MATHEMATICS · GRADES 10-12

Applications of sequences and series

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you add up a long run of regular payments or savings without adding every week one by one. Weekly deposits that grow by the same amount form a pattern, and the pattern has a shortcut for the total. It is how you work out what a savings plan is really worth, or what a loan really costs, over months and years.



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Worked examples

EXAMPLE 1

Q You save 5 dollars in week 1, 8 in week 2, 11 in week 3, and so on. How much do you save in week 10?

SOLUTION

Each week you save 3 dollars more than the week before, so the savings go up by the same amount each week.

Week 10 is 9 weeks after week 1, so add 9 lots of 3 dollars to the first week:
$5 + 9 \times 3 = 5 + 27$

Week 10 savings: 32 dollars

EXAMPLE 2

Q A population of 1000 grows by 10 percent each year. What is it after 2 years?

SOLUTION

10 percent as a decimal is 0.10, so each year the population is multiplied by
$1 + 0.10 = 1.10$

After 1 year: 1100. After 2 years: $1100 \times 1.10 = 1210$

Population after 2 years: 1210

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Practice questions

1

You save:
10 dollars in week 1
12 dollars in week 2
14 dollars in week 3
How much do you save in week 5?

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2

You save:
6 dollars in week 1
9 dollars in week 2
12 dollars in week 3
How much do you save in total over the first 5 weeks?

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3 A ball bounces to half its height each time, starting at 16 metres. How high on bounce 3?

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4 100 dollars grows by 5 percent per year. What is it after 1 year?

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5 You pay:
3 dollars on day 1
6 dollars on day 2
12 dollars on day 3
How much do you pay in total over the first 4 days?

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6 **Weekly savings rise by a fixed amount each week. What kind of sequence is this?**

A Geometric

B Arithmetic

C Quadratic

D Exponential

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7 **A geometric sequence has first term 3 and second term 12. What is the common ratio?**

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8 A salary starts at 30000 dollars and rises by 1000 each year. In which year does it first reach 35000 dollars?

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9 A car loses a quarter of its value each year from 16000 dollars. What is it worth after 1 year?

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10 A stack of chairs:
20 in row 1
17 in row 2
14 in row 3
How many chairs are in row 5?

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ANSWER KEY

1. 18 dollars

2. 60 dollars

3. 2 metres

4. 105 dollars

5. 45 dollars

6. Arithmetic

7. 4

8. 6

9. 12000 dollars

10. 8

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