



**GRADE 12 APPLIED
PAST PROVINCIAL EXAM
SELECTED PROBABILITY QUESTIONS**

Name: _____
Date: _____

**Extracted Probability Questions
From Past Provincial Exams**

Manitoba Education and Training
Winnipeg, Manitoba, Canada

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DIRECTIONS

Remember to:

- indicate your input values by writing them in your booklet or printing a copy
- if using a technology tool state any assumptions you make
- express your answers in decimal and percentage form to at least the nearest hundredth (two decimal places) when rounding, except for monetary values or when otherwise indicated

Example: $15/29 = 0.52$ or 51.72%

Note: Rounding too soon in your solution may result in an inaccurate final answer for which full marks will not be awarded.

A “*graphic organizer*” is a visual representation of information. Examples include a tree diagram, a chart, a list, a Venn diagram, a truth table, Pascal’s triangle, etc.



A clearly communicated answer

- is easily identified in the response space [BOX IT: LABEL IT]
 - includes the parameters in the equation, and “y =”, “sin”, “ln”, or “x”, nPr , etc. as applicable.
 - includes the units of measure, where applicable
 - includes labels, units, scales for the axes on graphs, and key characteristics of functions (e.g., maximum, minimum, intercepts, and appropriate shape)
 - is expressed as an exact value or is appropriately rounded
- Marks may be deducted for errors relating to any of the above.

JAN 2016

1. Which of the following values **cannot** describe the probability of an event?

- A. 100% B. $\frac{3}{4}$ C. 0 D. 1.2

2. You have a stack of ten cards numbered 11 to 20. What is the probability that a randomly drawn card is an odd number **or** a multiple of three?

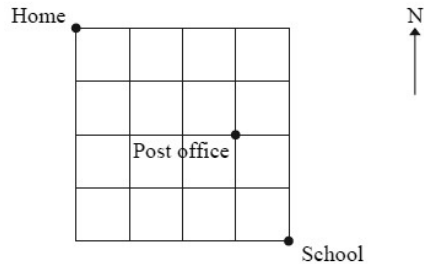
- A. 0.3 B. 0.5 C. 0.7 D. 0.8

3. Lena runs every day. If it is sunny, the probability she will run outside is 75%. If it is not sunny, the probability that she will run outside is 20%. A 45% probability of sunshine has been announced for tomorrow.

- Use a graphic organizer to show all the possible outcomes for this situation
- Determine the probability that Lena runs outside tomorrow. Show your work.

4. a) Determine the number of different ways the letters of the word "CINCINNATI" can be arranged.
 b) How many ways can the letters of the word "CINCINNATI" be arranged if the first letter must be T?

5. Alec walks eight blocks from home to school every morning.



- a) If he only travels south and east, what is the total number of routes from home to school?
 b) What is the probability that his route from home to school passes by the post office?
 Show your work.

6. There are 18 girls and 12 boys trying out for a debate team.
 a) How many different teams of 4 members can be formed if there are **no restrictions**?
 b) How many different teams of 4 members can be formed if **exactly two members must be girls**?
 c) How many different teams of 4 members can be formed if **at least two members must be girls**?

Show your work.

JUN 2016



7. The odds in favour of Philip winning a badminton match are 5:4. What is the probability that Philip will lose the match?
 A. 0.20 B. 0.44 C. 0.56 D. 0.80
8. Elaine has a bag containing 5 red pens and 10 blue pens. She randomly picks two pens out of the bag (no replacement). What is the probability that Elaine picked two red pens?
 A. $\frac{4}{15}$ B. $\frac{2}{21}$ C. $\frac{1}{9}$ D. $\frac{1}{3}$
9. Evan is arranging 8 different bicycles in a rack at his school.
 a) How many ways can the bicycles be arranged in the rack?
 b) How many ways can the bicycles be arranged in the rack if 3 students want their bicycles placed together?

Show your work.

10. Rosalind wants to make a trail mix for a snack. She has 15 ingredients to choose from. What is the total number of different mixes Rosalind can create containing 3, 4, or 5 ingredients?
Show your work.

11. Given the following collection of objects:



- a) Calculate the probability of randomly choosing 
- b) How can the collection be changed so that the probability of choosing  is exactly 40%?
12. Tim has a set of cards numbered 1 to 15. He randomly draws one card.
Consider the following events:
Event A: drawing a card that is a multiple of 2
Event B: drawing a card that is a multiple of 3
- a) Are these events mutually exclusive? Justify your answer.
b) What is the probability of drawing a numbered card that is a multiple of 2 or a multiple of 3?
Show your work.

13. You are asked to take a 3-question multiple-choice quiz. Each question has 4 possible answers, one of which is correct.
- a) If you randomly pick an answer for each question, what is the probability that all 3 answers are wrong?
b) What is the probability of getting at least one of the questions correct?

14. Student ID codes are made up using any two upper case letters of the alphabet followed by any two digits.
- a) How many ID codes are possible?
b) How many ID codes are possible given the following conditions?
- Repetition is not allowed.
 - The letters "I" and "O" cannot be used.

JAN 2017

15. Which of the following expressions represents the number of ways to create a 4-digit passcode for your phone using the digits 0 to 9, if repetition is allowed?
- A. $10 \cdot 9 \cdot 8 \cdot 7$ B. 10^4 C. ${}_{10}C_4$ D. ${}_{10}P_4$
16. Scott can choose from 8 toppings to make a pizza. How many pizzas can be made with 3 **different** toppings?
- A. 6 B. 56 C. 336 D. 6720

17. Joseph has 20 cards; 4 cards of each of the following colours: red, blue, yellow, green, and purple.
- What is the probability of randomly drawing 2 red cards in a row if the first card is replaced before drawing the second card?
 - What is the probability of randomly drawing 2 red cards in a row if the first card is not replaced before drawing the second card?
 - Explain which part, (a) or (b), is an example of dependent events.

18. If 4 coins are tossed at the same time, what is the probability that they will land as either all heads or as all tails? Show your work.

19. Last year, it was reported that 50.30% of Mathematica's population was 40 years of age or older. That same year, 65.74% of people 40 years of age or older saw a doctor and 60.09% of people younger than 40 years of age saw a doctor. If Mathematica's population last year was 1,265,400, determine how many people in Mathematica did not see a doctor. Show your work.

20. The probability that Louise will go out for dinner tonight is 0.4. The probability that she will watch a movie is 0.7. The probability she will do neither is 0.2.
- Draw a Venn diagram to represent this situation.
 - Determine the probability that Louise does only one of these activities

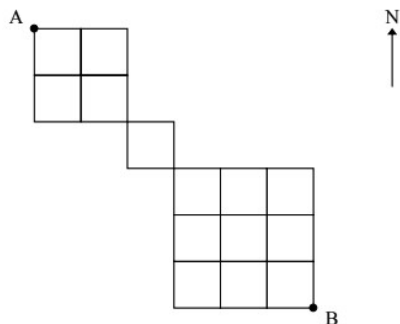
21. A coach randomly selects 5 players from a team of 18 to line up for a shot on goal.
- How many different 5-player arrangements are possible?
 - If Dustin and Andrew are 2 of the 18 players, what is the probability that Dustin will shoot first and Andrew will shoot second? Express your answer as a fraction or round to the nearest thousandth (three decimal places).

JUN 2017

22. The probability of rain tomorrow is $\frac{5}{8}$.
What are the odds against rain tomorrow?

- A. 3:8 B. 5:8 C. 3:5 D. 5:3

23. How many different routes are there from A to B if you only go east and south?
Show your work.



24. Andrei and Sergei are playing soccer. They each take a shot on goal. Andrei shoots first and Sergei shoots second. The probability of Andrei scoring is 0.70 and the probability of Sergei scoring is 0.60.

- a) Use a graphic organizer to show all the possible outcomes for this situation
b) What is the probability that at least one of them will score?
Show your work.

25. An ultimate frisbee team consists of 7 players. A team is formed by randomly choosing players from a group of 8 men and 7 women.
a) Determine the number of ways 7 players can be chosen to form a team.
b) Determine the probability that the team has exactly 3 women.
Show your work.

26. While playing a game, Cally pulls out the following letters from a bag containing some vowels (A, E, I, O, U) and some consonants:



- a) How many different arrangements can be made using all of the letters above?
b) If Cally places all the vowels together and all the consonants together, how many different arrangements can be made using all of the letters above?
Show your work.

JAN 2018

27. A coin is flipped twice.
What is the probability of the coin landing on heads exactly two times?

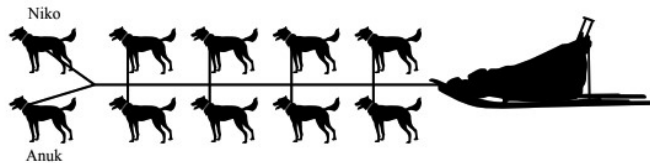
- A) 1 B) 0.75 C) 0.50 D) 0.25

28. The odds in favour of Danny's team winning the tournament are **3 : 7**.
Determine the probability that Danny's team does not win the tournament.

29. Using the digits 0 through 9, determine the number of 4-digit codes divisible by 5 that can be created if none of the digits repeat. Assume codes can start with zero.
Show your work.

30. Martha is entering the Hudson Bay Quest sled dog race. She owns 12 dogs and wants to enter a team of 10 dogs.

- Determine the number of ways she can randomly choose 10 of her dogs to make up a team
- Martha must now put the 10 chosen dogs in their starting positions. She begins by attaching her lead dogs, Niko and Anuk. Determine the number of ways she can randomly attach the remaining dogs.



31. At recess, students randomly pick one marble from a bag to determine teams for a game. Initially, there are 10 orange marbles and 10 blue marbles in the bag. Maria and Leah hope to be on the blue team. Maria picks her marble first and puts it in her pocket. Leah picks her marble second.

What is the probability that they will both pick a blue marble?
Show your work.

32. The weather report calls for a 60% probability of snow in northern Manitoba on Tuesday. The flight from Thompson to Flin Flon has a 30% probability of being on time when it is snowing. There is an 85% probability of the flight being on time when it is not snowing.

- Use a graphic organizer to show all possible outcomes for this situation
- Determine the probability that the flight on Tuesday will not be on time.

Show your work.

33. There are 5 jazz dancers and 7 ballet dancers from which 4 dancers are randomly chosen to form a group.

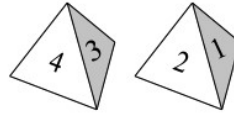
- Determine the number of ways 4 dancers can be chosen.
- Determine the probability that 4 jazz dancers will be chosen. Show your work
- Determine the probability that at least 1 ballet dancer will be chosen.

JUN 2018

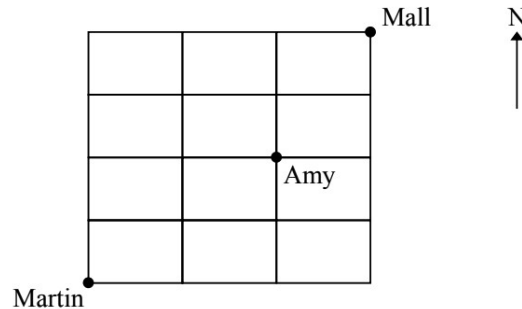
34. There are 16 girls and 11 boys enrolled in a physical education class. A volleyball team of 4 girls and 2 boys will be formed from this class. Which of the following expressions could be used to determine the number of teams possible?

- A) ${}_{27}C_6$ B) ${}_{27}P_6$ C) ${}_{10}C_4 \cdot {}_{11}C_2$ D) ${}_{16}P_4 \cdot {}_{11}P_2$

35. Rylan rolls two 4-sided dice with sides numbered 1 through 4. What is the probability that the sum of the rolled numbers is greater than or equal to 6? Show your work.



36. How many different routes can Martin take to the mall if he can only travel north and east and wants to meet Amy on the way? Show your work.



37. Arif, Simba, and Maritza ran for student council treasurer. Of the 650 students who voted:

- 44% voted for Arif
 - 36% voted for Simba
 - the remaining students voted for Maritza
- a) Determine the number of students that voted for Maritza
 - b) One of the students is selected at random. Determine the odds against this student having voted for Arif.

38. Jack is late for the bus 15% of the time. When he is late for the bus, the probability that he will see Jill at the bus stop is 8%. When he is not late, the probability that he will see Jill at the bus stop is 82%.

- a) What is the probability that Jack did not see Jill today? Show your work.
- b) Jack did not see Jill today. Using your answer in (a), what is the probability that Jack was late for the bus?

39. Guy's baseball team is playing in a tournament. There are six teams entered in the tournament. All teams play each other once and each game is played on the same baseball field.

- a) Determine the total number of games played in the tournament.
- b) Determine the probability that Guy's team plays the first game of the tournament.

40. Shivani needs to create a new password for her computer. The password must begin with three upper case letters followed by five digits.

- a) How many passwords are possible if repetition is not allowed?
- b) How many passwords are possible if repetition is not allowed and the password must begin with the letter M?

Show your work. [We should not have to tell you every time to show your work! How else would you get an answer that you could rely on and check?]

41. Joe is getting dressed in the dark. The only socks in his drawer are 12 white socks and 10 green socks. He randomly picks two socks from the drawer, one after the other.

- What is the probability that both socks are the same colour? Show your work.
- [Logic Unit]. Using logical reasoning, what is the minimum number of socks Joe would have to pick to guarantee a pair of the same-coloured socks?

JAN 2019

42. A building has 8 doors that can be used to either enter or exit. How many ways can Cindy enter and exit the building if she must enter through one door and exit through another?

- A) 15 B) 16 C) 56 D) 64

43. There are 2 principals and 5 teachers lining up in a row for a photograph that will appear in the local paper. Determine the number of ways they can line up in a row if a principal must stand on each end. Show your work.

44. The probability that Brian participates in a study group before his test is 0.70. If he participates in a study group, the probability that he will get an A on his test is 0.80. If he does not participate in a study group, the probability that he will get an A on his test is 0.40.

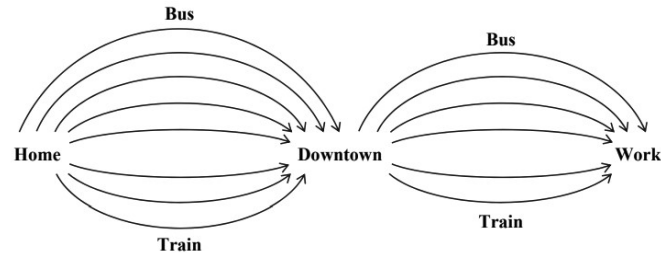
- Use a graphic organizer to show all possible outcomes for this situation.
- Determine the probability that Brian will get an A on his test. Show your work

45. Each housing area in Manitoba is assigned a postal code.

- Each postal code is made up of 3 letters and 3 digits that alternate.
- The postal code must begin with the letter R.
- The letters D, F, I, O, Q, U are not used.
- Repetition is allowed.

Determine the number of postal codes that can be created in Manitoba. Show your work.

46. From his home, Rasik has to take either a bus or a train downtown and then take a different bus or train to work. He has the following transportation options:
- 5 different bus routes or 3 different train routes from home to downtown
 - 4 different bus routes or 2 different train routes from downtown to work



- Determine the number of routes Rasik can take from home to work.
- Determine the number of routes Rasik can take from home to work by only taking the bus.
- If Rasik randomly chooses his routes, what are the odds that he takes only a bus from home to work?

47. At an amusement park, there are 11 adults and 17 teenagers wanting to go on a boat ride. The boat has a 9-passenger capacity. If there are at most 2 adult passengers, determine the number of ways 9 passengers can be chosen to go on the boat ride. Show your work.

48. Of the 41 students in Grade 12,
- 21 students are in drama club
 - 17 students are in chess club
 - 14 students are in environmental club
 - 8 students are in chess club and drama club
 - 10 students are in drama club and environmental club
 - 3 students are in chess club and environmental club only
 - 2 students are in all three clubs
- [Logic Unit] Draw a Venn diagram to represent this situation.
 - What is the probability that a randomly selected student is not in any of these clubs?

JUN 2019

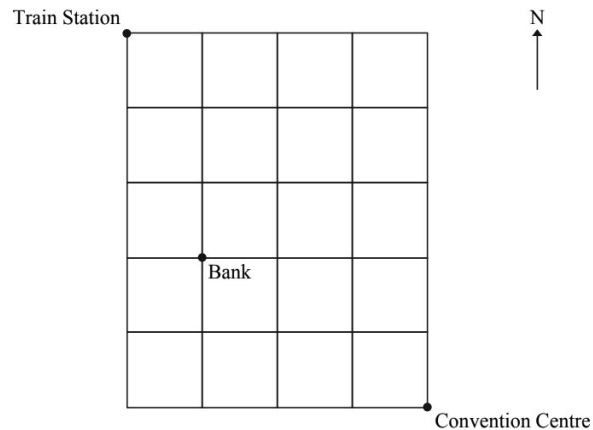
49. Cintra scores a goal on 11% of the shots she takes. Identify the odds against her scoring a goal.

A) 11:89 B) 89:11 C) 11:100 D) 89:100

50. Corbin wants to create an image [avatar] of himself on his cellphone. There are 7 choices for hair colour, 3 choices for hair length, and 9 choices for a hat. Using these options, how many different images in total can he create with or without a hat? Show your work.

51. There are 21 students in an applied math class. On a test, 10 students used an app, 14 students used a graphing calculator, and 4 students used both. What is the probability that a randomly selected student used only an app on the test?
Show your work.

52. Pedro is walking from the train station to the convention centre and must withdraw money at the bank on his way. He can only walk south and east. How many different ways can he get to the convention centre? Show your work.



53. There are 5 biology books, 4 math books, and 7 history books randomly placed on a shelf.

- Luis selects 2 books, one after the other. Determine the probability that both books are on the same subject. Show your work.
- Are the events in (a) independent or dependent? Explain.

54. Construction work has slowed travel near Dauphin, Manitoba. Harry must drive through the construction zone to get to work. The probability that he will be delayed because of the construction is 45%. If he is delayed, the probability he will get to work on time is 70%. If he is not delayed, the probability he will get to work on time is 85%.

- Use a graphic organizer to show all possible outcomes for this situation.
- Determine the probability that Harry will get to work on time.

Show your work.

55. A group of friends is ordering a meal of 3 pizzas and 2 salads from a restaurant. The restaurant offers 6 types of pizzas and 4 types of salads. If all pizzas and salads chosen must be different from one another, how many meal options do the friends have?

Show your work.

56. A dealership has 6 cars, 2 vans, and 4 trucks for sale.
- An employee is asked to park all of these vehicles in a row. How many different ways can this be done if all of the cars must be together, all of the vans must be together, and all of the trucks must be together?
 - [Finance Unit] Diane visits the dealership and decides to buy one of the trucks. The price of this truck is \$36 500.00, taxes included. She has \$4000.00 for a down payment. The balance will be financed at an interest rate of 2.99%, compounded monthly, for 7 years. Calculate her monthly payment.

Show your work.

ANSWERS ARE AVAILABLE ON REQUEST FROM INSTRUCTOR.

SUGGESTED FULL STEP BY STEP SOLUTIONS AND EXEMPLAR
ERRONEOUS SOLUTIONS ARE AVAILABLE ON-LINE AT.

<https://www.edu.gov.mb.ca/k12/assess/archives/#applied>

**ANSWERS TO
GRADE 12 APPLIED
PAST PROVINCIAL EXAM
SELECTED PROBABILITY QUESTIONS**

Remarks in [...] are mine , Mr.F

Do not forget; even if you do not get the *same answer* you still get marks for showing the correct steps for any question

So show your work!!!

It helps you do the correct steps, it helps you go back and check, it helps you readily correct any errors when you re-check.

JAN 2016

1. D cannot
2. C 0.7
3. a. diagram b. 0.45 or 44.75%
4. a. There are 50,400 ways b. There are 5,040 ways
5. a. There are 70 possible routes from home to school
b. The probability is $\frac{3}{7}$ or 0.43 or 42.86%
6. a. There are 27,405 teams.
b. There are 10,098 teams
c. There are 22,950 teams

JUN 2016

7. B. 0.44
8. B. $\frac{2}{21}$
9. a. There are 40,320 ways b. There are 4,320 ways
10. There are 4,823 different mixes
11. a. $\frac{1}{3}$ b. multiple possible answers; take away two non-squares
12. a. These events are not mutually exclusive because there are two numbers (6 and 12) that are both a multiple of 2 and a multiple of 3

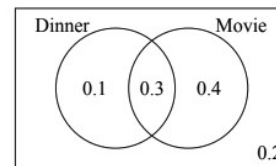
b. The probability is $\frac{2}{3}$, 0.67, or 66.67%
13. a. The probability is $\frac{27}{64}$, 0.42, or 42.19%
b. The probability is $\frac{37}{64}$, 0.58, or 57.81%

14. a. 67,600 codes are possible with no restrictions
b. 49,680 codes are possible

JAN 2017

15. B 10^4
16. B 56
17. a. The probability is $\frac{1}{25}$; 0.04, or 4.00%
b. The probability is $\frac{3}{95}$; 0.03, or 3.16%
c. an example of dependent events because there are fewer cards to choose from for the second draw when the first card is not replaced.
18. The probability is $\frac{1}{8}$; 0.13; or 12.50%
19. Last year, 469 059 people did not see a doctor [give or take a few depending on if you rounded too much in the intermediate steps]

20. a.



- b. The probability that she does only one of these activities is 0.5
21. a. There are 1,028,160 possible arrangements
b. The probability is $\frac{1}{306}$; 0.003; or 0.327%

JUNE 2017

22. C 3:5
23. There are 240 different routes.
24. The probability that at least one of them will score is 0.88 or 88%
25. a. There are 6,435 ways [no constraints]
b. The probability is $\frac{490}{1287}$; 0.38, or 38.07% [if constrained to have exactly 3 women]
26. a. There are 840 different arrangements [no constraints]
b. There are 48 different arrangements

JAN 2018

27. D 0.25
28. The probability is $\frac{7}{10}$; 0.70; or 70.00%
[the instructions say to round to nearest 0.01 so I put in the placeholder zeros even to show how accurate the answers is!]
29. A total of 1008 codes can be created.

30. a. There are 66 ways. b. There are 40,320 ways to arrange the dogs																										
31. The probability is $9/38$; 0.24; or 23.68%.																										
32. a.	b.																									
<p>A probability tree diagram starting from a single point on the left. The first level branches into two paths: the upper path is labeled $P(\text{snow}) = 0.60$ and the lower path is labeled $P(\text{no snow}) = 0.40$. From the $P(\text{snow}) = 0.60$ node, the second level branches into $P(\text{on time}) = 0.30$ (upper) and $P(\text{not on time}) = 0.70$ (lower). From the $P(\text{no snow}) = 0.40$ node, the second level branches into $P(\text{on time}) = 0.85$ (upper) and $P(\text{not on time}) = 0.15$ (lower).</p>	The probability is $12/25$; 0.48, or 48.00%.																									
33. a. There are 495 ways b. The probability is $1/99$; 0.01; or 1.01% c. The probability is $98/99$; 0.99, or 98.99%																										
JUN 2018																										
34. C. ${}_{16}C_4 * {}_{11}C_2$																										
35.																										
<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>+</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> </table>	+	1	2	3	4	1	2	3	4	5	2	3	4	5	6	3	4	5	6	7	4	5	6	7	8	The probability is $3/8$; 0.38, or 37.5%
+	1	2	3	4																						
1	2	3	4	5																						
2	3	4	5	6																						
3	4	5	6	7																						
4	5	6	7	8																						
36. He can take 18 different routes.																										
37. a. There are 130 students who voted for Maritza b. The odds against this student having voted for Arif are 56:44; or you might get 364:286 depending on how you calculate.																										
38. a. The probability is $291/1000$, 0.29, or 29.10% to see Jill b. The probability is $46/97$; 0.47, or 47.42% late for the bus																										
39. a. ${}_6C_2 = 15$. The total number of games played is 15. b. The probability is $1/3$; 0.33, or 33.33%																										
40. a. There are 471 744 000 passwords possible b. There are 18 144 000 passwords possible [with the restrictions (no repeats) and constraints (must begin with M)]																										

41. The probability is $37/77$ 0.48, or 48.05%	
JAN 2019	
42. C 56	
43. There are 240 ways.	
44. a. [Normal diagram] b. The probability is $17/25$; 0.68, or 68.00%	
45. There are 400,000 postal codes that can be created in Manitoba	
46. a. There are 48 routes. b. bus only routes = $5 * 4 = 20$ c. The odds are 20:28 or 5:7 [we generally prefer to see fractions and ratios reduced to simpler forms]	
47. There are 1,361,360 ways [Hint: 'at most two' means 0, OR 1, OR 2. OR means add!]	
48. a.	b.
<p>A Venn diagram with three overlapping circles labeled Drama, Chess, and Environmental. The regions are numbered as follows: Drama only is 5, Chess only is 6, Environmental only is 1, Drama and Chess overlap is 6, Drama and Environmental overlap is 8, Chess and Environmental overlap is 3, and the intersection of all three is 2. The number 10 is written outside the circles at the bottom right.</p>	The probability is $10/41$; 0.24, or 24.39%
JUNE 2019	
49. 89:11	
50. He can create 210 different images.	
51. The probability is $6/21$ or $2/7$; 0.29; or 28.57%	
52. a. There are 40 different ways [going past the bank].	
53. a. The probability is $37/120$; 0.31; or 30.83% b. The events in (a) are dependent because the books are not replaced. Therefore, the probability changes for the second selection of each book	
54. a. [standard diagram] b. The probability is $313/400$; 0.78, or 78.25%	



55. There are 120 meal options
56. a. There are 207 360 different ways. b. Her monthly payment is \$429.29 [Notice in 2019 they started making hybrid questions that combine different units of study; so combining Probability with Finance here]
<p style="text-align: center;">LOTS MORE ON THE WEBSITE!</p> <p>https://www.edu.gov.mb.ca/k12/assess/archives/#applied</p> <p>Including not just answers, but correct step-by-step solutions</p> <p>Not just step-by-step solutions but also exemplar examples of common mistakes!</p>