANSWER KEY

1. 3

2. $\frac{1}{2}$

3. 54

4. 20

5. 1

6. -2

7. 2, 4, 8

8. Divide any term by the term before it

9. 12

10. 24

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