MATHEMATICS · GRADES 10-12

Present and future value

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you decide whether money now is worth more than the same amount later, like choosing between a lump sum today or payments spread over years. A lottery winner faces this exact choice, and so does anyone offered a settlement paid out over time. Money today can be invested and grow, so a dollar today is usually worth more than a dollar next year. Comparing the two options properly means you choose the one that is really worth more, not just the one with the bigger number on it.



Rule

Future value: $FV = PV \times (1 + r)^n$, where r is the interest rate per period and n is the number of periods.

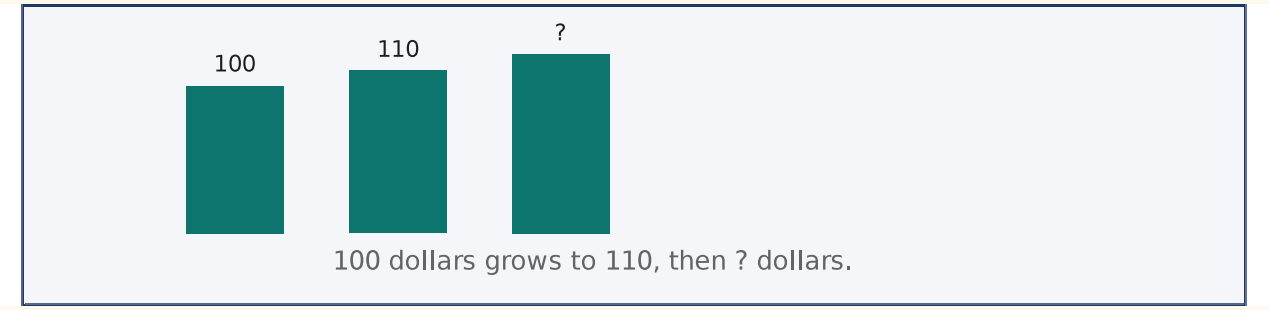
Present value: $PV = \frac{FV}{(1 + r)^n}$.

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Worked examples

EXAMPLE 1

Q What is the future value of 100 dollars in 2 years at 10 percent per year?



SOLUTION

Future value = present value × $(1 + r)^n$

$100 \times 1.10^2 = 100 \times 1.21$

Future value: 121 dollars.

EXAMPLE 2

Q What is the present value of 121 dollars due in 2 years at 10 percent per year?

SOLUTION

Present value = future value ÷ $(1 + r)^n$

So $\frac{121}{1.21}$

Present value: 100 dollars.

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Practice questions

1 What is the future value of 200 dollars in 1 year at 5 percent interest?

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2 What is the present value of 110 dollars due in 1 year at 10 percent interest?

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3 What is the future value of 100 dollars after 3 years at 10 percent interest each year?

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4 What is present value?

- **A** What a present amount will be worth later
- **B** What a future amount is worth today
- **C** The interest earned in one year
- **D** The amount you pay back on a loan

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5 What is future value?

- **A** What a future amount is worth today
- **B** What a present amount will be worth later
- **C** The interest rate charged each year
- **D** The amount you start with

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6 What is the present value of 242 dollars due in 2 years at 10 percent a year?

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7 What is the future value of 500 dollars after 2 years at 4 percent interest a year?

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8 What is the present value of 133.10 dollars due in 3 years at 10 percent a year?

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9 **What is the future value of 1000 dollars after 1 year if it earns no interest?**

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10 **Why is present value less than future value when interest is positive?**

A Because interest rates always fall

B Because money grows with interest over time

C Because prices always rise

D Because the future amount is smaller

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ANSWER KEY

1. 210 dollars

2. 100 dollars

3. 133.10 dollars

4. What a future amount is worth today

5. What a present amount will be worth later

6. 200 dollars

7. 540.80 dollars

8. 100 dollars

9. 1000 dollars

10. Because money grows with interest over time

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