

Compound Interest – Interest recalculated multiple times before the loan is paid back

Ex 9 What is the final balance on a \$1000 loan made at 12% annual interest after one year if simple interest is used?

$$B = P(1 + rt) = 1000(1 + .12(1)) = 1000(1 + .12) \\ = 1000(1.12) = 1120$$

$$I = Prt = 1000(.12)(1) = \$120$$

Ex What is the final balance on a \$1000 loan made at 12% annual interest (1% monthly interest) at the end of one year if the interest is compounded monthly?

Month	Interest that month	Balance at end of month
Jan.	$I = 1000 \left[\frac{(.12)}{12} \right] = 10$	$1000 + 10 = 1010$
Feb.	$I = 1010(.01) = 10.10$	$1010 + 10.10 = 1020.10$
March	$I = 1020.10(.01) \approx 10.20$	$1020.10 + 10.20 = 1030.30$
April	$I = 1030.30(.01) \approx 10.30$	1040.60
May	$I = 1040.60(.01) \approx 10.41$	1051.01
June	$I = 1051$	1061.52
July	$I = 10.62$	1072.14
August	$I = 10.72$	1082.85
Sept.	$I \approx 10.82$	1093.69
Oct.	$I = 10.94$	1104.62
Nov.	$I = 11.05$	1115.67
Dec.	$I = 11.16$	1126.83

\$1126.83 - \$1000 = \$126.83 interest was earned by compounding, not \$120 as with simple interest

$$\frac{\$126.83 \text{ interest earned}}{\$1000 \text{ invested}} = .12683, \text{ or } 12.683\% \text{ interest} \\ \text{(Actual Percentage rate, APR)}$$

So 12% interest compounded monthly is equivalent to 12.683% simple interest,

Realize that some banks compound daily, hourly, or continuously