

5.1 Compound interest

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12:42 PM

Algebra 2 Trig H
5.1 Compound interest

Name:

You decide to open four savings accounts, each holding \$10,000 earning 1.5% annual interest. Consider the four scenarios below:

- *Your bank compounds interest annually.*

How many times per year do you collect interest? 1

For any year t in this situation, the equation $A = 10,000(1.015)^t$ models the amount in your account.

How much money will be in your account after 2 years?

$$10,000(1.015)^2 = 10,302.25$$

- *Your bank compounds interest quarterly.*

How many times per year do you collect interest? 4

Quarterly growth rate: $\frac{1.5\%}{4} = 0.375\%$

For any year t in this situation, the equation $A = 10,000(1.00375)^{4t}$ models the amount in your account.

How much money will be in your account after 2 years?

$$10,000(1.00375)^8 = 10,303.97$$

- *Your bank compounds interest monthly.*

How many times per year do you collect interest? 12

Monthly growth rate: $\frac{1.5\%}{12} = 0.125\%$

For any year t in this situation, the equation $A = 10,000(1.00125)^{12t}$ models the amount in your account.

How much money will be in your account after 2 years?

$$10,000(1.00125)^{24} = 10,304.35$$

- *Your bank compounds interest daily. (Use 365 days in a year)*

How many times per year do you collect interest? 365

Daily growth rate: $\frac{1.5\%}{365} = 0.0041\%$

For any year t in this situation, the equation $A = 10,000(1.000041)^{365t}$ models the amount in your account.

How much money will be in your account after 2 years?

$$10,304.53$$

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

1. If \$2,000 is deposited into an account earning 5% annual interest compounded daily and, at the same time, \$5,000 is deposited into an account earning 2% annual interest compounded daily, will the first account ever be worth more than the second? If so, when? Describe your calculator window that helped you arrive at your conclusion.

After 30.55 years, account 1 > account 2.

y₁: $A = 2000 \left(1 + \frac{.05}{365}\right)^{365t}$ $\frac{5\%}{365} = ?$

y₂:

2. If \$1,200 is deposited into an account earning 7% annual interest compounded monthly and, at the same time, \$3,000 is deposited into an account earning 4% annual interest compounded monthly, will the first account ever be worth more than the second? If so, when? Describe your calculator window that helped you arrive at your conclusion.

Yes, after 30.68 years account 1 > account 2.

3. You inherit \$10,000 from relatives and decide to place the money into a bank account earning 2.5% annual interest. How much money is in the bank account after 5 years if the interest is ...

- a. Compounded monthly?

$$\$ 11,330.01$$

- b. Compounded daily?

$$\$ 11,331.43$$

- c. Compounded annually?

✓ $\$ 11,314.08$ $\$ 11,314.08$ $10,000(1.025)^5$

- d. Compounded semi-annually?

$$\$ 11,322.71$$

- e. You sign up for the account to compound monthly and decide to close the account when the initial amount **triples** in value. After how many years will the account triple?

$$30,000 = 10,000 \left(1 + \frac{.025}{12}\right)^{12x}$$

$$3 = 1.00208\bar{3}^{12x}$$

$$3 = 1.002083^{12x}$$

$$\log_{1.002083} 3 = 12x$$

$$x = 43.99 \text{ years}$$