PC 11

UNIT 9 Financial Literacy

Day 1 – Simple Interest

Money is not FREE to borrow! Interest is how much is paid by the borrower to a lender for the use of the money.

If you borrow money from a bank (LOAN), you must pay the bank interest.

Example
$1000 is borrowed from the bank for one year at 5% simple interest
What is the interest charge ?

5% of 1000
= 0.05 × 1000
= $50

If you invest your money, you are putting it somewhere it can grow.
You become the lender and the financial institution becomes the borrower.

Example
You purchase a $1000 2-year term deposit at 6% simple interest.
How much interest is earned ?

6% of 1000
0.06 × 1000 = $60 per year
$120

There are two types of interest:

simple
compound

Simple Interest Formula:

$$I = Prt$$

I = interest earned
P = principal
r = interest rate (decimal)
t = time (years)

principal, interest

Modification: $FV\ (Future\ Value) = P + Prt$

$= P(1 + rt)$

Ex. 1

A bank is offering 1.5% simple interest on a savings account. If you deposit \$2000, how much interest will you earn in 3 years?

$P = 2000$
$r = 0.015$
$t = 3$

$I = Prt$
$= 2000(0.015)(3)$
$= \$90$

Ex. 2

To buy a boat, Bob borrowed \$18,000 for four years at an annual simple interest rate of 6%. What is the total amount that he will have to repay the bank?

$P = 18000$
$r = 0.06$
$t = 4$

$I = Prt$
$= 18000(0.06)4$
$= \$4320$ ← interest

$18000 + 4320 = \$22\,320$ FV

Ex. 3

Kendra borrowed \$10,000 for four years for home improvements. If she repaid a total of \$12,320, at what simple interest rate did she borrow the money?

$P = 10000$
$r = ?$
$t = 4$

$I = FV - P$

$I = 12320 - 10000$
$= 2320$

$I = Prt$
$2320 = (10000)r(4)$
$2320 = 40000r$
$\frac{2320}{40000} = \frac{40000r}{40000}$

$r = 0.058$

$\boxed{5.8\%}$

Day 2 – Compound Interest

Compound interest is different from simple interest in that:
interest is calculated on principal and on any previously accumulated interest

Example

Suppose a person invests $10,000 in a fund with an annual interest rate of 6.5%, but it is compounded annually.

a) What amount will the person have in 3 years?
b) Compare this versus a simple interest scenario for the same time.

a)

Year	Principal	$I = Prt$		Total
1	10000	$I = (10000)(0.065)1$	= \$650	10650
2	10650	$I = (10650)(0.065)1$	= \$692.25	11 342.25
3	11342.25	$I = 11\,342.25(0.065)(1)$	= \$737.25	\$12 079.50

b) $I = Prt$ $I = 10000(0.065)3$
= \$1950 (650/yr).

10000 + 1950
FV = \$11 950

Compound Interest Formula:

P = principal
A = amount accumulated $A = P\left(1 + \frac{r}{n}\right)^{nt}$ $A = P(1+i)^n$
r = interest rate (decimal)
n = # of compounds/yr
t = # of years

Description	Compounding Periods in 1 Year
annual	1
semi-annually	2
quarterly	4
monthly	12
weekly	52
daily	365

bi-weekly 26

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

Ex.1 $P = \$10000$ $\quad 6.5\%$ $\quad 3$ yrs.

Repeat the calculations made in the previous example, but use the compound interest formula instead.

$$A = 10000\left(1 + \frac{0.065}{1}\right)^{(1)(3)}$$

$$= \$12\,079.50$$

Ex. 2

A principal of $4200 is borrowed at an annual interest rate of 5.4%, compounded daily, for 5 years. What amount will the borrower owe at the end of the 5 – year term? How much of this was interest?

$P = 4200$

$A = ?$

$r = 5.4\%$ 0.054

$n = 365$

$t = 5$

$$A = 4200\left(1 + \frac{0.054}{365}\right)^{365 \times 5}$$

$$= \$5501.74$$

$$-4200$$

$$\boxed{\$1301.74}$$

Ex. 3

Mr. Q wants to have $1,000,000 in his retirement fund by the time he retires at age 58. He thinks with his pension fund, this would allow him to live comfortably and travel the world. At age 24, he invested wisely in a fund that offered 12.4%, compounded monthly.

a) How much would Mr. Q needed to invest to reach his goal, assuming he does not make any other investments?

$A = 1000000$

$P = ?$

$r = 12.4 \rightarrow 0.124$

$n = 12$

$t = 58 - 24$

$= 34$

$$1000000 = P\left(1 + \frac{0.124}{12}\right)^{12 \times 34}$$

$$= \$15\,080.30$$

b) How much would Mr. Q needed to invest if he had not thought of retirement until he was 35?

$t = 58 - 35$

$= 23$

$$\boxed{\$58,579.80}$$

Day 3 – Investments

There are many ways to invest money to earn interest. Some are short term and others are long term. Some pay low interest, some pay higher interest. Here are some examples:

Savings Account: low interest rate
access to money.

Term Deposit:
short term investments (1-5 years)
higher rates than savings
GIC:
locked in / flexibility

RRSP:
contributions deducted from
RESP:
taxable income.

There are riskier ways to invest money. The returns are potentially higher, but the investments are subject to market fluctuations.

Some examples:

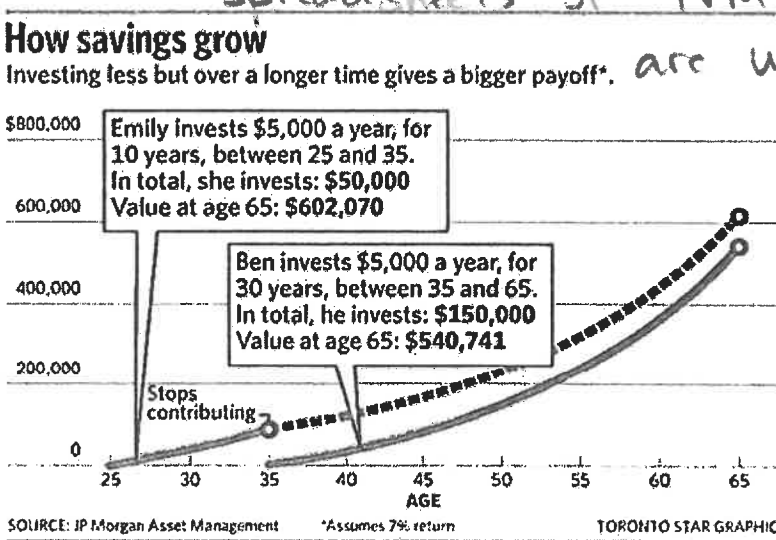
Stocks: shares in companies

Mutual Funds: a portfolio (collection) of bonds, stocks, and other investments managed by a pro.

Bonds: lending money to government, interest in return.

TFSA: because most people do not have large sums of money to invest all at once, regular payments are made.

Think Long Term ! → complicates things are spreadsheets or TVM solvers are used.



TVM SOLVER

The calculations to find interest rates and times to reach certain financial goals get quite complicated with the compound interest formula. The TVM time value of money solver is a financial calculator that is widely available online.

N = Number of years.
I% = Interest rate, left in **percent form.**
PV = Present value. Enter as a **negative** when money is leaving your possession, such as for an investment. Enter as a **positive** when money enters your possession, such as in borrowing.
PMT = Regular payment. For making investments or loan payments at regular intervals (ex. $500/month). Enter as a **negative** or leave as zero if not applicable.
FV = Future value. Will be positive since you get this money back at the end of the investment. In the case of borrowing, the future value will be zero (when you finish paying off the loan).
P/Y = Number of payments per year, if applicable. If not, leave as the default 1 or enter 0.
C/Y = Number of times per year that interest is compounded.

Ex. 1

Rachel's parents invested $10,500 in a Registered Education Savings Plan (RESP) when Rachel was born. The goal was to have $45,000 in the fund by the time Rachel graduated high school. What interest rate, compounded annually, will result in a future value of $45,000 ? ?

N=	18
I %=	? → 8.4%
PV=	-10500
PMT=	0
FV=	45000
P/Y=	1
C/Y=	1

Ex. 2

Priya's goal is to have $300,000 in 20 years to add to her retirement fund. She has found a trust account that earns a fixed rate of 10.8%, compounded annually.

a) What regular payments must Priya make at the end of each year to meet her goal? What about if she makes monthly payments instead?

Yearly

N=	20
I %=	10.8%
PV=	0
PMT=	-4781.09
FV=	300000
P/Y=	1
C/Y=	1

end

Monthly

N=	20 x 12 → 240
I %=	10.8
PV=	0
PMT=	-379.96
FV=	300000
P/Y=	12 ← monthly
C/Y=	1

b) How much interest will she earn over the next 20 years with each option?

Yearly
4781.09 x 20 = $95621.80 invested
Interest = 300000 - 95621.80
= $ 204378.20

Monthly-
379.96 x 240 = 91190.40
Interest = 300000 - 91190.40
= $208809.60

RULE OF 72 $\dfrac{72}{\text{annual interest rate}}$ = time to double investment (years)

Ex. 1
How long would it take an investment to double in value at the following annual rates of interest?

$\frac{72}{4}$

4%	18	years
6%	12	years
8%	9	years
12%	6	years
24%	3	years

Ex. 2
How long (in years) would it take an initial investment of $15,000 to grow to $30,000 if the rate of interest earned was 10% per year.

$\frac{72}{10}$ = 7.2 years.

Day 4 –Loans

Loan:

There are many types of loansand their rates can differ depending on your CREDIT SCORE. Credit scores range from 300-900 (median in Canada is around 740).

Bank Loans include:

Personal Loan: An installment loan provided by bank Can be secured (collatoral) or unsecured.

Line of Credit: Preset amount of money that you can draw when needed. No fixed payments but minimal monthly payments.

Mortgage: Special type of installment loan to purchase real estate.

Some Terminology:

Cash Price: Cost of an item bought w/o a loan.

Down Payment: Payment (cash) made at time of purchase (often a % of items cash price).

Finance Amount: Amount borrowed (Cash price - down payment)

Loan Term: Length of time to repay the loan.

Installment Cost: Total cost of item with interest (payments + down payment)

Finance Charge: Interest charged for loan.

Example Annual % rate

Ken borrowed $12,000 from a bank to buy a new snowmobile. The APR is 5% and will be compounded monthly. The bank has set the monthly payments at $350.

a) How long will it take to pay off the loan?

N= 37.07 → ÷12 = 3.09 yrs
I %= 5%
PV= 12 000
PMT= -350
FV= 0
P/Y= 12
C/Y= 12

3 years 1.07 months

3 years 2 months

b) Approximately how much interest will Ken have paid by the time the loan is done? $350 \times 37.07 = 12974.50$

$12974.50 - 12000 = \$974.50$

With installment an bank loans, the longer term, the lower your payment, but the more you will pay in interest.

CASHMONEY

Money Mart

PayDay Cash Advance Loans:

These can get you money fast, but the borrowing cost is extremely high.

Example

A borrower took out an $800 PayDay loan and was charged $90 in interest when they repaid the loan 8 days later. (This is a simple interest scenario).

a) What was the daily interest rate?

$I = Prt$

$90 = 800 r 8$ ← days.

$\frac{90}{6400} = \frac{6400r}{6400}$

$r = 0.0141$

$= 1.41\%$ / daily

b) Annual interest rate ?

$1.41\% \times 365$

$= 515\%$

Day 5 – Credit Cards

You must be 19 years of age to get a credit card in B.C. They are convenient and when used responsibly can help build credit scores. They sometimes have added advantages of accumulating Points, rewards, cash back.

Irresponsible use can lead to debt issues and will hurt your credit score.

- ***Minimum amount*** that must be paid each month based on a percent of the outstanding balance.
- ***Credit Limit*** is the maximum amount one can borrow
- If there is no outstanding balance and new purchases for the month are paid by due date, then no interest charged.
- ***Due date*** is usually 21 days from the time the monthly bill becomes available. This is the no interest, ***grace period.***
- Any outstanding balance at the end of the grace period, then ***interest is charged.***

Credit card interest is high! and it compounds daily.

Ex. 1
A cardholder has an unpaid balance of \$2500 on his credit card from a previous statement of April 20. On May 2, he charges \$3400 in purchases on the card. Interest rate is 19.99% on unpaid balances. Next statement has a due date of May 16. What would the financing charges be for this period ?

Apr 20 – May 16 → 26 days   \$2500

May 2 – May 16   \$3400

$$A = 2500\left(1+\frac{0.1999}{365}\right)^{\frac{365\cdot 26}{365}}$$

$= 2535.84 \rightarrow 2534.84$

$+3400$ -2500

$\boxed{\$5935.84}$ $\boxed{\$34.84}$

Ex. 2

Account number	5491 2324 1140 4951	Previous balance	2100.47
Period covered	Jan 20 - Feb 17 2011	Payments/credits	2164.28
New balance	2069.12	Purchase/Adjustments	2132.93
Minimum payment	50.00	Credit limit	35000.00
Due date	March 10 2011	Credit available	32930.88
		Statement closing date	Feb 17 2011
		Days in billing cycle	29

Transaction date	Posting date	Description	Reference #	Account #	Amount
01/21	01/22	Safeway	4378	4951	212.51
01/23	01/24	Nash Gym	8140	4951	54.88
01/25	01/26	SPCA	2151	4951	1000.00
01/28	01/29	Bike Shop	2609	4951	170.23
02/07	02/08	Thrifty's	5363	4951	126.13
02/11	02/12	London Drugs	2597	4951	89.95
02/14	02/15	Dental Care	1209	4951	479.23
			Charges this period		2132.93

Payments and other credits

12/14	01/15	Home Sense	4212	4212	-63.81
01/19	01/19	Payment	4378	4378	-2100.47

Interest charges this period at 19.99% annually 0

Interest charges on cash at 19.99% annually 0

Balance due 2069.12

a) If the cardholder only makes the minimum payment by the due date and makes no additional purchases, what will the balance due be on next month's bill in 30 days?

2069.12 - 50

\$2019.12

$$A = 2019.12\left(1 + \frac{0.1999}{365}\right)^{365 \cdot \frac{30}{365}}$$

$= \$2052.56$

b) If the cardholder only makes the minimum payment each month and makes no additional purchases, how long will it take to pay off the balance?

N=	71.29 ÷ 12
I %=	19.99
PV=	2069.12
PMT=	- 50
FV=	0
P/Y=	12
C/Y=	365

5.94 years

5 years 11.3 months

↓

12 months

$\boxed{\text{6 years}}$

Day 6 – Buying vs Leasing

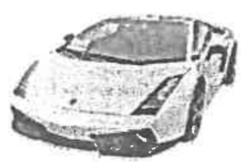
Lease: A contract for purchasing the use of property (building/vehicle) for a specific period of time.

Depreciation:
A decrease in value of an item over time usually due to 'wear + tear'

You pay depreciation when you lease.

COMPARISON OF BUYING VS. LEASING FOR A VEHICLE

	BUY	LEASE
THE MONEY	Requires more money up front, and each month.	Costs less up front and each month, so you can afford a more expensive car.
THE BILLS	Can pay off your auto loan, which eliminates a monthly cost.	If you always lease, you'll make car payments for life.
THE COMMITMENT	Have the freedom to sell or trade it in whenever.	A lease contract is difficult and expensive to break.
THE DOLLARS AND CENTS	Usually costs less than leasing overall, over time.	You can get a tax break if you use the car for business purposes.
THE TIME	It's yours to sell, total, or drive for 20 years.	Can upgrade to the newest model every couple of years.
AND KEEP IN MIND...	The car's value depreciates as soon as you drive it off the lot.	You'll owe fees for exceeding annual mileage limits or any damage to the car.



SOURCE: Edmunds.com

BUSINESS INSIDER

Example

Amira wants a new car. The model she wants costs \$33, 566.40 , which includes 12 % in taxes, levies (air conditioning, tire and environmental fees), freight costs, PDI (pre-delivery inspection) and any other administration fees. She has two options:

- BUY: The dealership has offered her 3.99% financing, compounded monthly with a 4 year term. Monthly payments.
- LEASE: A 4 year lease requires a \$2000 down payment and lease payments of \$451.94 / month.

a) Determine the monthly payment for buying:

N=	4x12 = 48
I %=	3.99
PV=	33 566.40
PMT=	−757.75
FV=	0
P/Y=	12
C/Y=	12

\$757.75 monthly payments

b) Determine the total cost for each option.

Buy − \$757.75 x (4 x 12) = \$36 372 − 33 566.40 = finance cost

Lease = \$2000 + (451.94 x 4 x 12)

= 23 693.12

c) Discuss pros and cons for each option.

	Pro	Con
Buy	get to keep vehicle	- more expensive
Lease	- cheaper	- no car