MATHEMATICS · GRADES 10-12

Compound interest

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how money grows over time in a savings account or a loan. The interest earned each period starts earning interest itself, so the balance grows faster and faster instead of by the same amount each year. That is why starting to save early matters so much, and why a debt left alone grows much bigger than people expect.



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 **Find the amount from 1000 dollars at 4 percent compound interest for 2 years.**

SOLUTION

Write the model: $A = 1000 \times 1.04^{t}$

Substitute $t = 2$: $1000 \times 1.04^{2} = 1000 \times 1.0816$

So the amount is 1081.60 dollars.

EXAMPLE 2

Q **Find the amount from 500 dollars at 5 percent compound interest for 3 years.**

SOLUTION

Write the model: $A = 500 \times 1.05^{t}$

Substitute $t = 3$: 500×1.157625

So the amount is 578.81 dollars, rounded to cents.

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Practice questions

1. Maya puts 800 dollars in a savings account that pays 5 percent compound interest per year. How much will she have after 3 years?

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2. A credit card charges 20 percent compound interest per year. Leo owes 500 dollars on his card and pays nothing for 2 years. How much will he owe then?

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3. Priya deposits 1200 dollars in an account that pays 4 percent compound interest per year. After 2 years, how much interest has she earned in total?

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4 **Sara can put 600 dollars in Bank A at 5 percent compound interest for 3 years, or in Bank B at 8 percent compound interest for 2 years. Which bank gives her more money?**

A Bank A

B Bank B

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5 **After 2 years at 10 percent compound interest per year, an account holds 1210 dollars. How much money was in the account at the start?**

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6 **An investment of 400 dollars grows to 484 dollars in 2 years with compound interest. What is the yearly interest rate?**

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7 How many years does it take 500 dollars at 10 percent compound interest per year to grow to 665.50 dollars?

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8 A tax bill of 2000 dollars is paid 3 years late, and 6 percent compound interest is charged per year on the amount owed. How much is owed in total?

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9 Sam puts 1000 dollars in an account at 5 percent compound interest per year for 3 years. How much more money does compound interest earn than simple interest at the same rate over the same time?

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10 **Noah puts 300 dollars in a savings account at 4 percent compound interest per year. After 2 years he takes out 100 dollars. How much money is left in the account?**

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ANSWER KEY

1. 926.10 dollars

2. 720 dollars

3. 97.92 dollars

4. Bank B

5. 1000 dollars

6. 10 percent

7. 3 years

8. 2382.03 dollars

9. 7.63 dollars

10. 224.48 dollars

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