

**GRADE 12 APPLIED  
UNIT B – FINANCIAL MATHEMATICS  
WORKBOOK 2**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**EXTRACTS OF MANITOBA PROVINCIAL EXAMS  
Full solutions are on the marking guide**

Source: Manitoba Education and Advanced Learning School Programs  
Division Winnipeg, Manitoba, Canada

Manitoba Education and Advanced Learning states on their exams that:

*“Permission is hereby given to reproduce this document for non-profit educational purposes provided the source is cited”.*

**[MrF: Common Mistakes in Financial Questions]**

Watch for the following mistakes that are liable for deduction of a [half] mark:

- does not include the dollar sign for monetary values
- does not include the units in the final answer
- does not include units with labels on a graph
- does not express monetary values to two decimal places
- does not include a percent sign
- does not identify the answer (e.g., TVM solver)
- incorrectly states the final answer
- rounds incorrectly
- rounds too soon
- does not express the answer to the appropriate number of decimal places]

**\*\*Be sure to include ‘screen shots’ written (or printed) of your input values and final result when displayed on a calculator\*\***

$$\begin{array}{l}
 N = 12 \\
 I = 10 \\
 PV = 10000 \\
 \square \text{ PMT} = -879.16 \quad \leftarrow \\
 FV = 0 \\
 P/Y = 12 \\
 C/Y = 12
 \end{array}$$

**PROVINCIAL EXAM - FINANCIAL MATHEMATICS JUN 2015**

The value of a house appreciates 4.10% per year. If the house was purchased for \$180 000 in June 2010, what is the approximate value of the house in June 2015?

- A. \$184 000
- B. \$220 000
- C. \$937 000
- D. \$1 003 000

Ans: B. [ C & D are not even realistic! ]

Deema is saving for a home renovation. She deposits \$50.00 every month into a new high-interest savings account that earns 4.60%, compounded monthly.

- a) What will be the value in Deema's account after 4 years? Show your work.
- b) How much interest will she have earned after 4 years? Show your work.

Ans: a) \$2629.47      b) \$229.47

Lisette is 50 years old and would like to retire at age 55. Her assets include \$60 000.00 in a guaranteed investment certificate (GIC), \$78 000.00 in a chequing account, and \$192 000.00 in stocks.

Make two recommendations to help Lisette strengthen her investment portfolio. Justify your recommendations.

Ans: Answers vary

Serge invests \$12 000.00 on his 30th birthday. If his investment earns 6.00% interest, compounded annually, apply the Rule of 72 to estimate how much money he will have when he retires on his 66th birthday.

Ans: \$96 000.00 when he retires [three doublings]

Harsimran invested \$20 000.00 in a simple interest savings bond. After 12 years, the future value of the bond was \$26 768.00.

- a) Determine the annual interest rate.
- b) Determine the rate of return.

Ans:     a) The annual interest rate is 2.82%  
          b) The rate of return is 33.84%

Maurice needs a truck for his new job that will last four years. He has the following two options:

**Option 1:** He can purchase the truck for \$45 194.35 (taxes included) with no down payment, at an interest rate of 4.00%, compounded monthly, for four years.

**Option 2:** He can lease the same truck for four years with a down payment of \$5000.00 and monthly payments of \$850.00 (taxes included). He would be allowed 20 000 km per year and there is a \$0.18 per km (taxes included) charge above this limit.

- a) What would be Maurice's total cost in Option 1 if he makes monthly payments? Show your work.
- b) If Maurice drives 25 000 km annually, what would be his total cost in Option 2? Show your work.
- c) Which option would you suggest to Maurice and why?

Ans: a) Total cost \$48 981.60 b) Total cost \$49 400.00  
c) Answers vary

*\*\*Be sure to include 'screen shots' written (or printed) of your input values and final result when displayed on a calculator\*\**

**PROVINCIAL EXAM - FINANCIAL MATHEMATICS JAN 2016**

Which of the following is an advantage of buying a house?

- A. no maintenance costs
- B. no property taxes
- C. no down payment required
- D. no restrictions on renovations

Ans: D

Select the best answer. Approximately how many years will it take a \$1000.00 investment to double its value at an interest rate of 3.60%, compounded annually?

- A. 5
- B. 7.2
- C. 20
- D. 50

Ans: C

Bruce is 24 years old. He graduated from college when he was 20 and since then he has worked full-time. He has also made some investments. His financial advisor sends him an update on his investment portfolio.

Investment	Initial Investment	Gain / Loss
low-risk mutual fund	\$2000	+ \$100
guaranteed investment certificate	\$6000	+ \$220
bonds	\$4000	+ \$180

- a) What is the overall rate of return on Bruce's investments?
- b) Do you think that Bruce's investment portfolio is appropriate for him at this stage of his life? Justify your answer, stating your assumptions.

ANS: a) rate of return is 4.17% b) answers vary

Pedro has a tax-free savings account (TFSA) with a balance of \$5000.00. Interest is earned at a rate of 4.00%, compounded monthly. If Pedro contributes \$400.00 to the TFSA at the end of every month, how long will it take him to save \$20 000.00? Show your work.

Ans: 34.06 months to save \$20 000.00

Kira purchases a sofa for \$1015.87 (taxes included). The department store offers her a promotion of 0% interest with no payments for one year. If Kira does not pay the amount in full within one year, interest will be charged from the date of purchase at an annual rate of 28.80%, compounded monthly.

- a) If Kira does not make any payments, what will the department store bill her one year after the date of purchase? Show your work.
- b) State a different compounding period such that the overall cost of the sofa is lower than if the annual interest rate were compounded monthly.

Ans: a) \$1350.32 one year after the date of purchase  
b) Any compounding period longer than monthly

Bill and Celine purchase a new home. They obtain a \$375 000.00 mortgage amortized over 25 years with their credit union. The initial 5-year term of the mortgage requires monthly payments. Interest is calculated at a rate of 3.25%, compounded semi-annually.

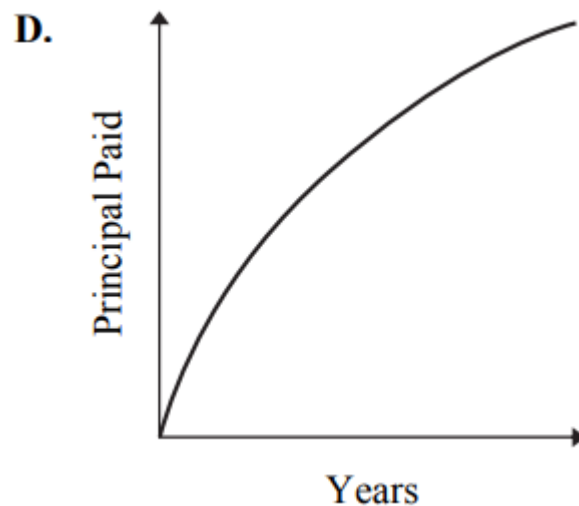
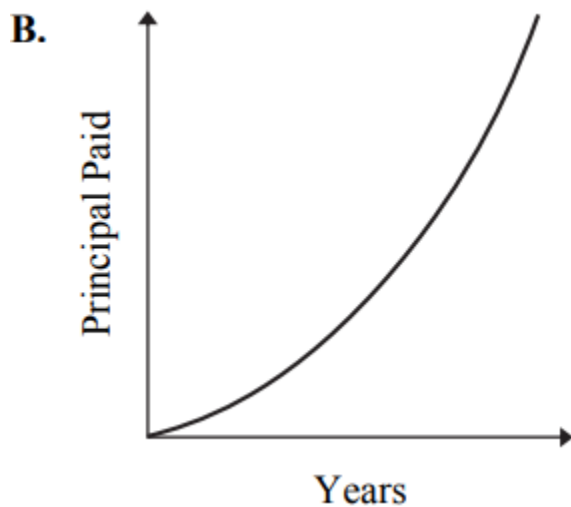
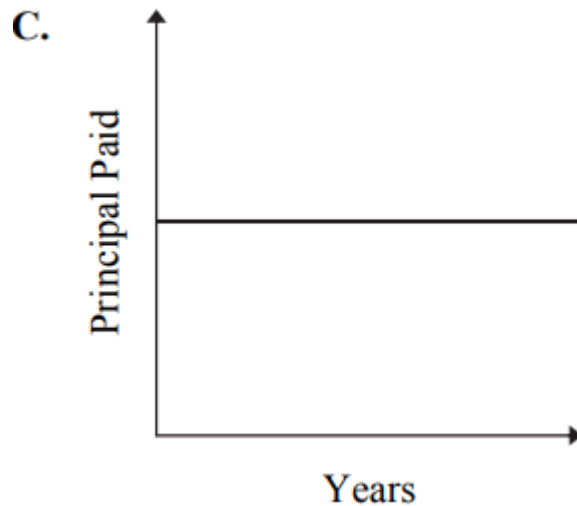
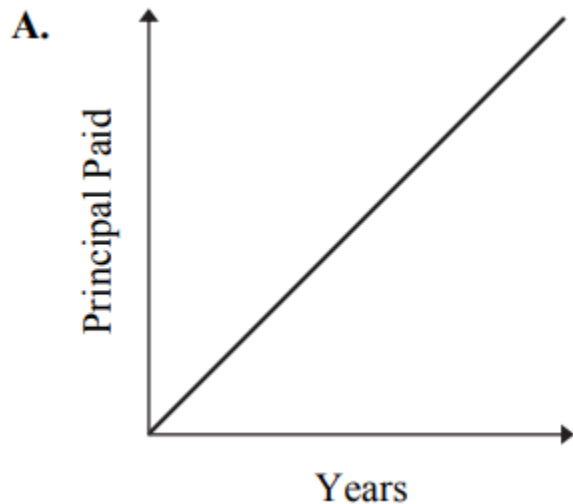
- a) Calculate Bill and Celine's mortgage payment. Show your work.
- b) How much will Bill and Celine owe at the end of their 5-year term?
- c) Bill and Celine make an additional \$10 000.00 payment on the principal at the end of the 5-year term. How much sooner will they pay off their mortgage if they keep the same payments and interest rate over the life of the mortgage? Show your work

Ans: a) monthly payment is \$1823.12  
b) They will owe \$322 054.57 after 5 years  
c) They will pay off their mortgage 10.32 months sooner

**\*\*Be sure to include 'screen shots' written (or printed) of your input values and final result when displayed on a calculator\*\***

**PROVINCIAL EXAM - FINANCIAL MATHEMATICS JUN 2016**

*Select the best answer.* Which of the following graphs shows the amount of principal paid on each payment over a 25-year mortgage?



ANS: B



Select the best answer. The price of a new car is \$26 000 (taxes included). It depreciates at a rate of 20% per year. What is the approximate residual value of the car after 3 years?

- A. \$10 400
- B. \$13 300
- C. \$15 600
- D. \$20 800

ANS: B

Use the following information to answer this question and select the best answer.

**Scenario 1:** A loan of \$30 000.00 at an interest rate of 7.00%, compounded monthly for 1 year

**Scenario 2:** A loan of \$30 000.00 at an interest rate of 7.00%, compounded \_\_\_\_\_ for 1 year

Assuming no payments are made, which compounding period frequency in Scenario 2 would result in less interest than in Scenario 1?

- A. every two weeks
- B. daily
- C. semi-annually
- D. weekly

ANS: C

Mr. and Mrs. Murthy have a total monthly gross income of \$6000.00. They are interested in purchasing a house with a mortgage payment of \$1300.00 per month, annual heating costs of \$2100.00, and annual property taxes of \$3675.00.

Calculate the gross debt service ratio (GDSR).

Determine if a bank is likely to offer them a mortgage. Justify your answer.

Ans: Yes, the bank will likely offer them a mortgage since the GDSR is below 32%

Gabrielle wants to buy a cabin at Lac du Bonnet that costs \$165 000.00. She has saved \$25 000.00 that she will use as a down payment. The bank will give her a 15-year mortgage for the balance at 3.49%, compounded semi-annually.

- a) What will Gabrielle's payment be every two weeks? Show your work
- b) If the cabin appreciates in value an average of 3.00% per year, calculate the appreciated value of the cabin after 10 years.
- c) How much equity will Gabrielle have in the cabin after 10 years?

Ans: a) Her payment will be \$460.45  
b) The cabin will be valued at \$221 746.20  
c) She will have \$166 815.40 in equity after 10 years

At the age of 30, Alfred began investing \$350.00 monthly into an investment account at an interest rate of 7.00%, compounded monthly. When he turned 45, the interest rate on this investment decreased to 5.00%, compounded monthly. Alfred plans to continue making monthly investments until he retires at 58.

a) How much money will Alfred have in his account when he retires?  
Show your work

b) Alfred withdraws \$2000.00 per month from his account after he retires. If the interest rate remains at 5.00%, how many months can he withdraw \$2000.00?

c) Alfred's sister, Marianne, retires at the age of 60. Her portfolio is valued at \$200 000.00, earning 5.00%, compounded monthly. If Marianne wants the money to last until she is 85 years old, what is the maximum she can withdraw each month? Show your work.

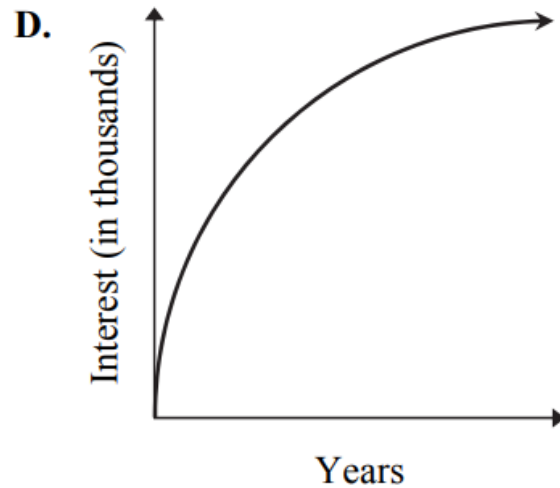
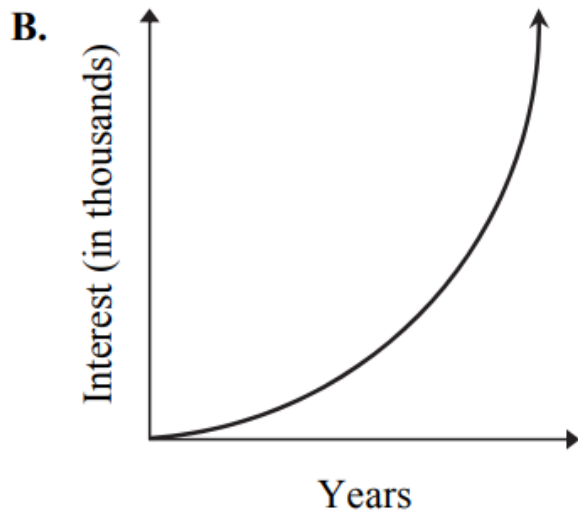
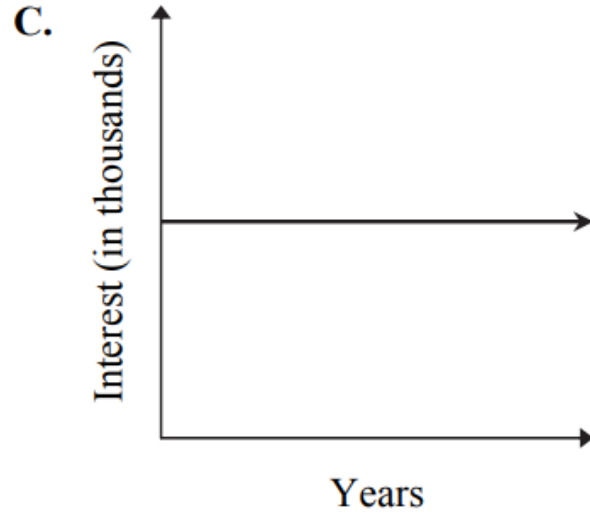
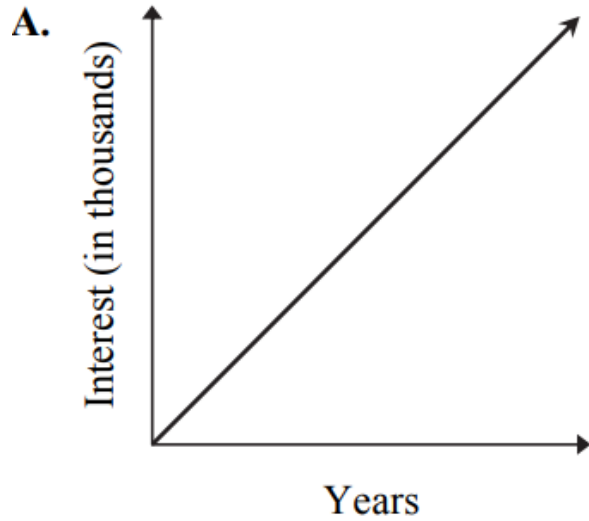
ANS: a) Alfred will have \$288 905.49 at retirement

b) He can make withdrawals for 221 months

c) Marianne can withdraw a maximum of \$1169.18 each month

**PROVINCIAL EXAM - FINANCIAL MATHEMATICS JAN 2017**

Select the best answer. Which of the following graphs shows the total amount of interest paid over the course of a 25-year mortgage?



Ans: D

Select the best answer. According to the Rule of 72, a reasonable estimate for the time it would take to double an investment of \$24 000.00 at an interest rate of 6.00%, compounded monthly is:

- A. 3 years
- B. 4 years
- C. 12 years
- D. 18 years

ANS: C

Imani is going to buy a car. She can afford monthly payments of \$600.00. The dealer offers two financing options:

**Option 1:** financing over 60 months at a rate of 0.90% compounded monthly

**Option 2:** financing over 60 months at a rate of 2.90% compounded monthly with an instant rebate of \$3000.00 at the time of purchase

Which option allows Imani to purchase a more expensive car? Show your work

Ans: Option 1 : \$35 189.11   Option 2: \$36 474.14  
Option 2 allows Imani to purchase a more expensive car.

Your friend has \$10 000.00 and is considering an investment in stocks, a guaranteed investment certificate (GIC), or rare collectibles. Choose one of the three investments mentioned above and indicate one advantage and one disadvantage for your choice.

Ans: Answers vary

When she turned 25, Alexa began investing \$400.00 monthly into a mutual fund account producing average returns of 6.00%, compounded monthly. Alexa will stop contributing when she retires at age 55.

- a) How much money will her investment be worth at retirement? Show your work.
- b) Alexa will withdraw \$2500.00 per month from her account after retiring. If the average return rate stays the same, how old will she be when the account balance is zero? Show your work.

Ans:

- a. Her investment will be worth \$401 806.02 at retirement
- b. She will be 82 years old when the account balance is zero.

Shirley and Cameron have just moved to Brandon and are considering the two following housing options:

**Option 1:** House for purchase

- purchase price of \$249 000.00
- down payment of \$50 000.00 required
- 25-year mortgage at an interest rate of 3.00%, compounded semi-annually

**Option 2:** Apartment for rent

- monthly payments of \$1300.00
- monthly parking fees of \$60.00

- a) What would be Shirley and Cameron's monthly mortgage payment with Option 1? Show your work
- b) What will be the total amount paid for each option at the end of 10 years?
- c) State one advantage of renting the apartment.

Ans:

- a) Shirley and Cameron's monthly mortgage payment would be \$941.76
- b) Total amount paid for Option 1: \$163 011.20  
Total amount paid for Option 2: \$163 200.00
- c) various answers