

2-7 Evaluation- Ordinary Simple Annuities: Mortgage Assignment

COMMUNICATION	/11	THINKING	/26
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THINKING**26 MARKS****Instructions:**

You are to research a house in either your area, or an area that you would like to live (ex. another country, city, province etc.). When you have the advertisement of your chosen house, copy and paste the advertisement, along with the URL link for your dream home in a word document to submit. The advertisement should include the address, price and the number of bedrooms and bathrooms.

For houses in Canada, you may find it useful to use realtor.ca or commfree.com.

Marking Scheme (4 marks)

- 4 marks for attaching the house advertisement including the address, price and the number of bedrooms and bathrooms

A **down payment** is an initial amount that you pay when you buy something on credit. It is custom in Canada to put a minimum of 5% "down" on a house, in order to protect yourself and the banks against market fluctuations, in the case of a forced sale.

The **mortgage amount** is the sale price of the house minus the down payment. This is the amount being borrowed.

Payments are commonly made monthly, bi-weekly or weekly. Since payments are made on the decreasing mortgage amount, a mortgage is a type of **simple annuity**.

In order to be approved for a mortgage, two main things have to fall into place: good credit and enough income to cover the debt.

The amount of **income required** to be approved for a mortgage is based on **GDSR**, gross debt service ratio. This means that an individual's debt payments (mortgage) can only account for 35% of their income. The ratio is calculated using the formula $\frac{\text{principal} + \text{interest} + \text{taxes} + \text{heat}}{\text{gross income}}$. For the scope of this assignment, we will use 0.5% of the house amount for the cost of the property tax and \$100 per month for heat.

Complete the following questions and submit these papers along with the attached advertisement.

Marking Scheme (total of 22 marks)

- 1 mark for listing the price of the house
- 1 mark for calculating the down payment (2 marks total)
- 1 mark for calculating the mortgage amount after the down payment (2 marks total)
- 3 marks for calculating the mortgage payment manually (12 marks total)
- 1 mark for calculating the property tax on the house
- 2 marks for calculating the income needed to be approved for the mortgage (4 marks total)

Option 1:

What is the price of the house?

$$\$2,202,256$$

If you wanted to put a 5% down payment on the house, what amount would this be?

$$2,202,256 \times 5\% = 110,112.8 \quad \$$$

After the 5% down payment, what is the mortgage amount?

$$2,202,256 - 110,112.8 = 2,092,143.2 \quad \$$$

Calculate the payment, "R," if the mortgage is paid **monthly** at an annual interest rate of 4.44% for 25 years.

$$i = \frac{4.44\%}{12} = \frac{0.0444}{12}$$

$$r = (1+i)^{-1} = \left(\frac{12.0444}{12}\right)^{-1}$$

$$n = 25 \times 12 = 300$$

$$\frac{R(1-r)^n}{1-r} = 2,092,143.2$$

$$\frac{R[1-(1+i)^{-n}]}{i} = 2,092,143.2$$

$$R \approx 11,557.66 \quad \$$$

Calculate the payment, "R," if the mortgage is paid **monthly** at an annual interest rate of 4.44% for 20 years.

$$i = \frac{4.44\%}{12} = \frac{0.0444}{12}$$

$$r = (1+i)^{-1} = \left(1 + \frac{0.0444}{12}\right)^{-1}$$

$$n = 12 \times 20 = 240$$

$$\frac{R[1-(1+i)^{-n}]}{i} = 2,092,143.2$$

$$R \approx 13,168.27 \quad \$$$

What is the cost of the property tax, based on 0.5% of the price of the house?

$$2,202,256 \times 0.5\% = 11,011.28 \quad \$$$

What would your income need to be in order to afford this house (given that you have no other debts)? 25 years

$$\text{income} = \frac{11,557.66 + \frac{11,011.28}{300}}{35\%} + 100$$

$$= 33,412.47 \quad \$$$

20 years

$$\text{income} = \frac{13,168.27 + \frac{11,011.28}{240}}{35\%} + 100$$

$$= 38,040.43 \quad \$$$

Option 2:

What is the price of the house (same as above)?

\$2,202,256

If you wanted to put a 20% down payment on the house, what amount would this be?

$$2202256 \times 20\% = 440451.2 \text{ \$}$$

After the 20% down payment, what is the mortgage amount?

$$2202256 - 440451.2 = 1761804.8 \text{ \$}$$

Calculate the payment, "R," if the mortgage is paid monthly at an annual interest rate of 4.44% for 25 years.

$$v = (1+i)^{-1} = \left(1 + \frac{4.44\%}{12}\right)^{-1} = \left(1 + \frac{0.0444}{12}\right)^{-1}$$

$$n = 25 \times 12 = 300$$

$$\frac{R \left[1 - \left(1 + \frac{0.0444}{12}\right)^{-n} \right]}{\frac{0.0444}{12}} = 1761804.8$$

$$R \approx 9732.78 \text{ \$}$$

Calculate the payment, "R," if the mortgage is paid monthly at an annual interest rate of 4.44% for 20 years.

$$v = (1+i)^{-1} = \left(1 + \frac{0.0444}{12}\right)^{-1}$$

$$n = 20 \times 12 = 240$$

$$\frac{R \left[1 - \left(1 + \frac{0.0444}{12}\right)^{-n} \right]}{\frac{0.0444}{12}} = 1761804.8$$

$$R \approx 11089.07 \text{ \$}$$

What is the cost of the property tax, based on 0.5% of the price of the house?

$$0.5\% \times 2202256 = 11011.28 \text{ \$}$$

What would your income need to be in order to afford this house (given that you have no other debts)? 25 years.

$$\text{income} = \frac{9732.78 + \frac{11011.28}{500} + 100}{55\%} = 28198.53 \text{ \$}$$

20 years

$$\text{income} = \frac{11089.07 + \frac{11011.28}{240} + 100}{55\%} = 32099.86 \text{ \$}$$

COMMUNICATION

Complete the following questions:

Marking Scheme (total 11 marks)

- 2 marks for valid and thoughtful reasons why you chose this house
- 1 mark for each calculation on the differences (total 3 marks)
- 2 marks for each explanation of your opinion on the difference (total 6 marks)

Why did you choose this house?

Because I like Toronto and the environment is good. And the house is very nice and big.

For the 5% down payment opinion, what is the difference in the payment amount between paying your mortgage off in 20 years and 25 years? What is your opinion on this difference?

(Hint: Compare Option 1 at 20 years and Option 1 at 25 years)

The longer you return the money to the bank, the less money you will pay each month.

I like to pay the money back in 25 years because I can pay less money each month.

For the 20% down payment opinion, what is the difference in the payment amount between paying your mortgage off in 20 years and 25 years? What is your opinion on this difference?

(Hint: Compare Option 2 at 20 years and Option 2 at 25 years)

The longer you return the money to the bank, the less money you will pay each month.

I like to pay the money back in 25 years because I can pay less money each month.

What is the difference in the payment based on whether you put 5% down or 20% down? What is your opinion on this difference?

(Hint: Compare Option 1 at 5% down payment and Option 2 at 10% down payment)

The more money you put down, the less money you will borrow from the bank, so you will pay less interest.

I like put 20% down because I can pay less interest to the bank.

House advertisement

1, Link:

<https://www.realestate.com.au/international/ca/toronto-ontario-120038144641/>

2, Address: Toronto, Ontario, Address available on request.

3, Price: CAD \$ 2,202,256

4, Number of bedrooms: 2

5, Number of bathrooms: not given

Advertisement:

Details:

Brilliantly completed under the careful eye of design firm, The Linear Workshop, this Brooklyn-style townhome will astound you. The juxtaposition of a historically correct restored brick façade (circa 1868) with three stories of dramatic glass at the back (circa 2018). Function and art meld perfectly here. Precise attention to detail is apparent throughout. Stunning architectural staircase drenched with natural sun from the skylights above. Art gallery-style recessed lighting. Seductive hits of black. Perfectly aligned wood grain of the white Oak custom cabinetry. Drama and intrigue. The main floor has been made for entertaining 2/3rds of the back wall of glass opens up onto the deck and back garden. Serious cooks and party goers will be very pleased here. Fun and sexy custom kitchen with an oversized peninsula perfect for guests to satisfy their appetite. Granite countertops and top-drawer appliances. Caterers can hide in the back prep kitchen. Grab a bottle of wine from the lower level wine towers and mill about this incredible space. Upstairs, you'll find two generously sized bedrooms and luxurious spa-like baths. The master suite, with its beverage centre, is right out of a dream. The piece-de-resistance on the second floor is the stupefying and amazing home office / media room. It could also be used as an overflow space, with pullout sofa, for overnight guests. Flooded with sunlight from the massive windows.

The lower level has been finished to the same caliber as the rest of the home. Third cozy bedroom. Superb full bath. Laundry room, with walk-out to the back garden, where washing clothes is not a chore. Park behind the remotely controlled back gate. For buyers with two cars, a future Romax double parking system can easily solve that issue. It even gets better: the property backs onto Milan Street, which is plowed by the city in winter and rubbish bins can be placed there for ease. Excellent highway access. Even though there is great parking, a Walk Score of 94 a Bikers Score of 98 means you can cancel your gym membership. Walk to work in the financial district in less than 15 minutes. Cycle to the discovery, university, or hospital districts in about the same time. Close proximity to the Distillery, St. Lawrence Market areas for live theatre and terrific night life. Set half way between vibrant Yonge Street downtown and foodie centric Cabbagetown, along Parliament Street: rustic pizza at Salt and Tobacco cappuccino at Jet Fuel deep fried Taiwanese style chicken at Kanpai Sunday night roast at the House on Parliament. Your food cravings are easily satisfied. Eponymous Daniel et Daniel gourmet food shop and the little Lcbo store make dinner at home a breeze. Ideal for the discerning single exec or busy professional couple who desires an easy-to-care-for downtown residence, without compromising impeccable quality style. Very urban. Very impressive!