

# Foundations of Math 12

## Exam Review

2013

### Unit 1 – Set Theory

#### Multiple Choice

1. If  $A = \{3, 6, 7, 8\}$  and  $B = \{5, 7, 9, 10\}$  what is the set of  $A \cup B$ ?

- A.  $\{7\}$
- B.  $\{3, 5, 6, 8, 9, 10\}$
- C.  $\{5, 7, 9, 10\}$
- D.  $\{3, 5, 6, 7, 8, 9, 10\}$

Let the Universal set  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ ,  $M = \{2, 3, 5, 7\}$ , and  $N = \{1, 3, 5\}$

2. The intersection of sets M and N is

- A.  $\{3, 5\}$
- B.  $\{1, 3, 5\}$
- C.  $\{1, 2, 3, 5, 7\}$
- D.  $\{1, 2, 3, 4, 5, 6, 7\}$

3. What is the value of  $n((M \cup N)')$ ?

- A. 4
- B. 6
- C.  $\{4, 6, 8, 9\}$
- D.  $\{1, 2, 3, 5, 7\}$

Let the  $P = \{\text{the set of all foods}\}$ ,  $Q = \{\text{The set of all fruit with a peel}\}$ ,  
 $R = \{\text{the set of all fruit}\}$  and  $S = \{\text{the set of all vegetables}\}$

4. Which of the following statements is false?

- A.  $Q \subset P$
- B.  $Q \subset R$
- C.  $R \subset Q$
- D.  $S \subset P$

Use the following information for questions 5 to 7

All grade 12 students at a small high school were surveyed about what they would like to do next year. The results of the survey are given below.

Go to University	34
Work to make money	39
Got to University and work to make money	13
Neither go to University or work to make money	28

5. Determine the total number of students in the universal set.

- A. 114
- B. 88
- C. 86
- D. 60

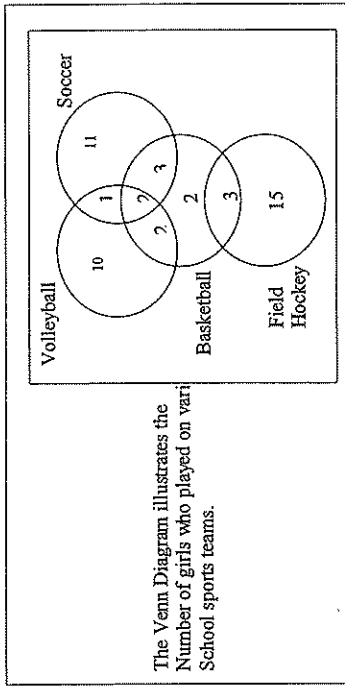
6. The total number of students who would not like to work to make money is:

- A. 21
- B. 28
- C. 49
- D. 62

7. The number of students who would like to go to University or work to make money:

- A. 86
- B. 60
- C. 47
- D. 13

Use the following information for questions 8 to 11



8. The number of girls who played soccer and volleyball was:

- A. 1
- B. 3
- C. 8
- D. 29

9. The number of girls who played on exactly 2 teams was:

- A. 6
- B. 8
- C. 9
- D. 11

10. Determine  $n((\bar{S} \cap B) \cup V)$ .

- A. 2
- B. 19
- C. 5
- D. 3

11. Determine  $n((V \cap (\bar{B} \cup S)))$

- A. 5
- B. 2
- C. 34
- D. 6

The converse of the statement "If the sky is blue, then there are no clouds" is

- A. If the sky is not blue, then there are clouds.
- B. If there are no clouds, then the sky is blue.
- C. If there are clouds, then the sky is not blue.
- D. The sky is blue if and only if there are no clouds.

Consider the following conditional statement: "If a quadrilateral has equal sides then it is a square." Which of the following sentences is correct?

- A. Both the conditional statement and the contrapositive of the statement are true.
- B. The converse of the statement but not the contrapositive of the statement is true.
- C. The contrapositive of the statement but not the converse of the statement is true.
- D. Both the converse of the statement and the contrapositive of the statement are true.

Section II - Written Section - Show All Work Leading to a Solution

1. The first 185 grade 12 students were surveyed as they entered the building [Harfeevan and Tim were not surveyed] to determine which soft drink they liked to drink.

100 drink Dr. Pepper  
115 drink Coke  
92 Drink A&W Root Beer  
52 drink A&W Root Beer and Dr. Pepper  
43 drink Coke and Dr. Pepper  
52 Drink A&W Root Beer and Coke  
25 drink all three

- a. Complete a Venn Diagram

- b. Determine how many students:

- i) drink only Coke:
- ii) do not like to drink any of the drinks
- iii) drink Coke or Root Beer

Given the following Conditional statement: "If a student attends Abby Senior Secondary School, then the student attends high school in British Columbia," write a Converse of the statement, an Inverse of the statement and a contrapositive of the statement.

- a) Converse
  - b) Inverse
  - c) Contrapositive
  - d) Identify which of the statements are positive.
  - e) Write a biconditional statement of the original conditional statement.
3. In a class of 60 students, 40 students drink Coke, 35 drink Pepsi, 28 drink Sprite, 26 drink both Coke and Pepsi, 17 drink both Pepsi and Sprite, and 33 students drink both Coke and Sprite. How many students drink all three?

### Unit 2 - Probability

#### Probability and Statistics:

$${}^nC_r = \frac{n!}{r!(n-r)!} \qquad {}^nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$P(A) = 1 - P(\bar{A}) \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} \qquad P(A \text{ and } B) = P(A) \times P(B|A)$$

#### Multiple Choice:

1. An eight sided die with outcomes 1, 2, 3, 4, 5, 6, 7, and 8 is rolled twice. What is the probability that both rolls result in an odd number?

- A.  $\frac{1}{2}$
- B.  $\frac{1}{16}$
- C.  $\frac{1}{4}$
- D.  $\frac{1}{8}$

2. Which of the following events are dependent?

- A. Rolling a six with a die, then rolling it again and getting a two
- B. Drawing 2 consecutive green balls, without replacement, from a bag of green & white balls
- C. Tossing a coin 6 times and getting 3 heads and 3 tails
- D. Winning at poker twice in a row

3. A bag contains 7 orange balls and 4 purple balls. 4 balls are drawn out, without replacement. What is the probability of drawing 4 orange balls?

- A.  $\frac{5}{66}$
- B.  $\frac{1}{11}$
- C.  $\frac{7}{66}$
- D.  $\frac{1}{4}$

4. A spinner has sections numbered 1, 2, 3, 4, and 5. The numbers on the spinner are all equally likely to occur. What is the probability that on 3 spins the spinner will point to an even number first, then an odd number twice?

- A)  $\frac{1}{8}$
- B)  $\frac{1}{5}$
- C)  $\frac{12}{125}$
- D)  $\frac{18}{125}$

5. A market study found that 45% of Abby students dance funny, 32% of Abby students drive ugly cars, and 18% of Abby students do both. What is the probability that a randomly selected student will drive an ugly car but will not dance funny?

- A) 32%
- B) 14%
- C) 18%
- D) 50%

6. Based on team records, the probability that the Tigers win any game is  $\frac{11}{20}$  and

the probability that the Broncos win any game is  $\frac{4}{9}$ . If they are both playing different opponents tonight, what is the probability that at least one of the teams will win?

- A)  $\frac{91}{180}$
- B)  $\frac{11}{45}$
- C)  $\frac{3}{4}$
- D)  $\frac{1}{4}$

7. Two cards are drawn without replacement from a shuffled deck of 52 cards. What is the probability that the first card is a diamond and the second card is the ace of diamonds?

- A)  $\frac{1}{221}$
- B)  $\frac{1}{204}$
- C)  $\frac{1}{52}$
- D)  $\frac{1}{48}$

8. Two cards are drawn without replacement from a well-shuffled deck of 52 cards. Determine the probability that at least one card is a red card.

- A)  $\frac{1}{2}$
- B)  $\frac{26}{51}$
- C)  $\frac{25}{102}$
- D)  $\frac{77}{102}$

9. Two cards are drawn without replacement from a well-shuffled deck of 52 cards. Determine the probability that the first card is a spade and the second is a face card.....READ THIS ONE AGAIN!

- A)  $\frac{1}{17}$
- B)  $\frac{3}{52}$
- C)  $\frac{11}{204}$
- D)  $\frac{11}{221}$

10. One bag contains 7 white balls and 3 black balls. Another bag contains 4 white balls and 6 black balls. A coin is tossed to select a bag, and then a ball is randomly selected from that bag. What is the probability that a black marble will be drawn?

- A)  $\frac{3}{10}$
- B)  $\frac{2}{5}$
- C)  $\frac{9}{20}$
- D)  $\frac{3}{5}$

11. F represents drawing a face card and S represents drawing a spade. When one card is drawn from a well-shuffled deck of 52 cards, what is P(F or S)?

- A)  $\frac{3}{52}$
- B)  $\frac{3}{13}$
- C)  $\frac{11}{26}$
- D)  $\frac{25}{52}$

12. A company has two factories that manufacture light bulbs. 60% of the light bulbs are manufactured in factory A and 40% come from factory B. In factory A, 1.5% of the bulbs are defective and in factory B, 2% of the bulbs are defective. A defective light bulb is discovered. What is the probability that the defective bulb came from factory A?

- A) 0.0090
- B) 0.3061
- C) 0.4706
- D) 0.5294

Written Response

1. The sample space shown indicates the results of rolling a red die and a black die. (4 marks)

	Black Die (2 <sup>nd</sup> number)					
Red Die	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

Event A: The sum of the 2 dice is greater than 8.  
 Event B: The black die is odd.

- Determine  $P(A)$  \_\_\_\_\_
- Determine  $P(A \text{ and } B)$  \_\_\_\_\_
- Determine  $P(A \text{ or } B)$  \_\_\_\_\_

2. Five cards are dealt from a well-shuffled deck of 52 cards. What is the probability that the hand will contain 2 aces, 2 tens and 1 other card?

3. It is known that 52% of all grade 12 students in BC own an mp3 player. Three grade 12 students are chosen at random. Given that at least one of the students has an mp3 player, what is the probability that all 3 will have an mp3 player?

4. A committee of 4 is chosen from a group of 10 women and 6 men. Determine the probability that the committee consists of exactly 3 women.

5. A medical test for workphobia is 95% accurate. Suppose 26% of the student population has workphobia. What is the probability that a student who tests positive does actually have workphobia?

6. Bag A contains 3 black and 2 white marbles. Bag B contains 1 white and 2 black marbles. A die is rolled to determine which bag to draw a marble from. If it is an even number a marble is drawn from Bag A, otherwise it is drawn from Bag B. Given that the marble drawn is white, what is the probability that it came from Bag B.

### Unit 3 - Combinatorics

#### Multiple Choice Questions:

- Timmy's favourite restaurant, Tim Horton's, offers 4 different flavours of coffee, 3 different types of soup and 4 different sandwiches. In how many different ways can a person select a meal by choosing one item from each category (a coffee, a soup and a sandwich)?  
A) 54  
B) 48  
C) 18  
D) 11
- A multiple-choice test has 7 questions, with 4 possible choices for each question. How many different ways would there be for Kevin to answer the test if the answer to each question is a random guess?  
A) 2 401  
B) 5 040  
C) 16 384  
D) 120 960
- How many different arrangements are there of all the letters in the word DANIEL?  
A) 6  
B) 120  
C) 720  
D) 46 656
- A used car dealer has a window display area in which 3 cars can be displayed. If he has 7 different show cars to select from for the display, how many different arrangements are possible?  
A) 21  
B) 35  
C) 170  
D) 210
- An area code consists of 3 digits. The first digit must not be a 0 or an 8, the second digit must be a 0 or a 1, and the third digit can be any number from 1 to 9. How many different area codes are possible?  
A) 112  
B) 120  
C) 144  
D) 504
- Nine buttons differ only by colour. There are 3 red buttons, 3 green buttons and 3 yellow buttons. If the buttons are placed in a row, how many different arrangements are possible?  
A) 504  
B) 1 680  
C) 13 440  
D) 362 880
- In how many ways can a family of 6 people (Parents Sanjay and Heidi and 4 children) sit in a row if a parent must sit on each end of the row?  
A) 24  
B) 48  
C) 120  
D) 720
- Which expression is equivalent to  $\frac{n!(n-2)!}{(n+2)!(n-1)!}$ ?  
A)  $\frac{(n-2)}{(n+2)(n+1)}$   
B)  $\frac{n(n+1)}{(n-1)}$   
C)  $(n+2)(n+1)(n-1)$   
D)  $\frac{1}{(n+2)(n+1)(n-1)}$
- Jesse, Raymon, Nick and Rae Anne often discuss Math at their favourite pizza parlour. How many different two-topping pizzas can be made if the restaurant advertises that it has 9 toppings to select from?  
A) 18  
B) 36  
C) 72  
D) 81

10. In the game LOTTO 4-20, a player must select 4 different numbers from the numbers 1 to 20. In how many ways can a group of 4 numbers be selected?

- A)  $\frac{20!}{4!}$
- B)  $\frac{20!}{16!}$
- C)  $\frac{20!}{4!16!}$
- D)  $16!$

11. At Robyn's pre-planned wedding reception in 2020, there will be 10 tables of guests...Future husband is irrelevant in the planning. The Master of Ceremony will have to randomly determine the order in which these 10 tables will be served. In how many ways can the order of the tables be determined?

- A)  ${}_{10}P_{10}$
  - B)  ${}_{10}C_{10}$
  - C)  $10 \times 10$
  - D)  $10^{10}$
12. From a standard deck of 52 cards, how many 5-card hands can be formed containing only face cards?
- A) 60
  - B) 792
  - C) 95 040
  - D) 2 598 960

13. From a standard deck of 52 cards, how many 5-card hands can be formed containing 2 hearts and 3 black cards?

- A) 22 308
- B) 92 950
- C) 202 800
- D) 2 433 600

14. From a standard deck of 52 cards, how many 5-card hands can be formed containing at least 4 clubs?

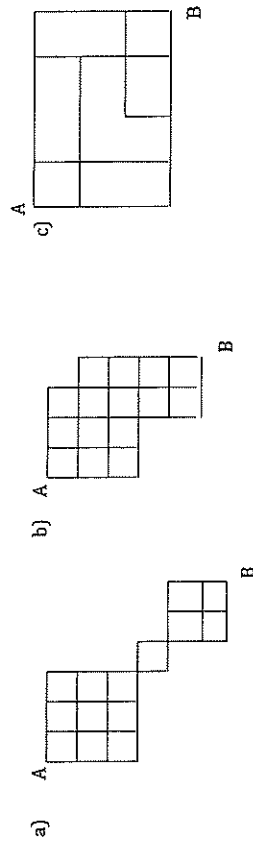
- A) 2 002
- B) 27 885
- C) 29 172
- D) 454 480

15. Amarpreet is very organized and needs to have order on her bookshelf. In how many ways can 2 different Chemistry books, 3 different Math books and 4 different French books be displayed in a row on a shelf if the books of each subject must be kept together?

- A) 72
- B) 288
- C) 864
- D) 1728

**Part B -- Subjective Questions. Please show appropriate work. Marks as shown.**

1. Assuming you can only travel right or down, determine the number of pathways from point A to point B in each of the following diagrams. [2 marks....1 mark....1 mark]



2. A student grad committee consists of 7 girls and 6 boys. They wish to form a sub-committee of 4 people chosen from the grad committee. (2 marks each)

- a) In how many ways can the sub-committee be formed if there are to be 2 girls and 2 boys?



5. If you invest \$200 a month at 9.5% p.a. compounded monthly, how much do you have after 5 years to the nearest \$?

- A \$1024      B \$15405      C \$15329      D \$19260

6. If you invest \$100 a month at 4.5% compounded semi-annually for 3 years, how much interest have you made?

- A \$259      B \$858      C \$114      D \$14

7. What is the monthly payment on a mortgage of \$100 000 at 6% p.a. compounded monthly for 20 years?

- A \$716.<sup>63</sup>      B \$52266.<sup>65</sup>      C \$820.<sup>25</sup>      D \$2321.<sup>40</sup>

8. A mortgage of \$200 000 is taken out at 5.5% per year compounded semi-annually, and is paid back monthly for 25 years. How much could be saved overall if the monthly payments were amortized over 20 years instead of 25 years? Answer to the nearest \$10

- A \$166 300      B \$128 560      C \$14 800      D \$37 730

9. Justin can afford \$1200 a month for his mortgage. He has saved a down-payment of \$10 000 for the house. If he can get a mortgage at 4% p.a. compounded semi-annually amortized over 25 years, what price house can he afford? Answer correct to the nearest \$1000

- A \$218 000      B \$228 000      C \$238 000      D \$248 000

10. If you have \$2000 to invest at 5% p.a. over 3 years, which is the best compounding period to choose?

- A semi-annually      B bi-weekly      C quarterly      D monthly

b) In how many ways can the sub-committee be formed if there must be at least 2 boys?

3. Solve algebraically for n:  $\frac{n!}{(n-2)!} = 72$

#### Units 4/5 - Financial Math

1. How much must you invest at the start of each month at 5% p.a. compounded semi-annually for five years in order to have \$10 000? Round to the nearest \$

- A \$7811      B \$978      C \$188      D \$147

2. A loan is taken out at 4% p.a. for 5 years paid monthly and compounded semi-annually. The number of payments is

- A 5      B 10      C 20      D 60

3. How much interest is earned on an investment of \$2000 at an interest rate of 7% per year, compounded semi-annually for 3 years?

- A \$2217.<sup>44</sup>      B \$217.<sup>44</sup>      C \$2458.<sup>51</sup>      D \$458.<sup>51</sup>

4. Approximately how long would it take for an investment to double in value if the interest rate is 5% p.a. compounded semi-annually?

- A 14 years      B 28 years      C 56 years      D not possible to calculate

Written Questions: Show all necessary work

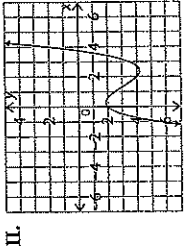
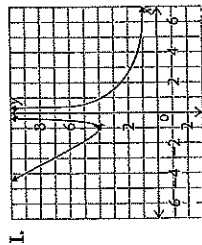
1. Peter and Paula are buying a home for \$120 000 with a \$20 000 down payment, and a 20 year mortgage. They have negotiated their interest at for a five year term at 4.5% p.a. compounded semi-annually and paid monthly. Calculate the following:

- a) The amount borrowed to purchase the house.
- b) The monthly payment on this mortgage.
- c) The total amount owing on the house after 5 years
- d) After the five year term is over, they renegotiate their mortgage at 4% p.a. compounded semi-annually. Calculate their new payment after 5 years if the loan is amortized over the remaining 15 years.

# 6 Chapter Test

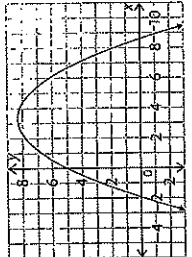
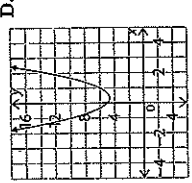
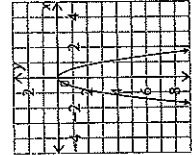
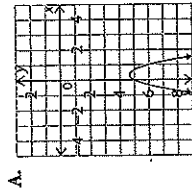
## MULTIPLE CHOICE

1. Which graphs represent polynomial functions?



A. I only    B. II only    C. both I and II    D. neither I nor II

2. Which graph represents the polynomial function  $f(x) = -3x^2 + 2x - 5$ ?



3. The winning times for the men's 50 km walk in various Summer Olympics from 1984 to 2008 are shown.

Year	1984	1988	1992	2000	2004	2008
Winning Time (min)	227.43	218.93	230.23	222.36	222.76	217.15

Predict the winning time for the event in the 1996 Summer Olympics.

A. 220.0 min    B. 219.83 min    C. 217.44 min    D. 223.14 min

4. A spherical weather balloon is being inflated. The table shows the volume of the balloon at different times.

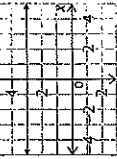
Time (s)	0	1	2	3	4
Volume (cm <sup>3</sup> )	0	95	120	365	1070

Use cubic regression to determine the volume of the balloon after 5 s.

A. 1205 cm<sup>3</sup>    B. 2055 cm<sup>3</sup>    C. 2475 cm<sup>3</sup>    D. 1020 cm<sup>3</sup>

## NUMERICAL RESPONSE

5. Consider the graph shown.



- The graph is a \_\_\_\_\_ line.
- There are \_\_\_\_\_  $x$ -intercepts and \_\_\_\_\_  $y$ -intercept(s).
- The graph extends from Quadrant \_\_\_\_\_ to Quadrant \_\_\_\_\_.
- The domain is  $\{x \mid \text{_____}\}$ .
- The range is  $\{y \mid \text{_____}\}$ .
- There is (are) \_\_\_\_\_ turning point(s).
- This graph represents a \_\_\_\_\_ function.

6. Enter the characteristics for each polynomial function.

a)  $g(x) = 14x + 3$

b)  $f(x) = 9x^3 - 3x^2 + 2x - 1$

- degree: \_\_\_\_\_
- leading coefficient: \_\_\_\_\_
- constant term: \_\_\_\_\_
- number of  $x$ -intercepts: \_\_\_\_\_
- $y$ -intercept: \_\_\_\_\_
- extends from Quadrant \_\_\_\_\_ to Quadrant \_\_\_\_\_
- domain: \_\_\_\_\_
- range: \_\_\_\_\_
- number of turning points: \_\_\_\_\_
- degree: \_\_\_\_\_
- leading coefficient: \_\_\_\_\_
- constant term: \_\_\_\_\_
- number of  $x$ -intercepts: \_\_\_\_\_
- $y$ -intercept: \_\_\_\_\_
- extends from Quadrant \_\_\_\_\_ to Quadrant \_\_\_\_\_
- domain: \_\_\_\_\_
- range: \_\_\_\_\_
- number of turning points: \_\_\_\_\_

7. Each year, the Mapleton health department tests about 15 000 water samples for drinking water and swimming pools. These tests are done with a chemical medium called differential coliform media (DCM). This table shows what one supplier charges for various quantities of DCM.

Number of Samples	2 500	5 000	12 500	14 000	16 000	20 000
Cost (\$)	1 200	2 000	5 000	5 618	6 400	8 000

Use linear regression to complete this statement:

The Mapleton health department should expect to spend \$ \_\_\_\_\_ on DCM next year.

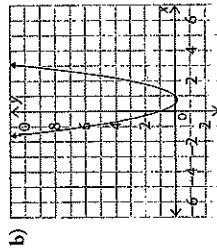
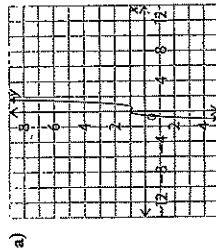
8. Etienne, an architect, is designing a suspension bridge. There will be a suspension cable on each side of the bridge, with support wire hanging down from the cable at different distances, as shown.

Distance from Centre of Bridge (m)	15	30	40	45	50	60
Length of Support Wire (m)	2.84	5.48	8.24	9.91	11.80	16.16

- a) The quadratic regression function that models the data is  $f(x) = \underline{\hspace{1cm}}x^2 + \underline{\hspace{1cm}}x + \underline{\hspace{1cm}}$ .
- b) The support wire that is 75 m from the centre of the bridge should be  $\underline{\hspace{1cm}}$  m long, to the nearest centimetre.

**WRITTEN RESPONSE**

9. Determine whether each graph represents a polynomial function. Explain how you decided.



10. The manager of a large chain of outdoor stores is buying sealed meal packets for camping from a supplier. The supplier offers the prices shown. Based on previous sales, the manager expects to sell 6000 packets. Use linear regression to determine what price she should expect to pay in total. Explain your answer.
- 3000 packets for \$8.75 each
  - 3500 packets for \$8.95 each
  - 4000 packets for \$7.95 each
  - 4500 packets for \$7.25 each
  - 5000 packets for \$6.50 each

11. A biochemist is studying the growth of recently discovered bacteria. She collects the data shown.

Day	1	2	3	4	5	6	7	8
Mass (g)	5.42	4.56	3.14	1.88	1.50	2.72	5.26	12.84

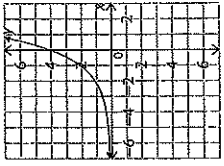
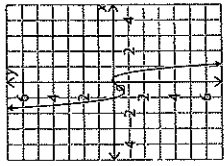
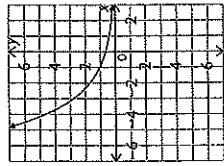
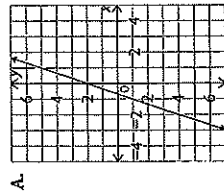
- a) Describe the trend.
- b) Use cubic regression to determine the equation of the curve of best fit for the data.
- c) Estimate the mass of the bacteria on Day 11.
12. Kendall likes to solve Kakuro puzzles in the morning newspaper. The puzzles increase in difficulty from Monday to Sunday. The table shows how long Kendall takes to solve the puzzle each day. Use quadratic regression to determine how long Kendall would take to solve Friday's puzzle. Explain what you did.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Saturday	Sunday
Time to Solve (min)	2	3	5	8	17	23

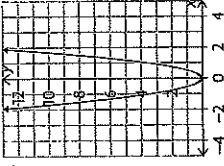
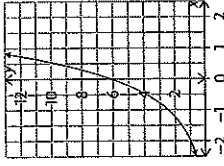
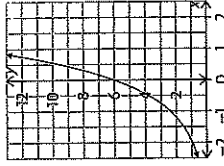
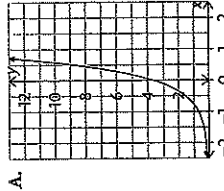
# 7 Chapter Test

## MULTIPLE CHOICE

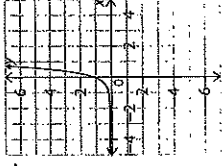
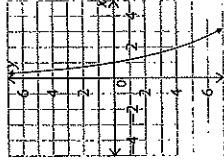
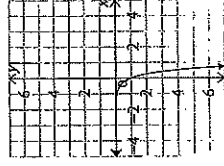
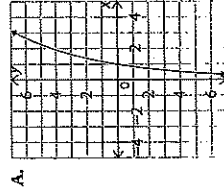
1. Which graph represents an increasing exponential function?



2. Which graph represents the function  $y = 6(3.5)^x$ ?



3. Which graph represents the function  $y = -14 \log x$ ?



4. A biologist has been studying the effects of acid rain on the population of fish in a lake. The observations are shown in the table.

Time (years), $x$	0	1	2	3	4	5
Fish Population (estimated), $f(x)$	2700	2300	1950	1660	1400	1200

a) By what percent is the fish population declining every year?

- A. 100%    B. 15%    C. 400%    D. 10%

b) Which exponential regression function models the decline in the fish population?

A.  $f(x) = 2700(1.15)^x$     C.  $f(x) = 2700(0.15)^x$

B.  $f(x) = 2700(0.85)^x$     D.  $f(x) = 1200(3.2)^x$

5. Arlene bought a rare stamp for \$47 in 2006. She has been tracking the value of the stamp every year since she bought it.

Years since Purchase, $t$	0	1	2	3	4	5
Stamp Value (\$), $A(t)$	47.00	61.57	79.43	106.43	138.36	179.87

a) Which regression equation best models the value of the stamp over time?

A.  $A(t) = 47t + 2$     C.  $A(t) = 47(1.3)^t$

B.  $A(t) = 2.1t + 47$     D.  $A(t) = 1.3(47)^t$

b) Assume the same growth rate as in part a). What will the stamp be worth 10 years after it was purchased?

- A. \$120    B. \$210    C. \$470    D. \$695

## NUMERICAL RESPONSE

6. Examine the graph of the exponential function.

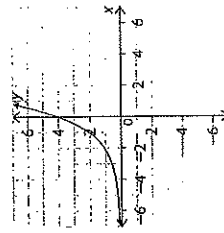
a) There are \_\_\_\_\_  $x$ -intercepts.

b) The  $y$ -intercept is \_\_\_\_\_.

c) The graph extends from Quadrant \_\_\_\_\_ to Quadrant \_\_\_\_\_.

d) The domain is \_\_\_\_\_.

e) The range is \_\_\_\_\_.



7. Complete the table to predict the characteristics of each exponential function.

Function	y-intercept	Base	Increasing or Decreasing
a) $y = 7(3)^x$			
b) $y = 4\left(\frac{1}{3}\right)^x$			
c) $y = 6(2)^x$			

8. Complete the table to predict the characteristics of each function. Verify your predictions using graphing technology.

Function	x-intercept	Number of y-intercepts	End Behaviour	Domain	Range	Increasing or Decreasing
a) $y = -6 \log x$			from Quadrant _____ to Quadrant _____			
b) $y = 12 \ln x$			from Quadrant _____ to Quadrant _____			

9. The element strontium-90 is radioactive. The percent of strontium-90,  $A(t)$ , left in a sample can be modelled by the half-life function

$$A(t) = A_0 \left(\frac{1}{2}\right)^{\frac{t}{29}}$$

where  $t$  represents the time, in years, after the initial time, and  $A_0$  represents the initial amount, 100% of the strontium.

- A sample of strontium-90 will decay to half its initial amount in \_\_\_\_\_ years.
- After 20 years, \_\_\_\_\_ % of a sample of strontium-90 will remain. Round your answer to one decimal place.
- A sample of strontium-90 will decay to 20% of its original amount in \_\_\_\_\_ years, rounded to one decimal place.

10. Canada's exports, in billions of dollars, are shown from 2002 to 2008.

Year, $t$	2002	2003	2004	2005	2007	2008
Exports (billions of dollars), $F(t)$	261	261	279	316	405	459

- An exponential regression equation for Canada's exports over this period is \_\_\_\_\_.
- An estimated value for Canada's exports in 2006 is \$ \_\_\_\_\_ billion. This value is \$ \_\_\_\_\_ billion less than the actual value of \$365 billion.
- An estimated value for Canada's exports in 2009 is \$ \_\_\_\_\_ billion. This value is \$ \_\_\_\_\_ billion more than the actual value of \$323 billion.

WRITTEN RESPONSE

11. Predict whether each function is increasing or decreasing, without graphing it. Explain how you know. Verify your predictions by graphing the functions.

- $y = 6(2)^x$
- $y = 5(0.9)^x$

12. A telephone dial tone has a sound level of 80 dB. A motorcycle engine has a sound level of 100 dB. How many times louder is the motorcycle engine than the telephone dial? Explain.

**TIP**  
The loudness of sound is measured in decibels (dB). The decibel scale is logarithmic, like the pH scale. A measure of 11 dB is 10 times louder than a measure of 1 dB.

13. The population of British Columbia is given from 2007 to 2011.

Year	2007	2008	2009	2010	2011
Population (1000s)	4309.6	4384.0	4459.9	4529.7	4573.3

- Construct a scatter plot to display the data.
- Use exponential regression to define a function that models the data.
- Assuming the same growth rate as in part b), estimate the population of British Columbia in 2020. Describe your process.
- Assuming the same growth rate as in part b), when would you expect the population to reach 4 700 000? Describe your process.

14. Carla invested \$12 000 in a guaranteed investment certificate that pays 4% interest, compounded annually, over the next 5 years.

Years since investment	0	1	2	3	4	5
Value of investment (\$) $y$	12 000	12 480	12 979	13 498	14 038	14 600

- a) Use exponential regression to determine the equation of a function that models the growth of Carla's investment over  $x$  years.
- b) Determine the value of Carla's investment after 8 years, assuming that the interest rate remains the same over the entire time.

## 8 Chapter Test

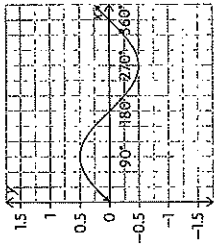
### MULTIPLE CHOICE

- Estimate the value of 1.2 in degree measure.
 

A.  $75^\circ$       B.  $1.2^\circ$       C.  $30^\circ$       D.  $70^\circ$
- Estimate the value of  $420^\circ$  in radian measure.
 

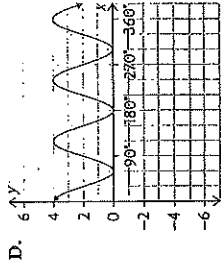
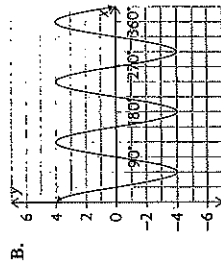
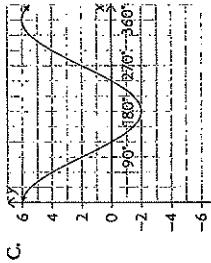
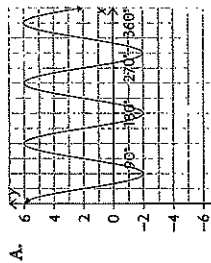
A. 2.0      B. 3.7      C. 7.3      D. 10
- Which reason explains how you know that this graph is not the graph of  $y = \sin x$  or  $y = \cos x$ ?
 

A. It has just one  $x$ -intercept.  
 B. The amplitude is 0.5.  
 C. The period is  $270^\circ$ .  
 D. The equation of the midline is  $y = 1$ .



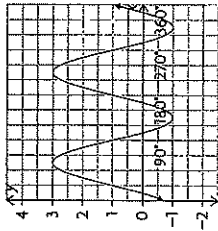
4. Which one of these graphs has all of the following features?

- a range of  $\{y \mid -2 \leq y \leq 6, x \in \mathbb{R}\}$
- a maximum value of 6 and a minimum value of  $-2$
- an amplitude of 4
- a midline equation of  $y = 2$
- a period of  $120^\circ$



5. Which equation describes this graph best?

- A.  $y = 2 \sin 2(x + 30^\circ) + 1$
- B.  $y = 2 \sin 2(x - 30^\circ) + 1$
- C.  $y = 4 \sin 3(x - 30^\circ) + 2$
- D.  $y = 3 \cos 0.5(x + 180^\circ) + 3$



The table shows the monthly average high temperatures for Lethbridge, Alberta, in degrees Celsius. Use the table to answer questions 6 and 7.

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average High (°C)	-1.8	1.5	6.0	18.2	22.3	25.5	25.4	20.1	14	4.3		

6. Which choice is the best estimate for the average high temperature in Lethbridge in April? Use sinusoidal regression.
- A.  $4^\circ$
  - B.  $10^\circ$
  - C.  $0^\circ$
  - D.  $13^\circ$
7. Which choice is the best estimate for the average high temperature in Lethbridge in December? Use sinusoidal regression.
- A.  $4.3^\circ$
  - B.  $-1^\circ$
  - C.  $2.6^\circ$
  - D.  $26^\circ$

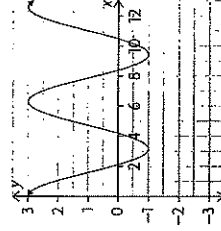
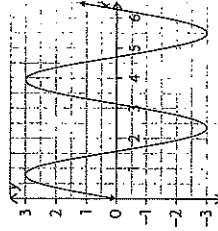
NUMERICAL RESPONSE

8. a) To the nearest tenth,  $75^\circ$  is about \_\_\_\_\_ in radian measure.  
 b) To the nearest tenth,  $480^\circ$  is about \_\_\_\_\_ in radian measure.  
 c) The value of 2.6 in degree measure is about \_\_\_\_\_.  
 d) The value of 4.1 in degree measure is about \_\_\_\_\_.
9. Consider this graph.

The amplitude of this graph is \_\_\_\_\_ and the period is \_\_\_\_\_, so it is not a graph of  $y = \sin x$  or  $y = \cos x$ .

10. Consider the graph shown.

The range is \_\_\_\_\_.  
 The equation of the midline is \_\_\_\_\_.  
 The amplitude is \_\_\_\_\_.  
 The period is \_\_\_\_\_.



11. Describe the graph of this function:

$$y = 4 \sin 2(x - 45^\circ) + 2$$

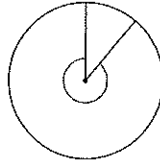
- There is a horizontal translation of \_\_\_\_\_ $^\circ$  to the \_\_\_\_\_.  
 The amplitude is \_\_\_\_\_.  
 The equation of the midline is \_\_\_\_\_.  
 The range is \_\_\_\_\_.  
 The period is \_\_\_\_\_ $^\circ$ .

12. The table below shows the percent of the Moon illuminated from June 1 to July 27 of 2012 in Regina. Enter estimates for what percent of the Moon was illuminated on June 3 and on July 25. Use sinusoidal regression.

Date/Day	Jun. 1, Day 1	Jun. 3, Day 3	Jun. 5, Day 5	Jun. 7, Day 7	Jun. 9, Day 9	Jun. 11, Day 11	Jun. 13, Day 13
Illumination (%)	92.4%		98.9%	88.1%	69.8%	49.2%	29.7%
Date/Day	Jun. 15, Day 15	Jun. 17, Day 17	Jun. 19, Day 19	Jun. 21, Day 21	Jun. 23, Day 23	Jun. 25, Day 25	Jun. 27, Day 27
Illumination (%)	13.7%	3.3%	0.1%	5.0%	18.0%	37.5%	60.5%
Date/Day	Jun. 29, Day 29	Jul. 1, Day 31	Jul. 3, Day 33	Jul. 5, Day 35	Jul. 7, Day 37	Jul. 9, Day 39	Jul. 11, Day 41
Illumination (%)	82.1%	96.5%	99.6%	96.5%	83.8%	65.5%	45.6%
Date/Day	Jul. 13, Day 43	Jul. 15, Day 45	Jul. 17, Day 47	Jul. 19, Day 49	Jul. 21, Day 51	Jul. 23, Day 53	Jul. 25, Day 55
Illumination (%)	26.9%	11.7%	2.2%	0.6%	8.1%	24.1%	

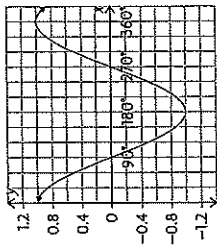
WRITTEN RESPONSE

13. Estimate the measure of the circle's central angle in degrees. Then express the value of the angle in radian measure. Explain what you did.

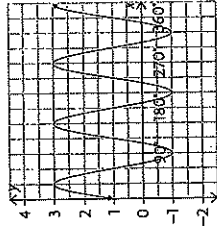




14. Is this a graph of  $y = \sin x$  or  $y = \cos x$ ? Explain.



15. Determine the amplitude, equation of the midline, range, and period of this graph. Show your calculations.



16. Consider  $y = 2 \sin 4(x - 45^\circ) + 1$ , where  $x$  is measured in degrees.

a) Describe the graph of the function, including the amplitude, equation of the midline, range, period, and horizontal translation from  $y = \cos x$ . Provide your reasoning.

b) Confirm your description using graphing technology.

17. The average monthly temperatures for Flin Flon, Manitoba, and Lethbridge, Alberta, are given in the table. Use sinusoidal regression to predict the difference between the average temperatures for the two communities on April 1. Explain what you did.

Average Low Monthly Temperature (°C)	Flin Flon	Lethbridge
January	-24.5	-15.9
February	-20.1	-11.9
March	-13.6	-6.4
April	-3.8	-0.1
May	4.1	5.5
June	10.3	9.9
July	13.2	12.0
August	12.1	11.4
September	5.9	5.6
October	-0.4	-0.1
November	-11.0	-8.0
December	-21.2	-13.6

## Year End Review Answers

FoM 12

### Unit 1: Set Theory

#### Multiple Choice

1. D      2. A      3. A      4. C      5. B      6. C  
7. B      8. B      9. C      10. D      11. A      12. B  
13. C

#### Written Section

- 1bi. 45      bii. 0      biii. 155  
2a. If a student attends high school in BC then the student attends Abby.  
b. If a student doesn't attend Abby, then the student doesn't attend high school in BC.  
c. If a student doesn't attend high school in BC, then the student doesn't attend Abby.  
d. Contrapositive true  
e. Answers may vary.  
3. 33

### Unit 2: Probability

#### Multiple Choice

1. C      2. B      3. C      4. D      5. B      6. C  
7. A      8. D      9. B      10. C      11. C      12. D

#### Written Section

- 1a. 0.28      b. 0.11      c. 0.67      2. 0.061%      3. 0.158      4. 0.396  
5. 0.870      6. 0.455

### Unit 3: Combinatorics

#### Multiple Choice

1. B      2. C      3. C      4. D      5. C      6. B  
7. B      8. D      9. C      10. B      11. A      12. B  
13. C      14. C      15. D

#### Written Section

- 1a. 240      b. 104      c. 10      2a. 315      b. 470      3. 9

### Units 4/5: Financial Math

#### Multiple Choice

1. D      2. D      3. D      4. A      5. B      6. A  
7. A      8. D      9. C      10. B

#### Written Section

- 1a. \$100 000      b. \$630.41      c. \$62 175.40  
d. \$458.88

Chapter 6 Test, page 172

- B. 2. A. 3. D. 4. C.
- horizontal, straight line; 0, 1; II, I;  $\{x \in \mathbb{R}\}; \{y \mid y = 3, y \in \mathbb{R}\}; 0$ ; constant, linear
- a) 1; 14; 3; 1; 3; III, I;  $\{x \in \mathbb{R}\}; \{y \mid y \in \mathbb{R}\}; 0$   
b) 3; 9; -1; 1; -1; III, I;  $\{x \in \mathbb{R}\}; \{y \mid y \in \mathbb{R}\}; 2$
- e.g., \$6010
- e.g., a)  $f(x) = 0.004x^2 - 0.004x + 2$  b) 24.20 m
- a) cubic polynomial function b) quadratic polynomial function
- e.g., I plotted the points on a graph using technology, and they appeared to form a straight line. A linear regression gave the equation  $f(x) = -0.00112x + 12.24$ . 6000 packets would cost \$5.52 each.  $6000 \times \$5.52 = \$33\,120$ , so the manager should expect to pay \$33 120 for 6000 packets.
- e.g., a) At first, the bacteria's mass grows quickly, then less quickly, then quickly again. The growth appears to represent a cubic function with a positive leading coefficient.  
b)  $f(x) = 0.12x^3 - x^2 + 1.3x + 5$   
c) about 58.02 g
- e.g., I ran a quadratic regression function. The function  $f(x) = 0.5x^2 - 0.5x + 2$  models the data, where  $x$  is the day of the week. According to the equation, Kendall will solve Friday's puzzle in 12 min.

Chapter 7 Test, page 197

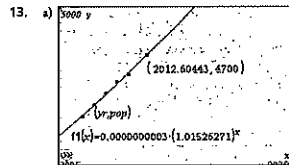
- D. 2. B. 3. C. 4. a) B. b) A.
- a) C. b) D.
- a) 0 b) 4 c) II, I d)  $\{x \mid x \in \mathbb{R}\}$  e)  $\{y \mid y > 0, y \in \mathbb{R}\}$

Function	y-intercept	Base	Increasing or Decreasing
a) $y = 7(3)^x$	7	3	increasing
b) $y = 4\left(\frac{1}{3}\right)^x$	4	$\frac{1}{3}$	decreasing
c) $y = 6(2)^x$	6	2	increasing

8.

Function	Intercept	Number of x-intercepts	End Behaviour	Domain	Range	Increasing or Decreasing
a) $y = -5 \log_3 x$	1	0	from Quadrant I to Quadrant IV	$\{x \mid x > 0, x \in \mathbb{R}\}$	$\{y \mid y \in \mathbb{R}\}$	decreasing
b) $y = 12 \ln x$	1	0	from Quadrant IV to Quadrant I	$\{x \mid x > 0, x \in \mathbb{R}\}$	$\{y \mid y \in \mathbb{R}\}$	increasing

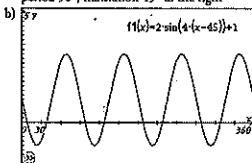
- a) 29 years b) 62.0% c) 67.3 years
- a) 2.406... (1.106...)<sup>x</sup> b) \$362 billion; \$3 billion less  
c) \$491 billion; \$168 billion more
- a) increasing, because  $a > 0$  and  $b > 1$   
b) decreasing, because  $a > 0$  and  $0 < b < 1$
- 100 times as loud



- a)  $f(x) = 0.000\,000\,000\,271(1.015...)^x$   
b) 5 265 120; e.g., I substituted  $x = 2020$  into my function from part b).  
c) e.g., in the second half of 2012; I identified the point of intersection of the regression function and  $y = 4700$ .
- a)  $f(x) = 11\,999.911... (1.029...)^x$  b) \$16 422.63

Chapter 8 Test, page 225

- D. 2. C. 3. B. 4. A. 5. A.
- B. 7. C.
- a) 1.3 b) 8.4 c)  $150^\circ$  d)  $240^\circ$
- $3; \pi$
- $\{y \mid 0 \leq y \leq 4, y \in \mathbb{R}\}; y = 2; 2; 2\pi$
- $45^\circ$  to the right; 4;  $\{y \mid -2 \leq y \leq 6, y \in \mathbb{R}\}; y = 2; 180^\circ$
- 98.9%; 44.0%
- e.g.,  $315^\circ; 5.5$
- $y = \cos x$
- $2; y = 1; \{y \mid 0 \leq y \leq 4, y \in \mathbb{R}\}; 120^\circ$
- a) amplitude 2; midline  $y = 1$ ; range  $\{y \mid -1 \leq y \leq 3, y \in \mathbb{R}\}$ ; period  $90^\circ$ ; translation  $45^\circ$  to the right



- about  $5.3^\circ\text{C}$ ; e.g., I graphed the data for each community on a scatter plot, and the data points appeared to follow a sinusoidal pattern. I did a sine regression to determine equations that fit the points on each scatter plot. Then I used interpolation to predict the average temperature on April 1 for each location, and determined the difference.

