Final Practice Examination
Answer Key
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Name: ___________________________________

Student Number: ___________________________

Attending  □  Non-Attending  □

Phone Number: ____________________________

Address: _________________________________

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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.
Name: _________________________________

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)

   Answer: (Modules 1 to 8, Cover Assignments)

   Strategies may vary. For example, you may use reasoning, model the situation algebraically, or make a systematic list.

   Method 1:

   Since there is 1 dime, the value of the quarters and nickels is $3.60. Four quarters and four nickels are worth $1.20. We want $3.60 so we need 3 such groups of quarters and nickels. Therefore, she has 12 quarters, 12 nickels, and 1 dime for a total of 25 coins.

   Method 2:

   \[0.10 + 5(x) + 25(x) = 3.70\]
   \[30x = 3.60\]
   \[x = 12\]

   She has 12 nickels, 12 quarters, and 1 dime for a total of 25 coins.

   Method 3:

   \[
   \begin{array}{|c|c|c|c|}
   \hline
   \text{Number of Dimes} & \text{Number of Nickels} & \text{Number of Quarters} & \text{Value} \\
   \hline
   1 & 1 & 1 & 0.10 + 0.05 + 0.25 = 0.40 \\
   1 & 10 & 10 & 0.10 + 0.50 + 2.50 = 3.10 \\
   1 & 11 & 11 & 0.10 + 0.55 + 2.75 = 3.40 \\
   1 & 12 & 12 & 0.10 + 0.60 + 3.00 = 3.70 \\
   \hline
   \end{array}
   \]

   She has 1 dime, 12 nickels, and 12 quarters for a total of 25 coins.
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)

Answer: (Module 5, Lesson 1)
Graph B.
2. Name a situation in which compound interest is earned or paid. (1 mark)
   Answer: (Module 5, Lesson 1)
   Answers may vary. Possible solutions include mortgages, loans, credit cards, and investments.

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)
      Answer: (Module 5, Lesson 1)
      Nathanael. His investment is compounded more often.
   
   b) How much are these investments worth after 5 years? (1 mark)
      Answer: (Module 5, Lesson 1)
      Mireille: \( A = $1159.27 \)
      Nathanael: \( A = $1161.78 \)

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)
      Answer: (Module 5, Lesson 3)
      
      The image below shows the values using a TVM solver to calculate the payment.

      \[
      \begin{array}{c}
      N=60 \\
      I\%=3.75 \\
      P V=33999 \\
      \text{PMT}= -621.872296 \\
      F V=0 \\
      P / Y=12 \\
      C / Y=2 \\
      \text{PMT: END BEGIN}
      \end{array}
      \]

      His monthly payment will be $621.87.
b) Determine the amount of interest he will pay over the term of this loan. (2 marks)

Answer: (Module 5, Lesson 3)

Method 1:
Add up all payments and subtract the principal.

\[621.87 \times (5 \times 12) - 33\,999 = \$3313.20\]

Method 2:
The first two lines in the image below show the value using the TVM solver “sum of interest” command for payments 1 to 60. The other calculations show the total amount paid in 60 payments, minus the principal, as shown in Method 1.

\[
\begin{array}{c}
\Sigma \text{Int} (1, 60) \\
3313.337759 \\
(621.87 \times 12) - 33 \\
999 \\
3313.2
\end{array}
\]

Using the TVM solver: \$3313.34

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)

Answer: (Module 5, Lesson 3)

Use the TVM solver to calculate the payment.

\[
\begin{array}{c}
N=300 \\
I\%=3 \\
PV=168000 \\
PMT=-796.67500... \\
FV=0 \\
P/Y=12 \\
C/Y=12 \\
PMT=\text{END BEGIN}
\end{array}
\]

His monthly payment would be \$796.68.
The total interest paid can be calculated using the TVM solver “sum of interest” command, as shown in the first two lines of the image below. Alternately, the interest can be calculated by adding up all payments and subtracting the principal, as shown in the next three lines of the image below.

\[
\sum \text{Int}(1,300) = 71,002.50218 \\
796.68 \times 25 \times 12 - (21,000 - 42,000) = 71,004
\]

The total interest paid would be about $71,002.50 or $71,004.00.

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)

Answer: (Module 5, Lesson 3)

Use the TVM solver to calculate the number of payments after calculating the value of the bi-weekly payment.

\[
796.68 \div 2 = 398.34
\]

\[
\begin{array}{|c|}
\hline
N=578.0348905 \\
I%=3 \\
PV=168000 \\
PMT=-398.34 \\
FV=0 \\
P/Y=26 \\
C/Y=12 \\
PMT: \text{\underline{BEGIN}} \\
\hline
\end{array}
\]

579 payments are required (or 578 full payments and a 579th partial payment).
c) If KaranVeer makes his payments every two weeks, how much interest will he have saved by the end of the mortgage? (1 mark)

Answer: (Module 5, Lesson 3)

Use the TVM solver to calculate the interest earned over 579 payments, as shown in the first two lines of the image below. Alternately, calculate the interest by adding up all payments and subtracting the principal.

The amount of interest saved is the difference between the answers in parts (a) and (c).

He would save about $8748.08.

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)

Answer: (Module 5, Lesson 3)

Answers may vary. Possible solutions may include one of the following:

- Shorten the length of the mortgage to 15 or 20 years instead of 25.
- Increase his monthly payment amount to $800 or $850.
- Increase his payment frequency to $400 semi-monthly, $400 biweekly, or $200 weekly.
- Make annual lump-sum contributions to reduce the principal.
- Negotiate a lower interest rate.
- Increase the amount of his down payment.
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)

Answer: (Module 5, Lesson 2)

He will pay $229.80 at the time of purchase and the remaining $849.15 is due within 12 months. Since he is one day late in paying the balance, he is charged 29% interest on this amount for the 12 months and owes $1130.92.

Method 1:
Use the TVM solver to calculate the future value, FV.

\[
\begin{align*}
N & = 1 \\
I/Y & = 29 \\
PV & = -849.15 \\
PMT & = 0 \\
FV & = 1130.920447 \\
P/Y & = 1 \\
C/Y & = 12 \\
P/M & = END \text{ BEGIN}
\end{align*}
\]

The furniture costs him $229.80 + $1130.92 = $1360.72.

Method 2:
Use the compound interest formula to calculate the future amount, A.

\[
A = 849.15 \left(1 + \frac{0.29}{12}\right)^{1 \times 12}
\]

\[
A = 1130.92
\]

The furniture costs him $229.80 + $1130.92 = $1360.72.
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)
   
   Answer: (Module 5, Lesson 6)
   
   Add taxes to the total cost and find the principal of the loan after the down payment.
   
   \[ 24999 \times 1.13 \times 5000 = 23248.87 \]

   Use the TVM solver to calculate the payment.

   \[
   \begin{array}{l}
   N=48 \\
   I%=6.5 \\
   PV=23248.87 \\
   PMT=-551.34585... \\
   FV=0 \\
   P/Y=12 \\
   C/Y=12 \\
   PMT:END BEGIN
   \end{array}
   \]

   The monthly payment would be $551.35 per month.

b) Find the total amount of interest you pay over the loan period. (1 mark)
   
   Answer: (Module 5, Lesson 6)
   
   Depending on the method used, the total interest paid is $3215.73 or $3215.93.

   \[
   \Sigma \text{Int}(1,48) = -3215.73117 \\
   551.35 \times 48 = 23248.87 \\
   3215.93
   \]
c) Find the total cost to lease the car and buy it out at the end of the term. (3 marks)
   Answer: (Module 5, Lesson 6)
   48 payments + down payment + acquisition fee + residual value = total cost
   \[ 48 \times (300 \times 1.13) + 5000 + 649 + (24,999 \times 0.45 \times 1.13) = 34,632.99 \]
   The total cost is $34,632.99.

d) How much do you save by purchasing instead of leasing and then buying it out? (2 marks)
   Answer: (Module 5, Lesson 6)
   To purchase the car with financing: \[ 551.35 \times 48 + 5000 = 31,464.80 \]
   Total cost to purchase is $31,464.80, a savings of $3168.19 over leasing.

e) Describe two situations when leasing might be a better option than buying a depreciating asset such as a car. (2 marks)
   Answer: (Module 5, Lesson 6)
   Possible answers include 2 of the following:
   - when you want to upgrade every few years and always drive a new car
   - when you always want full warranty coverage
   - when you can write off a portion of the lease payments as a business expense
   - when you want lower payments than typically given for loan payments
   - when you cannot get a loan
   - when you don’t want to worry about having to sell the car in a couple of years
8. Approximately how long will it take for an investment to double in value if it is invested at 8%, compounded interest? (1 mark)

Answer: (Module 5, Lesson 1)

\[ \frac{72}{\text{interest rate}} = \text{approximate years to double} \]

\[ \frac{72}{8} = 9 \]

It will take about 9 years to double.

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)

Answer: (Module 5, Lesson 4)

\begin{verbatim}
FV=1847.902084
\end{verbatim}

After one year, she will have saved $1847.90 by investing her coffee and muffin money.
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)

Answer: (Module 5, Lesson 5)

\[75 \times 44.13 = 3309.75 \quad \text{Amount invested}\]
\[75 \times 52.60 = 3945.00 \quad \text{Value of shares when sold}\]
\[3945 - 3309.75 = 635.25 \quad \text{Amount earned}\]
\[75 \times 0.06 = 4.50\]
\[4.50 + 25 = 29.50 \quad \text{Broker fees}\]
\[635.25 - 29.5 = 576.25 \quad \text{Profit}\]

\[\text{ROR} = \frac{576.25}{3309.75}\]

\[\text{ROR} = 0.1741\]

Her rate of return is 17.4%

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)

Answer: (Module 5, Lesson 5)

Calculate the Gross Debt Service (GDS) ratio. It must be less than 32%.

\[\text{GDS ratio} = \frac{\left( \frac{\text{monthly mortgage payment}}{\text{monthly monthly}} + \frac{\text{monthly property taxes}}{\text{monthly costs}} + \frac{\text{monthly heating costs}}{\text{monthly costs}} \right)}{\text{Gross Monthly Income}}\]

\[\text{GDS ratio} = \frac{1000 + \left( \frac{2400}{12} \right) + 62}{3450}\]

\[\text{GDS ratio} = \frac{1262}{3450} \approx 0.3657 \approx 37\%\]

Since the Gross Debt Service ratio is 37%, which is greater than 32%, the bank is not likely to loan him the money.
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)

**Answer:** (Module 5, Lesson 4)

Mehrit’s plan sees them investing a total of $15,600 in $200 contributions 26 times per year. Yacob would invest $14,400 over the three years in three payments. This is the equivalent of $400 per month, but since Mehrit invests bi-weekly, she contributes $5200 per year.

<table>
<thead>
<tr>
<th>Mehrit</th>
<th>Yacob</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=78</td>
<td>N=3</td>
</tr>
<tr>
<td>i%=5.4</td>
<td>i%=5.4</td>
</tr>
<tr>
<td>PV=0</td>
<td>PV=0</td>
</tr>
<tr>
<td>PMT=200</td>
<td>PMT=4800</td>
</tr>
<tr>
<td>FV=-16915.6689</td>
<td>FV=-15191.5968</td>
</tr>
<tr>
<td>P/Y=26</td>
<td>P/Y=1</td>
</tr>
<tr>
<td>C/Y=26</td>
<td>C/Y=1</td>
</tr>
<tr>
<td>PMT:END BEGIN</td>
<td>PMT:END BEGIN</td>
</tr>
</tbody>
</table>

The difference in the savings approaches is: $16,915.67 – $15,191.60.

Following Mehrit’s suggestion, they would save $1724.07 more for their down payment after 3 years.
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)
   
   Answer: (Module 6, Lesson 1)
   
   \[ (1 \times 1 \times 1 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10) = 10^7 \]

   b) What assumptions are you making? (1 mark)
   
   Answer: (Module 6, Lesson 1)
   
   Use all digits from 0 to 9 with repetitions, no restrictions

   Tutor/marker note: Other assumptions could lead to other answers.

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)
   
   Answer: (Module 6, Lesson 1)
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)

Answer: (Module 6, Lesson 2)

Group the five different pairs of twins together.

\[ 5! \times 4! \times 3! \times 2! \times 1 = 5! \times 2! \times 2! \times 2! \times 2! \times 2! = 3840 \]

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

Answer: (Module 6, Lesson 2)

Because there are duplicate As, Is, and Ns, 11! must be divided by 2!2!2! to account for the identical arrangements of the repeated letters.

\[ \frac{11!}{2!2!2!} = 4989600 \]

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)

Answer: (Module 6, Lesson 4)

\[ 7C_4 \times 8C_3 = 1960 \]

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)

Answer: (Module 6, Lesson 3)

The total number of arrangements using any of the numbers is:

\[ 29P_3 = 21924 \]

There are 9 single-digit numbers and the number of arrangements is:

\[ 9P_3 = 504 \]

The probability that the code uses only single-digit numbers is:

\[ \frac{504}{21924} = 0.0229 \]
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.

<table>
<thead>
<tr>
<th>Date</th>
<th>% Illuminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 3</td>
<td>12</td>
</tr>
<tr>
<td>Jan. 6</td>
<td>39</td>
</tr>
<tr>
<td>Jan. 9</td>
<td>70</td>
</tr>
<tr>
<td>Jan. 11</td>
<td>87</td>
</tr>
<tr>
<td>Jan. 15</td>
<td>100</td>
</tr>
<tr>
<td>Jan. 19</td>
<td>80</td>
</tr>
<tr>
<td>Jan. 24</td>
<td>29</td>
</tr>
<tr>
<td>Jan. 26</td>
<td>12</td>
</tr>
<tr>
<td>Jan. 27</td>
<td>6</td>
</tr>
</tbody>
</table>

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)

*Answer:* (Module 7, Lesson 1)

\[\{y \mid 0 \leq y \leq 100, \: y \in \mathbb{R}\}\]

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

*Answer:* (Module 7, Lesson 1)

- The minimum value is 0%. This is at the new moon phase.
- The maximum value is 100%. This is a full moon.

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

*Answer:* (Module 7, Lesson 1)

The amplitude is 50.

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

*Answer:* (Module 7, Lesson 1)

The median value is 50%.
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)

Answer: (Module 7, Lesson 2)

\[
y = 50.7 \sin(0.21x - 1.5) + 49.8
\]

\[
\begin{array}{l}
\text{SinReg} \\
y = a \cdot \sin(bx + c) + d \\
a = 50.72186447 \\
b = 0.2100144947 \\
c = -1.477746545 \\
d = 49.80990515
\end{array}
\]

(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)

Answer: (Module 7, Lesson 2)

On approximately January 7th.
period = \frac{2\pi}{b}

b = \frac{2\pi}{29}

b = 0.217

Phase shift = \frac{-c}{b} \quad y = 50 \sin \left(0.217x - 1.5\right) + 50

7 = \frac{-c}{0.217}

c = -1.5

a = 50

d = 50

If the next full moon is observed on Feb 13th, the period of this function is 29 days.

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)

Answer: (Module 7, Lesson 2)

A Blue Moon could not occur in February, unless it is a leap year, since the period of the lunar cycle is about 29 or 30 days and February usually only has 28 days.

Period calculated from information given: 29 days
Period calculated using equation: 30 days

period = \frac{2\pi}{b}

period = \frac{2\pi}{0.21}

period = 29.9
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.

![Diagram of a solid with dimensions 6" and 15".]  

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

*Answer:* (Module 8, Lesson 1)

Volume of the half sphere is 452.389 in.$^3$  
\[ V_{\text{sphere}} = \frac{4}{3} \pi r^3 \]
\[ V_{\text{sphere}} = \frac{4}{3} \pi 6^3 \]
\[ V_{\text{sphere}} = 904.778 \]

Volume of the half sphere is 452.389 in.$^3$

Volume of the cone is 565.487 in.$^3$

Total volume = 452.389 + 565.487 = 1017.876 in.$^3$

Convert from cubic inches to cubic feet.

\[ \frac{1 \text{ ft.}^3}{(12 \text{ in.})^3} = \frac{x \text{ ft.}^3}{(1017.876 \text{ in.})^3} \]
\[ \frac{1}{1728} = \frac{x}{1017.876} \]
\[ x = 0.589 \text{ ft.}^3 \]

Cost = 0.589 ft.$^3 \times $1.87 $/\text{ft.}^3 = $1.10
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)

*Answer:* (Module 8, Lesson 2)

\[ \text{Surface area of the half sphere} = 226.195 \text{ in.}^2 \]

\[ \text{Slant height} = \sqrt{15^2 + 6^2} \]

\[ s = 16.15549 \]

\[ \text{Total surface area} = 226.195 + 304.524 = 530.719 \text{ in.}^2 \]

Cost = $530.719 \times 0.8$

Cost = 424.575 cents or $4.25
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)

Answer: (Module 8, Lesson 3)

Calculate the cost per square foot of garden area.

Soil: 12” × 12” × 4” = 576 in.³

Since there are 1728 in.³ in a ft.³, he would need 0.3333 ft.³ of soil for each square foot of garden area.

Cost of this topsoil: 0.3333 × 1.79 = $0.60 per square foot
Flowers: 0.79 × 3 = $2.37 per square foot
Fertilizer: 0.58 per square foot

Cost per square foot of garden: 0.60 + 2.37 + 0.58 = 3.55

With $50, he can create \( \frac{50}{3.55} \) = 14.0845 sq. ft. of garden.

He can create a garden with a maximum area of approximately 14 ft.².
b) Sketch a diagram showing the shape and dimensions of a potential garden within his budget. (1 mark)

"Answer: (Module 8, Lesson 3)"

Answers will vary. Possible diagrams are shown below.

3.75 ft. square

or, 2 ft. by 7 ft. rectangle

or, circle with radius of 2.1 ft.