

Financial Applications Review

Try each problem first. You don't need to finish everything.

Core path ~55 min · Full sheet ~1 h 50 min

Recommended: K1-K5, then one A and one T problem

K = Knowledge & Understanding · A = Application · T = Thinking · Boss = Challenge



vertexmath.ca
Hints, answers &
more worksheets

QUICK REFERENCE

Simple interest: $I = Prt$ and $A = P(1 + rt)$. Write the rate as a decimal and the time in years.

Annuities (payment R at the end of each period): $FV = \frac{R[(1+i)^n - 1]}{i}$ and $PV = \frac{R[1 - (1+i)^{-n}]}{i}$. A loan amount is a present value.

$(1+i)^{-n}$ is a reciprocal, not a negative amount. A present value is always smaller than the future amount.

Compound interest: $A = P(1+i)^n$ and $PV = A(1+i)^{-n}$, where $i = \frac{r}{m}$ and $n = mt$ for m compounding periods per year.

n counts compounding periods, **not** years: 3 years compounded monthly is $n = 36$.

Show your work on separate paper.

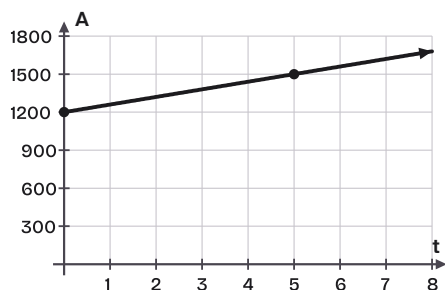
Core Skills (K)

Simple Interest · Compound Interest · Present Value · Annuities · Loans

K1 Simple Interest

Each investment or loan earns simple interest.

- Determine the interest earned on \$2400 invested at 3.5%/a for 8 months.
- Determine the total amount owed on a \$1500 loan at 4.2%/a after 30 months.
- The graph shows the amount A , in dollars, of an investment after t years. Each grid square is 1 year by \$300. Determine the principal and the annual interest rate.



K2 Compound Interest

Determine the amount of each investment.

- \$2500 at 3.5%/a compounded annually for 6 years.
- \$4000 at 5.2%/a compounded semi-annually for 7 years.
- \$1800 at 7.2%/a compounded monthly for 30 months. Also find the interest earned.

K3 Present Value

- Determine the present value of \$6500 due in 4 years at 5%/a compounded annually.

- Determine the present value of \$15 000 due in 8 years at 4.4%/a compounded quarterly.
- \$2500 grows to \$3600 in 4 years, compounded annually. Determine the annual interest rate, to two decimal places.

K4 Annuities: Future Value

Each deposit is made at the end of its period.

- Determine the future value of \$600 deposited every year for 5 years at 4%/a compounded annually.
- Determine the future value of \$250 deposited every 3 months for 6 years at 6%/a compounded quarterly.
- Determine the monthly deposit needed to have \$15 000 in 5 years at 4.8%/a compounded monthly.

K5 Annuities: Present Value & Loans

Each payment is made at the end of its period.

- Determine the present value of \$400 paid every 3 months for 5 years at 8%/a compounded quarterly.
- A car loan of \$18 000 at 7.2%/a compounded monthly is repaid over 4 years. Determine the monthly payment.
- Determine the total interest paid on the loan in (b).

Real World (A)

Doubling Time · Loan Payments · Savings Plans

A1 Doubling Time

Amira deposits \$4000 in a savings account at a Sudbury credit union. It pays 4.8%/a compounded monthly, and interest is credited at the end of each month.

- Write an equation for the balance A after n months. Then find the balance after 5 years.

- b) Use a table of values or graphing technology to solve $4000(1.004)^n = 8000$, to one decimal place.
- c) Is the balance ever exactly \$8000? At which month-end does it first reach \$8000, how many years is that, and what is the balance then?

A2 Credit Card Balance

Jordan owes \$3000 on a store credit card that charges 19.2%/a compounded monthly.

- a) Find the monthly payment that pays off the balance in 2 years.
- b) Find the total interest Jordan pays with this plan.
- c) Jordan pays \$45 a month instead. Find the interest charged in the first month. Will the balance ever reach \$0? Explain.

A3 Education Fund

From the month Maya is born, her parents deposit \$150 at the end of every month into an education savings plan earning 4.8%/a compounded monthly. A government grant adds 20% of each deposit to the plan.

- a) Find the total amount added to the plan each month, and the value of the plan after 17 years.
- b) How much of that value is interest?
- c) Maya's grandfather puts \$150 a month into a jar at home: no grant, no interest. What does the future value formula give with $i = 0$? How much is in the jar after 17 years?

Think It Through (T)

Error Analysis · Counterexamples

T1 Spot the Flaw

A student finds the value after 4 years of \$800 deposited at the end of each year at 5%/a compounded annually. The student's table is below.

"Adding the last row:

$$800(1.05)^4 + 800(1.05)^3 + 800(1.05)^2 + 800(1.05) \approx \$3620.51."$$

Deposit	1	2	3	4
Made at end of year	1	2	3	4
Years of growth	4	3	2	1
Value at year 4	$800(1.05)^4$	$800(1.05)^3$	$800(1.05)^2$	$800(1.05)$

- a) Identify the error in the table and correct the "Years of growth" row.
- b) Find the correct value after 4 years, and check it with the future value formula.
- c) Explain why the student's total is exactly 1.05 times the correct value. When would the student's total be correct?

T2 True or False?

Decide whether each claim is true. If it is false, give a counterexample with numbers.

- a) "Leaving an investment twice as long earns twice as much interest."
- b) "If you invest twice as much, it takes twice as long to double."
- c) "Paying off a loan in half the time doubles the monthly payment."

Boss Level

Optional challenge

Pay Now or Pay Later

A laptop costs \$1000 cash. The store also offers a pay-later plan: \$550 one year from now and \$605 two years from now.

- a) Find the annual interest rate, compounded annually, at which the two plans are worth the same today.
- b) At that rate, the store switches to two equal payments, one and two years from now. Find the payment.
- c) Your savings earn 4%/a compounded annually. Which plan is better for you, and by how much in today's dollars?



vertexmath.ca
Hints, answers &
more worksheets

Free to print, copy, adapt and share for
classroom use · CC BY-NC 4.0 · ©
VertexMath