Bayview Secondary School
Mathematics Department – Course Code MDM4U
Assessment For Learning: Unit 2 Organized Counting

Name: Solutions

KU	APPS	THINKING	COM
/10	/15	/4	/2

Instructions:
1) Scientific calculators can be used but not shared
2) Show all necessary steps and calculations to demonstrate a clear logical flow and thinking process for all questions to obtain full marks.
3) The use of cell-phone, and other electronic devices are prohibited during the assessment.
4) Assessment duration: 40 minutes

PART A: KNOWLEDGE/UNDERSTANDING [10 marks] (All questions are worth one mark unless otherwise indicated. You must show some work for 2 marks questions.)

1. A teacher is working with a group of 10 students in total. In how many ways can the teacher:

   a. Choose a president, vice president, secretary and treasurer for a committee?

   $_{10}P_4 = 5040$ ways

   b. Seat 7 of the students if Jim must sit in the second seat?

   $\underset{\text{Jim}}{9} \times 1 \times 8 \times 7 \times 6 \times 5 \times 4 = 60480$ ways

   c. Seat all of the students if Chris and Anthony must not sit beside each other? [2 marks]

   Indirect method:
   $10! - 2!\,9! = 2903040$ ways

   d. Seat 5 of the students at a round table for a meeting?

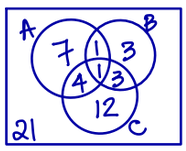
   $\binom{10}{5}(5-1)! = 6048$ ways

2. The universal set is defined as S = {full deck of cards}. A = {spades}, B = {6's, 7's}, C = {even numbers}. Fill in the blanks with the missing information.

   a. $n(A \cup B)$ 19

   b. $n(A \cap C)$= 5

   c. $n(B \cup C)$= 24



3. What is the value of row 9 box 6 of Pascal's Triangle?

   $\binom{9}{6} = {}_9C_6 = C(9,6) = 84$

4. You have 5 loonies, 3 toonies, 4 pennies, and 1 nickel. How many sums of money can you save?

   $6 \times 4 \times 5 \times 2 - 1$
   $= 239$ ways

PART B: APPLICATION [15 marks]

5. There are 8 Adults and 6 children. In how many ways can you:

   a. Make a group of 5 if there are no restrictions? [1 mark]

   $\binom{8+6}{5} = \binom{14}{5} = 2002$ ways

   b. Make a group of 5 with at least one adult? [1 mark]

   Indirect method: $\binom{14}{5} - \binom{8}{0}\binom{6}{5}$ ("no adults")
   $= 1996$ ways

4 consonants | 3 vowels
GZBL | AUO

7. How many 4 letter words can be formed from the word GAZUBLO if
   a) No vowels are to be used? [1 mark]

$4! = 24$ ways

   b) If B is not be used OR no vowels are to be used. [2 marks]

${}_6P_4 + 4! = 384$ ways

8. How many five-digit numbers greater than 40 000 are …
   a) … divisible by 5 with no repetition allowed? [1 mark]

Case 1: $\frac{5}{4,6,7,8,9} \times \frac{8}{} \times \frac{7}{} \times \frac{6}{} \times \frac{1}{5}$ + Case 2: $\frac{6}{4,5,6,7,8,9} \times \frac{8}{} \times \frac{7}{} \times \frac{6}{} \times \frac{1}{0} = 3696$ ways

   b) … divisible by 5 if the number 0 must be used (with no repetition)? [2 mark]

Case 1: $\frac{6}{} \times \frac{8}{} \times \frac{7}{} \times \frac{6}{} \times \frac{1}{0}$ + Case 2: $\left(\frac{5}{4,6,7,8,9} \times \frac{1}{0} \times \frac{7}{\text{or } 0 \text{ or } 0} \times \frac{6}{} \times \frac{1}{5}\right) \times 3 = 2646$ ways

9. A checker is placed on a checkerboard as shown. The checker may move diagonally upward on the white squares only. Although it cannot move into a square with an **X**, the checker may jump over the X into the diagonally opposite square to the next white square. How many paths are there to the top of the board? [2 marks]

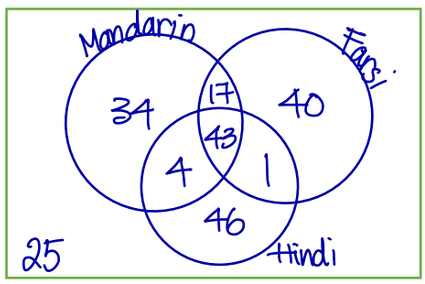
	13		23		20	
4		9		14		6
	X		8		6	
1		4		4		2
	1		3		X	
		1		2		1
			1		1	
				●1		

$13 + 23 + 20 = 56$ ways

10. There are 210 people sign up to volunteer at an immigration center as translators. The following information was gathered by the secretary to determine the scheduling for next week.

98 volunteers speak Mandarin
101 volunteers speak Farsi
94 volunteers speak Hindi
44 volunteers speak both Farsi and Hindi
60 volunteers speak Mandarin and Farsi
47 volunteers Mandarin and Hindi
43 volunteers speak all three languages

a) Draw a Venn diagram illustrating the above information. [2 marks]



b) How many volunteers speak exactly two languages? [1 mark]

$17 + 4 + 1 = 22$ volunteers

c) How many volunteers speak Hindi or Farsi? [1 mark]

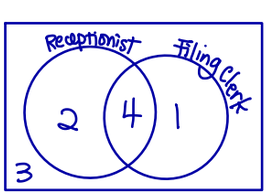
$17 + 40 + 43 + 4 + 1 + 46 = 151$ volunteers

d) How many volunteers do not speak ~~all~~ any of the three languages? [1 mark]

25 volunteers

PART C: THINKING [4 marks]

11. There are 10 applicants for a job. In how many ways can 10 jobs be filled if only 6 of the applicants are qualified receptionists, 5 of the applicants are qualified filing clerks, and only 4 of the candidates are suitable for both a receptionist position and a filing clerk position? All applicants can fill any other position that is available. You must hire one applicant for the filing clerk position and one applicant for the receptionist position. [4 marks]



Case 1 + Case 2 + Case 3

$= 2 \times 5 \times 8! + 4 \times 1 \times 8! + 4 \times 3 \times 8!$

$= 1048320$ ways

PART D: COMMUNICATION [2 marks]

★2 marks will be added for mathematical form throughout the quiz.

--- End of Assessment. ---