Chapter 2 - Finance
2.1 - Income

The currency of currency is mathematics. If you are able to become comfortable delving into the world of numbers -- or at least are not afraid to work with them-- you will become literate in the medium of which money and finances are defined. The bottom line is that MONEY is NUMBERS.

We will start our investigation of finances by discussing salary and different forms of income. There are four main ways in which people are paid for their work (they are not mutually exclusive):

1) Salaries
2) Commission
3) Wages
4) Piece Work

Salary

Salary is a set amount of money that is paid out over a fixed period of time. Examples of salary jobs include teachers, store managers, architects, and professional athletes. Often, with salary jobs, your performance and professionalism are implied and the number of hours in which you work can vary over the course of the year.

Formula: Annual Pay = Paycheque $\times$ number of pay periods

Commission

Those who are paid by commission earn a certain percentage of the sales they make. Every commission-based job might have a different way of calculating this percentage. For example, car-salespeople earn a large percentage of the *profit* that is made on each sale (~25%); whereas real-estate salespeople make a small percentage of the *gross* selling price (~3%).

Formula: Commission Pay = Sales $\times$ Commission Rate

Wages

Wages, also known as hourly pay, are the baseline and most common income system. Most jobs are wage-based and include construction workers, grocery store workers, retail salespeople (which may also receive commission income), and educational assistants. With wage-based jobs, there are often opportunities to work "overtime hours" that pay ×1.5 (time and a half) or ×2 (double time) of the regular wage. Workers are often entitled to overtime if they work more than 8-hours in a day, 40-hours in a week, or work during statutory holidays.

Formula:

Pay = Hourly Rate × Number of Hours

Gross Pay = Regular Wage Pay + Overtime Wage Pay

Piece Work

Piece work is where the worker is paid a particular price per item that is produced. If you are self-employed, your entire salary may be dependent on the items you sell -- examples include farmers, furniture makers, artists, fisherman. If you are an employee, you probably still make an hourly wage and complete your income with piece-work earnings -- jobs include call-centre workers, trucking, fish filleters.

Formula:

Pay = Price per item × Number of pieces produced

Termonology

Gross Income: A person's salary before any deductions (taxes, union dues, CPP, etc.) are taken off. We often view this as how much someone makes.

Deductions: Obligatory service fees that are paid for directly from your gross earnings. Examples include federal and provincial income tax, Canadian Pension Plan premiums, Employment Insurance, and union dues).

Net Income: Gross income minus any deductions. This value is known as your "take-home pay" as it is the portion of your salary you actually will receive on your personal paycheque.

Pay Periods
Pay periods are set, recurring, lengths of time between each paycheque. Examples include:

Weekly: 52 times per year

Biweekly (every two weeks): 26 times per year

Monthly: 12 times per year

**Semimonthly** (every half month): 24 times per year

Calculation Examples:

1) Teachers are contracted on a 10-month period from September 1st to June 30th. If 40% is deducted from the gross pay, find the semimonthly net pay of
   a) A first-year teacher who earns $53,000 a year.
   b) A 10th-year senior teacher with a master's degree earning $90,000 annually, who's paycheque is prorated over 12 months.

net income (annual)

a) $53000 \times .6 = (\$31800) \left(\dfrac{year}{year}\right) \left(\dfrac{month}{10\ months}\right) \left(\dfrac{month}{2\ pay\ cheques}\right) = \$1,590/pay\ cheque$

left over after deductions

but only 10 months

b) $90000 \times .6 = (\$54000) \left(\dfrac{year}{year}\right) \left(\dfrac{month}{12\ months}\right) \left(\dfrac{month}{2\ pay\ cheques}\right) = \$2,250/pay\ cheque$

but 12 months

☆ $\dfrac{\$}{year} \rightarrow month \rightarrow pay\ cheque$
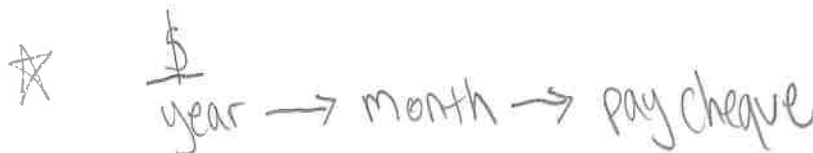
2) Aviv earns a monthly salary of $2550, paid out biweekly. Aviv works fulltime at Poke Fresh 40 hours a week. During the first two weeks of October, Aviv worked 5.5 hours of overtime, paid at time and a half.
   a) What is Aviv's regular hourly pay?
   b) How much was Aviv's gross pay for the month of October?

a) $\left(\dfrac{\$2550}{month}\right)\left(\dfrac{12\ months}{year}\right)\left(\dfrac{year}{26\ biweekly}\right)\left(\dfrac{biweekly}{80\ hrs}\right) = \$14.71/hr$

★ $/month → year → biweekly → hourly

b) Total = regular + overtime

$\$2550 + (14.71 \times 1.5 \times 5.5) = 2550 + 121.36 = \underline{2671.36}$

3) Alex works as a real estate agent. She makes 7% commission on the first $100,000 of the sale, and 2.5% thereafter. In July, Alex sold two houses at $350,000 and $1,000,000. How much was her gross pay for July?

$\boxed{350000} \Rightarrow (100000 \times .07) + (250000 \times .025) = 7000 + 6250 = \$13250$

$+$

$\boxed{1000000} \Rightarrow (100000 \times .07) + (900000 \times .025) = 7000 + 22500 = \$29500$

$+$

$\boxed{\$42750}$

4) According to the LA Times, Forever 21 employs pieceworkers to sew on their brand-tags. If Ulloa makes 10 cents per tag sewn, how much does she make per hour if she can sew 700 tags in her 11-hour workday? How much does she make per year if she works Monday through Friday, year-round?

$\left(\dfrac{\$.10}{tag}\right)\left(\dfrac{700\ tag}{day}\right)\left(\dfrac{day}{11\ hrs}\right) = \$6.36/hr$

★ $/tag → day → hours

★ hr → day → week → year

$\left(\dfrac{\$6.36}{hr}\right)\left(\dfrac{11\ hr}{day}\right)\left(\dfrac{5\ day}{week}\right)\left(\dfrac{52\ weeks}{year}\right) = \boxed{\$18189.60}$ per year

2.2 - Simple Interest

Interest is a key component of our financial world and something that should be navigated with care. Interest rates are decided by banks and work either in your favour (like in a savings accounts, which are often less than 1%) or against you (like for credit cards, which often sit around 20%).

Simple Interest

Interest is based on three pieces of information: the **principal**, the **rate**, and the **time.**

Interest (*I*): The extra amount of money charged/made.

Principal (*P*): The original amount of money which is being worked on.

Rate (*r*): The percent charged for borrowing the principal.

Time (*t*): The amount of time the rate is working on the principal.

Simple Interest and Future Amount Formulas:

$Interest = Principal \times Rate \times Time$

$I = Prt$

Future Amount = What you have at the start + what you pay extra as interest

$Amount = Principal + Interest$

$A = P + I \quad$ or $\quad A = P(1 + r \cdot t)$

Examples:

1) Find the simple interest of $2500 borrowed for:

   a) 5 years at 8% annually

   $$I = Prt$$

   $$I = 2500 \times .08 \times 5$$

   $$\boxed{I = \$1000}$$

   b) 30 years at 1% annually

   $$I = Prt$$

   $$I = 2500 \times .01 \times 30 = \boxed{\$750}$$

2) You need to borrow $1200 to pay your rent. The lender states it will cost you
   $1325 if you pay within three months. What is the annual rate of the loan?

   $$A = P(1 + r \cdot t) \Rightarrow \$1325 = 1200 \left(1 + r\left(\tfrac{1}{4}\right)\right)$$

   $$1.104 = 1 + \tfrac{1}{4}r$$

   $$.104 = \tfrac{1}{4}r \qquad \rightarrow .416 = \boxed{41.67\%}$$

3) Current mortgage interest rates are around 3.5%. How much interest do you
   pay the bank over a fixed 5-year term, if you put a $100,000 down-payment
   on a $900,000 home?

   $$I = Prt$$

   $$I = \left(800000 \times .035 \times 5\right)$$

   $$\boxed{I = \$140,000}$$

2.4 - Budget

Developing a budget is one of the fundamental skills of a successful life. Many people do this process in their heads in real-time but without a grand-scope explicit understanding of where your money is going in the short and long-term, big issues can arise. A brief but comprehensive budget can provide a framework for financial success, give you insight on what you can and cannot afford, and direct you in decision making in general.

When creating a budget there are two mutually exclusive facets. Your *income* (the money you are making) and your *expenses* (the money you are spending). Of these two categories, there are two more ways of defining them: *fixed* (standardized, never changing) and *variable* (random, may change from month to month).

Note: It is also sometimes worth specifying if any expense is a "need" or a "want." While it is not imperative to budgeting, such a list can focus your costs and reduce unnecessary spending.

Example: What is the hourly wage someone must earn to live an "average" life in Victoria (circa 2019) -- that is, they have a common amount of needs and wants and spend the average amount for those items?

Facet	Price per Month
Rent	$1,400
Home Insurance	$60
Utilities	$80
Car Payment	$300
Car Insurance	$100
Gas	$160

Cell Phone	$80
Internet	$70
TV Subscriptions	$10
Music Subscription	$10
Groceries	$350
Restaurants	$200
Clothing	$50
Vanity	$25
Medical/Dental Insurance	$150
Loans	$280
TOTAL:	$3325

$$\left(\frac{\$3325}{month}\right)\left(\frac{12\ months}{year}\right)\left(\frac{year}{52\ weeks}\right)\left(\frac{week}{40\ hrs}\right) = \$19.18/hr$$

minimum wage = $13.85 in 2019

$14.60 in 2020

$15.20 in 2021

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Notes: