# PRESENT VALUE

## RECAP

| Simple Interest Formula | Compound Interest Formula |
|---|---|
| $I = Prt$ and $A = P + I$ | $A = P(1+i)^n$ |
| $I$ = interest earned<br>$P$ = Principal ($ invested)<br>$r$ = interest rate in DECIMAL<br>$t$ = how long $ invested (years)<br>$A$ = total amount | $A$ = Total amount<br>$P$ = Principal<br>$i$ = interest rate per compounding Period (DECIMAL)<br>$n$ = number of compounding periods |

**Another word for...**    $A$ = Amount is... <u>Future Value (FV)</u>
                          $P$ = Principal is ... <u>Present Value (PV)</u>

## PRESENT VALUE FORMULA

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

The compound interest formula $A = P(1+i)^n$ can be rearranged to solve for $P$ so that

or written with a negative exponent $\boxed{P = A(1+i)^{-n}}$

## EXAMPLE 1: INVESTMENTS

Ravi wants to invest enough money **today** to have $5 500 for college tuition in **two years**. If he invests his money at 6% per year, **compounded monthly**, how much does he need to invest?

Type = compounded monthly
$A = 5500$
$P = ?$
$i = 6\%/a = 0.06$
$n = 2$years $\times 12 = 24$

$$P = A(1+i)^{-n}$$
$$= 5500(1+0.06)^{-24}$$
$$= 1358.38$$

∴ He needs to invest $1358.38.

## EXAMPLE 2: LOANS

Suppose you want to borrow $200. A **creditor** will add interest to the principal and then give you a loan for the full amount (interest included). You then make payments until the entire loan is paid off.

Jamie took out a $3 000 loan, due in four years. If interest is 5.7% per year, **compounded semi-annually**, how much should Jamie's creditor be willing to accept to pay off the loan **today**?

Type = semi-annually
$A = 3000$
$P = ?$
$i = 5.7\%/a = 2.85\% = 0.0285$
$n = 4$ years $\times 2 = 8$

$$P = A(1+i)^{-n}$$
$$= 3000(1+0.0285)^{-8}$$
$$= 2396$$

∴ The principal of the loan is $2396.