Chapter 9 Notes *Key*

Finance

Date	Topic/Lesson	Assignment
	9.1 – Simple and Compound Interest	After Notes ex 2 – p.349: 1, 2ac AND 9.1 Worksheet: Sheet 1, #1-4 After Notes ex 4 – p.350: 4-7, 9, 10, 12 AND 9.1 W/S: Sheet 1, #5-6; Sheet 2 all
	9.2/9.3 – Investments	(No assignment. Continue working on 9.1 questions.)
	9.4 – Loans	After Notes – p.371: 3-6, 9, 11-12
	9.5 – Canadian Mortgages	(No assignment.)
		Chapter 9 Mini Test (Simple and Compound Interest)
		Chapter 9 Project Work Block 1
		Chapter 9 Project Work Block 2
		Chapter 9 Project Due

Review:

To convert a % to a decimal, _move decimal point 2 left, or ÷100_

    e.g.   4.5% → 0.045

There are __365__ days in a year.   Semi-annually means _2 times/yr_
There are __52__ weeks in a year.   Quarterly means _4 times/yr_
There are __12__ months in a year.   Bi-weekly means _26 times/yr_
                                                   (52 ÷ 2)

Interest: Financial investing is the process of setting money aside with the intention of receiving a greater amount in return in the future. The money made back is called the **interest**. There are two forms of interest: **simple** and **compound**.

Simple interest: calculated as a percent of an initial investment.

Compound interest: calculated from the initial investment and on any previously earned interest.

Simple Interest:

$$I = P \cdot r \cdot t \qquad\qquad A = P + I \quad \text{or} \quad A = P(1 + r \cdot t)$$

where
  I = interest earned
  P = the principal amount, or the money on which interest is paid
  r = the percent charged for money borrowed, or the interest rate (given yearly)
  t = the time the money is invested (given in years)
  A = the final amount

"per annum" or "%/a"

Example 1 – Find the future amount of an investment of $8000 at 6% simple interest for 5 years.

$P = 8000$
$r = 0.06$
$t = 5$

$$I = Prt$$
$$I = 8000 \times 0.06 \times 5$$
$$I = 2400$$

$$A = P + I$$
$$= 8000 + 2400$$
$$= 10\,400$$

Example 2 – Yazia borrowed $5200 at 7.5% simple interest to build a swimming pool. If she paid $2340 interest, find the a) term of the loan and b) monthly payments.

$P = 5200$
$r = 0.075$
$I = 2340$
$t = ?$

ⓐ $I = Prt$
$$2340 = 5200(0.075) \cdot t$$
$$\frac{2340}{390} = \frac{390t}{390}$$
$$6 = t$$

ⓑ $A = P + I$
$$= 5200 + 2340$$
$$A = 7540 \leftarrow \text{amount to pay off}$$

in 6 yrs
× 12
= 72 months

monthly
Payment $= 7540 ÷ 72$
$= \$104.73$ (round up)

Compound Interest

Interest can be compounded more than once a year, such as semi-annually, quarterly, monthly or daily.

Compound Interest Formula

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

where
- A = final amount
- P = principal or starting amount
- r = rate of yearly interest
- n = number of times yearly interest is compounded per year
- t = time, in years

Example 3 – To have savings for university, the parents of a child invest $25 000 for 18 years.
a) Calculate how much they would have in the account if they earned 6% simple interest.
b) Calculate how much they would have if they invest in a savings plan paying 6% interest compounded quarterly.
c) How much interest did they earn? (compound interest)

a) $I = Prt$
$\quad I = 25000(0.06)(18)$
$\quad I = 27000$

$A = P + I$
$\quad = 25000 + 27000$
$\quad = \$52000$

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

$A = 25000\left(1 + \frac{0.06}{4}\right)^{4 \times 18}$

$A = 25000(1.015)^{72}$

$A = \$73\,028.95$

$P = 25000$
$r = 0.06$
$n = 4$
$t = 18$

c) $I = A - P$
$\quad = 73028.95 - 25000$
$\quad = \$48\,028.95$

Example 4 – How much would you have to invest into a 10 year bond paying 4.2% compounded weekly to make it worth $5000 at the end of its term?

$A = 5000$
$P = ?$
$r = 0.042$
$t = 10$
$n = 52$

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

$5000 = P\left(1 + \frac{0.042}{52}\right)^{52 \times 10}$

$5000 = P(1.0008077)^{520}$

$5000 = P(1.5217)$

$P = \frac{5000}{1.5217}$

$P = 3285.791073$

You would need to invest $3285.80.

An investment generally involves giving money to someone (usually a bank or investment business) and expecting the money to earn more money. You may earn **interest** or **dividends**. There are a variety of types of investments. Different investments carry different amounts of risk.

Interest: Paid by a financial institution to those who put money into an account.
Dividends: Distribution of a company's profits to shareholders.

Reflect: how much of a risk-taker are you? Think of a situation when you made a decision based on how much risk you are comfortable with.

(answers will vary)

Investing in the **stock market** carries a fairly high amount of risk, whereas investing in a **term deposit** has very little risk since banks will usually guarantee an interest rate.

Common Investments

There are many types of investments you can make. Regardless of the type of investment you choose, companies in which you decide to invest are required by law to provide you with pertinent, factual information at the time of purchase.

Real Estate:
One ~~can also invest in~~ way to invest is to buy **property**, or real estate. The amount of risk involved varies depending on location and a number of other factors. Property in Victoria has risen dramatically in recent years: a house purchased in the year 2000 for $250 000 may have been sold in 2019 for $650 000. Some people buy property to live in, and hope the value goes up. Others buy properties to rent them out.

Pros/Cons:

Real estate can go up/down dramatically. Hard to predict.
Landlords may have trouble with tenants. Very expensive! + insurance, property tax, maintenance, etc. If not primary residence, will pay capital gains...

Bonds:
Companies or governments issue bonds to raise capital for their operations. Bonds are purchased for a fixed period of time, so you are lending the company or government money until the bond matures. Essentially they are borrowing money from you and paying you interest. You are kind of like the bank! As it makes a profit, the company or government pays out a portion of that profit as a dividend to bond holders. Once ~~it~~ the bond matures, it no longer earns interest.

Pros/Cons:

Lower risk than stocks, but no guarantees.

Stocks:
Companies allow people to buy "shares" in the company, which represent part ownership in the company depending on how many shares you buy. The company is selling you a piece of itself. The price of shares fluctuates depending on how well the company does. The goal is to buy low and sell high. A challenge with stocks is that they go up and down in value, and there is no guarantee that you will make a profit. Trading on the stock market is high risk; however, the highest rate of return on investments has historically come from investing in stocks.

Pros/Cons:

Higher risk, but can pay higher return. Note - new companies riskier. (also might not!)

Mutual Funds:
"A mutual fund is a type of investment fund. An investment fund is a collection of investments, such as stocks, bonds or other funds. ... A mutual fund typically focuses on specific types of investments. For example, a fund may invest mainly in government bonds, stocks from large companies or stocks from certain countries. Some funds may invest in a mix of stocks and bonds, or other mutual funds."
https://www.securities-administrators.ca/uploadedFiles/General/pdfs/mutual_funds_brochure.pdf

Pros/Cons:

A mutual fund includes a variety of investments, which makes it less risky. Some will go up, some down. Return could be lower, though

Term Deposits:
Term deposits are commonly known as GIC's in Canada (Guaranteed Investment Certificate). They are a deposit you make with a financial institution for a fixed period of time. You cannot withdraw the money until it matures, unless you pay a penalty. Term deposits earn a higher rate of interest than savings/chequing accounts, but lower rates than other investments because the return is guaranteed. (usually 2-4%)

Pros/Cons:

Guaranteed return (☺) but lower rate (☹). Lower risk, lower reward.

Taxes
The money earned from an investment is typically taxable. However, the government of Canada offers TFSAs and RRSPs, which allow people to invest either tax-free, or to defer their taxes until a later time.

TFSAs:

TFSA stands for Tax Free Savings Account. The government of Canada began this program in 2009. People can deposit money in a TFSA (up to a specific maximum, currently $5000 - $10 000 in a calendar year). The interest that is earned is not taxable, unlike interest earned from other investments. TFSAs can hold stocks, bonds, GIC's, mutual funds, etc. You can withdraw money and you may redeposit the following calendar year.

Pros/Cons:

Tax free interest! ☺   Can only invest so much ☹

RRSPs:

RRSP stands for Registered Retirement Savings Plan. An RRSP allows you to put more money in than a TFSA. Money deposited in an RRSP is **tax deductible**, as long as it is not withdrawn. The interest earned in an RRSP is also not taxed until it is withdrawn. When you retire, you are typically in a lower tax bracket so while you are taxed on the RRSP amount (including interest) at that the time of withdrawal, it is usually at a lower rate.

Pros/Cons:

Good idea to save for retirement ☺. Can help lower your taxes while you're earning ☺. Will have to pay tax later (☹) but hopefully at lower rate (☺)

Investment Tips: Ask a trusted adult for the best advice they've received (and have tried out!) about investing money for the future. Be prepared to share next day.

Answers will vary.

- start early! Use power of compound interest!
- use automatic transfers into savings so you don't notice it as much (similar to automatic bill payments)
- keep track of money (budget) and plan to save/invest

It can be a challenge to purchase expensive items, especially if you need that item right away. Here are some ways to purchase a big item:

> ➤ Save up money ahead of time until you have enough for the purchase.
> ➤ Have an emergency fund so that if you need something urgently (e.g. car breaks down, fridge stops working) you have money to pay up front.
> ➤ Get a loan (either from the bank or directly from the company. For example, many people get a car loan from the car company.)
> ➤ Lease instead of buy.

Loans:
When you take out a loan, you agree to make small, regular payments (usually equal monthly payments) until the loan is repaid. You also pay interest on the loan. This is called **installment buying**. For an installment loan, you are paying off money that was borrowed to purchase an item.

The interest on an installment loan (such as a car loan) is closer to simple interest than compound interest, but it is actually more complicated. For simplicity's sake, we will usually use simple interest. When you see "APR," this stands for Annual Percentage Rate, which represents the true simple interest a consumer pays.

When you use a **credit card**, you are basically borrowing money from the credit card company. If you pay off the balance owing on the card each month, you are not charged interest. However, if you "carry a balance," that is you do not pay off the entire amount you owe each month, then you are charged interest. Credit cards charge compound interest, and have very high interest rates.

Reflect: What interest rate do you think credit cards typically charge? _____
Do a quick search to find out some typical credit card interest rates. _____
How close were you? Are you surprised?

Answers will vary.

Leasing:
Rather than purchasing an item, it is sometimes possible to lease it instead. One of the most common leases people get is a car lease. When a person leases something, it is a kind of paying rent. The owner and the person doing the leasing sign papers that specify the cost of the lease, how long a period of a time the lease is for, and exactly what their responsibilities are regarding the upkeep of the item. After the lease expires, the person can return the item to its owner. In some cases, the person may be able to "pay out" the remainder of the item's value and ultimately own it themselves.

An advantage of leasing a car is that you can drive a new car every couple of years. A disadvantage is that you are always paying a monthly charge. If you get a car loan, you can eventually pay it off and not have to make payments any longer. In general, car companies make money on leasing, which means they are making that money from you!

Loan Terminology

Down Payment: a percentage of the item's cost paid up front.

Fixed Installment Loan: a loan where equal, usually monthly payments are made.

Amount Financed: the amount that has been borrowed

(amount financed = price of the item − down payment)

Installment Price: the total price of the item, including interest

(installment price = sum of all payments + down payment)

Finance Charge: the interest charged for not paying immediately

(finance charge = installment price − cost of the item)

Example 1 – Rachel bought a new car with a retail price of $35000. Her down payment was $3000 and she had to pay $838.14 per month for 48 months. Calculate her total cost for the car, including interest.

Installment Price = sum of payments + down payment
(total cost)

$$= 838.14 \times 48 \ + \ 3000$$

$$= 40\,230.72 \ + \ 3\,000$$

$$= \$43\,230.72$$

Example 2 – New appliances for a house cost $15000. The full cost was financed over three years at 9% simple interest per year.

a) Find the finance charge (interest)
b) Find the installment price
c) Find the monthly payment

a) $I = Prt$

$I = 15000 \times 0.09 \times 3$

$I = \$4050$

b) Installment (total)

= interest + cost

= 4050 + 15000

= $19050

c) 3 yrs × 12 mo/yr = 36 months

$19050 ÷ 36

= $529.17

Credit Cards

Credit cards charge interest on any unpaid balance each month. The rate is much higher than bank rates, so paying off credit cards regularly is encouraged. The credit card company will only require minimum payments (often around $25) but it is much better to pay off the whole balance, or as much as possible.

If credit cards have such high interest rates, why do people use them?

*Build a good credit rating! *

- convenient, don't want to carry cash, online purchases, earn points/rewards...

Example 3 – You really want a new device but you don't have the cash to buy it right now. You decide to put it on your credit card. It costs $800. Use the following online debt calculator: https://www.creditcanada.com/debt-calculator

What happens if you make only minimum payments?

Length of time it takes to pay off: _12.4 yrs_

Amount of interest you end up paying: _$1049.98_

What if you pay off $50 a month?

Length of time it takes to pay off: _1.6 yrs_

Amount of interest you end up paying: _$137.45_

Example 4 – On March 1, James had an unpaid balance of $1350.50 on his credit card. He made purchases of $1200.60 over Spring Break and made a payment of $500 on the balance. The monthly interest on the unpaid balance was 7%. Find the finance charges, and the new balance on April 1.

balance: 1350.50 + 1200.60 − 500
(money he owes) = $2050.60

interest = 2050.60 × 0.07
(finance charges) = $143.54

new balance = 2050.60 + 143.54 = $2194.14

Borrowing Tips: Ask a trusted adult for the best advice they've received (and have tried out!) about borrowing money (e.g. car loans, mortgages, etc.). Be prepared to share next day.

Answers will vary.

- get a credit card and pay it off every month to build credit but not be in debt!

- pay off loans/mortgages as quickly as possible to avoid interest

- Spend less than you earn! Budget! Have an emergency fund!

A mortgage is a particular type of loan used for real estate. A bank or other financial institution gives these loans. Over a period of many years, the borrower repays the loan, plus interest, until they eventually own the property free and clear.

Because these loans are usually very large, banks use the property as collateral. If the borrower can no longer make the required payments, the bank can evict the home's tenants and sell the house for them to clear the debt.

An alternative to buying and owning property (which almost always means you need a mortgage) is to rent. Renting is another word for leasing.

Consider buying vs renting. What are some reasons for choosing one or the other? (answers will vary)

Buying: mortgage payments (☹) but eventually you own property (☺). Insurance (☹) upkeep (?) very expensive (☹) may increase in value (☺).

Renting: cheaper (☺) no downpayment (☺) landlord does upkeep (☺) payments last forever (☹) won't own home when older (?) not an investment (☹) can be evicted (with notice) (☹)

Mortgage Terminology

Down Payment: The amount of money you pay up front to obtain a mortgage. There are minimum down payments depending on the size of the loan (often 5%). If you do not have a large enough down payment (often 20%) you will need to pay mortgage default insurance.

The following definitions are from https://youngandthrifty.ca/variable-and-fixed-open-and-closed-mortgages/

Open Mortgage: With an open mortgage, you can pay off your mortgage at any time without a penalty. However, the interest rates for an open mortgage tend to be variable and much higher.

Closed Mortgage: In contrast, a closed mortgage has rules about how much you can pay down on your mortgage. If you pay down your mortgage before the term ends, your lender will charge you a hefty penalty. It may feel like you're locked in with a closed mortgage but remember that most lenders allow you to make "pre-payments" (extra payments over and above your normal mortgage payment) up to a certain amount annually.

Fixed-rate Mortgage: In a fixed-rate mortgage, your lender offers an annual percentage rate and term, such as 2.80% for five years on a $500,000 loan, which will be paid back over 25 years. Since it's a fixed rate mortgage, the interest rate will stay at 2.80% for the full five-years.

Variable-rate Mortgage: Like fixed rate mortgages, variable rate mortgages (VRMs) also have a set term (e.g. 5 years), but they have one big difference: the interest rate can go up and down during your mortgage term. This can happen as often as every month, as it's tied to whatever is happening with the rate set by the Bank of Canada.

Scenario:
You have been saving up money to buy a condo. You have $70 000. Your grandparents give you $10 000 as a gift to help you buy your first home.

The condo you are interested in costs $470 000.

a) How much will you need to borrow from the bank? (i.e. what is the principal value of your mortgage?)

470 000 − 80000 = $390 000

b) Most lending institutions (credit unions, banks, mortgage brokers, etc.) have an online mortgage calculator. The following site allows you to easily compare scenarios:
https://tools.td.com/mortgage-payment-calculator/
On the right, make use of the " Create new option to compare" feature.
At the bottom, choose "Show amortization graph."

Explore different interest rates, payment frequencies, and additional "lump-sum payments."

Note at least 2 scenarios here: (example from Jan 2020)

(25 yr amortiz'n period)

Interest rate: (5 year fixed) 3.2%	Interest rate: (5 year fixed 3.2%
Payment frequency: monthly	Payment frequency: (aka "accelerated bi-weekly") rapid bi-weekly
Balance at end of term: $334 609.54	Balance at end of term: $317 050.89
Extra payments? no	Extra payments? $100/month

* graphs show you will pay off mortgage 4 years early with 2nd plan.

c) What do you notice?

Answers will vary.

* extra payments make a big difference! In the examples above,

* Longer amortization = costs more
(but lower payments)

A) monthly payment $1885.91/mo
1885.91 × 12 mo × 25 yrs
= $565 773 total

B) payment $942.96/biweekly
942.96 × 26 × 21 yrs
+ 100 × 12 × 21 (extra pmts)
= $540 056.16

saved $25 716.84 !