Date: _____

CHAPTER 3

One Variable Statistics

Get Set

Answer these questions to check your understanding of the Prerequisite Skills concepts on pages 100–101 of the *Foundations for College Mathematics 11* textbook.

Numeracy Skills

1. Order the numbers in each set from greatest to least.

a) 19, 31, 11, 7, 22, 17, 6, 10, 13, 28, 4

b) –2, 12, –19, 0, 42, 61, –44, 58, 17, 4

c) $\frac{7}{8}, \frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{3}{11}$

2. Evaluate. Round your answer to two decimal places, if necessary.

a) $\frac{12 + 9 + 13 + 15 + 17 + 20 + 11}{7}$ **b)** $\frac{7.1 + 4.3 + 9.9 + 0.5 + 1.6 + 5.5 + 13.1 + 10.6 + 7.8}{9}$

c) $\sqrt{54}$ **d)** $\sqrt{2^2 + 5^2}$

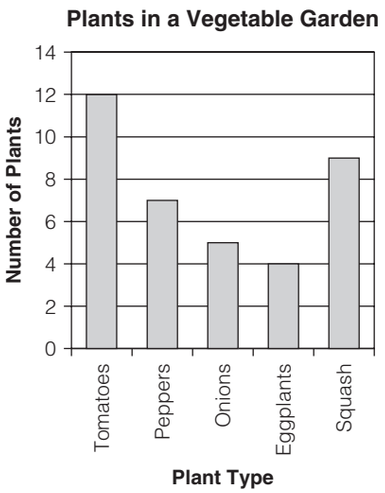
Interpret Graphs

3. The graph shows the number of each type of plant at a community vegetable garden.

a) Identify the type of graph.

b) Which plant type is most abundant?

c) What is the total number of plants in the garden?



Date: _____

3.1 Sampling Techniques

Textbook pp. 102–109

Warm-Up

1. Number Skills

Evaluate.

a) $\frac{117 + 33}{75 \div 3}$ **b)** $\frac{10}{5 \times 4}$

2. Algebra

Simplify.

a) $4x + 5y + 3x + 6y$

b) $5s - 3t - 2s + 8t$

c) $3a + 7b - 3 + 7a - 6a$

3. Relations

A line has the equation $y = \frac{3}{4}x + 7$.

a) State the coordinates of the y-intercept.

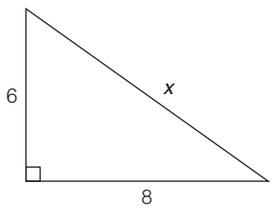
b) State the slope of a parallel line.

c) State the slope of a perpendicular line.

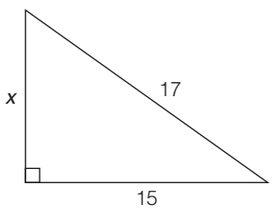
4. Geometry/Measurement

Solve for x.

a)



b)



5. Data/Probability

Calculate the probability of each event.

a) rolling an even number with one die

b) rolling a sum of 12 with two dice

6. Modelling

Write an equation to model the following situation.

A square's side length is increased by x units. The perimeter of the resulting rectangle is 20 units.

7. Math Literacy

What is the name of a five-sided figure?

What is the name of a triangle with each side a different measure?

8. Previous Section

Order the numbers from greatest to least.

1.15, 1.12, 1.31, 1.09, 1.71, 1.22

Date: _____

Practise

1. A friend conducting a survey calls you and others in your group of friends to ask about your favourite movie. Which sampling technique is being used?

2. Choose the best sampling technique for each survey. Explain your choice.

a) Liam wants to know which political party Canadians plan to vote for in the next federal election.

b) Elise wants to know which email program students in her high school use most often.

c) Eric wants to know the favourite NHL hockey team of people in his town.

d) Alexis wants to find out whether people in the province are in favour of switching to cloth bags for groceries.

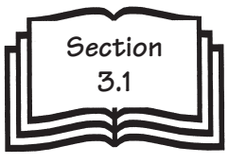
3. In each situation, identify the sample and population.

a) The College of Physicians and Surgeons of Ontario asks family doctors to give out surveys to every tenth patient who visits them to ask whether patients are satisfied with the services provided by their family doctor.

b) A fast-food restaurant wants to know if customers would be interested in a healthy choices menu. They have a kiosk set up at the restaurant and offer customers a free combo meal if they are willing to fill out the 5-minute survey.

c) Emma wants to know if her fellow students plan to go to college after high school or if they plan to get a job. She surveys every student who takes English and asks them about their plans.

Date: _____



d) A battery manufacturer wants to test how long their brand of batteries lasts for quality control purposes. They randomly choose 1% of the batteries produced each day and test the battery life.

4. The company that supplies food to the school cafeteria is planning on changing their menu. The hope is that after the menu changes, more students will buy their lunch from the cafeteria. They survey every fifth student who uses the cafeteria one day. What sampling technique was used?

5. Refer to question 4. The school principal points out the to the company that there are more grade 9 and 10 students at the school than grade 11 and 12 students. The population of the school according to grade is shown in the table.

Grade	Number of Students
9	411
10	352
11	241
12	209

The company decides to randomly sample 50 students from each grade.

a) What sampling technique was used?

b) Is this an appropriate technique? Explain.

6. Zainab works in the human resources department of an international company. She needs to determine the level of job satisfaction of Canadian employees within the company. There are offices in Vancouver, Calgary, Winnipeg, Ottawa, Montreal, and Halifax. Explain how she can use each technique to choose a sample for her survey.

a) simple random sampling

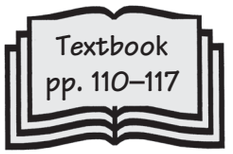
b) cluster sampling

c) stratified random sampling

d) voluntary response sampling

Date: _____

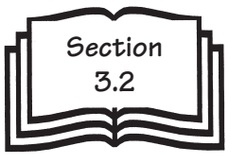
3.2 Collect and Analyse Data



Warm-Up

1. Number Skills	2. Algebra
Evaluate. **a)** $3 + [2 + (7 - 4)]$ **b)** $8 - [6 - (10 - 7)]$	Simplify. **a)** $3xy - 4x + 5y - 2xy$ **b)** $7a + 3b - 4 - 6a + 11$ **c)** $(3x + 5) - (2x + 6)$
3. Relations	**4. Geometry/Measurement**
State the number of x-intercepts for the line that passes through (0, 2) and (10, 2).	A can has a radius of 5.5 cm and a height of 11.2 cm. What is the volume of the can, in millilitres? Hint: 1 cm^3 = 1 mL.
5. Data/Probability	**6. Problem Solving**
State the probability of each event. **a)** drawing a red card from a deck of cards **b)** drawing a spade from a deck of cards	Find the next two numbers in this pattern. 1, 4, 9, 16, 25, …
7. Math Literacy	**8. Previous Section**
Select the correct statement. **A** Congruent figures have at least two sides that are equal length. **B** Congruent figures have one pair of equal angles. **C** Congruent figures have equal sides and equal angles. **D** None of the above.	Jack wants to know if people are going to the prom. He puts a sign up on one of the gym doors that says: *Place a check mark on the sheet if you're going to the prom.* What kind of sampling technique did Jack use?

Date: _____



Practise

1. An athletics company surveys random members of the population about their levels of physical activity. The survey question starts with this statement: *Healthy behaviours, including regular physical activity, that begin at a young age and continue throughout life are important to achieving and maintaining a healthy weight.*

a) Explain why this question might result in response bias.

b) How could you eliminate the possible response bias?

2. Identify each source as a primary source of data or a secondary source of data.

a) Nidal accesses the World Bank database to determine the life expectancy of citizens in various counties.

b) Arina surveys her classmates to determine which team they think will win the next Stanley Cup.

c) Archie's parents ask their friends which college their children go to and if the children like the college they chose.

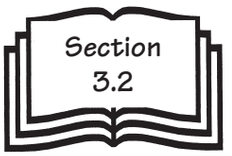
d) Elise accesses the school database to determine what percent of students are born in the month of July.

3. Henry wrote this survey question: *Who do you think is the best musical group of all time?*

a) *The Beatles*
b) *The Rolling Stones*
c) *Radiohead*
d) *U2*
e) *Coldplay*
f) *Other:* _____

Identify any weakness in this survey question.

Date: _____



4. Identify the bias in each survey. Suggest how the bias might be removed.

a) A Web site asks visitors to click a button if it is one of their favourite sites.

b) A car dealer mails out surveys to previous customers. The survey asks: *What brand of car do you think is the most reliable?*

c) To find out whether basketball game tickets are too expensive, season ticket holders of the Toronto Raptors are asked: *Do you think ticket prices are too high?*

d) A college mails out 5000 surveys to past students. Approximately 900 surveys are returned. The college makes statements about the professions of its students based on the survey results.

5. The airport improvement committee at a busy international airport wants to know if they should build an Internet café in one of the terminals. Two members of the committee have these suggestions:

- Olivia suggests surveying every tenth traveller who passes the security check, asking them if they would use an Internet café if it were located in that terminal.
- Max suggests surveying random patrons in the Air Canada lounge since 50% of travellers in the terminal in which the café would be placed are Air Canada travellers.

a) Identify the sampling technique each committee member suggested.

b) Give a strength and a weakness for each person's sampling technique.

Olivia's Survey Technique	
Strength	Weakness

Max's Survey Technique	
Strength	Weakness

Date: _____

3.3 Display Data

Textbook pp. 118–129

Warm-Up

1. Number Skills

Round each number to the nearest tenth.

a) 0.84

b) 1.71

c) 100.95

2. Algebra

Simplify.

a) $(2x^2 + 3x + 4) + (5x^2 + 4x + 9)$

b) $(m^2 + 2) - (5m^2 + 2m - 6)$

c) $(5x + 6y) - (3y + 6x) - (y - 3x)$

3. Relations

Solve the linear system.

$y = x + 4$

$y = 2x - 4$

4. Geometry/Measurement

At a point 5.3 m away from the base of a tree, the angle of elevation to the top of a tree is 52°. How tall is the tree?

5. Data/Probability

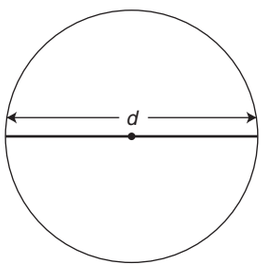
Elenora tossed a coin 100 times and got heads 42 times.

a) What is the experimental probability?

b) What is the theoretical probability of getting heads on 100 tosses?

6. Modelling

Write an equation to model the circumference, C, of the circle.



7. Math Literacy

Which set describes the set of integers?

A {1, 2, 3, 4, 5, . . .}

B {0, 1, 2, 3, 4, . . .}

C {. . ., –3, –2, –1, 0, 1, 2, . . .}

D None of the above.

8. Previous Section

Describe the difference between a primary source of data and a secondary source of data.

Date: _____

Practise

Section 3.3

1. Classify each set of data as continuous or discrete.

a) the amount of rainfall each month for one year

b) the report-card mathematics marks for students in your school

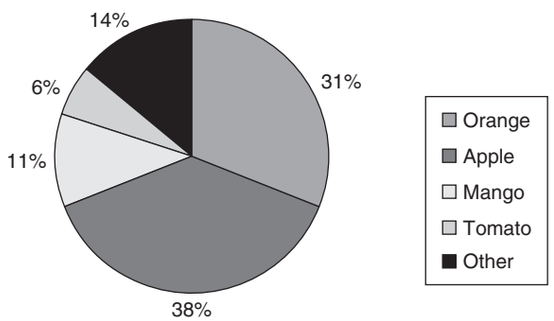
c) the cost of a bouquet of flowers at the florist

d) the population of a country from 1960 to 2008

e) the heights of students at your school

2. Cynthia surveyed students in her class about their favourite type of juice. The data is displayed in the graph.

Favourite Juices in Cynthia's Class



a) Which type of juice was the most popular? How do you know?

b) What type of juice was the least popular? How do you know?

c) What other type of graph could have been used to display the data?

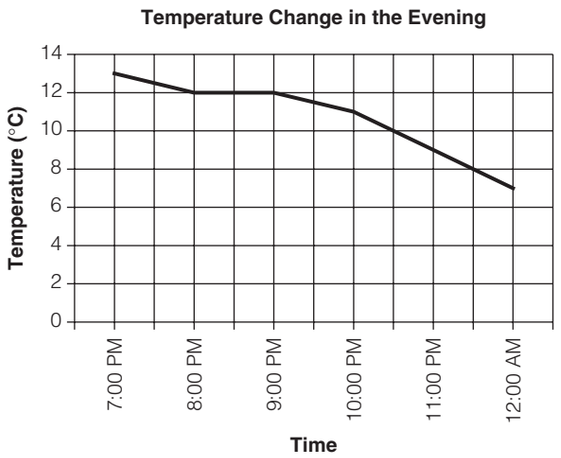
d) How many students are in Cynthia's class?

e) If five students chose "other" as their favourite, how many students chose "tomato"?

Date: _____

Section 3.3

3. Examine the line graph and the bar graph.

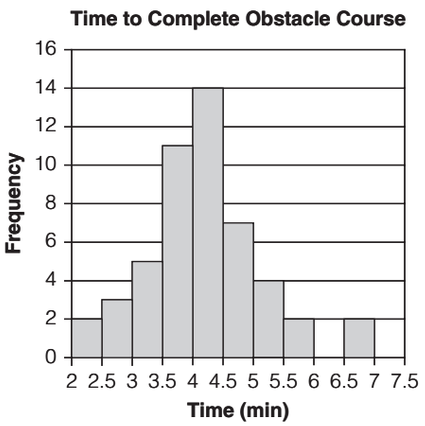


a) Could a bar graph have been used to display the data in the line graph?

b) Could a line graph have been used to display the data in the bar graph?

c) Which graph displays discrete data? Explain how you know.

4. The histogram shows the times to complete an obstacle course.



a) How many people completed the obstacle course in at least 3 min but less than 4 min?

b) How many people completed the obstacle course in at least 4.5 min?

c) How many people total completed the obstacle course?

d) Find the percent of people who completed the obstacle course in at least 4.5 min.

Date: _____

5. Which type of graph would best represent each set of data? Give reasons for your choices.

a) all the items in the advertising budget for a new restaurant

b) the daily high temperature of each day in May

c) the arm span of students in your class

d) the attendance numbers for each one of the top ten grossing movies on the weekend

e) the depreciation of a car's value over time

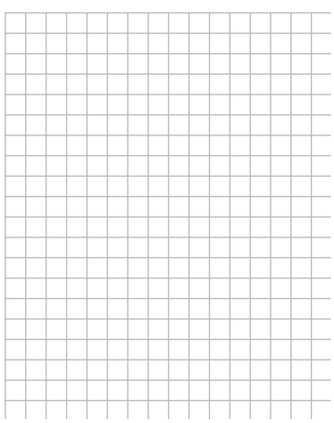
f) the number of customers who order a hamburger, a hotdog, or a veggie dog from a street vendor on one day

6. Here are the marks for one of the grade 11 mathematics classes at Trudeau High School.

Mark Interval	Tally	Frequency
[40–50)	| | |	
[50–60)	𝍸	
[60–70)	𝍸 | | |	
[70–80)	| | | |	
[80–90)	| | |	
[90–100]	| |	

a) Complete the table.

b) Create a histogram to display the data. You may use a graphing calculator or computer software to create the histogram. If you use technology, print or sketch a copy of your histogram. Remember to label your axes and provide a title for your graph.



Date: _____

3.4 Measures of Central Tendency

Textbook pp. 130–139

Warm-Up

1. Number Skills

Evaluate.

a) $4^2 + \sqrt{9} + 7$

b) $\sqrt{121} - \sqrt{9^2}$

2. Algebra

Solve.

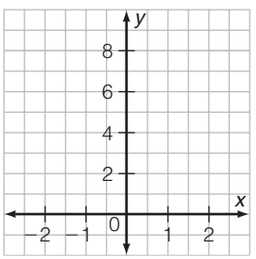
a) $2x + 3 = 7$

b) $2(x - 1) = 6$

c) $(3x + 5) - (2x + 6) = 4$

3. Relations

Sketch a graph of the quadratic relation $y = x^2 + 3$.



4. Geometry/Measurement

Find the volume of each cylinder.

a) $r = 4$ cm, $h = 12$ cm

b) $r = 11.2$ cm, $h = 10.5$ cm

5. Data/Probability

Determine the mean, the median, and the mode of the set of data.

54, 33, 78, 42, 99, 61, 82, 87, 77

6. Modelling

Write an equation to model the following situation.

Alan is 7 years older than his sister. The sum of their ages is 42 years.

7. Math Literacy

What is the term for an angle less than 90°?

What is the term for an angle greater than 90°?

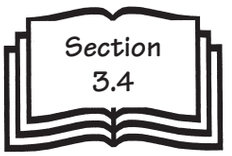
8. Previous Section

Which type of graph would you use to represent each situation?

a) temperature of a cup of coffee over one hour

b) the portion of the graduating class who are planning to: go to college, work, travel, have other plans

Date: _____



Practise

1. Find the mean, the median, and the mode for each set of data.

a) the ages of players on a baseball team: 22, 27, 41, 28, 33, 39, 22, 27, 55, 31

mean: _____ median: _____ mode: _____

b) the batting averages of players on a baseball team: 0.402, 0.391, 0.291, 0.317, 0.313, 0.204, 0.498, 0.376, 0.302, 0.277

mean: _____ median: _____ mode: _____

c) the highest price of gas per litre each day for a week: $1.02, $1.08, $1.01, $1.05, $1.02, $1.05, $1.07

mean: _____ median: _____ mode: _____

2. Which measure of central tendency do you think best describes the data for each situation in question 1? Explain.

a)

b)

c)

3. The table shows the final English mark ranges for the graduating class at Redbridge High School. Find the median, the mode, and the maximum possible range of the marks.

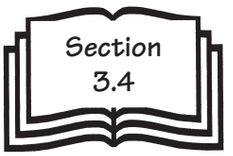
median: _____

mode: _____

maximum possible range: _____

Mark	Frequency
[30–40)	1
[40–50)	2
[50–60)	4
[60–70)	10
[70–80)	5
[80–90)	4
[90–100]	2

Date: _____



4. One of the starters for the school's baseball team is ill and the coach must decide who to put on the starting line-up. Leroy and James have had the same number of at-bats in the past 6 practice games. The number of hits for each player is shown in the table.

Game	1	2	3	4	5	6
Leroy	3	2	4	0	1	2
James	2	2	4	3	2	3

a) Find the mean, the median, and the mode number of hits for each player.

Leroy mean: _____ median: _____ mode: _____

James mean: _____ median: _____ mode: _____

b) Which player should be put on the starting line up? Justify your answer.

5. Jenny canvassed door-to-door for a local charity. The amounts of the donations she received are shown in the table.

Amount of Donation ($)	Frequency
0–9	17
10–19	26
20–29	13
30–39	11
40–50	2

a) Which measure of central tendency cannot be calculated? Explain.

b) Calculate the measures of central tendency that are possible to determine.

c) Which of the measures of central tendency from part b) best describes the data? Give reasons for your choice.

Date: _____

3.5 Measures of Spread

Textbook pp. 140–147

Warm-Up

1. Number Skills

Order the numbers from least to greatest.

0.93, 1.71, –1.91. –0.99, 1.21, –1.03

2. Algebra

Solve.

a) $-2x + x - 4 = 3x + 8$

b) $2(m + 3) + 3(m - 1) = 3(m - 2) + 1$

c) $10(2m - 7) - 3(m + 2) = 20m - 70$

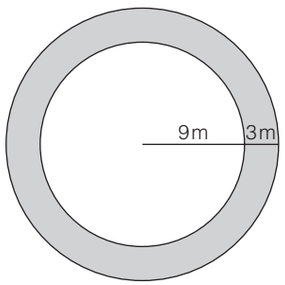
3. Relations

State the value of the maximum or minimum for the quadratic relation.

$$y = -x^2 - 5$$

4. Geometry/Measurement

Find the area of the shaded region.



5. Data/Probability

The mean of a set of data is 42.5. The sum of the data values is 935. How many values are in the set of data?

6. Modelling

Write an equation to model the perimeter of the rectangle.

The width of a rectangle is 4 cm less than its length. The perimeter of the rectangle is 32 cm.

7. Math Literacy

Which figure is *not* a polygon?

A square
B circle
C trapezoid
D irregular pentagon

8. Previous Section

The owner of a shoe store recorded the women's shoe sizes sold in one day.
6, 7, 9, 10, 6, 10, 9, 9, 10, 7, 7, 10, 11

a) Find the mean, the median, and the mode shoe size.

b) Which is the best measure of central tendency?

Date: _____

Practise

Section 3.5

1. The least value in a set of data is 13. The range of the data is 112. What is the greatest data value?

2. The greatest value in a set of data is 9.4. The range of the data is 3.2. What is the least data value?

3. For each variance, find the standard deviation.

a) 81

b) 225

c) 52

d) 7.8

4. For each standard deviation, find the variance.

a) 4

b) 28

c) 52.8

d) 6.3

5. Elle works full-time as a waitress in the summer. She recorded the tips she earned for each shift in the month of July.
$87, $113, $49, $120, $133, $77, $93, $89, $90, $120,
$122, $95, $84, $111, $92, $84, $62, $59, $72, $83

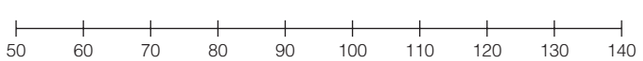
a) Order the data from least to greatest.

b) Find the median for the set of data.

c) Find the first and third quartiles.

d) What is the interquartile range?

e) Display the data using a box-and-whisker plot.



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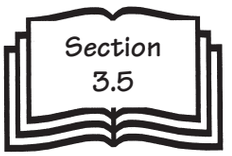


6. Calculate the range, the mean, the variance, and the standard deviation for each set of data.

a) the heights, in centimetres, of players on a basketball team:
181, 173, 194, 200, 185, 190, 178, 186, 192, 196, 181, 176

range: _____ mean: _____

variance: _____ standard deviation: _____

b) the masses, in kilograms, of bags of peanuts sold at a bulk-food store:
2.2, 1.7, 1.6, 1.9, 2.1, 2.2, 2.8, 1.9, 2.5, 1.8

range: _____ mean: _____

variance: _____ standard deviation: _____

c) the number of runs scored by a baseball team at their last 10 games:
3, 6, 1, 2, 9, 2, 0, 5, 4, 7

range: _____ mean: _____

variance: _____ standard deviation: _____

d) the number of visitors to a theme park on Saturdays in one summer:
1298, 970, 899, 1402, 1312, 1105, 1004, 1230, 1005, 1190

range: _____ mean: _____

variance: _____ standard deviation: _____

7. Two classes both have a mean test mark of 72. Class A's marks have a standard deviation of 7.2. Class B's marks have a standard deviation of 15.8.

a) Which class has a greater range of marks? How do you know?

b) How do the two classes' marks compare?

Date: _____

3.6 Common Distributions

Textbook pp. 148-155

Warm-Up

1. Number Skills

Find the approximate square root of each value. Round to two decimal places.

a) 51 **b)** 6.4

c) 90 **d)** 2.3

2. Algebra

Solve.

a) $3(x + 1) + 4 = 2(x - 1)$

b) $\frac{2x - 1}{3} = 5$

c) $\frac{x + 7}{4} = \frac{2x - 1}{3}$

3. Relations

Determine the value of x when $y = 4$ for the linear relation $y = \frac{1}{2}x + 6$.

4. Geometry/Measurement

A right triangle has one side measuring 15 cm and a hypotenuse measuring 21 cm. Determine the measure of the angle between the given sides.

5. Data/Probability

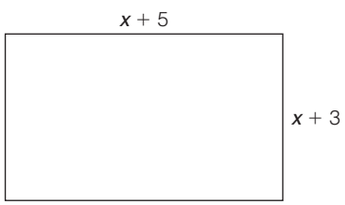
Write the probability of each event.

a) tossing 3 heads in 3 coin tosses

b) *not* tossing 3 heads in 3 coin tosses

6. Modelling

Write an equation to model the area of the rectangle.



7. Math Literacy

What is the name of the point where the x-axis intersects the y-axis on a Cartesian plane?

8. Previous Section

Calculate the standard deviation of the set of data.

4, 8, 2, 1, 10, 7, 5, 8, 13, 7

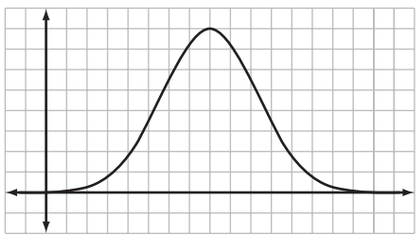
Date: _____

Practise

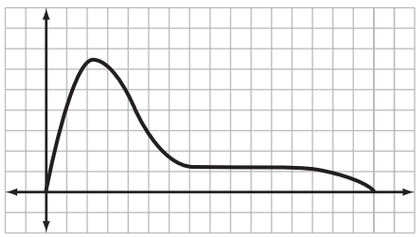
Section 3.6

1. Classify each distribution as normal, skewed, or bimodal.

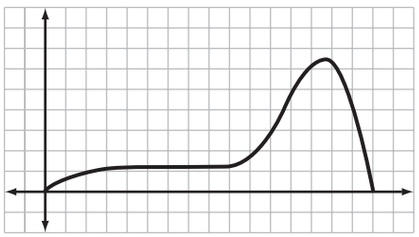
a)



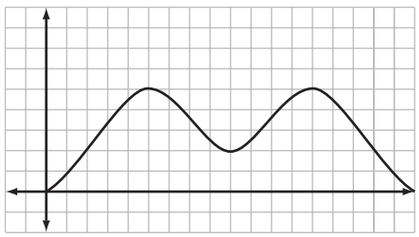
b)



c)



d)



2. Which type of distribution you would expect for each scenario? Explain.

a) the selling price of cars at a North American car dealership

b) the heights of students at a public elementary school

c) the gas efficiency of motorcycles and SUVs

d) the masses of males exercising at the local YMCA

3. Give an example of a set of data that has each distribution.

a) normal distribution

b) skewed distribution

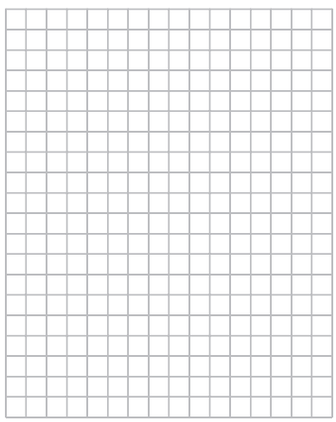
c) bimodal distribution

Date: _____

4. Salaries (in $1000s) for employees at a company are shown.

Salary ($1000s)	Frequency
[30–40)	5
[40–50)	9
[50–60)	14
[60–70)	4
[70–80)	3
[80–90)	2
[90–100)	1
[100–110)	1

a) Display the data using a histogram.



b) What type of distribution does the graph represent? Explain.

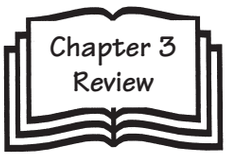
c) What conclusions can you draw about the salaries at the company? Explain.

d) Do you think this type of salary distribution is typical in most companies? Explain.

e) The company decides to contract out some of its skilled labour jobs to cut labour costs. They lay-off 75% of their computer technicians, who earned an annual salary of $50 000–$60 000. Then, they hire 5 new computer technicians on contract, at an annual salary of $20 000–$30 000. What type of distribution does the new data show? Explain.

Date: _____

Chapter 3 Review



3.1 Sampling Techniques, textbook pages 102–109

1. Lesley wants to determine what Internet service provider most people in her neighbourhood use. Choose the best sampling technique for collecting this data.

2. The Ottawa Public Library wants to know whether more computers are required for library patrons. They randomly generate names from the card-holder database for the survey. Identify the sample and the population.

3.2 Collect and Analyse Data, textbook pages 110–117

3. Identify each source as a primary source of data or secondary source of data.

a) Anita surveys all the employees at her grocery store to ask if they plan to take vacation during the summer.

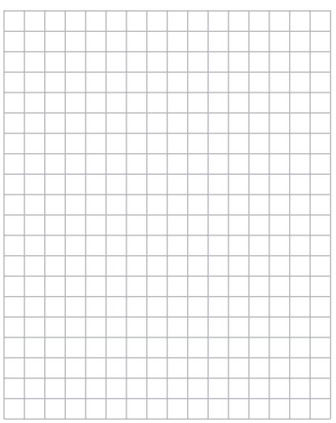
b) Allen finds the areas of various provincial parks from a government Web site so he can compare the area of each park to the total area of all provincial parks.

3.3 Display Data, textbook pages 118–129

4. The ages of players on a women's soccer team are shown.
31, 22, 44, 50, 27, 29, 25, 37, 42, 30,
24, 26, 37, 40, 22, 21, 29, 38, 54

Age Interval	Tally	Frequency
[20–29)		
[30–39)		
[40–49)		
[50–59)		

a) Complete the table.
b) Create a histogram to display the data.



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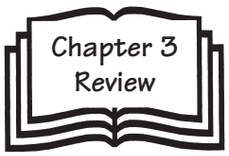


3.4 Measures of Central Tendency, textbook pages 130–139

5. The table shows the number of prizes awarded in a contest and the value of each prize.

Prize Value ($)	Number of Prizes
1000	1
500	2
100	5
25	10

a) Find the mean prize value.

b) Find the median prize value.

c) Find the mode prize value.

d) Which measure of central tendency was easiest to find?

e) Which measure of central tendency best describes the data? Explain.

3.5 Measures of Spread, textbook pages 140–147

6. Find the range and the standard deviation for each set of data.

a) the number of hours Erica surfed on the Internet each day last week:
2.5, 5, 4.25, 1, 2.25, 0.5, 5

range: _____ standard deviation: _____

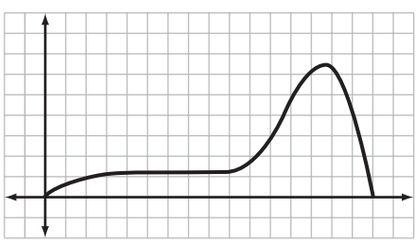
b) Adam's weekly earnings during the summer months:
$312, $290, $440, $170, $225, $305, $330, $380

range: _____ standard deviation: _____

3.6 Common Distributions, textbook pages 148–155

7. Classify each distribution as normal, skewed, or bimodal.

a)



b)