

# INTEREST

**P** = Principal = balance on which interest is paid  
**APR** = annual percentage rate (decimal form for hand calculations)  
**APY** = annual percentage yield = actual percentage by which a balance increases in one year  
**Y** = number of years (may be a fraction)  
**A** = accumulated balance after Y years  
**n** = number of compounding periods per year

	<b>Formula</b>	<b>Examples</b>	<b>APY</b>
<b>Simple Interest</b>	$Interest = P \times APR \times Y$	Interest on a starting balance of \$1000 at an annual interest of 6% per year for 15 years. $Interest = \$1000 \times .06 \times 15 = \$900$ $Accumulated\ balance = \$1000 + \$900 = \$1900$	APY = relative increase over one year = $\frac{\text{absolute increase over one year}}{\text{starting principal}}$ (multiply by 100 to convert to %) APY = APR = annual interest rate
<b>Compound Interest paid once per year</b>	$A = P \times (1 + APR)^Y$	Accumulated balance on a deposit of \$1000 at an interest rate of 6% per year compounded yearly for 15 years  $A = \$1000 \times (1 + .06)^{15} = \$2396.55$	APY = APR for yearly compounding APY = 6%
<b>Compound Interest paid n times per year</b>	$A = P \times \left(1 + \frac{APR}{n}\right)^{(n \times Y)}$	Accumulated balance on a deposit of \$1000 at an interest rate of 6% per year compounded monthly for 15 years (note: n = 12)  $A = \$1000 \times \left(1 + \frac{.06}{12}\right)^{(12 \times 15)} = \$2454.09$	In one year a deposit of \$1000 at an APR of 6% compounded monthly would have an accumulated balance of $A = \$1000 \left(1 + \frac{.06}{12}\right)^{(12 \times 1)} = \$1,061.67$ This is an increase of \$61.67. APY = relative increase of this year = $\frac{61.67}{1000} = .06167 \approx 6.167\%$
<b>Continuous Compounding of Interest</b>	$A = P \times e^{(APR \times Y)}$	Accumulated balance on a deposit of \$1000 at an APR of 6% compounded continuously for 15 years  $A = \$1000 \times e^{(.06 \times 15)} = \$2459.60$	In one year a deposit of \$1000 at an APR of 6% compounded continuously would have an accumulated balance of $A = \$1000 \times e^{(.06 \times 1)} = \$1061.83$ . This is an increase of \$61.83. APY = relative increase of this year = $\frac{61.83}{1000} = .06183 \approx 6.183\%$