

MBF 3C1

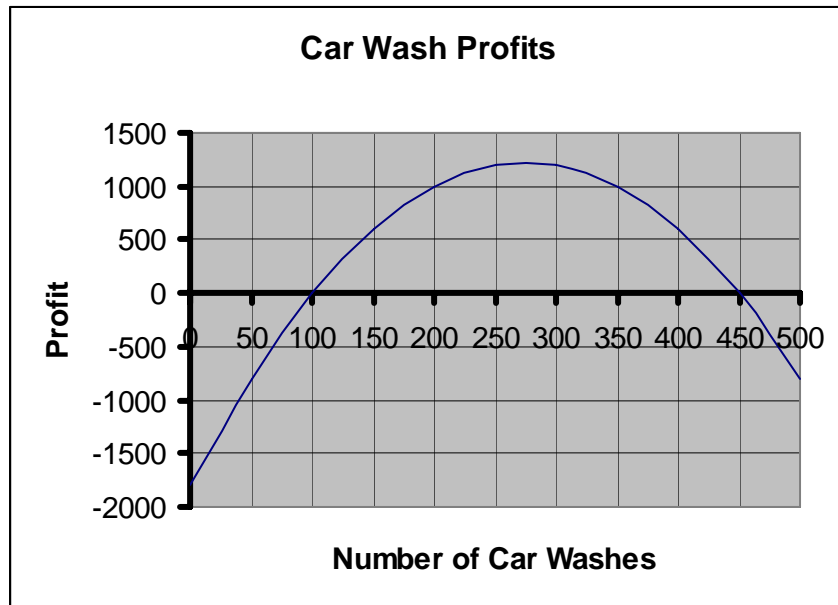
Final Examination

Section	Marks Available	Marks Earned
Section 1 – Multiple Choice	20	
Section 2 – True/False	10	
Section 3 – Full Solution	80	
TOTAL	110	

SECTION 1: MULTIPLE CHOICE – 20 Marks
(Circle answers on your SCANTRON CARD)

Questions 1 to 5 refer to the example below

The fundraising director of a high school has compiled data about the school’s car washes. The data was sent to be analyzed by the Mathematics Team and they produced a written report for the director. The report was emailed to the director but unfortunately, only the graph below was received by the director.



1. What is the maximum profit possible?
 (a) 275 cars (b) \$1500 (c) \$100 and \$450 (d) \$1225

2. How many cars need to be washed in order to make this profit?
 (a) 275 cars (b) 200 cars (c) 100 cars (d) 500

3. If the director would like to make \$1000 profit, how many cars need to be washed?
 (a) 200 cars (b) 350 cars (c) 200 or 350 cars (d) 275 cars

4. A company is said to “break even” when revenue equals expenses, or when profit equals zero. How many car washes are needed for the fundraiser to break even?
 (a) 275 cars (b) 100 cars (c) 100 or 450 cars (d) 0 cars

5. **{PROBLEM SOLVING}** Which of the following equations would best describe the above graph?
 (a) $y = 0.5(x - 275)^2 + 1225$ (b) $y = -275(x - 100)^2 + 450$
 (c) $y = -0.04(x - 275)^2 + 1225$ (d) $y = 2(x - 275)^2 + 1225$

6. The factored form of $y = x^2 - 5x + 6$ is
 (a) $y = (x - 3)(x + 2)$ (b) $y = (x - 3)(x - 2)$ (c) $y = (x + 3)(x + 2)$ (d) $y = (x - 2)(x + 3)$

7. The equation which represents an exponential relationship is
 (a) $y = 2^x$ (b) $y = x^2$ (c) $y = 2x$ (d) $y = x + 2$

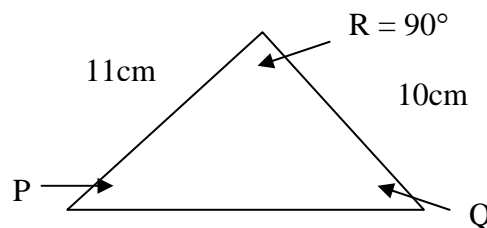
8. An equivalent form of $\frac{1}{a^5}$ is
 (a) a^5 (b) $-a^5$ (c) $\frac{5}{a}$ (d) a^{-5}

Questions 9 to 13 refer to the example below

An RRSP is an investment offered by many financial institutions. In a particular RRSP, which is compounded monthly, the amount in dollars (A) in the RRSP after n months is given by the equation $A = 5000(1.005)^n$

9. What is the principal of the investment?
 (a) \$1.005 (b) \$5000 (c) \$5025 (d) \$0
10. What is the amount in the RRSP after 3 years?
 (a) \$5000 (b) \$5075.38 (c) \$5807.00 (d) \$5983.40
11. What is the amount in the RRSP after 5.5 years?
 (a) \$6949.12 (b) \$5139.06 (c) \$61 668.67 (d) \$5983.40
12. How much **interest** will the RRSP have earned in one year?
 (a) \$5308.39 (b) \$5025.00 (c) \$25.00 (d) \$308.39
13. What is the annual interest rate (compounded monthly) of this RRSP?
 (a) 0.5% (b) 5% (c) 6% (d) 0.06%

Questions 14 to 16 refer to the triangle below



14. The measure of the missing side is
 (a) 221cm (b) 14.87cm (c) 21cm (d) 1cm
15. The measure of the angle at vertex P is
 (a) 42.3° (b) 43.2° (c) 47.7° (d) 132.3°
16. The measure of the angle at vertex Q is
 (a) 42.3° (b) 43.2° (c) 47.7° (d) 132.3°

Questions 17 to 20 refer to the data set below:

1, 1, 2, 2, 2, 3, 4, 4

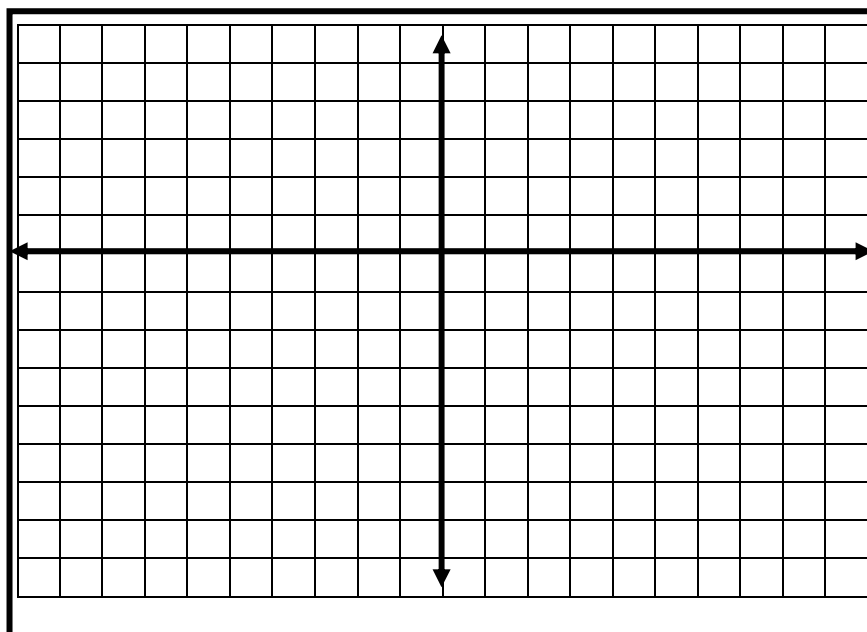
17. The mean of the data is
 (a) 2.375 (b) 2.5 (c) 4 (d) 8
18. The median of the data is
 (a) 1 (b) 2 (c) 2.5 (d) 3
19. The mode of the data is
 (a) 1 (b) 2 (c) 3 (d) 4
20. The range of the data is
 (a) 1 (b) 2 (c) 3 (d) 4

SECTION 2: TRUE AND FALSE – 10 Marks
 (On your SCANTRON CARD, select A for TRUE, B for FALSE)

- | TRUE | FALSE | |
|------|-------|---|
| A | B | 21. The first differences are the same in a linear relation. |
| A | B | 22. The first differences are the same in a quadratic relation. |
| A | B | 23. The second differences are the same in an exponential relation. |
| A | B | 24. The graph of $y = 3^x$ has a y-intercept of (0, 1) |
| A | B | 25. The parabola $y = 3(x - 4)(x + 2)$ has x – intercepts at (-2, 0) and (4, 0) |
| A | B | 26. Doubling the interest rate will half the time it takes for an investment to double its value. |
| A | B | 27. “Categorical data” refers to numbers which may take any value. |
| A | B | 28. A normal distribution is a symmetric, bell-shaped data distribution. |
| A | B | 29. Samples are usually used because they are more accurate than a census. |
| A | B | 30. The probability of rolling a five on a six-sided die is about 17%. |

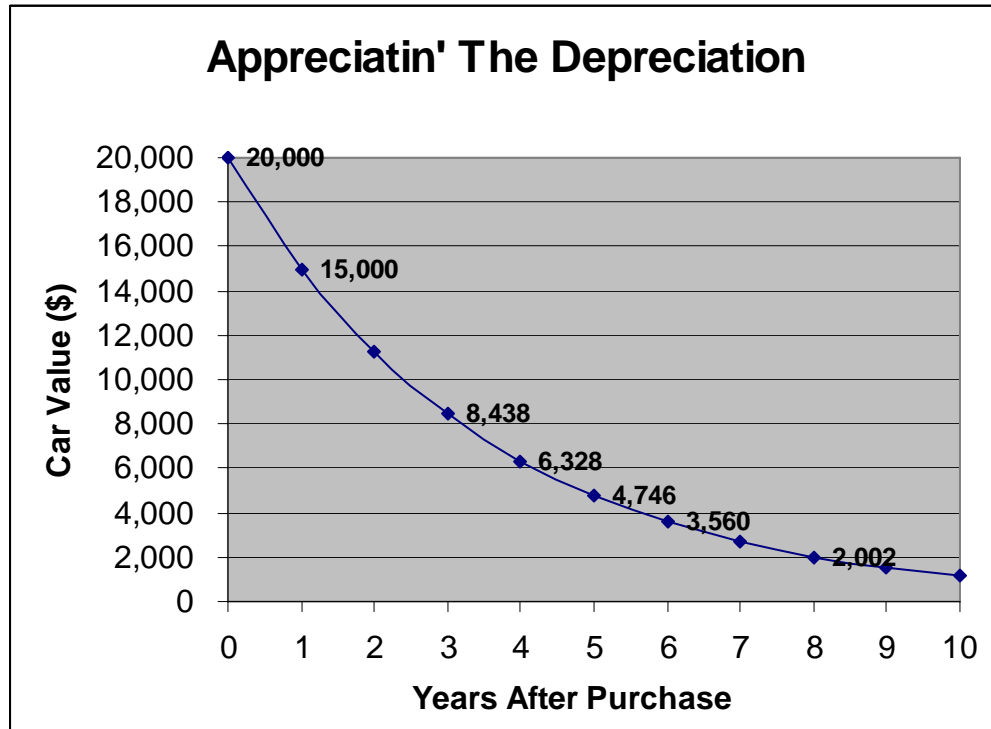
SECTION 3: FULL SOLUTION – 80 Marks
 (Answer on the exam paper)

1. Let a parabola be defined by the equation $y = 2(x - 3)^2 - 8$
- (a) graph the parabola on the grid provided [3 marks]



- (b) write the equation of the parabola in Standard Form [3 marks]
- (c) factor the expression in (b) and write the equation of the parabola in Factored Form [2 marks]

2. The graph below shows the projected value of a car over the next 10 years.



(a) *{COMMUNICATING}* Does this graph show traits of a linear relationship, quadratic relationship, or exponential relationship? Explain your reasoning. [2 marks]

(b) Using the graph, estimate the car's value [4 marks]

- a. originally _____
- b. after 2 years _____
- c. after 7 years _____
- d. after 10 years _____

(c) Based on the graph, what percent of its value does car lose each year?[1 mark]

3. Evaluate the following. [3 marks]

- (a) 2^{-4}
- (b) 1.03^4
- (c) 14.432^0

4. Evaluate, but do not write as a decimal. [3 marks]

- (a) 5^{-2}
- (b) $\left(\frac{2}{3}\right)^2 \times \left(\frac{1}{5}\right)^3$

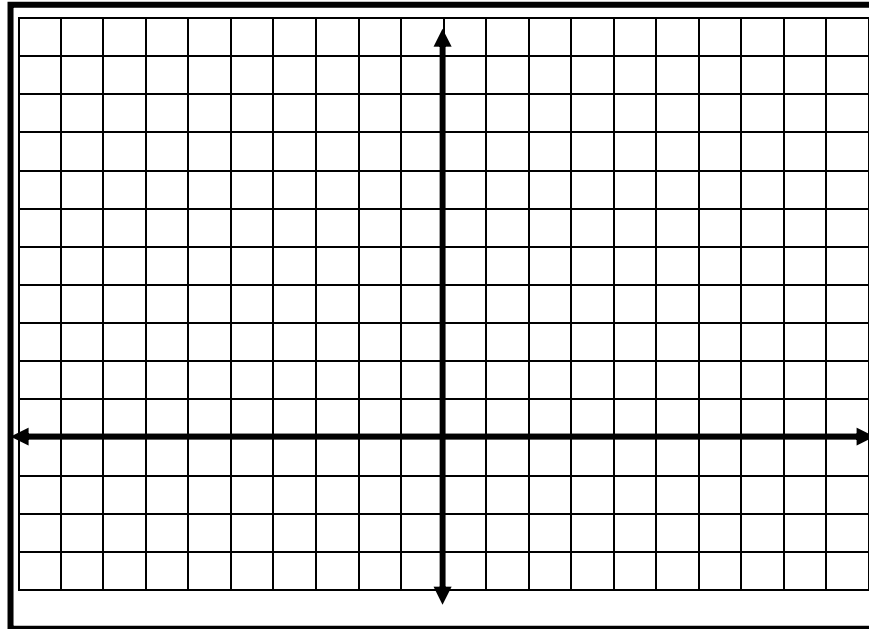
5. Simplify the following. Write each answer as an expression with a single positive exponent. [3 marks]

(a) $4^4 \times 4^5$

(b) $(3^2)^6$

(c) $\frac{2^4 \times 2}{2^9}$

6. Using the grid below, graph the equation $y = 3^x$ [2 marks]



7. (a) How much money is needed in a bank account (which pays 4.8%/a compounded monthly) in order to have \$5000 after 4 years? [2 marks]

(b) How much interest was earned in this situation? [1 mark]

8. You are trying to explain to a friend the power of compound interest. So you use the following example: You will invest \$500 into two bank accounts which each pay 6% interest per year, but the first (Account A) pays simple interest and the second (Account B) pays the interest compounded yearly. How much is in each account after 3 years?

Use the table below to demonstrate the difference between simple and compound interest. [3 marks]

BANK ACCOUNT A	
Year	Amount in Account
0	\$500
1	
2	
3	

BANK ACCOUNT B	
Year	Amount in Account
0	\$500
1	
2	
3	

9. Many financial experts advise that the first step to becoming financial “secure” is to eliminate all credit card debt. They even suggest adding a credit card debt to another loan, such as a mortgage or a line of credit, in order to eliminate the credit card debt.

- (a) Why is it so important to eliminate credit card debt? [1 mark]

- (b) Some credit cards offer incentives to use them. Give an example of such an incentive and describe how it works. [2 marks]

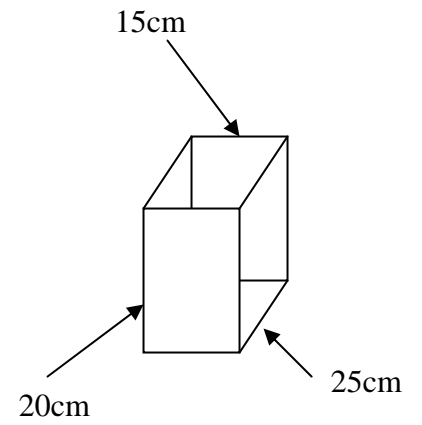
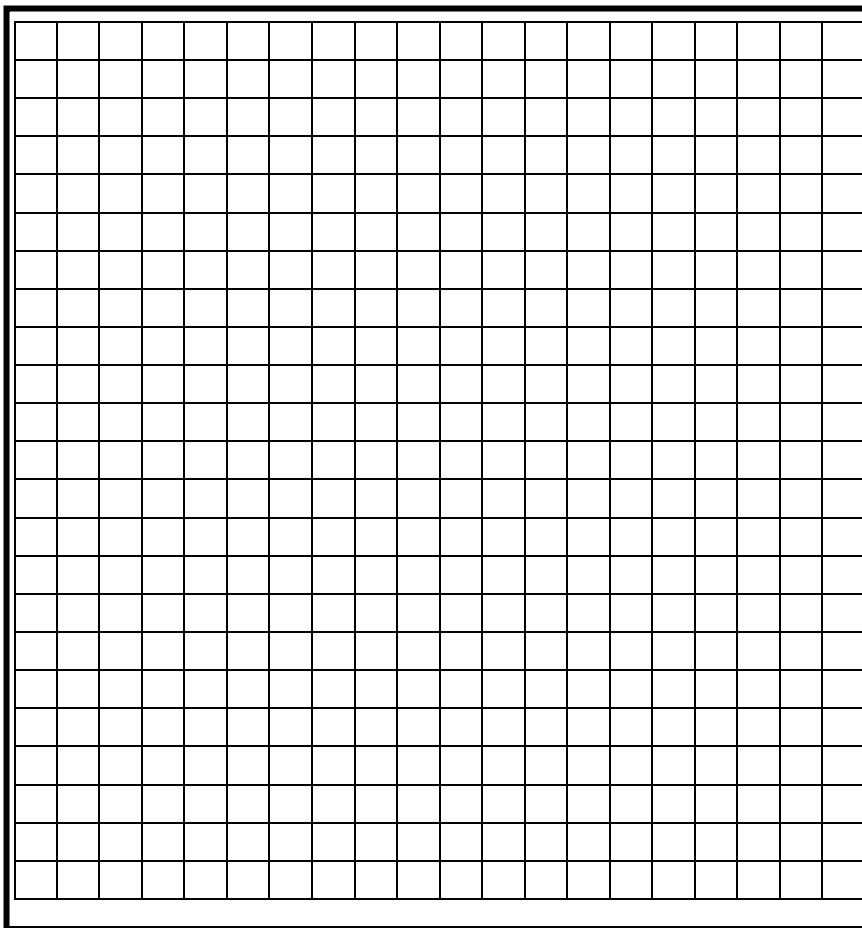
- (c) Other than interest what other costs can be associated with a credit card? [1 mark]

10. Many people struggle over the decision of acquiring a vehicle. Usually the three main choices involve buying a used vehicle, buying a new vehicle or leasing a new vehicle. In the table below provide two positive aspects (pros) and two negative aspects (cons) for each of the options. [6 marks]

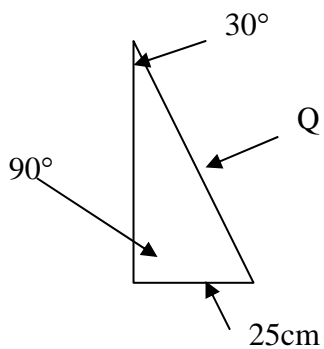
	Buying Used	Buying New	Leasing New
Pros			
Cons			

11. You own a car that consumes diesel fuel at a rate of 6.7L/100km. On a 2500km trip to the East Coast you estimate that the average fuel price will be \$0.93/L. What will be your estimated fuel cost to drive the 2500km trip? [2 marks]

12. Using the grid below, and the scale of 1 grid square = 5cm, create a net for the rectangular prism shown. [3 marks]



13. Solve for the measure of Q [3 marks]



14. A surveyor is marking a rectangular plot which is scheduled for development. Standing on one corner the surveyor uses a laser sextant to determine that that diagonal corner of the rectangular plot lies 300m away at an angle of 40 degrees to the short side of the rectangle. Draw a diagram, and find the dimensions of the rectangular plot. [4 marks]

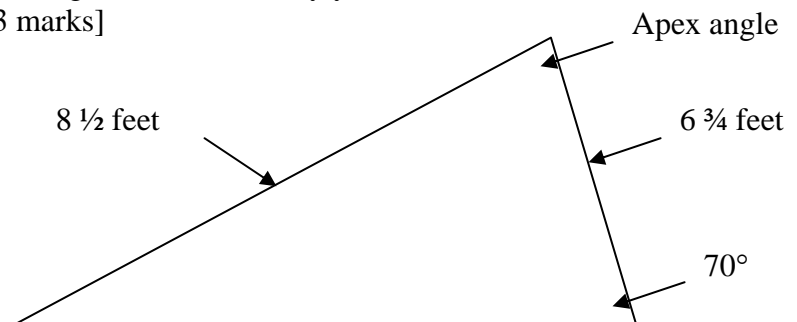
15. *{SELECTING TOOLS...}* Captain Jack Sparrow is anchored at Isle de los Nombres 40 miles north of Tortuga when he spies billowing smoke in the distance, at a bearing of $N60^\circ W$. He sets sail in that direction and, 20 miles later, finds the charred remains of a fishing vessel. As he mutters "Scurvy Pirates!" to himself, he wonders how long it will take him to get back to Tortuga.

(a) Sketch the positions of Tortuga, Isle de los Nombres and the burnt fishing vessel in a correctly labeled diagram [2 marks]

(b) Calculate how far the fishing vessel is from Tortuga [2 marks]

(c) Captain Jack's ship can sail at 16mph. How many minutes will it take for him to reach Tortuga? [1 mark]

16. The carpenter on the Curb Appeal home improvement program wants to change the roof of a garden shed to give it more... well... curb appeal. He designs the roof shown in the diagram below but then remembers that an apex angle greater than 70° requires additional truss structures for stability. These additional truss structures are expensive and the homeowner wants to avoid any unnecessary cost. Will the carpenter need to redesign the roof? Justify your answer with mathematical reasoning. [3 marks]



17. **{CONNECTING}** The Runner’s Room is doing a study on how often shoes need to be replaced. They are hoping to find a running shoe which they will advertise as their “Feature Shoe”. The managers have narrowed down the choices to two shoes with data shown below.

Tester	Number of kilometers run before shoe needed to be replaced	
	Nike “Harmony”	New Balance “Libra”
Julia	500	600
John	550	550
Jessica	450	575
Jarell	475	650
Jillian	800	575
Jolicia	525	625

(a) Fill in the table below (use the space around the table for your calculations) [10 marks]

	Nike “Harmony”	New Balance “Libra”
mean		
median		
mode		
range		
standard deviation		

{REASONING AND PROVING} Based on the data analysis above, what shoe would recommend as the “Feature Shoe”? Justify your decision. [2 marks]

18. Based on the data from the previous question what is the probability that a person wearing Nike “Harmony” shoes will run 500km or more before the shoes need to be replaced? [1 mark]

19. **{REPRESENTING}** Kirk and Carly are playing dice in the cafeteria during their spare. Kirk's die is a six-sided die with the numbers 1, 2, 3, 3, 3, 6 on it and Carly's die is an eight-sided die with the numbers 1, 1, 1, 2, 4, 4, 7, 8 on it. They each roll their own die and whoseever roll is the largest wins a dollar. If the two rolls are the same, they re-roll.

(b) What is the probability that they have to re-roll? [2 marks]

(c) What is the probability that Kirk wins? [1 mark]

(d) What is the probability that the two rolls add up to more than seven? [2 marks]

SPACE FOR FORMULA SHEET
