

# MDM4U Final Exam REVIEW

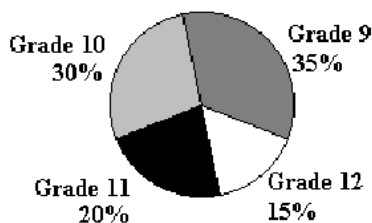
\*\*This review is a supplement only. It is to be used as a guide along with other review.

## Chapter 1

1. The circle graph shows the relative size of each grade (9, 10, 11, and 12) in a high school.

(a) If the school has 900 students in all, calculate the number of students in each grade.

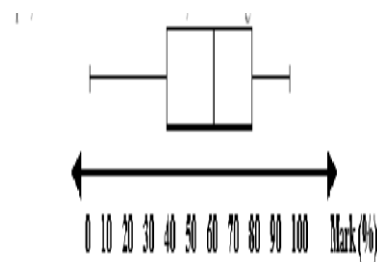
(b) Construct a new circle graph to show how the percent of Grade 9 students rose by 10% and the percent of Grade 11 students fell by 10% the following year. Compare graphs.



2. Analyze the following box-and-whisker plot. What are the median value for the whole sample, the median values for each half, and the range?



3. Students in Mrs. Singh's math class were asked if they can watch television and do math homework at the same time. According to the results shown on the right, are males or females more likely to think they are able to do this? Explain. (*The darker area represents Males*)



4. Dexter is 45 years old and 181 cm tall. For the last 8 years, his doctor has charted Dexter's mass and related it to his BMI (Body Mass Index). A BMI between 20 and 26 is considered healthy. The data is shown in the following table.

**Mass(kg)** 62 72 66 79 85 82 92 88

**BMI** 19 22 20 24 26 25 28 27

(a) Create a scatter plot for the data.

(b) Describe any trends in the data. Explain.

(c) Construct a median–median line for the data. Write a question that requires the median–median line to make a prediction.

(d) Determine the equation of the median–median line that you constructed.

(e) If Dexter's mass was 83 kg in the ninth year, what do you predict would be his BMI?

(f) In which year(s) was Dexter's BMI outside of the “healthy zone”?

(g) Dexter's friend Chandra is 167 cm tall. If she had the same mass, how do you think her graph would differ from Dexter's? Explain.

## Chapter 2

1. For each of the scenarios below, (i) determine the population, (ii) create a suitable thesis question, (iii) identify the key variables, (iv) state whether the data is qualitative or quantitative, (v) for the variables that are quantitative, state whether the data will be discrete or continuous, (vi) determine whether a census or sample should be used and describe it, and (vii) state whether a cross-sectional or longitudinal study would be most appropriate to draw conclusions.

- (a) A travel company calls people to ask where and how often they take vacations.
- (b) A child psychologist wants to find out if “skipping” a student ahead to the next grade would hinder her socially.
- (c) Clients at a dental office are asked how much they spend on average on dentistry per year.
- (d) A shoe store wishes to determine trends in consumer buying habits over the next 10 years.

2. The following is a list of species for five types of animals.

Mammals	Reptiles	Amphibians	Fish	Birds
cheetah	turtle	frog	shark	woodpecker
elephant	alligator	salamander	stingray	lark
dog	rattlesnake	toad	trout	goose
human	lizard	mud puppy	carp	ostrich
rabbit	crocodile	nwt	eel	chicken

- (a) Select 6 animals using simple random sampling.
  - (b) Select 5 animals using systematic random sampling.
  - (c) Select 10 animals using stratified random sampling.
3. Identify the type(s) of bias that may result from each of the following data collection methods.
- (a) You wish to find out how many hours teenagers spend playing video games on an average school night, so you survey your school’s computer club.
  - (b) You wish to determine how many students will come to an upcoming dance and so you send a survey to all Grade 9 classes.
  - (c) To collect data on teen shopping habits, you send surveys to every third house on a street.
  - (d) You take a random sample of females to survey them about their preference towards various brands of potato chips.
  - (e) You are interested in determining how many hours of television teenagers in your school watch per week, so you survey the chess club.
4. Give an example of a survey with household bias and another example of one with sampling bias. How do they differ? Explain.

## Chapter 3

1. Lulu’s quiz marks were 67, 45, 55, and 60 for the first four days of this week. By the end of Friday, her mean quiz mark for the five days was 58. What was her quiz mark on Friday?
2. On a given day, the temperatures (in °C) for 15 Ontario cities are: 12, 17, 11, 10, 7, 15, 18, 14, 13, 16, 9, 10, 15, 12, 15. Find the mean, median, and mode for this set of data. Which measure would be affected the most if the lowest temperature was not included?

3. Calculate the range, mean, median, quartile values, interquartile range, and the standard deviation of the world garbage production data at right. What does this suggest?

Country	Garbage (kg/person/day)
Canada	1.7
Australia	1.6
United States	1.6
Switzerland	1.3
Netherlands	1.1
United Kingdom	0.9
Japan	0.9
Sweden	0.8
China	0.5
Ethiopia	0.2

4. Germaine has been caught speeding seven times on a certain road near her house! The speed limit on this road is 60 km/h. Her speeds the seven times she was caught were recorded as follows, in km/h: 65, 72, 80, 69, 85, 75, 90. She received a letter from the police department saying that unless she reduces her speed to the speed limit consistently, she will lose her licence. Over the next few months, Germaine records her speed on that road as: 60, 61, 58, 64, 57, 60, 59. Should Germaine lose her licence? Use statistics to justify your answer. Can this type of calculation “hold up in court,” in your opinion?

5. Out of 150 packages of “Crispy Crunch Crackers,” 102 packages contain between 80 and 100 crackers. Use your knowledge about normal distributions to estimate the average number of crackers and the standard deviation of the sample. Use your answer to find the percent of packages with less than 85 crackers.

6. The ten test marks of two students are compared.

Sue: 75, 59, 58, 72, 80, 66, 71, 79, 68, 55 Leopold: 90, 83, 55, 84, 72, 63, 50, 65, 52, 91

(a) Calculate the mean and standard deviation for each student.

(b) What percent of each student’s marks falls within one standard deviation of the mean?

(c) What mark would be two standard deviations above the mean for Leopold?

7. For the distribution  $N(4, 0.39^2)$ , determine the percent of the data that is within the given interval.

(a)  $1.64 < x < 3.56$  (b)  $5 < x < 12.8$

8. The mean temperature in Waikiki, Hawaii is  $27^\circ\text{C}$  in December with a standard deviation of  $2.7^\circ\text{C}$ . The mean temperature in Key West, Florida is  $24^\circ\text{C}$  in December with a standard deviation of  $4.8^\circ\text{C}$ . It is  $30^\circ\text{C}$  on December 25 in both cities. Which city has a lower z-score and what does this mean in this context?

## Chapter 4

1. Each of the letters of the word PROBABILITY is printed on same-sized pieces of paper and placed in a bag. The bag is shaken and one piece of paper is drawn. (Consider Y as a vowel.)

(a) What is the probability that the letter A is selected?

(b) What is the probability that the letter B is selected?

(c) What is the probability that a vowel is selected?

(d) What is the probability that a consonant is *not* selected?

2. A lottery mixing bin contains 149 balls numbered 1 to 149. If a winning ball is drawn at random, find the probability that the winning ball is between 10 and 20 inclusive.

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- 4.** A magician's hat contains three types of rabbits: floppy-eared, white, and baby rabbits.  
(a) Draw a Venn diagram to illustrate the contents of the magician's hat, given that there are: 27 floppy-eared, 25 white, 34 baby, 13 floppy-eared and white, 9 floppy-eared baby, 5 white baby, and 2 floppy-eared white baby rabbits.  
(b) Suppose the magician selects one rabbit from the hat at random. Determine the probability that the magician chooses:  
(i) a white rabbit  
(ii) a rabbit without floppy ears  
(iii) a baby rabbit without floppy ears.
- 5.** What is the probability of drawing two queens in a row from a well-shuffled deck of 52 playing cards?
- 6.** If a pair of fair dice is tossed, what is the probability that the sum of the faces showing is even, given that the sum is greater than 7?
- 7.** A test has three multiple choice questions that offer five possible answers.  
(a) Determine the probability that a student will get two out of three questions correct by guessing on all of them.  
(b) Determine the probability that a student will get one out of three questions correct by guessing on all of them.
- 8.** How many distinct arrangements of the letters in PERMUDATIONS can you make?  
(a) taking all the letters at a time  
(b) taking seven letters at a time  
(c) taking three letters at a time
- 9.** Manpreet has 6 romance novels, 4 fiction novels, and 9 war novels on a shelf. In how many ways can she arrange her novels on the shelf if novels of the same genre are to be kept together?
- 10.** A drawer contains five blue, seven pink and three orange scarves. Three scarves are drawn from the drawer, one at a time, without replacement. Determine the probability that the order in which they are selected is:  
(a) blue, pink, orange (b) pink, blue, orange (c) orange, blue, pink
- 11.** In how many ways can a group of five people be chosen from seven couples (each of which has one male and one female) to form a club, given each of the following conditions?  
(a) All are equally eligible for the club.  
(b) The club must include two females and three males.
- 12.** Two teachers and six students on a class trip must ride in two four-passenger cars.  
(a) What is the number of ways that the eight people can be divided into two groups to ride in the two cars?  
(b) What is the number of ways if only teachers are allowed to drive?  
(c) What is the probability that the teachers will ride in the same car?

## Chapter 5

**1.** An insurance company's statistical records indicate that a particular type of house theft has occurred nearly six times per 20 000 homes. The company wants to break even on policies that pay out \$350 000 in the event of this type of theft. Find the premium that the insurance company must charge customers for insurance against this type of theft.

**3.** There are 10 questions on a multiple-choice quiz. Each question has four possible answers. Suppose Pitu knows the answer to six of the questions and guesses the answers to the other four. What is the probability of these events?

**(a)** Pitu gets at least eight questions right. **(b)** Pitu gets all 10 questions right.

**4.** A card is drawn from a standard deck and replaced. If this experiment is repeated 50 times, what is the probability that:

**(a)** exactly 20 of the cards are hearts

**(b)** at least 20 of the cards are hearts

## MDM4U Final Exam REVIEW Answers

1. (a) Gr. 9, 315; Gr. 10, 270; Gr. 11, 180; Gr. 12, 135 (b) Gr. 9, 45% (largest sector); Gr. 11 10% (smallest sector)  
 2. Overall median 62%; bottom-half median 40%, and top-half median 80%; approximately 2% to 99% range  
 3. Males are more likely to be able to do this 4. (a) (b) The points are scattered in a strong positive correlation ( $r = 1.0$ ). Greater mass means a higher BMI. (c) If Dexter's BMI is 30 in the tenth year of his visits to the doctor, what is his approximate mass?(d) The equation is  $BMI = m/3.28$  (e) just over 25 (f) Year 1, 7, 8(g) higher slope; steeper line

1. (a) i. General population (adults); ii. Where and how often do Canadians take vacations?; iii. Place and frequency of vacations; iv. Where (qualitative) and how often (quantitative); v. Discrete; vi. Sample; vii. Cross-sectional (b) i. School age children; ii. Is there a relationship between students who are skipped ahead and their social abilities?; iii. Age, current grade level, sociability; iv. Qualitative; v. N/A; vi. Sample; vii. Longitudinal (c) i. Clients at dental office; ii. How much do people spend on average on dentistry per year? iii. Spending; iv. Quantitative; v. Continuous; vi. Census; vii. Cross-sectional (d) i. Shoe customers; ii. What are consumer buying habits of shoes over the last 10 years?; iii. Buying of shoes ;iv. Quantitative; v. Discrete; vi. Sample; vii. Cross-sectional  
 2. (a) frog, newt, goose, eel, human, lizard; (b) stingray, trout, carp, eel, shark; (c) choose two from each strata. 3. (a) Sample bias The likelihood that members of the computer club play more video games is quite high. A random representation would be more accurate. (b) Non-response bias is possible unless you are there to collect the questionnaires. Other students should also be surveyed to eliminate sample bias. (c) If the survey is sent to every third house on your street, you may not be targeting homes where teens live. It is best to take a random sample in a high school. (d) Response Bias. Both males and females should be surveyed, as it is possible to skew the results by asking one gender only. (e) Sample bias: Chess club members aren't a fair representation of all teens in the school. 4. Household bias: You send a survey of Canadian families to an equal number of residents in each province. Sampling bias: Surveying only two Grade 10 classes in your school regarding an issue about all teens.

1. 63 2. mean = 12.9, median = 13, mode = 15; the mean would be affected the most. 3. range = 1.5, mean = 1.06, median = 1, interquartile range = 0.8, standard deviation = 0.47 4. Before: {65, 69, 72, 75, 80, 85, 90} mean = 76.57, standard deviation  $\hat{s} = 8.26$ ; After: {57, 58, 59, 60, 60, 61, 64} mean = 59.86, standard deviation  $\hat{s} = 2.10$ ; Her speed is more consistent with the speed limit, since the mean and standard deviation are lower with the second set of calculations. This statistical data should help in court. 5. 68% contain between 80 and 100 crackers. This implies that the mean would be somewhere in the middle of this interval with a standard deviation of approximately 10. Aprx 31% 6. (a) Sue: mean = 68.3, standard deviation  $\hat{s} = 8.3$ ; Leopold: mean = 70.5, standard deviation  $\hat{s} = 14.9$  (b) For Sue and Leopold, 5 of the 10 marks (50%) fall within one standard deviation. (c)  $70.5 + 2(14.9) = 100\% +$  7. (a) 0.13 or 13% (b) 0.0052 or .52% 8. Z-score for Waikiki's temperature:  $z = 1.11$ ; z-score for Key West's temperature:  $z = 1.25$ . Waikiki has a slightly lower z-score, which means that its temperature is closer to its mean than Key West's temperature is.

(a)  $\frac{1}{11}$  (b)  $\frac{2}{11}$  (c)  $\frac{5}{11}$  (d)  $\frac{5}{11}$  2.  $\frac{11}{149}$  4. (a) Venn diagram has the following data: 2 floppy white, baby; 11 floppy white; 7 floppy baby; 7 floppy only; 3 white baby; 9 white only; 22 baby only.  
 (b) (i) 25/61 (ii) 34/61 (c) 25/61 5. 1/221 6. 3/5 7. a) 12/125 b) 48/125 8. (a) 12! (b) 3991680 (c) 1320 9.  $(6!4!9!)(3)(2)$   
 10. a)b)c)  $(5 \times 7 \times 3)/(15 \times 14 \times 13)$  11. (a)  $C(14, 5) = 2002$  (b)  $C(7, 2) \cdot C(7, 3) = 735$   
 12. (a)  $C(8, 4) = 70$  (b)  $C(2, 1) \times C(6, 3) = 40$  (c)  $1 - \frac{40}{70} = \frac{3}{7}$

(a)  $\frac{67}{256}$  (b)  $\frac{1}{256}$  11. \$105 premium to break even. 3. 4. (a)  $7.65 \cdot 10^{-3} = 0.00765$  (b)  $P(X = 19.5) = 1 - P(z = 2.29) = 0.011$