Chapter

9

Financial Mathematics: Borrowing Money

How do you think knowledge about borrowing money can help you become financially literate and achieve your personal goals?

LEARNING GOALS

You will be able to develop number sense in financial applications by

- Understanding the relationship between earning interest and paying interest when investing and borrowing money
- Determining how the different variables of a loan affect the total interest paid
- Considering the costs and benefits of a variety of options for borrowing money
- Considering the costs and benefits of renting, leasing, or buying in a given situation

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When a Loan Is an Investment p. 516

Doris works as a personal loan manager at a bank. It is her job to decide whether the bank should lend money to a customer. When she approves a loan, she thinks of it as the bank making an investment in the person who is borrowing the money. Doris is considering a loan application from Leandro, who wants to borrow $10 000 to renovate his garage so that he can use it as a workshop. She expects the money borrowed plus interest to be repaid as a single payment at the end of 2 years. She is considering the following three loan options for Leandro:

Option A: A loan at 6% simple interest

Option B: A loan at 5.5% compound interest with annual compounding

Option C: A loan at 5% compound interest with semi-annual compounding

? Which option is most beneficial for the bank, and which is most beneficial for Leandro?

A

```
10000+10000(0.06
)(2)
                11200
```

Bank

B

```
10000(1+0.055)^2
                11130.25
```

C

```
10000(1+0.05/2)^
4
                11038.12891
```

Leandro

WHAT DO You Think?

Decide whether you agree or disagree with each statement. Explain your decision.

1. When the interest rate on a loan increases, the total interest charged also increases.
2. Early in the term of a loan with regular payments, most of each payment goes toward paying off the interest charged. The rest goes toward paying off the principal. Later in the term, most of each payment goes toward paying off the principal.
3. The loan or credit option that results in the least interest charged is the best choice for the borrower.
4. It is better to pay cash to purchase an item than to use credit.
5. It is better to buy than to rent.

1) AGREE DISAGREE
2) AGREE DISAGREE
3) AGREE DISAGREE
4) AGREE DISAGREE
5) AGREE DISAGREE

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EXAMPLE 2 Solving for the future value of a loan with a single loan payment

Trina's employer loaned her $10 000 at a fixed interest rate of 6%, compounded annually, to pay for college tuition and textbooks. The loan is to be repaid in a single payment on the maturity date, which is at the end of 5 years.

How much will Trina need to pay her employer on the maturity date? What is the accumulated interest on the loan?

$A = 10000\left(1 + \frac{0.06}{1}\right)^{1\times 5}$

$A = \$13382.62$

$I = A - P$

$I = 13382.62 - 10000$

$I = \$3382.62$

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EXAMPLE 3 Solving for the present value and interest of a loan with a single payment

Annette wants a home improvement loan to renovate her kitchen. Her bank will charge her 3.6%, compounded quarterly. She already has a 10-year GIC that will mature in 5 years. When her GIC reaches maturity, Annette wants to use the money to repay the home improvement loan with one payment. She wants the amount of the payment to be no more than $20 000. A

a) How much can she borrow?

b) How much interest will she pay?

a) $P = \dfrac{A}{\left(1+\frac{r}{n}\right)^{nt}}$

$= \dfrac{20000}{\left(1+\frac{0.036}{4}\right)^{4\times 5}}$

$=$

```
20000/(1+0.036/4
)^20
     16718.86038
■
```

$

Borrow $\Rightarrow$ 16718.86

HOMEWORK...

#2 & #3 * Time → years

6 months / 12 = 0.5 yrs

18 months / 12 = 1.5 years.

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Simple Interest

$$I = \text{Pr}t \qquad A = P + \text{Pr}t$$
$$A = P + I \qquad A = P(1 + rt)$$

Compound Interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \qquad I = A - P$$

Present Value

$$P = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}}$$

Attachments

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