

Financial Mathematics Lesson #5: Buying, Renting, and Leasing

Leasing

When **buying** an expensive item, such as a vehicle, the vehicle is purchased with savings, or a loan is taken out with some amount of down payment being made.

An alternative to purchasing an expensive item is to **lease** it. When an item, such as a vehicle, is leased, the monthly payments are made to the leasing company to cover depreciation, taxes, and interest. A major difference between leasing and a loan is that when the loan is paid off, the vehicle is owned by the purchaser. With a lease, the vehicle is not owned at the end of the leasing agreement, and a "buyout" option is offered.

The **residual value** of a lease is the price at which an item is expected to be sold at the end of its lease (or the amount remaining on the depreciated value of the item).
The **residual value** is also sometimes referred to as the **lease-end value**.



- When **leasing** an item, the **GST** is calculated on the **monthly payment** of the lease. NOT on the purchase price of the item.
- When **leasing** an item, **GST is also calculated on the deposit** (if any) and then divided by the number of payments in the lease. This is then added to the monthly lease payment. For example, if the deposit is \$3000, then the GST is \$150. If the term of the lease is two years, then $\frac{3000 \times 0.05}{24} = \6.25 . This amount would then be added to the monthly lease payment.
- When purchasing an item with a **loan**, the **GST** is calculated on the **purchase price** of the item, NOT the monthly payment. **The monthly payment is based on the loan including GST.**
- Note the following points when calculating **monthly lease** payments with TVM Solver:
 - The **FV** is the residual value, or the lease end value, and is entered as a **negative value**.
 - **PMT: END BEGIN** is **BEGIN** for **leases**.
Unless otherwise specified, assume all of the **leases** to be **BEGIN**.
 - **PMT: END BEGIN** is usually the **END** for **loans**.
Unless otherwise specified, assume all of the **loans** to be **END**.



Write the advantages and disadvantages of leasing versus owning a vehicle.

↓

→ only pay for what you use

→ lower monthly payments

→ at end of lease, you don't own vehicle.

Class Ex. #2 Who would be likely to lease a vehicle?

→ lower income / less payments
 → business

Class Ex. #3 A sports utility vehicle is advertised with a purchase price of \$32 000. Scott is considering the following options to buy the vehicle. **GST 5%**

Option 1: Purchase the Vehicle with a Loan.

- The down payment is \$8 000.
- The interest rate on the loan is 7.5% p.a., compounded monthly.
- Monthly payments are made for three years.

Option 2: Lease the Vehicle.

- No down payment is required, but Scott will choose to make a down payment of \$8 000 if he chooses this option.
- The lease payment is \$383.14 per month plus GST for three years.
- Buyout option is \$15 865.72.

a) What is the total purchase price of the SUV including taxes?
 $(32,000)(1.05) = \$33,600$

b) What is the amount of the loan?
 $33,600 - 8,000 = \$25,600$

c) What is the monthly payment of the loan?

N=	36
I%=	7.5
PV=	25,600
FV=	0
PMT=	796.32
P/Y=	12
C/Y=	12
PMT	(END) BEGIN

 $\$796.32$

d) What is the total cost of the SUV if Scott chooses Option 1?
 $(796.32)(36) + 8,000 \text{ deposit} = \$36,667.52$

e) What is the total purchase price of the SUV including taxes?
 $(383.14)(1.05) = 402.297$
 $(8000)(1.05) = 8,400$
 $\frac{402.297 + 8,400}{36} = \413.41

f) What is the total of the lease payments over the three years?
 $(413.41)(36) = \$14,882.76$

g) What is the residual value of the SUV?
 $\$15,865.72$

h) What would the total cost of the SUV be if Scott decided to choose Option 2 and purchase the vehicle at the end of three years?
 $8,000 \cdot 0.00 + 14,882.76 + 15,865.72 = \$38,748.48$

Class Ex. #4 Consider the scenario in Class Example #3.

a) How much does Scott spend in total on monthly payments over the term of the financing for each option? Explain the difference between the two amounts.

$36 (796.32) = 28,667.52$
 $36 (413.41) = 14,882.76$

→ purchasing vehicle ... larger payments

Class Ex. #4 Consider the scenario in Class Example #3.

c) What is the difference between these two totals? Explain this difference.

lease: 38,748.48
 purchase: - 36,667.52
 = 2,080.96
 more to lease

Class Ex. #4 Consider the scenario in Class Example #3.

d) How much would Scott have to save each month in an account paying 5% p.a. compounded monthly to pay for the \$15 865.72 buyout at the end of the three year term?

$N = 3 \times 12$
 $I = 5$
 $PV = 0$
 $FV = 15\ 865.72$
 $P/Y = 12$
 $C/Y = 12$
 (END)

$\$409.40$
 $+ 413.41$
 above purchase amount...

Class Ex. #5 Jessie has decided that she will lease, with no down payment, a Honda Ridgeline LX truck for her landscape company. The Ridgeline LX is priced at \$34 800 and the lease is calculated at 6.9% p.a. compounded monthly for four years. The lease includes a plan with an option for a final buyout of \$12 789.

a) Calculate the monthly payment for the lease before and after GST.

$N = 4 \times 12$
 $I = 6.9$
 $PV = 34\ 800$
 $FV = 12\ 789$
 $P/Y = 12$
 $C/Y = 12$
 PMT: END BEGIN

Before GST: $\$596.17$ *GST ON MONTHLY LEASE AMT*

After GST: $(596.17)(1.05)$
 $\$625.98$

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b) Jessie has decided that the monthly payments are too high and she would like to pay only \$375 per month, not including GST. Calculate the new final buyout, or residual value, of the lease.

$N = 4 \times 12$
 $I = 6.9$
 $PV = 34\ 800$
 $PMT = -375$
 $P/Y = 12$
 $C/Y = 12$
 PMT: END BEGIN

$25\ 044.77$

Renting a House

Renting is the process of making a payment for the use of a facility, equipment, or a service provided by another person or company.

Unlike leasing, there is NO option to buy or purchase the service or item.

Common expenses when renting a home are:

- rent
- hydro/electric
- insurance
- water/utilities

} utilities

Buying a Home with a Mortgage

Most people who buy a house borrow money in the form of a mortgage from a bank because they do not have the cash to pay for it (see Lesson 4 of this unit to review term, amortization, and TVM Solver).

To receive a mortgage, one must have a down payment; usually 10% of the purchase price is the standard.

To calculate the **price range one can afford for a mortgage**, financial analysts suggest that the maximum allowable mortgage should **NOT exceed 28% of total gross monthly income** (source: First Financial Mortgage Corp., <http://www.kchomeloans.com/calculator/>). Others suggest 36% of your monthly gross income, less any long term obligations.

Buying a Home with a Mortgage

For our purposes, we will use the maximum allowable mortgage, i.e. up to 28% of total gross monthly income.

Remember, by Canadian law, mortgage interest must be calculated annually or semi-annually. We assume mortgages to be compounded semi-annually.

Common expenses when owning a home are:

- taxes
- hydro/electric
- gas
- water/utilities
- maintenance
- insurance



Class Ex. #6 Don and Dawn have saved \$25 000 and are considering whether to rent a duplex or buy a home with a mortgage. They consider two options.

Option 1: Purchase with a Mortgage.

- house price is \$190 000.00
- mortgage is 7.95% p.a., compounded semi-annually amortized over 20 years
- taxes - \$253 per month
- hydro - \$115 per month
- gas - \$60 per month
- water - \$45 per month
- insurance - \$57 per month
- maintenance - \$115 per month
- mortgage = \$1361.85

Option 2: Rent.

- rent home for \$1025 per month
- hydro - \$112 per month
- gas - \$65 per month
- water - \$43 per month
- insurance - \$35 per month

\$1280

a) Calculate the average monthly cost for each option.

$N = 20 \times 12$
 $I = 7.95$
 $PV = 190000 - 25000$
 $FV = 0$
 $\times PMT =$
 $P/Y = 12$
 $C/Y = 2$
END

\$1361.85 + expenses = \$2006.85

b) Based on the monthly average cost, list an advantage and a disadvantage of both options.

advantage \rightarrow purchasing ... own house
 \rightarrow renting ... less
 no maintenance