MATHEMATICS · GRADES 10-12

Compound interest

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how your money actually grows, or how a debt grows. A savings account pays you interest, then pays interest on that interest too. A loan or a credit card works the same way in reverse, and so does interest on a tax bill you pay late. Knowing compound interest tells you what your savings will be worth, or what you will owe.



Rule

Compound interest: interest earns interest, so the amount grows by the same factor each period.

The amount after t periods is $A = P \times (1 + r)^t$, where P is the starting amount and r is the rate per period.

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Worked examples

EXAMPLE 1

Q 100 dollars at 10 percent per year, compounded yearly, for 2 years. Find the final amount.

SOLUTION

Each year multiply by 1.10.

After 1 year: 100 × 1.10 = 110

After 2 years: 110 × 1.10 = 121

Final amount: 121 dollars.

EXAMPLE 2

Q 200 dollars at 5 percent per year, compounded yearly, for 2 years. Find the final amount.

SOLUTION

Each year multiply by 1.05.

After 1 year: 200 × 1.05 = 210

After 2 years: 210 × 1.05 = 220.50

Final amount: 220.50 dollars.

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Practice questions

1 You put 100 dollars in a bank at 10 percent for 1 year, compounded yearly. What is it worth?

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2 A savings account holds 1000 dollars at 5 percent for 2 years, compounded yearly. What is it worth?

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3 **Write the compound interest formula using P for the principal, r for the rate, and n for the number of years.**

- **A** $P(1 + r)^n$
- **B** $P(1 - r)^n$
- **C** $P(1 + r)$
- **D** $P + (1 + r)^n$

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4 **You invest some money at 10 percent for 2 years, compounded yearly, and it is worth 242 dollars. How much did you invest?**

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5 **500 dollars grows to 520 dollars in 1 year. What is the yearly interest rate?**

- **A** 2 percent
- **B** 4 percent
- **C** 5 percent
- **D** 10 percent

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6 **You invest 100 dollars at 20 percent for 2 years. How much MORE do you earn with compound interest than with simple interest?**

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7 How is compound interest different from simple interest?

A. Both pay only on the original amount.

B. Both pay on the amount plus past interest.

C. Compound interest pays only on the original amount; simple interest pays on the amount plus past interest

D. Simple interest pays only on the original amount; compound interest pays on the amount plus past interest

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8 You invest 1000 dollars at 10 percent for 3 years, compounded yearly. What is it worth?

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9 You save 100 dollars at 12 percent per year, compounded monthly at 1 percent per month. What is it worth after 2 months?

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10 You save 50 dollars at 10 percent per year, compounded yearly. After how many years is it worth 60.50 dollars?

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ANSWER KEY

1. 110 dollars

2. 1102.50 dollars

3. $P(1 + r)^{n}$

4. 200 dollars

5. 4 percent

6. 4 dollars

7. Simple interest pays only on the original amount; compound interest pays on the amount plus past interest

8. 1331 dollars

9. 102.01 dollars

10. 2 years

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