6.4B Compound Interest

Compound Interest is the interest earned on the principal and on previously earned interest. The balance y of an account earning compound interest is

$$y = P(1 + \frac{r}{n})^{nt}$$

P = principal (initial amount)

r = annual interest rate (decimal form)

t = time (in years)

n = number of times interest is compounded per year

How many times per year does each term mean?

monthly = 12 times

quarterly = 4 times

daily = 365 days

weekly = 52

bi-monthly = 24

annually = 1

You deposit $100 in a savings account that earns 6% annual interest compounded monthly.

$100 = P$

$r = .06$

$n = 12$

a) Write a function that represents the balance after (t) years.

$y = 100\left(1 + \frac{.06}{12}\right)^{12t}$

$y = 100(1 + .005)^{12t}$

$y = 100(1.005)^{12t}$

b) How much money do you have after 10 years? $t = 10$

$y = 100(1.005)^{12(10)}$

$y = 100(1.005)^{120}$

$y = \$181.94$

You deposit $500 in a savings account that earns 9% annual interest compounded quarterly.

$P=500$
$r=.09$
$n=4$

a) Write a function that represents the balance after t years.

$y = 500\left(1+\frac{.09}{4}\right)^{4t}$

$y = 500(1.0225)^{4t}$

b) How much money do you have after 18 years? $t=18$

$y = 500(1.0225)^{4(18)}$

$y = 500(1.0225)^{72}$

$y = \$2,481.58$

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1) You invest $12,000 at 7.1% APR compounded monthly. How much is your initial investment worth after 10 years?

$P=12,000$
$r=0.071$
$n=12$
$t=10$

$y = 12,000\left(1+\frac{.071}{12}\right)^{120}$

$y = 12,000(1.005916)^{120}$

$y = \$24,356.88$

2) You invest $12,000 at 7.1% APR compounded yearly. How much is your investment worth after 10 years?

$P=12,000$
$r=0.071$
$n=1$
$t=10$

$y = 12,000\left(1+\frac{.071}{1}\right)^{10}$

$y = 12,000(1.071)^{10}$

$y = \$23,827.36$

Write and solve a function for each situation.

1. $1550 invested at 3.5% APR compounded weekly for 14 years $y = 1550\left(1 + \frac{.035}{52}\right)^{52(14)}$ ^{728}

$y = \$2529.67$

$P = 1550$
$r = .035$
$n = 52$
$t = 14$

2. $10,000 invested at 2.25% APR compounded monthly for 25 years

$y = 10{,}000\left(1 + \frac{.0225}{12}\right)^{12(25)}$ ^{300}

$y = \$17{,}541.31$

$P = 10{,}000$
$r = .0225$
$n = 12$
$t = 25$

3. $800 invested at 6.75% APR compounded daily for 10 years

$y = 800\left(1 + \frac{0.0675}{365}\right)^{3650}$

$y = \$1{,}571.13$

$P = 800$
$r = .0675$
$n = 365$
$t = 10$

Homework

WS 6.4 Exponential Growth, Decay, Compound Interest