

Financial Applications

Ontario MCR3U · simple and compound interest, present value, annuities, loans

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Worksheet, answers &
this cheat sheet



MOST TESTED Find the monthly payment on a \$15 000 loan over 5 years at 6% compounded monthly. (card 5)

Which formula?

One deposit, value later

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

One amount later, value now

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

Equal regular payments

Annuity FV or PV

1 Simple interest

$$I = Prt \quad A = P(1 + rt)$$

USE r as a decimal, t in years. Solving for P , r or t : divide by the whole product, in brackets.

EXAMPLE \$1500 at 4% for 9 months:
 $I = 1500(0.04)(0.75) = \$45$.

TRAP Time is in years: 8 months is $t = 8/12$, not $t = 8$.

2 Compound interest

$$A = P(1 + i)^n \quad i = \frac{r}{m} \quad n = mt$$

USE m = compounding periods per year. n counts periods, not years: 3 years monthly is $n = 36$.

EXAMPLE \$3000 at 6% quarterly for 4 years: $3000(1.015)^{16} \approx \$3806.96$.

TRAP Adjust both: 8% quarterly for 2 years is $(1.02)^8$, not $(1.02)^2$.

TRAP $1.02^n = 2$ gives $n \approx 35$ quarters, about 8.75 years, when $i = 8\%/4$.

3 Present value

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

USE PV is always less than A . Compare options at the same moment: all present values, or all future values.

EXAMPLE \$8000 in 6 years at 4.5% annually: $8000(1.045)^{-6} \approx \$6143.17$.

TRAP $4500 = 3000(1 + i)^5$:
 $1 + i = 1.5^{1/5}$, so $i \approx 8.4\%$. Never divide 1.5 by 5.

4 Annuities: future value

$$FV = \frac{R[(1 + i)^n - 1]}{i}$$

$$R = \frac{FV \cdot i}{(1 + i)^n - 1}$$

USE Payments at the end of each period; the last one earns no interest. Payment and compounding periods must match.

EXAMPLE \$200 a month for 3 years at 6% monthly: $200(1.005^{36} - 1)/0.005 \approx \$7867.22$.

TRAP On a calculator, bracket $(1.005^{36} - 1)$ before dividing by i .

5 Annuities: present value and loans

$$PV = \frac{R[1 - (1 + i)^{-n}]}{i}$$

$$R = \frac{PV \cdot i}{1 - (1 + i)^{-n}}$$

USE A loan amount is a present value. Total interest = (number of payments) $\times R - PV$.

EXAMPLE \$15 000, 5 years, 6% monthly: $R = 75/(1 - 1.005^{-60}) \approx \$289.99$; interest $\approx \$2399.40$.

TRAP Total paid uses the number of payments: 60 monthly payments, not 5.

6 Financial decisions

USE Bring every cash flow to the same moment (usually now) at the same rate: down payments, payments and resale values. Then compare.

TRAP Discount the resale value too: \$8000 received in 4 years is worth less than \$8000 today.