Compound Interest: interest received on a specific amount of money in a bank account over a set amount of time

A = Account Balance after t years

P = Beginning Principal

r = APR (Annual Percentage Rate)

n = number of times compounded per year

t = number of years

Formula for Simple Compound Interest:

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

Examples:

1. Determine the amount of money in a money market account providing an annual rate of 5% compounded daily if Marcus invested $2000 and left it in the account for 7 years. How much interest will he have earned?

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

$$A = 2000\left(1 + \frac{.05}{365}\right)^{365 \cdot 7}$$

$A = \$2,838.07$

-2000

Interest = $\$838.07$

2. How much should Sabrina invest now in a money market account if she wishes to have $9000 in the account at the end of 10 years, with an interest rate of 6% compounded quarterly?

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

$$9000 = P\left(1 + \frac{.06}{4}\right)^{4 \cdot 10}$$

$$P = \$4961.36$$

- Some banks offer accounts that compound the interest continuously instead of a set amount of times.

Here is the formula for **Continuous Compound Interest**:

$$A = Pe^{rt}$$

Example:
On the day of a child's birth, a deposit of $25,000 is made in a trust fund that pays 8.25% interest. Determine the balance in this account on the child's 26th birthday if the interest is compounded:

a. Quarterly
b. Monthly
c. Continuously

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

$A = 25{,}000\left(1 + \frac{.0825}{4}\right)^{4 \cdot 26}$

$A = \$208{,}941.65$

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

$A = 25000\left(1 + \frac{.0825}{12}\right)^{12 \cdot 26}$

$A = \$211{,}989.34$

c) $A = Pe$

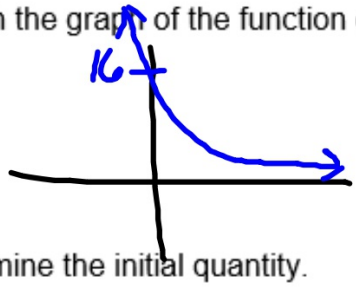
$A = 2500$

$A = \$213$

Example:

Let Q represent the *mass of radium* whose half-life is 1620 years. The quantity of radium present after t *years* is given by $Q = 16\left(\frac{1}{2}\right)^{t/1620}$.

a. Sketch the graph of the function over the interval from t = 0 to t = 5000.



b. Determine the initial quantity.

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c. Determine the quantity present after 1000 years.

$Q = 16\left(\frac{1}{2}\right)^{1000/1620} = 10.43$