

5
UNIT 5 – DATA & PROBABILITY

Assignment	Title	Work to complete	Complete
7.1	<i>Mean, Median, Mode & Range</i>		
7A	<i>Worksheet</i>		
	<i>Quiz 1</i>		
7.2	Displaying Data: <i>Histograms & Bar Graphs</i>	n o t i n c l u d e d	
	Scatter Plots		
	Line Graphs		
	Circle Graphs		
	Pictographs		
7.2	Worksheet		
	Quiz 2		
7.3	<i>Experimental Probability</i>		
7C	<i>Worksheet</i>		
	<i>Quiz 3</i>		
Practice Test	Practice Test / Unit Review Assignment		
Chapter Test	Show me your stuff !		
Self-Assessment	On the next page, complete the self-assessment.		

Self Assessment

On the following chart, indicate how confident you feel about each statement.

1 – I need more help

2 – I need more practice

3 – I could teach it!

Discuss this with your teacher *before* you write the test!

Statement	1, 2 or 3
After completing this chapter;	
<ul style="list-style-type: none">I can interpret and analyze and create a variety of graphs (bar, histogram, line, circle, pictographs, infographs, scatter plots)	
<ul style="list-style-type: none">I can create a variety of graphs (bar, histogram, line, circle, pictographs, infographs, scatter plots) from a set of data	
<ul style="list-style-type: none">I can calculate the measures of central tendencies for a given set of data (mean, median and mode)	
<ul style="list-style-type: none">I can identify outliers and analyze how they may affect measures of central tendency	
<ul style="list-style-type: none">I can identify relationships (correlations) between two variables in a set of data	
<ul style="list-style-type: none">I can calculate theoretical probability of an event	
<ul style="list-style-type: none">I can conduct an experiment (or create a simulation) to determine the probability of an event happening	
<ul style="list-style-type: none">I understand the difference between theoretical and experimental probability	

Vocabulary:

mean
median
mode
range
measures of central tendency
experimental probability
theoretical probability

data
scatter plots
outliers
infographs
positive correlations
negative correlations

Statistics is a field of mathematics that deals with the collecting and summarizing of data. There are four measures of central tendency that we will be working with:

Mean (sometimes called average). To calculate the mean we add up all the values and then divide by the number of values we have.

Median is the center or middle value. To find the median we order all the numbers from smallest to largest and then pick the middle number.

(If there are two numbers in the middle we take the mean of those two numbers.)

Mode is the most frequent value. To find the mode we look for the value that occurs most often.

Range is the difference between the highest and lowest values. (Subtract the lowest value from the highest value)

Example 1: Find the Mean, Median, Mode and Range of the following set of numbers:

32 , 33 , 34 , 33 , 23 , 26 , 34 , 34 , 3

Example 2: Find the Mean, Median, Mode and Range

4.2 , 10.3 , 11.3 , 5.0 , 60.5 , 35.2 , 21.7 , 24.0 , 4.9 , 18.9

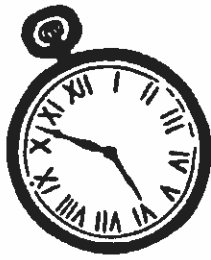
Sample Final Exam Question:

The tuition costs for ten universities are given in a table:

University	UBC	UVIC	TRU	Waterloo	McGill	UFV	UNBC	SFU	UofA	Uo
Costs (\$)	7568	8650	9225	5880	6720	8840	7820	8432	8990	8260

Find the Mean, Median, Mode, and Range of the tuition prices:

Assignment: Worksheet 7A



What Happened To The Owl Who Swallowed A Watch?



Work out each question on the left and draw a straight line connecting the question to the correct answer. Each line will cross a number and a letter. The number tells you where to put the letter in the row of boxes at the bottom of the page.

Find the Mean:	3, 15, 12, 16, 8, 4, 19	■																■ 144	
	1.2, 3.3, 1.7, 2.5, 2.7, 3.0	■	③															■ 83	
	53, 45, 62, 70, 58, 65, 46	■		⑥														■ 70	
	157, 133, 142	■																■ 2.1	
	85, 92, 67, 81, 90, 76, 94, 51	■	①⑥	⑨															■ 11
Find the Median:	3, 15, 12, 16, 8, 4, 20	■	①															■ No Mode	
	1.2, 3.3, 1.7, 2.5, 2.7, 3.0	■																■ 24	
	157, 133, 142	■																■ 2.4	
	85, 92, 67, 81, 90, 76, 94, 51	■	①④	⑫															■ 79.5
	3, 15, 12, 16, 8, 4, 20	■																	■ 2.6
Find the Mode:	1.2, 3.3, 1.7, 2.1, 2.7, 3.3	■																■ 25	
	46, 70, 62, 70, 58, 70, 46	■	②	⑧														■ 57	
	85, 92, 67, 85, 92, 76, 92, 51	■	⑬															■ 3.3	
	3, 15, 12, 16, 8, 4, 20	■																■ 17	
	1.2, 3.3, 1.7, 2.5, 2.7, 3.0	■																■ 12	
Find the Range:	53, 45, 62, 70, 58, 65, 46	■																■ 43	
	157, 133, 142	■																■ 142	
	85, 92, 67, 81, 90, 76, 94, 51	■																■ 92	

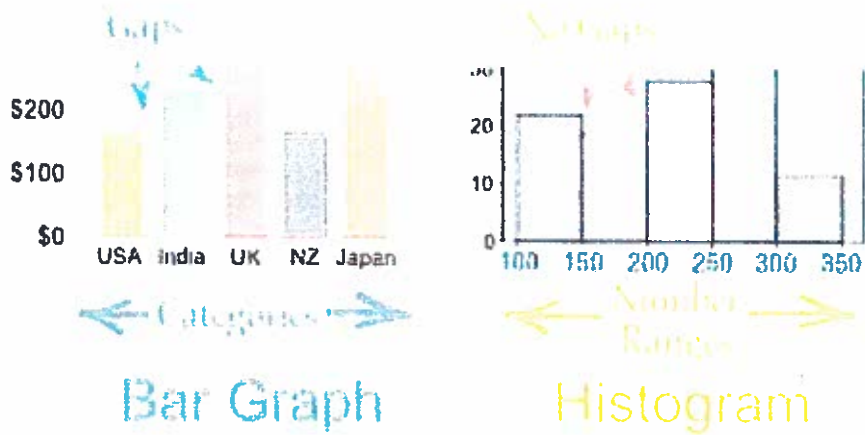
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

* Ask for Quiz 1

Histograms & Bar Graphs:

We use **Bar Graphs** when the data is in categories. There are spaces between the bars.

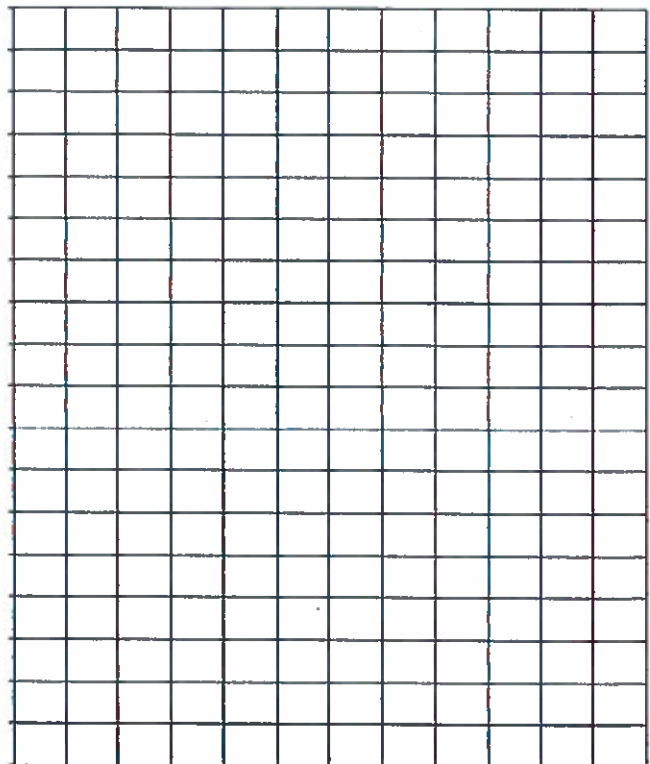
We use **Histograms** when the data is continuous. There are no spaces between the bars.



Example 1: For a recent science project, you collected data regarding the distribution of fish and aquatic life in a nearby pond. Your data consists of the number of living creatures found in each 1 meter depth increment in the pond.

Decide whether to use a histogram or a bar graph. Draw the axes and decide on scale. Label the axes and draw your graph.

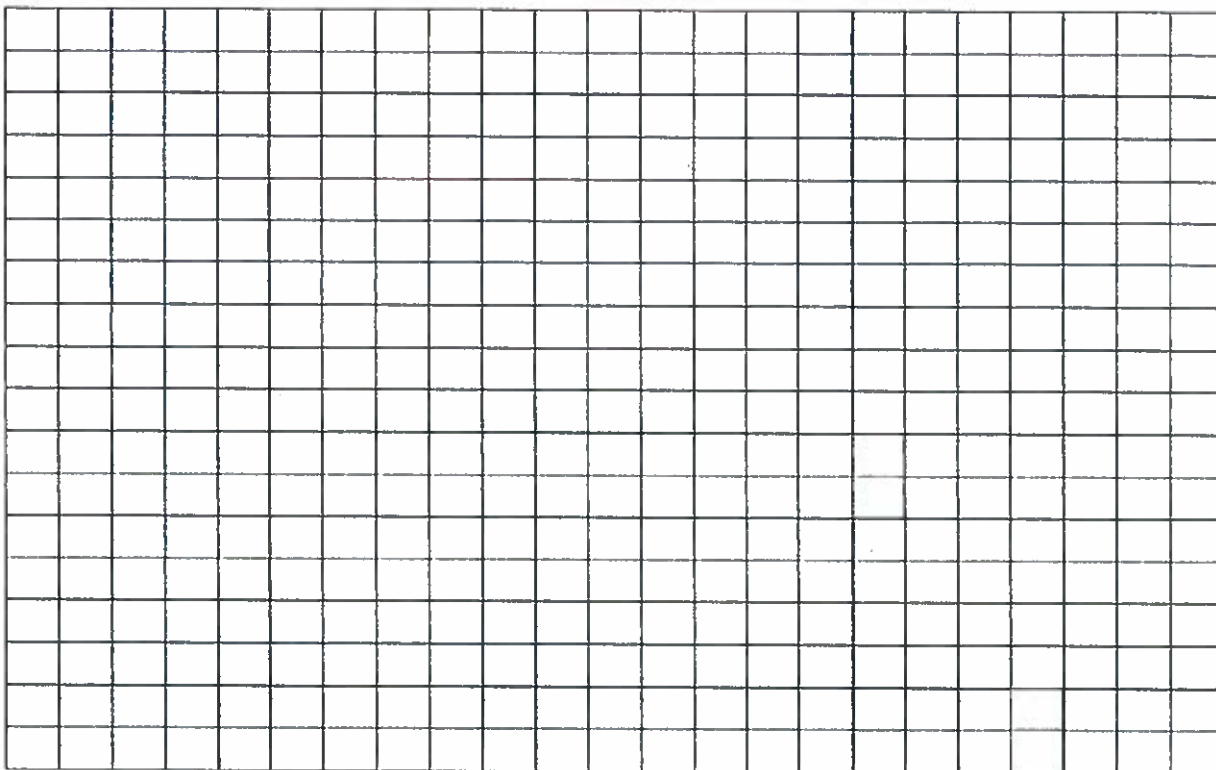
Depth Range	Number of Living Creatures
0-1 meters	10
1-2 meters	19
2-3 meters	23
3-4 meters	47
4-5 meters	68
5-6 meters	51
6-7 meters	43
7-8 meters	21
8-9 meters	15
9-10 meters	8



Example 2: The medal counts from the 2014 Winter Olympics in Sochi Russia are found below.

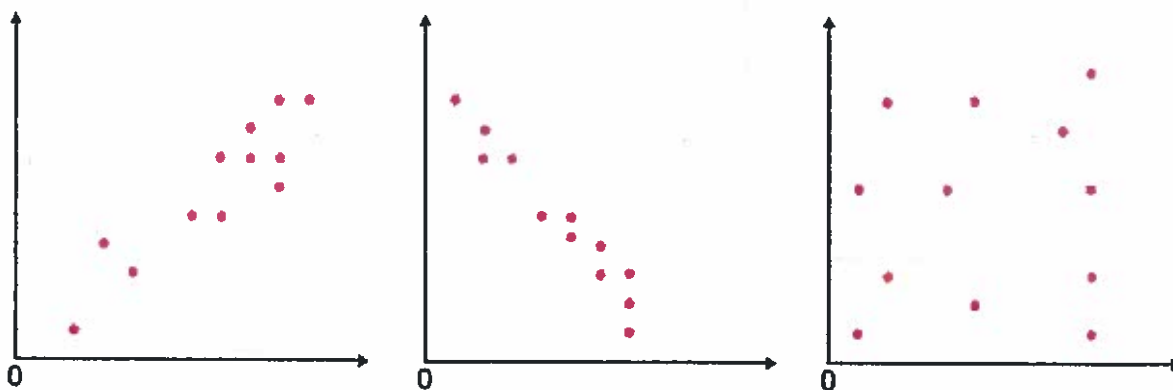
- Austria – 17
- Belarus – 6
- Canada – 25
- France – 15
- Germany – 19
- Netherlands – 24
- Norway – 26
- Russia – 33
- Switzerland – 11
- United States – 28

Decide whether to use a histogram or a bar graph. Draw the axes and decide on scale. Label the axes and draw your graph.

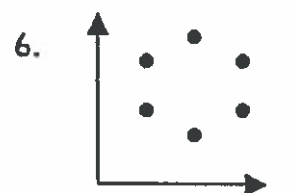
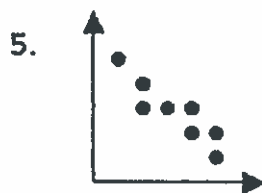
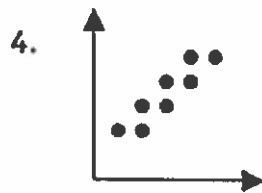
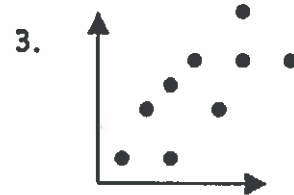
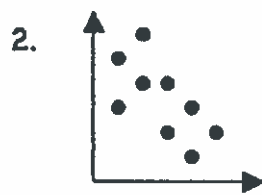
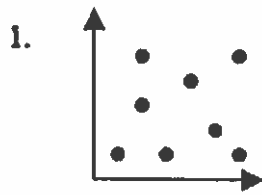


Scatter Plots:

We use **Scatter Plots** to find relationships (correlations) between two variables.

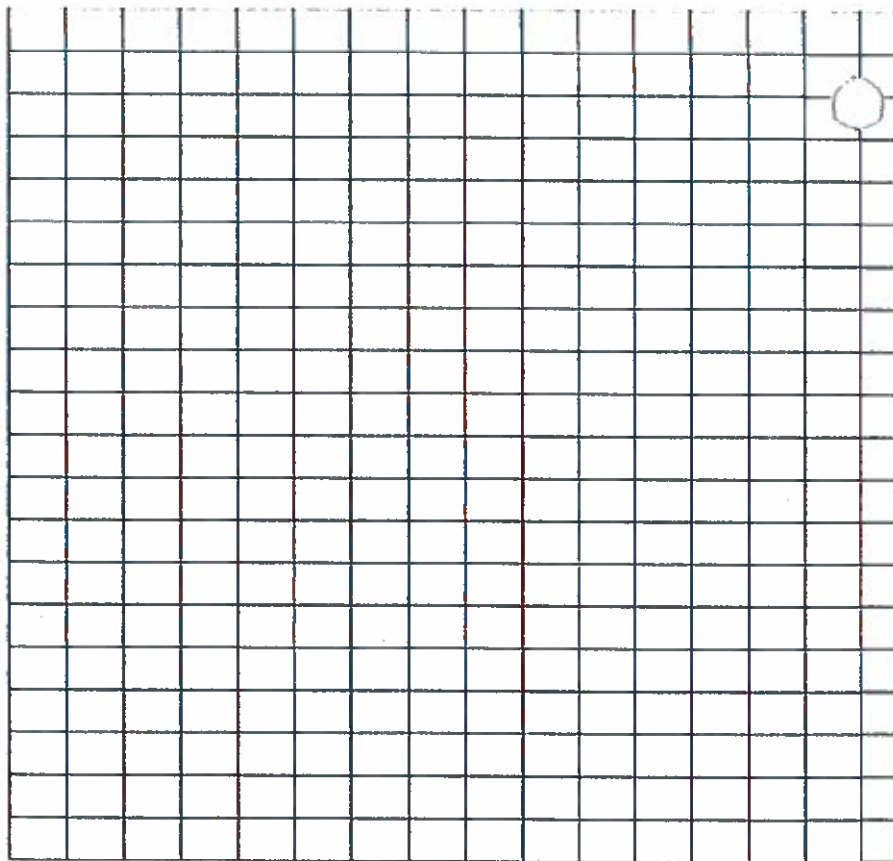


Example 3: Classify the scatter plots as having a positive, negative, or no correlation:



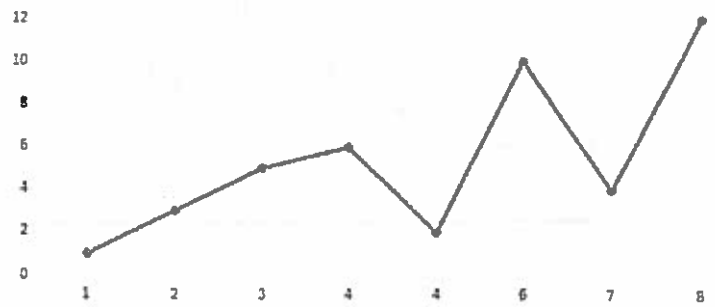
Example 4: Construct a scatter plot of the following data. Is there a correlation?

Temperature °C	Ice Cream Sales
14.2°	\$215
16.4°	\$325
11.9°	\$185
15.2°	\$332
18.5°	\$406
22.1°	\$522
19.4°	\$412
25.1°	\$614
23.4°	\$544
18.1°	\$421
22.6°	\$445
17.2°	\$408



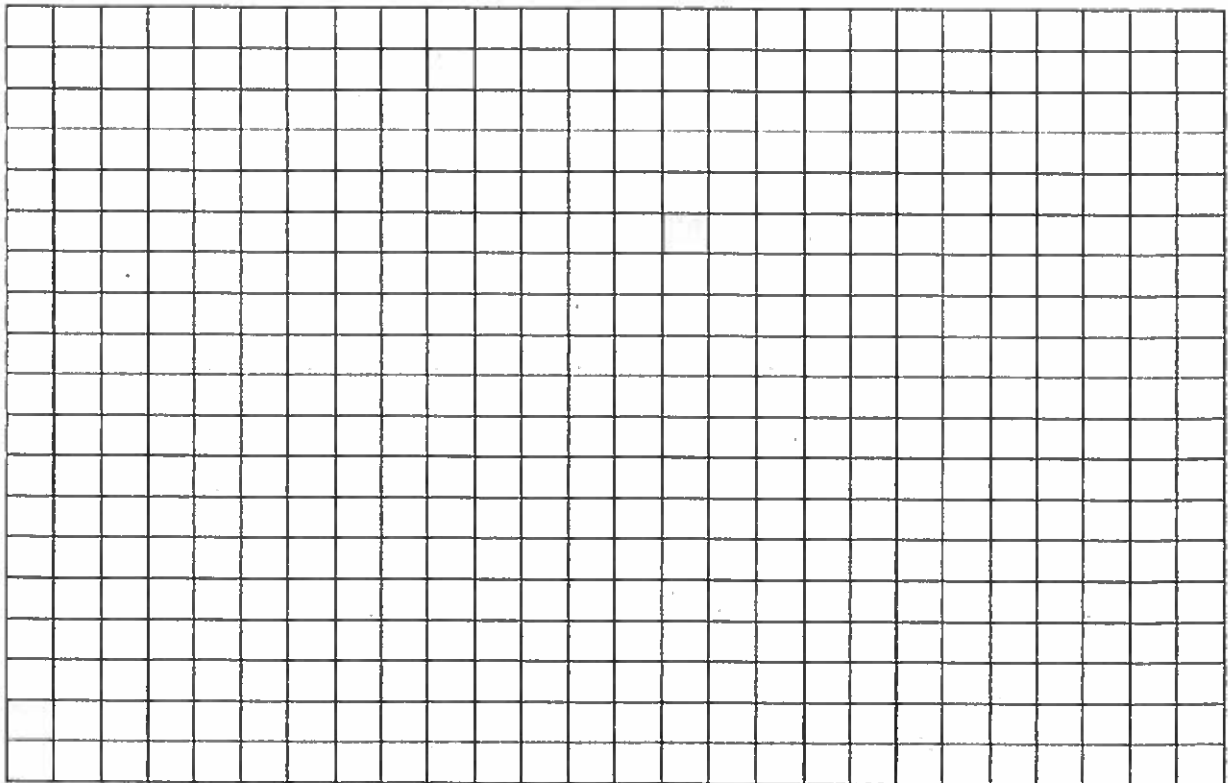
Line Graphs:

We use **Line Graphs** when the data occurs **over time**. (time is always placed on the horizontal axis, the other variable is placed on the vertical axis)



Example 5: Make a line graph for the set of data below. Label both the horizontal and vertical axis. Give the graph a title.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Average Temperature (°C)	2	5	7	15	18	22	24	28	21	15	10	4



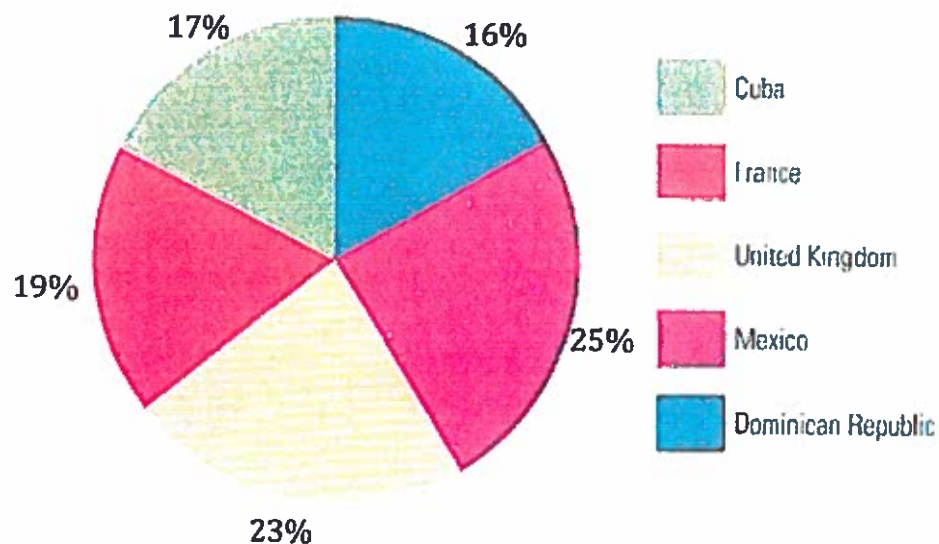
Circle Graphs:

A circle graph provides a good visual representation of a set of data because the size of the slices varies visibly compared to the whole. So you can more readily see proportional amounts, and it is less likely that you can misrepresent the data and mislead observers unless important data is omitted.



Example 6: Raymond works in the tourism industry. His information shows him that five of the most popular countries for Canadians to visit are Mexico, the United Kingdom, France, Cuba, and the Dominican Republic. The following graph indicates the percentage of visits to each of these countries.

Top Five Tourist Destinations of Canadians



- Which country is most popular with Canadian tourists?
- What percentage of people visiting these countries visited Cuba?
- If 200 people were surveyed, how many of these people visit the Dominican Republic?
- This graph indicates the percentage of visits to the various countries. List at least two things you cannot determine from the graph.

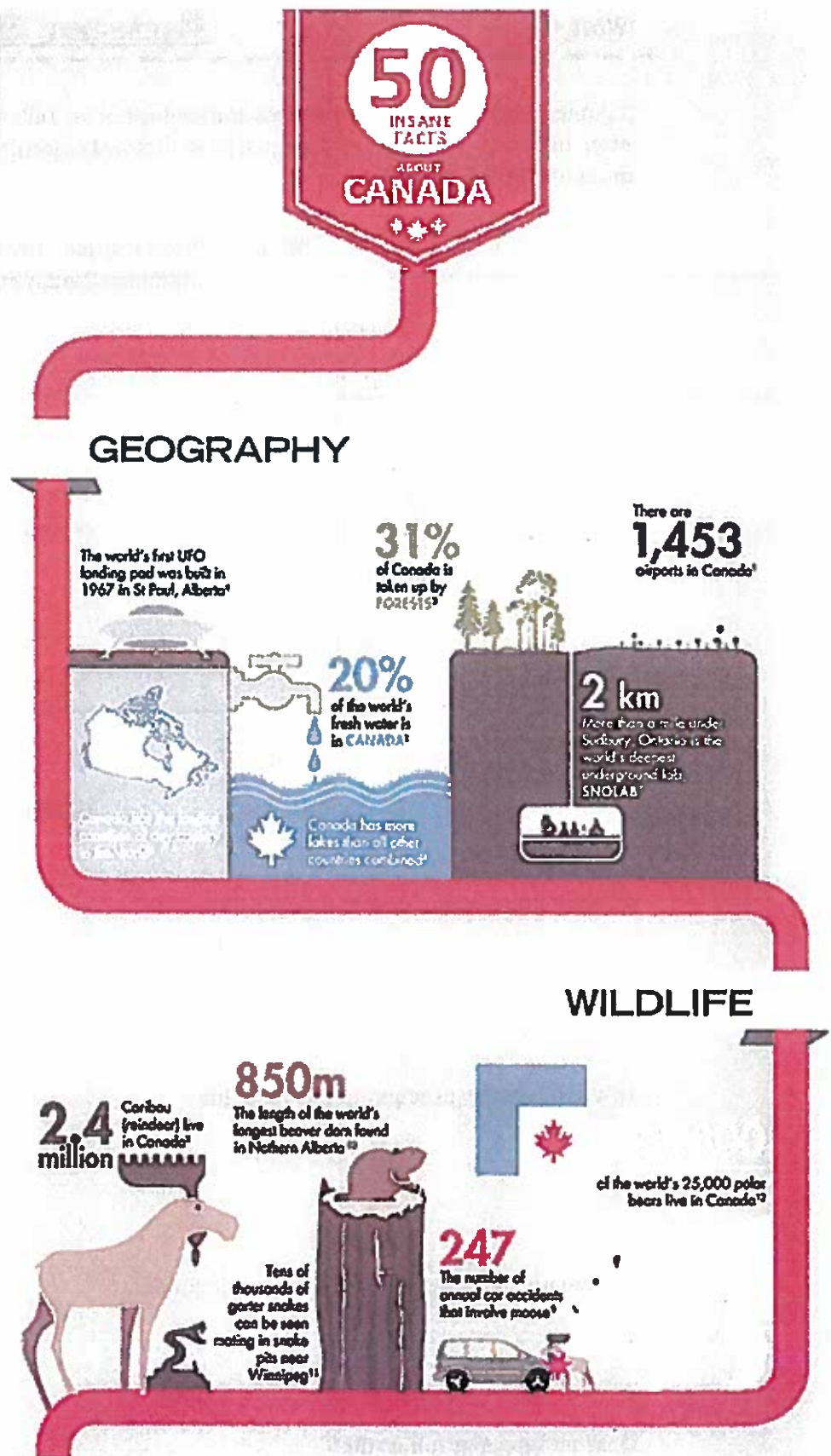
Infographics:

An infographic is a graphic visual representation of information, data or knowledge. The way the information is displayed is intended to present information quickly and clearly.

Example 7:

a) If the surface area of Canada is roughly 9,985,000 km² how much of Canada is taken up by forests?

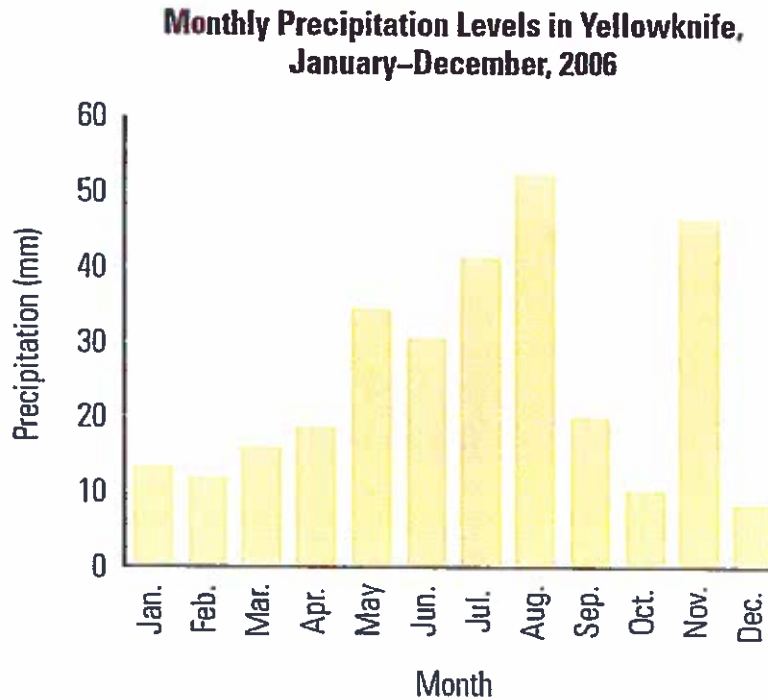
b) How many car accidents happen each year that involve a moose?



(**Not all of the infographic is shown)

Assignment: Worksheet 7B

1. James works at the flight services station located at Yellowknife airport. He uses weather data often in his job as a flight service specialist. Below is a graph displaying monthly precipitation amounts for Yellowknife.



a) What information does this graph show you?

b) What was the precipitation level in July?

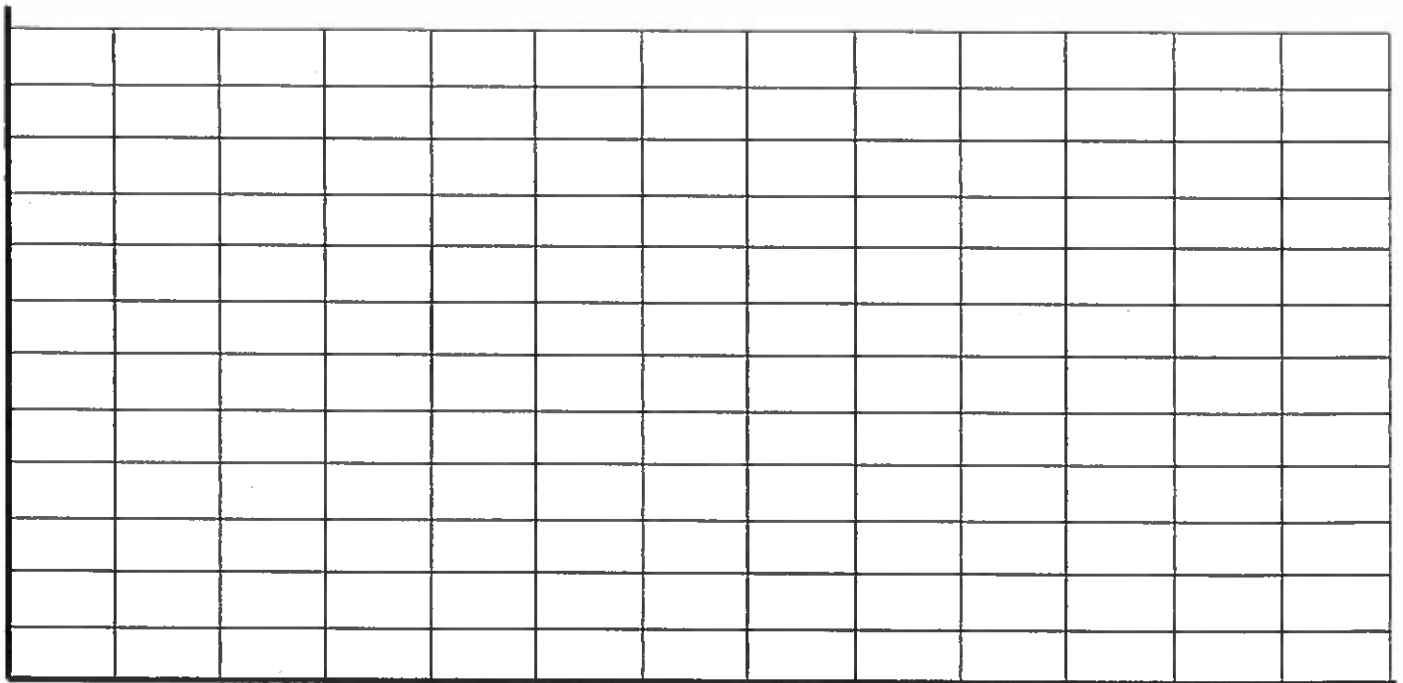
c) How much precipitation fell in total in 2006?

d) What type of graph is this?

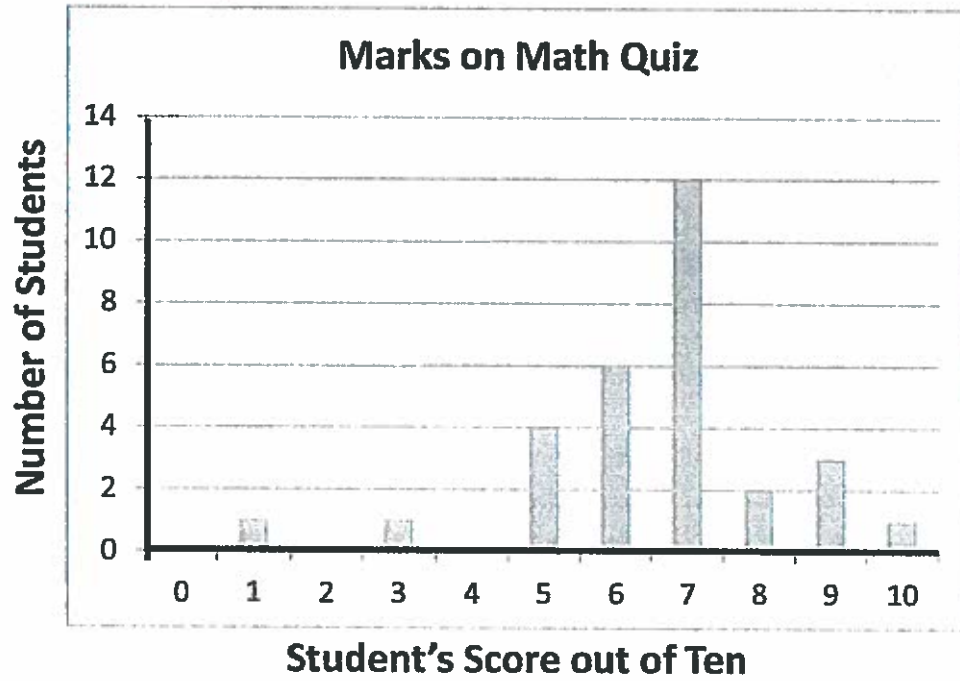
2. June works at a call centre. Her job is to provide information to callers about her company's products. June must ask each caller which province he or she is from, and where he or she found the company's contact information. Consider June's data table below, which includes her caller data for the month of May.

CALL CENTRE DATA						
Source	Internet	Information on Product Packaging	Television Commercial	Print Advertisement	Doctor	Other
Number of Callers	97	134	17	180	78	12

Draw a bar chart for this information. Label your axes and include a title.



3. Ms. Runson posted a graph on her notice board.



- a) What does the graph tell you?

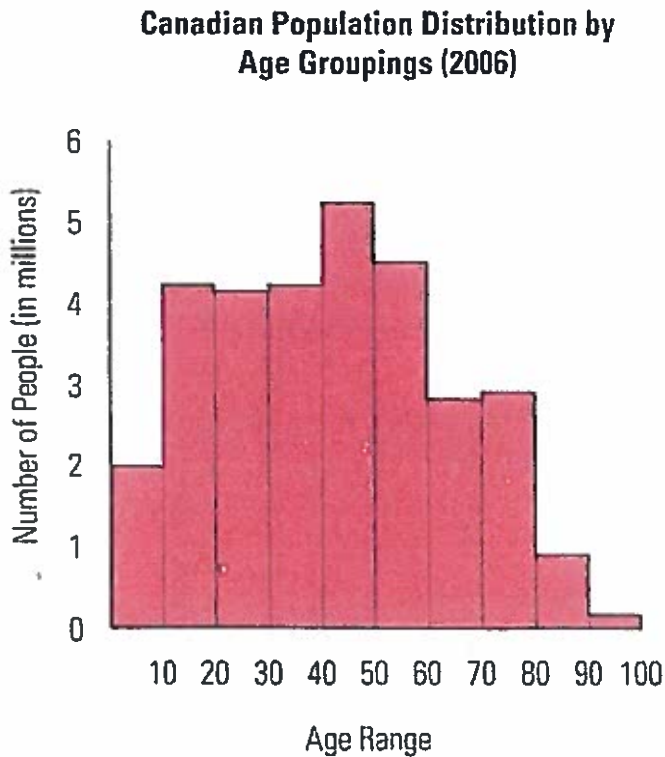
- b) How many students wrote a perfect paper?

- c) What was the most common score?

- d) How many students got 0 on the quiz?

- e) How many students wrote Ms. Runson's quiz?

4. The histogram below shows the distribution by ten-year age groupings of Canada's population in 2006, rounded to the nearest thousand. Use the histogram to answer the following.



- a) Which age group has the greatest population? What is the approximate size of this group?
- b) Approximately how many Canadians are between 10 and 20?
- c) Approximately how many Canadians are between 30 and 50?
- d) Approximately how many Canadians are in their 90's?
- e) Approximately how many children under 10 were there in 2006?
- f) Sometimes when discussing the population of a country, the first category is "under 15" and the last category is "65 and over". Even though the ranges of these two age categories are not the same as the others, why might they be used?

5. Adèle is a student at college and is completing a research project for one of her courses. She is interviewing people across Canada to determine the average number of hours of television they watch per week. Adèle recorded her survey results below.

TELEVISION VIEWING							
Time	$0 \leq h < 5$	$5 \leq h < 10$	$10 \leq h < 15$	$15 \leq h < 20$	$20 \leq h < 25$	$25 \leq h < 30$	$30 \leq h < 35$
No. of People	254	875	684	912	345	123	62

a) Draw a histogram that fairly represents this data.



b) How many people watch between 10 and 15 hours of television a week?

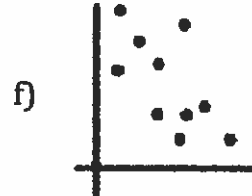
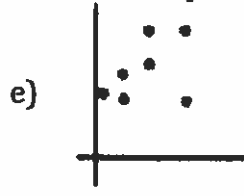
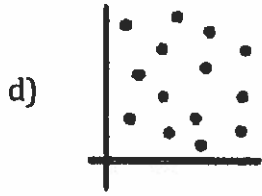
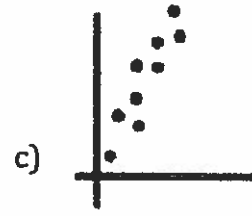
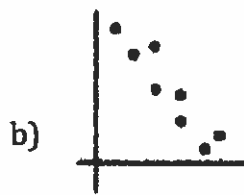
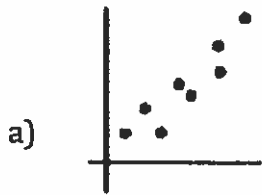
c) How many people watch less than 15 hours a week?

d) How many people watch 15 or more hours of television during the week?

e) What information is more obvious from the histogram than from the numerical data or vice versa?

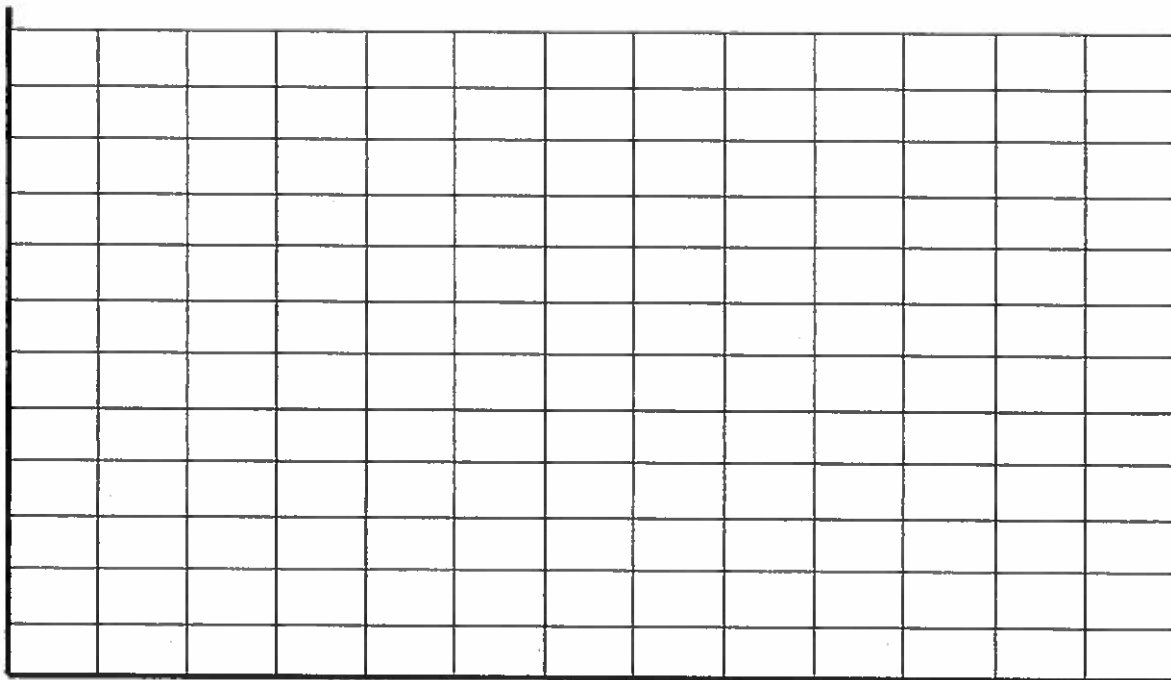
f) What information is not displayed in this histogram?

6. Examine each of the following scatter plots. Determine the type of correlations (positive, negative, or none)



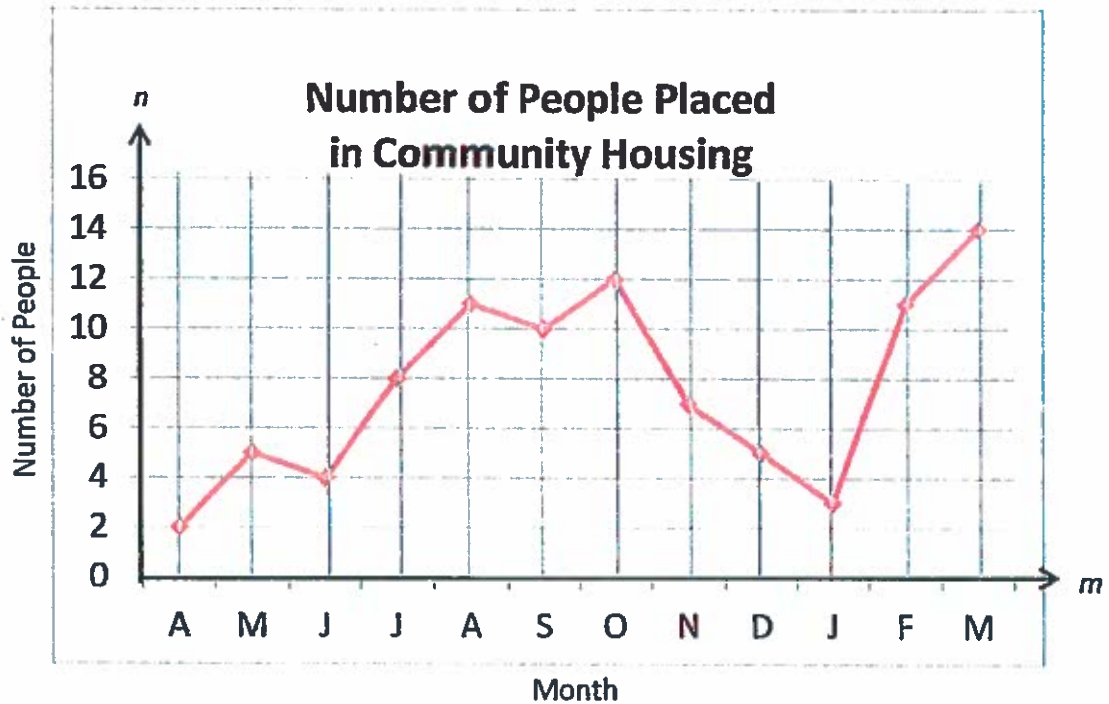
7. The number of people in attendance at a small theme park were recorded along with the temperature. The data is recorded below. Display the information in a scatter plot. (Temperature on the horizontal axis and Number of people on the vertical axis)

Temperature (°C)	20	24	36	32	28	38	34	26
Number of People	280	360	450	420	400	500	475	320



Is there a correlation in the data? What kind of correlation is it?

8. Julie started working as a community government assistant housing manager for the city of Brandon, Manitoba, in April of last year. Her boss has been asked to write a report on the average number of people placed in community housing monthly. Julie has been given the task of recording the number of people who have been placed in community housing each month.



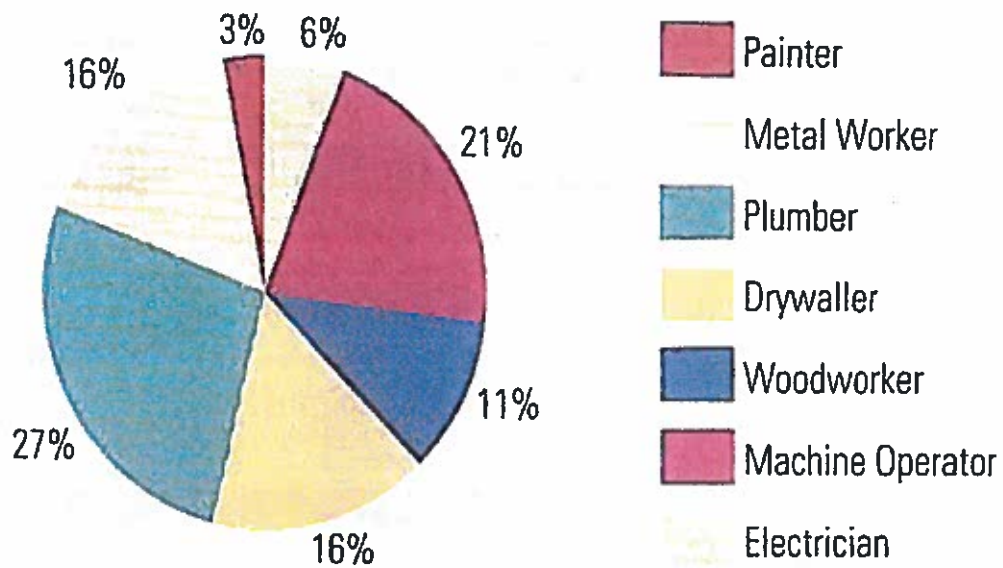
a) In which month were the most people placed? How many people were placed?

b) In which month were the fewest people placed? How many people were placed?

c) Previous statistics show that, on average, ten people were placed in community housing in Brandon each month. Compare the average data that Julie collected with the previous average. Predict the reasons for any differences in the averages. (Find the Mean number of people placed in Community Housing each month).

9. Mark is the foreman on a construction site. He is concerned that some workers are accidentally injured at work and has prepared the graph below to indicate percentages of workers from each occupation who were injured on the job in the past five years.

Occupations of Injured Employees



a) What percentage of the injured workers were painters?

b) If a total of 33 workers were injured, how many of them were electricians?

c) Which appears to be the most dangerous job? Can you say this for certain? Why or why not?



10.

a) What does the term "bluenoser" mean?

Bluenoser: A term used for people from the province of Nova Scotia¹¹

COLOUR, BEHAVIOUR, LABOUR
Canadian words spelled the British way, rather than the American way¹²

Canada's largest glacier name:
Pikwachnamoykoiwakwayipiwank Lake

LOONIES AND TOONIES
commonly used names for \$1 and \$2 coins¹³

9.5 million of Canada's 34.9 million people speak French^{14,15}

1835
The first known use of the term "Canuck", referring to a Canadian¹⁶

"A Mari usque ad Mare" (from sea to sea) is Canada's official motto¹⁷

Li is the most common surname in Canada, according to the nation's phone books¹⁸

40.6
The average age of a Canadian

2.37m (7'9")
the world's longest beard, belonging to Canada's Sarwan Singh¹⁹

1/5 Canadians were born out's de Canada²⁰

It is not just a rumour
Americans have been known to masquerade as Canadians when abroad

42%
of the Canadian population have a higher education qualification²¹

Canada is the best G20 country in which to be a woman²²

17 spoons were balanced on the face of Canadian boy Aaron Cassie to set a world record²³

b) If Canada's population is approximately 35 million. How many Canadians have a higher education qualification?

PEOPLE

More than **42%** of Canadians are Roman Catholic²⁴



23% are Protestant²⁵



8 countries are deemed to be less corrupt than Canada²⁶



Li is the most common surname in Canada, according to the nation's phone books¹⁸



40.6
The average age of a Canadian

c) How many people in Canada speak French?

2.37m (7'9")
the world's longest beard, belonging to Canada's Sarwan Singh¹⁹



1/5 Canadians were born out's de Canada²⁰



42%
of the Canadian population have a higher education qualification²¹

Canada is the best G20 country in which to be a woman²²



It is not just a rumour
Americans have been known to masquerade as Canadians when abroad

17 spoons were balanced on the face of Canadian boy Aaron Cassie to set a world record²³



Theoretical Probability - Probability that a certain outcome will occur, based on reasoning or calculation (What we expect to happen)

$$P(A) = \frac{\text{Number of Favourable Outcomes for Event A}}{\text{Total Number of Outcomes in Sample Space}}$$

Example 1: A jar contains 5 red, 6 green and 4 blue marbles:

a) What is the probability of choosing a green marble?

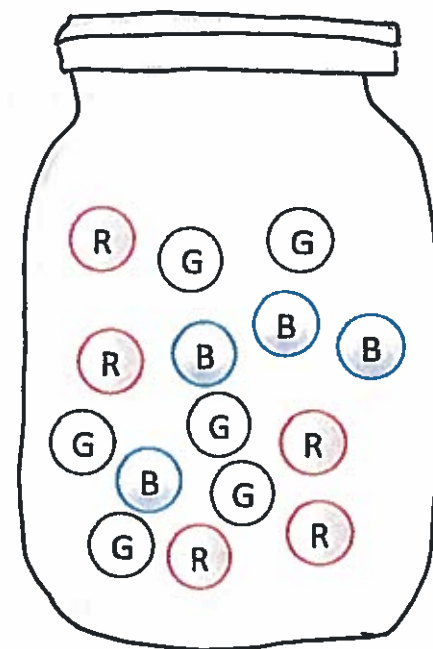
b) What is the probability of choosing a red marble?

c) What is the probability of choosing a blue marble?

d) What do all the probabilities add up to?

e) What is the probability of choosing a red or a green?

f) What is the probability of not choosing a red or a green?



c) Roll a 6-sided cube (a die) 20 times and record the results. What is the Experimental Probability of rolling a 5?

(Write your answer as a fraction as well as a decimal rounded to 4 decimal places.)

Trial #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Outcome																				

d) Roll a 6-sided cube (a die) 40 times and record the results. What is the Experimental Probability of rolling a 5?

(Write your answer as a fraction as well as a decimal rounded to 4 decimal places.)

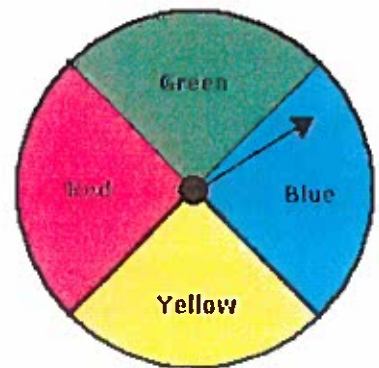
Trial #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Outcome																				

Trial #	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Outcome																				

e) What is the Theoretical Probability of rolling a 5?

f) What do you notice when you compare your experimental probabilities and the theoretical probability?

1. A spinner has 4 equal sections as shown. One is green, one is blue, one is red, and one is yellow.

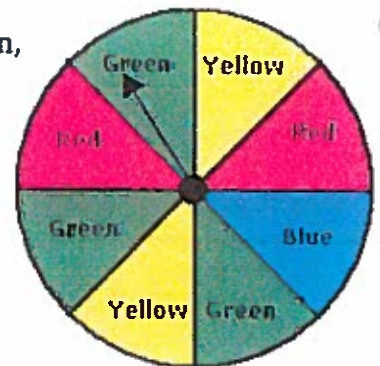


a) What is the Theoretical Probability of spinning a red?

b) What is the Theoretical Probability of spinning a green or yellow?

c) What is the Theoretical Probability of spinning a red, green, yellow, or blue?

2. A spinner has 8 equal sections as shown. Three sections are green, one is blue, two are red, and two are yellow.



a) What is the Theoretical Probability of spinning a red?

b) What is the Theoretical Probability of spinning a green or yellow?

c) What is the Theoretical Probability of spinning a purple?

7. Flip a coin 25 times and record the results. What is the Experimental Probability of getting a Heads? (Give your answer as a fraction AND as a decimal to 4 places)

Trial #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Outcome																								

8. Flip a coin 50 times and record the results. What is the Experimental Probability of getting a Heads? (Give your answer as a fraction AND as a decimal to 4 places)

Trial #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Outcome																								

Trial #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Outcome																								

9. What is the Theoretical Probability of getting a heads?

10. What do you notice when you compare your experimental probabilities and the theoretical probability?

AWM10 – Unit 7 – Quiz 1

Name: _____

Rick's scores in his last 15 rounds of golf are 72, 80, 75, 84, 78, 72, 75, 68, 81, 74, 79, 70, 77, 83, and 72. If he scores an 80 on each of the next three rounds, which measure of central tendency would increase more, the mean or median?
Justify your answer. (show your calculations)

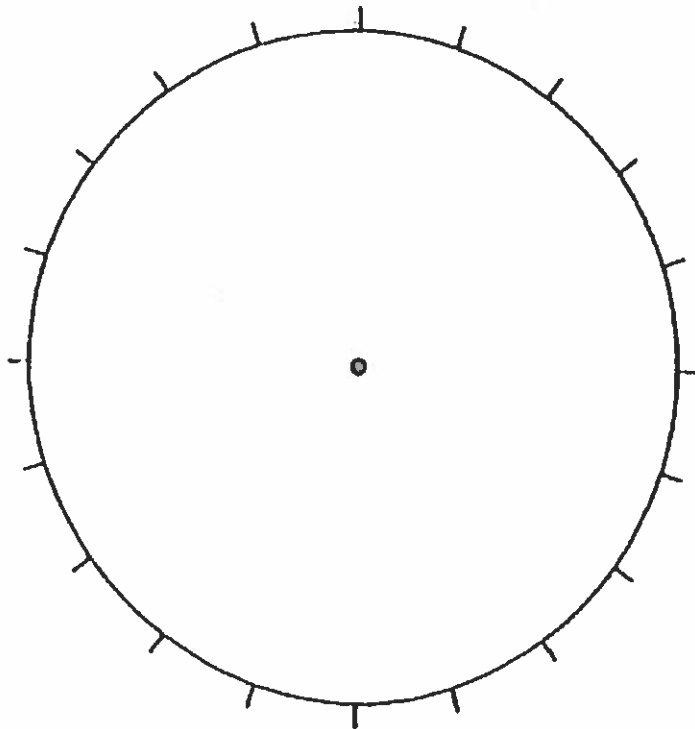
The total number of medals won by Canada in the Winter Olympics is shown in the table below. Find the Mean, Median, Mode and Range of the data.

Year	Number of Medals
1994	13
1998	15
2002	17
2006	24
2010	26
2014	25

Neechi can be translated as “friends” in both the Cree and Ojibwa languages. Neechi Foods Co-op Ltd. provides healthy food to the people living in Winnipeg, MB. Trina works at Neechi Foods Co-Op and has been keeping track of sales data for the last year. Below is the data for the jam sales by brand based on the number of jars sold.

Product Popularity: Jam by Brand	
Brand	Percentage of Sales
Green Orchards	5
Big River Products	30
LaBelle’s Jams	10
Wild Products	25
Sunrise Farms	22.5
McArthur’s	7.5

a) The circle below is divided into 5% increments. Use the information in the table to create a circle graph. Include a legend so that readers will know which colour or pattern represents which brand of jam.



- Green Orchards
- Big River Products
- LaBelle’s Jams
- Wild Products
- Sunrise Farms
- McArthur’s

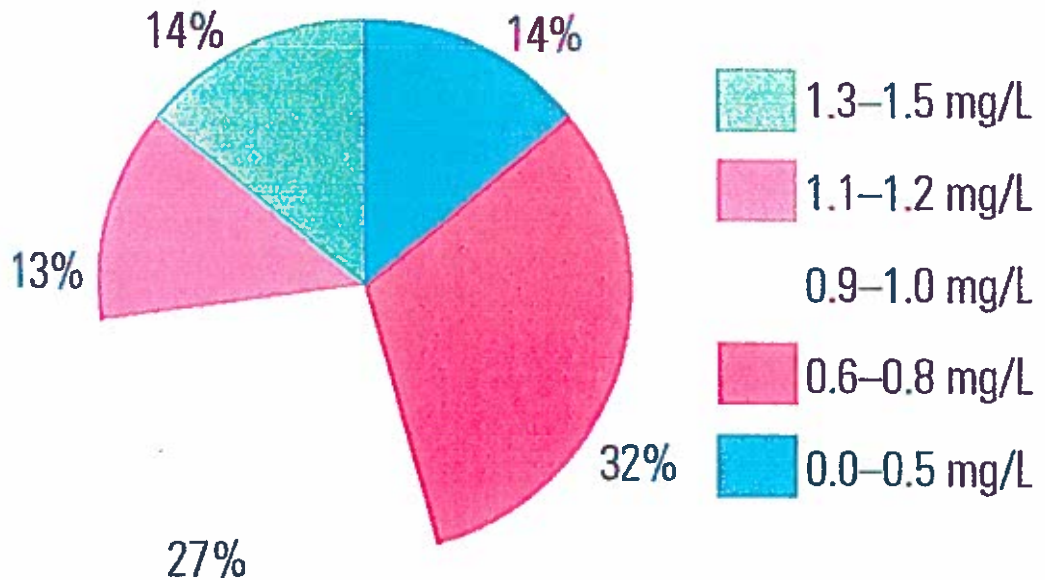
b) Which brand is the least popular?

c) What are some ^{dis}advantages of displaying data in a circle graph?

Rochelle is an environmental monitor working out of Chilliwack, BC, who gathers water samples from different rivers. The samples are tested for the presence of various pollutants. The graph below represents the percentage of rivers that contain a certain level of nitrogen, a nutrient often associated with agricultural fertilizer and animal waste.

The nitrogen is measured in milligrams per litre (mg/L)

Rivers by Nitrogen Level
(measured in mg/L)



What else would you need to know to determine the number of rivers that fall in the 1.1 – 1.2 mg/L range?

- A. You need to know the maximum level of nitrogen found
- B. You need to know the total number of rivers tested
- C. You need to know the minimum level of nitrogen found
- D. It is not possible to determine

AWM10 – Unit 7 – Quiz 3

Name: _____

a) On a four-sided dice (with the numbers 1, 2, 3 and 4) what is the theoretical probability of rolling a 3?

b) Based on your answer from part a, if you rolled the die 100 times, how many 3's would you expect to roll?

Raul rolled an 8-sided die (with the numbers 1 – 8) 20 times. Below are his results. What was his Experiment Probability of rolling a 4?

Trial #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Outcome	6	5	7	5	1	4	4	7	4	4	6	6	5	2	8	6	5	1	5	2

A. $\frac{1}{5}$

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{1}{2}$

