# Compound Interest Formula

Harry inherits $7600 on his 13th birthday. The money is invested into a G.I.C. that pays 3.75%/a compounded monthly. How much will it be worth on his 18th birthday?

$$A = P(1+i)^n$$

$$A = 7600\left(1+\frac{.0375}{12}\right)^{60}$$

$$= \$9164.67$$

Compound interest can sometimes apply to loans. You can think of a loan as an savings investment from the bank's point of view.

Mr. Elliott doesn't pay off $2000 on his credit card bill. Interest is charged at a rate of 17.5% compounded daily. If he waits a whole year to back off the bill, how much will he owe?


$$A = P(1+i)^n$$

$$A = 2000\left(1+\frac{.175}{365}\right)^{365}$$

$$A = \$2382.39$$

*We can also use the compound interest formula if we want to find interest or principle.*

**Example:** Susan will start university in exactly 2 years. How much money must she invest right now (at 2.5%/a compounded monthly) to have exactly $4000 to pay her tuition. (This amount is often referred to as the ***present value*** of the investment).

$A = P(1+i)^n$

$4000 = P\left(1+\frac{.025}{12}\right)^{24}$

$P = \frac{4000}{\left(1+\frac{.025}{12}\right)^{24}}$

$P = 4000\left(1+\frac{.025}{12}\right)^{-24}$

$P = \$3805.12$

$P = \frac{A}{(1+i)^n}$ or $P = A(1+i)^{-n}$

$PV = \frac{A}{(1+i)^n}$

**Example**

Gerry has a savings account that pays interest compounded monthly. He deposits $5000 into the account. Two years later the account has a balance of $5152.18. What interest rate did the savings account pay?

$A = P(1+i)^n$

$5152.18 = 5000(1+i)^{24}$

$\frac{5152.18}{5000} = (1+i)^{24}$

$x^2 = 10$

$x = \sqrt{10}$

$x^{\frac{1}{24}} = \sqrt[24]{x}$

$\sqrt[24]{\frac{5152.18}{5000}} = 1+i$

$\sqrt[24]{\frac{5152.18}{5000}} - 1 = i$

$i = 0.0012500$

$\times 12 \quad \times 100$

$= 1.5\%$

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**Text page 360 #8, 12, 15 and page 365 #3, 5, 6, 7 and page 370 #7, 8, 11**