GRADE 12 APPLIED MATHEMATICS (40S)

Final Practice Examination

Grade 12 Applied Mathematics

Final Practice Examination

Name: _____

Student Number: _____

Attending ❑ Non-Attending ❑

Phone Number: _____

Address: _____

_____

_____

For Marker's Use Only

Date: _____

Final Mark: _____ /100 = _____ %

Comments:

Instructions

The final examination is based on Modules 5 to 8 of the Grade 12 Applied Mathematics course. It is worth 25% of your final mark in this course.

Time

You will have a maximum of **3.0 hours** to complete the final examination.

Format

The format of the examination will be as follows:

Part A: Games and Numbers	4 marks
Part B: Financial Mathematics	42 marks
Part C: Techniques of Counting	18 marks
Part D: Sinusoidal Functions	18 marks
Part E: Design and Measurement	18 marks
Total	100 marks

(see over)

Notes:

You are allowed to bring the following to the examination: pens/pencils (2 or 3 of each), metric and imperial rulers, a graphing and/or scientific calculator, and your Final Exam Resource Sheet. Your Final Exam Resource Sheet must be handed in with the examination.

Graphing and financial applications technology (either computer software or a graphing calculator) **are required** to complete this examination.

Show all calculations and formulas used. Use all decimal places in your calculations and round the final answers to the correct number of decimal places. Include units where appropriate. Clearly state your final answer. Final answers without supporting calculations or explanations will **not** be awarded full marks. Indicate equations and/or keystrokes used in calculations.

When using graphing technology, include a screenshot or printout of graphs **or** sketch the image and indicate the window settings (maximum and minimum x- and y-values), increments, and axis labels, including units. When using a financial TVM solver, state all input values used (N, I%, PV, PMT, FV, P/Y, C/Y) and the results of calculations.

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Answer all questions to the best of your ability. Show all your work.

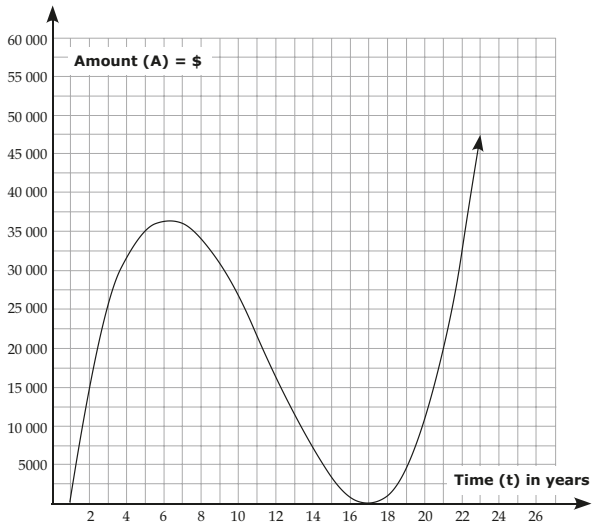
Part A: Games and Numbers *(4 marks)*

1. A quarter is worth $0.25, a dime is worth $0.10, and a nickel is worth $0.05. Ava has coins in her pocket worth $3.70. She tells you she has 1 dime and equal numbers of quarters and nickels. How many coins does she have in her pocket? *(4 marks)*

Part B: Financial Mathematics *(42 marks)*

1. Circle the graph below that best represents the dollar value of an investment earning compound interest over a period of years. *(1 mark)*

A



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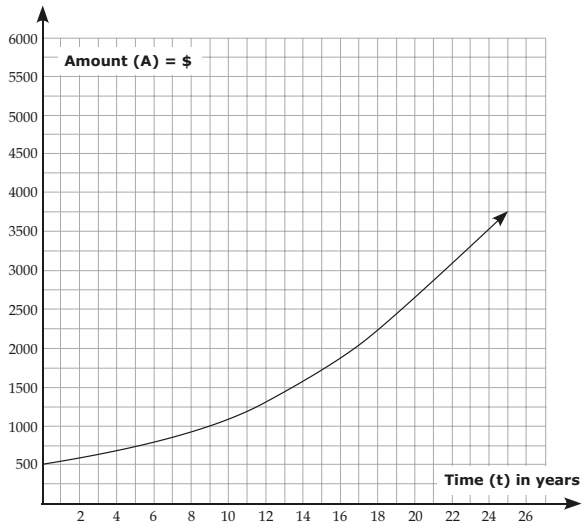
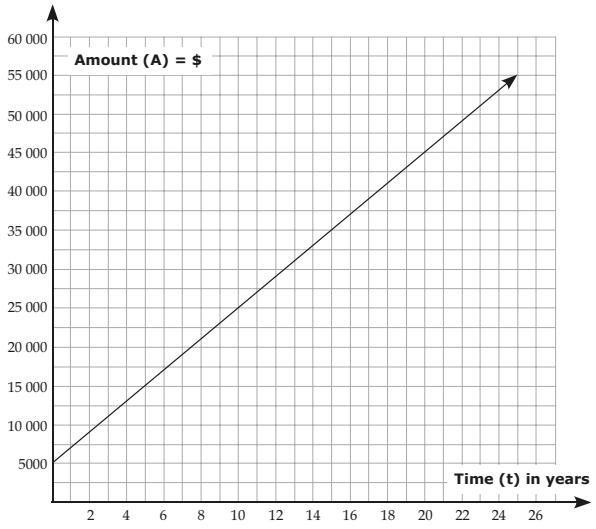
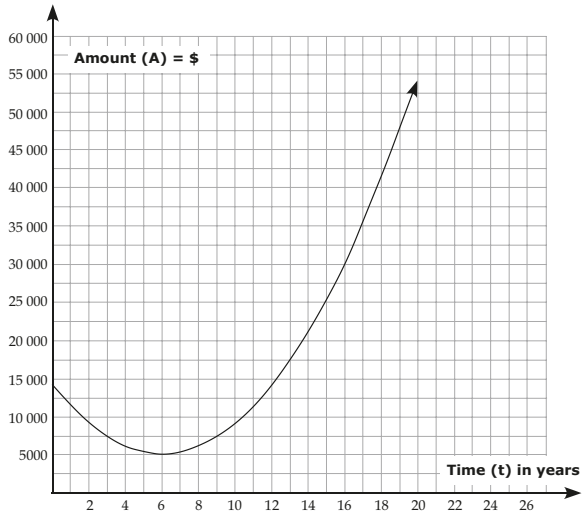


C



D



Name: _____

2. Name a situation in which compound interest is earned or paid. *(1 mark)*

3. Mireille invests $1000 in a term deposit at 3%, compounded annually for 5 years. Nathanael invests $1000 in a term deposit at 3%, compounded weekly for 5 years.
   a) Who will earn more in interest? Explain. *(1 mark)*

   b) How much are these investments worth after 5 years? *(1 mark)*

4. Keith takes out a car loan from his bank for $33 999. He negotiates a 5-year term at 3.75%, compounded semi-annually and paid monthly.
   a) Calculate the amount of his monthly payment. *(2 marks)*

b) Determine the amount of interest he will pay over the term of this loan. *(2 marks)*

5. KaranVeer is negotiating the terms of a mortgage with his bank. The house he would like to purchase is $210,000. He has a down payment of $42,000 available. The bank offers him a 25-year term at 3%, compounded monthly.

   a) Determine his monthly payment amount and the total interest paid if he accepts these terms. *(2 marks)*

Name: _____

b) If KaranVeer divided the monthly payment in half and paid that amount every two weeks instead, how many payments would be required to pay off the mortgage? *(1 mark)*

c) If KaranVeer makes his payments every two weeks, how much interest will he have saved by the end of the mortgage? *(1 mark)*

d) Suggest two other specific things KaranVeer could change in the terms of his mortgage to reduce the total amount of interest paid. *(1 mark)*

Name: _____

6. Thomas considers purchasing new furniture worth $999 (including taxes) from a store that offers a "Buy now, pay later" promotion. He reads the fine print: A 15% deposit of total sale (including taxes) and a processing fee of $79.95 are due at the time of purchase. Balance is due 12 months from the date of purchase. Outstanding balances are subject to 29% annual interest, compounded monthly, from the date of purchase.

   Thomas pays the appropriate amount at the time of purchase but is one day late in paying his balance after the 12 months. What is the total amount he will pay for the furniture? *(4 marks)*

7. You compare the offers from a dealership to either buy or lease a car. The price for the vehicle is $24,999 plus taxes. You have a $5000 down payment for either option.

   The lease is over 4 years and payments are $300 plus 13% tax per month. The residual value is set at 45%. You would take the option to purchase it after the four years and pay for it outright (include 13% taxes). There is a lease acquisition fee of $649.

   To finance the car with monthly payments over 48 months, the bank offers you a loan with an interest rate of 6.5%, compounded monthly.

   a) Find the monthly payment if you finance the car. *(2 marks)*

   b) Find the total amount of interest you pay over the loan period. *(1 mark)*

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c) Find the total cost to lease the car and buy it out at the end of the term. *(3 marks)*

d) How much do you save by purchasing instead of leasing and then buying it out? *(2 marks)*

e) Describe two situations when leasing might be a better option than buying a depreciating asset such as a car. *(2 marks)*

8. Approximately how long will it take for an investment to double in value if it is invested at 8%, compounded interest? *(1 mark)*

9. Tanya likes to buy a coffee and muffin each morning. However, this year she is training for a marathon and decides to forgo this daily routine and puts the $4.95 she saves each day into a Growth Fund account. The account is compounded daily at 4.5%. How much will she have saved after one year? *(2 marks)*

Name: _____

10. Naomi purchases 75 shares in a certain stock. The purchase price is $44.13 per share. Her broker charges $25 plus $0.06 per share each time she buys or sells shares. If she sells her shares three years later for $52.60 per share, what is the rate of return on her investment? *(3 marks)*

11. Scott thinks he can afford to pay $1000 per month for a mortgage payment for a property that has annual property taxes of $2400 and heating costs estimated at $62 per month. His gross monthly income is $3450. Based on this information, should he expect the bank to lend him the money to buy the house? Justify your answer. *(4 marks)*

12. Mehrit and Yacob are saving for a down payment on a home. Mehrit suggests they invest $200 every two weeks for 3 years in a term deposit earning 5.4%, compounded bi-weekly. Yacob suggests they rather invest a lump sum of $4800 each year for three years in a term deposit at 5.4%, compounded annually. Determine whose investment strategy will result in larger savings for a down payment. Justify your answer. *(5 marks)*

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Part C: Techniques of Counting (18 marks)

1. a) How many ten-digit telephone numbers can be created if they must begin with area code 204? *(2 marks)*

   b) What assumptions are you making? *(1 mark)*

2. Represent the following situation with a graphic organizer such as a tree diagram or table to illustrate all the ways in which you can both choose one marble from a box containing blue, red, and green marbles, as well as flip a coin and have it land either heads or tails. *(3 marks)*

3. In how many ways can five sets of twins be arranged in a row for a photo if each set must be seated together? State your answer in factorial notation and solve. *(2 marks)*

4. In how many ways can the letters in the word EXAMINATION be arranged? Show your work. *(3 marks)*

5. Lillia is arranging flowers into a bouquet for her grandmother. If she has 7 different coloured daisies and 8 different types of roses, in how many ways can she make a bouquet containing four daisies and three roses? Show your work. *(3 marks)*

6. Rani's locker code consists of three different numbers each of which is from one to twenty-nine. What is the probability her locker code uses only single-digit numbers? *(4 marks)*

Name: _____

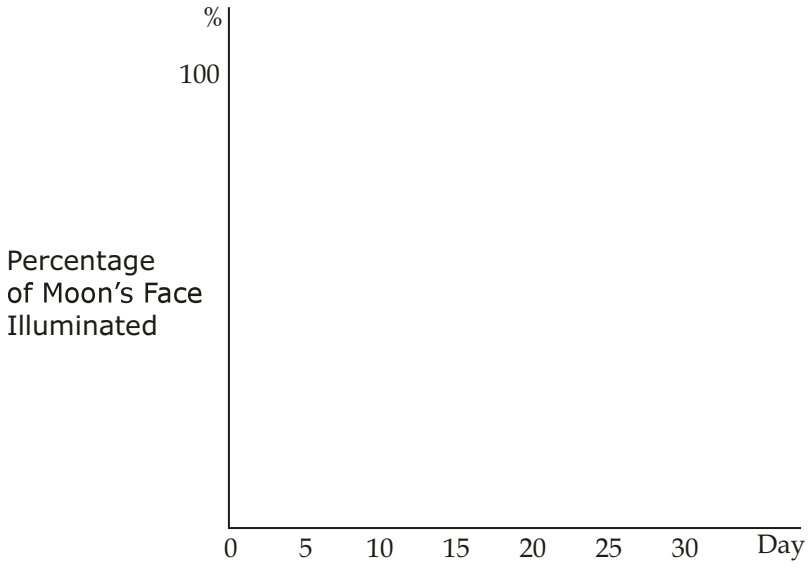
Part D: Sinusoidal Functions (*18 marks*)

1. The phases of the moon cycle between new moon, first quarter, full moon, and last quarter in the period of a lunar month. During a full moon, 100% of the moon's visible surface is illuminated, while 50% is visible on the first and last quarters, and 0% of the moon's visible surface is illuminated at new moon.

   Keith observes the moon through his telescope on various nights during the month of January and calculates the approximate percentage of the moon's visible surface that is illuminated. He records his data in a table.

Date	% Illuminated
Jan. 3	12
Jan. 6	39
Jan. 9	70
Jan. 11	87
Jan. 15	100
Jan. 19	80
Jan. 24	29
Jan. 26	12
Jan. 27	6

   a) Sketch a graph of this data. You may use technology and print a copy of the graph created, or sketch it below. *(3 marks)*



b) What is the range of y-values in this situation? Write it in set notation. *(2 marks)*

c) State the maximum and minimum y-values possible. What phase of the moon do these values represent? *(2 marks)*

d) What is the amplitude in this situation? *(1 mark)*

e) What is the median value in this situation? *(1 mark)*

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f) Use technology to determine a sinusoidal regression equation that models this data, or calculate the values for a, b, c, and d from the information given to determine the equation. (**Note:** The next full moon Keith observed was on February 13th.) *(5 marks)*

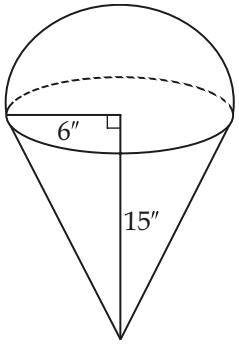
g) Use technology or the sinusoidal regression equation to determine the approximate date in January of a first-quarter moon. This occurs when 50% of the moon's visible surface is illuminated, and the phases are increasing towards a full moon. *(2 marks)*

h) If there are two full moons in one given month, the second full moon that occurs is called a "Blue Moon." Are there any months in the year during which it would be impossible for a "Blue Moon" to occur? Explain your answer. *(2 marks)*

Name: _____

Part E: Design and Measurement (*18 marks*)

1. The three-dimensional solid (shown below) is to be constructed out of plastic, which costs $1.87 per cubic foot.



a) Determine the cost to produce the solid. *(6 marks)*

b) If it costs 0.8¢ per square inch to apply a spray finish to the outside surface of the object, determine the cost of finishing. *(6 marks)*

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2. Denis has $50 to create a flower garden for his mother. He must put down 4 inches of topsoil, add fertilizer, and plant the flowers. The topsoil costs $1.79 per cubic foot. The fertilizer costs $0.58 per square foot, and flowers are $0.79 each. He would need three flowers per square foot. All costs already include taxes.

   a) Determine the maximum size of garden he can create within his $50 budget. Show your work. *(5 marks)*

b) Sketch a diagram showing the shape and dimensions of a potential garden within his budget. *(1 mark)*