5.1: Day 1 Measures of Central Tendency

NOTE: Video Lessons for this entire booklet can be found at the following link: https://goo.gl/Jv82wO

GOAL Explore the similarities and differences between two sets of data.

THREE DIFFERENT TYPES OF "AVERAGES" USED IN STATISTICS:

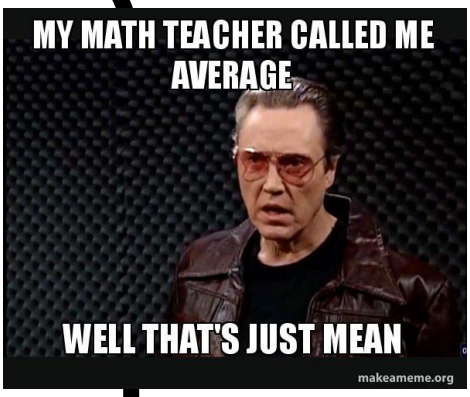
Mean the average; determine the sum of all the data and then divide by the number of items

Median

the middle number when the data is arranged in order.

* If there is an odd number of data the median is the middle number.
* If there is an even number of data the median is the mean of the two middle numbers.

Mode the number that is repeated most often. If no numbers repeat there is no mode. There can be more than one mode.



OTHER IMPORTANT MEASURES:

Dispersion

A measure that varies by the spread among the data in a set; dispersion has a value of zero if all the data in the set is identical, and it increases in value as the data becomes more spread out.

Range Highest value - lowest value

Example #1:

Paulo needs a new battery for his car. He is trying to decide between two different brands. Both brands are the same price. He obtains data for the lifespan, in years, of 30 batteries of each brand.

Measured Lifespans of 30 car batteries (years)									
Brand X					Brand Y				
5.1	7.3	6.9	4.7	5.0	5.4	6.3	4.8	5.9	5.5
6.2	6.4	5.5	5.7	6.8	4.7	6.0	4.5	6.6	6.0
6.0	4.8	4.1	5.2	8.1	5.0	6.5	5.8	5.4	5.1
6.3	7.5	5.0	5.7	8.2	5.7	6.8	5.6	4.9	6.1
3.3	3.1	4.3	5.9	6.6	4.9	5.7	6.2	7.0	5.8
5.8	6.4	6.1	4.6	5.7	6.8	5.9	5.3	5.6	5.9

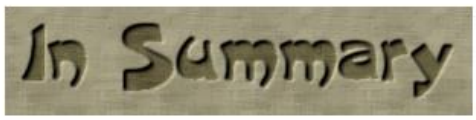
How can you compare the data to help Paulo decide which brand of battery to buy?

a) Determine the mean, median, mode and range of each Brand.

b) Explain why the mean and median do not fully describe the difference between these two brands of batteries. Consider the range. What additional information can be learned from the range?

c) Is the mode useful in this situation?

d) Suppose one battery from brand Y is defective and has a lifespan of 0.5 years instead of 5.9 years. Would this affect Paulo's decision?



- Measures of central tendency (mean, median, mode) are not always sufficient to represent or compare sets of data.
- You can draw inferences from numerical data by examining how the data is distributed around the mean or the median.
- To compare sets of data, the data must be organized in a systematic way.
- When analyzing two sets of data, it is important to look at both similarities and differences in the data.

ASSIGNMENT 1

PART A: Pg 211 #1-3

PART B:

1. Determine if each of the following estimates or predictors are based on mean, median or mode.
   a) The average salary for students with part-time jobs is $86.78/week.
   b) The middle mass of a collage football player is 70.62 kg
   c) Most snowmobile accidents occur in the winter
   d) The average speed on a Canadian highway is 95km/h
   e) More people play golf then play billiards.

2. For boxes of biscuits, the mass is printed as 500g. Fifteen samples are selected and the masses are recorded.

491 516 493 505 496 503 476 512 492 504 480 480 517 486 498

   a) Find the range of the data
   b) Find the mean of the data
   c) Find the mode of the data
   d) Find the median of the data
   e) If the mean is between 495 and 505 the company declares the amount in each box is acceptable. Is the amount in the sample above acceptable?
   f) Do you think this is fair?

3. A random sample of the weight of twenty football players in kg was recorded as follows.

   70 74 68 70 68 73 75 75 77 74
   72 76 72 72 69 72 73 72 73 73

   a) Find the range of the data
   b) Find the mean of the data
   c) Find the mode of the data
   d) Find the median of the data
   e) The middle mass of a collage football player is 70.62 kg. Do you think the above information is from a college football team?

4. The following data is from two math tests given by the same teacher to the same class in the same semester

   Unit Test #1

   81 80 79 79 78 76 75 75 74 73 73 73
   73 73 72 71 71 68 67 66 64 63 61 58

   Unit Test #2

   98 95 93 89 87 84 81 79 79 76 73 73
   73 73 73 71 69 64 59 59 57 53 44 41

   a) Find the range of the data for both tests
   b) Find the mean of the date for both tests
   c) Find the mode of the data for both tests
   d) Find the median of the data for both tests
   e) Which test did the class perform better on? Justify your answer

5.2: Day 2 Frequency Tables & Graphs

GOAL Create frequency tables and graphs from a set of data

Frequency Distribution

A set of intervals (table or graph), usually of equal width, into which raw data is organized, each interval is associated with a frequency that indicates the number of measurements in this interval.

Example #1:

The following data represents the flow rates of the Red River from 1950 to 1999, as recorded at the Redwood Bridge in Winnipeg.

a) Create a frequency table.

Maximum Water Flow Rates for the Red River, from 1950 to 1999, Measured at Redwood Bridge*

Year	Flow Rate (m^3/s)	Year	Flow Rate (m^3/s)	Year	Flow Rate (m^3/s)	Year	Flow Rate (m^3/s)	Year	Flow Rate (m^3/s)
1950	3058	1960	1965	1970	2280	1980	881	1990	396
1951	1065	1961	481	1971	1526	1981	159	1991	280
1952	1008	1962	1688	1972	1589	1982	1458	1992	1399
1953	357	1963	660	1973	530	1983	1393	1993	946
1954	524	1964	1002	1974	2718	1984	1048	1994	1121
1955	1521	1965	1809	1975	1671	1985	991	1995	1877
1956	1974	1966	2498	1976	1807	1986	1812	1996	3058
1957	654	1967	1727	1977	187	1987	2339	1997	4587
1958	524	1968	510	1978	1750	1988	564	1998	1557
1959	991	1969	2209	1979	3030	1989	1390	1999	2180

National Research Council Canada

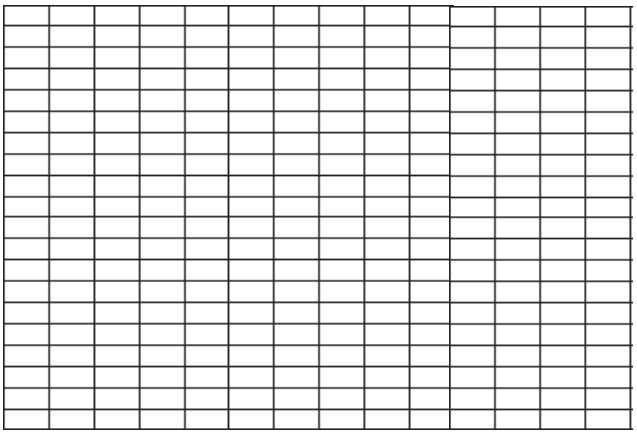
(*assumes NO flood protection works in place, for data after 1969 when the floodway was in use)

FLOW RATE (m^3/s)	Tally	Frequency (number of years)

Histogram

The graph of a frequency distribution, in which equal intervals of values are marked on a horizontal axis and the frequencies associated with these intervals are indicated by the areas of the rectangles drawn for these intervals.

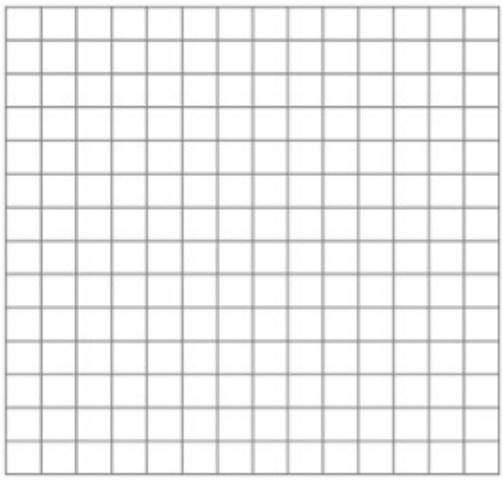
b) Using the information about the Red River on the previous page, create a histogram.



Frequency Polygon

The graph of a frequency distribution, produced by joining the midpoints of the intervals using straight lines.

c) Create a Frequency Polygon using the Red River information.



S1/2: ASSIGNMENT 2 **Pg 222 #3, 4, 5, 7, 9**

5.3: Day 3 Standard Deviation

GOAL Determine the standard deviation for sets of data, and use it to solve problems and make decisions.

Example #1:

The coach of a varsity girl's basketball team keep statistics on all the players. Near the end of one game, the score is tied and the best starting guard has fouled out. The coach needs to make a substitution.

The coach examines the field goal stats for two guards on the bench in the last 10 games.

Player	Field Goal Percent in Last 10 Basketball Games									
Morgan	34	41	38	37	48	19	33	43	21	44
Paige	34	35	33	35	33	34	33	35	34	33

How can the coach use the data to determine which player should be substituted into the game?

a) Calculate the mean of the data, $\bar{x}$, for both of the players.

b) Based on the mean, which player would you choose as a substitute? Explain.

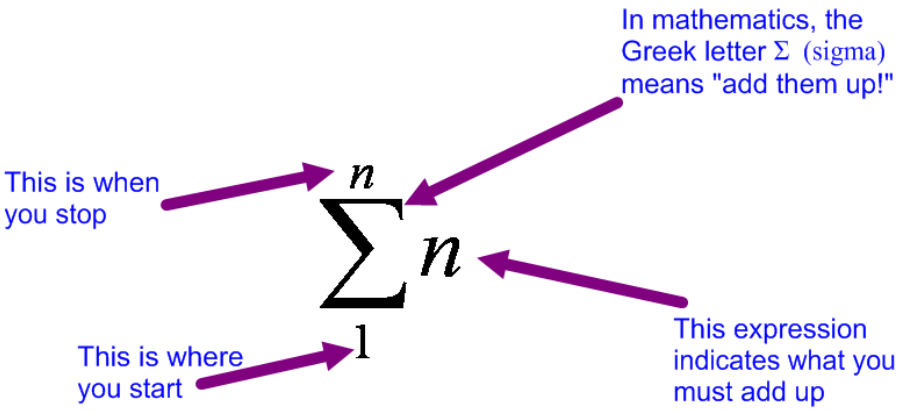
You have investigated several concepts from data analysis such as **mean**, **median** and **mode**. Sometimes finding the measure of central tendency doesn't give you the information you are looking for. Central tendency gives you information about how the data is clustered but nothing about how the data is dispersed.

We need to learn about **standard deviation**, which is a measure of the dispersion of data values in relation to the mean.

- A low standard deviation indicates that most data values are close to the mean.
- A high standard deviation indicates that most values are farther from the mean.

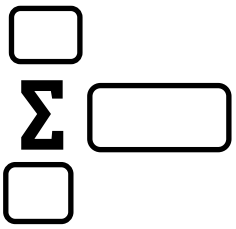
NOTE: In order to use the standard deviation formula you must learn about a new notation. This notation is a "shorthand" way of representing a time when you must add up several numbers that are found using a certain formula.

Sigma Notation



For Example: If you were asked to **FIND** and **ADD UP** all of the answers to the formula y = x + 3 when you plug in values of x from 1 -4, your work would look like this:

Another way of representing the original question asked would be:



Deviation

The difference between a data value and the mean for the same set of data.

$(x - \bar{x})$

The symbol σ is called SIGMA and is the symbol used for Standard Deviation

Standard Deviation σ

A measure of the dispersion or scatter of data values in relation to the mean; a low standard deviation indicates that most data values are close to the mean, and a high standard deviation indicates that most data values are scattered farther from the mean.

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

Because the SD formula involves using a smaller formula over and over again and adding up the results, we will actually find the answer to questions that use the SD formula by using a table.

c) Referring back to Example #1, complete the following table:

Morgan's Field Goal %	Deviation $(x - \bar{x})$	Square of Deviation $(x - \bar{x})^2$	Paige's Field Goal %	Deviation $(x - \bar{x})$	Square of Deviation $(x - \bar{x})^2$
34			34		
41			35		
38			33		
37			35		
48			33		
19			34		
33			33		
43			35		
21			34		
44			33		
Mean: 35.8		Mean:	Mean: 33.9		Mean:
Standard Deviation: (Square root the mean of the square of deviation)			Standard Deviation: (Square root the mean of the square of deviation)		

d) Look back at your answer to part b). Would you still choose the same player to substitute? Explain.

e) What does a lower standard deviation imply about the shooting consistency?

f) What does a higher standard deviation imply about the shooting consistency?

Example #2:

A machine, packaging candy in 90 g packages, is thought to be faulty. A sample of 10 packages is randomly selected and the actual masses in grams are:

86, 91, 89, 88, 92, 90, 93, 90, 90, 91
In order that the machine work properly, the standard deviation must be less than 1.3 g. Is the machine faulty?

a) Find $\bar{x}$

b) Fill in the chart to find the standard deviation.

Values of x	**Deviation ($x - \bar{x}$)**	**Square of Deviation ($x - \bar{x}$)^2**
MEAN of this row of x's: (add up this row and divide by how many #'s) $\bar{x}$ = ___		**Mean of this row of ($x - \bar{x}$)^2's: (add up this row and divide by how many #'s)** $\overline{(x - \bar{x})^2}$=

Find the STANDARD Deviation by taking the square root of the Mean of the Row of ($x - \bar{x}$)^2

$$\sigma = \sqrt{\overline{(x - \bar{x})^2}}$$

In Summary

When data is concentrated close to the mean, the standard deviation is low. When data is spread far from the mean, the standard deviation is high. As a result, standard deviation is a useful statistic to compare the dispersion of two or more sets of data.

Standard deviation is often used a measure of consistency. When data is closely clustered around the mean, the process that was used to generate the data can be interpreted as being more consistent than a process that generated data scattered far from the mean.

S1/2: ASSIGNMENT 3 **Pg 233 #2, 3, 6, 7, 10, 13**

5.3: Day 4 Standard Deviation of Grouped Data

Example #1:
The following information regarding gaming hours per week for grade 11 students was obtained through a survey at RHS.

a) Find the mean and standard deviation of the data

Hours	Frequency
3-5	7
5-7	11
7-9	16
9-11	19
11-13	12
13-15	5

Step 1: Determine the midpoint of each interval
Step 2: Multiply the midpoint with the frequency
Step 3: Find the mean of the midpoint x frequency (This is the estimated mean)
Step 4: Find the difference between the midpoint and the mean
Step 5: Find the square of the difference between the midpoint and the mean
Step 6: Multiply the squared difference by the frequency
Step 7: Find the mean of the results of the multiplication from step 6 and then take the square root of that number.

HOURS (x)	FREQUENCY	FIND: MIDPOINT of HOURS (these are your values of x)	FIND: MIDPOINT multiplied by FREQUENCY	FIND: $(x - \bar{x})$ (Midpoint –Mean)	FIND: $(x - \bar{x})^2$ Square each term in the previous column	FIND: The previous column multiplied by frequency
3-5	7					
5-7	11					
7-9	16					
9-11	19					
11-13	12					
13-15	5					
	Add this column to find n n = ____		Now find the mean $\bar{x}$: Add this column and divide by n $\bar{x}$ = _____			Now find the σ by finding mean of this column $\bar{x}$ of column = ___ and then find its' square root. σ = √____ = _____

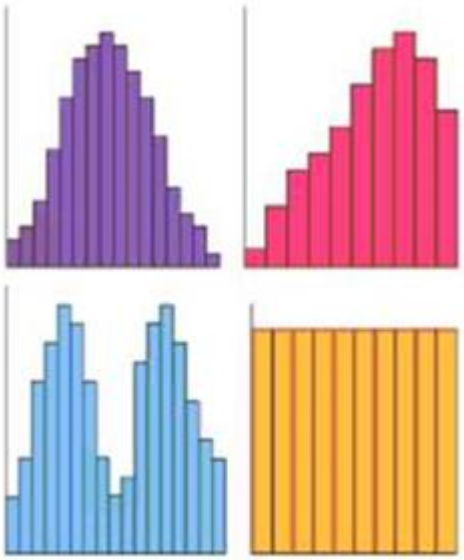
S1/2: ASSIGNMENT 4

Pg 235 # 9, 11, 14

5.4: Day 5 THE NORMAL DISTRIBUTION

GOAL Determine the properties of a normal distribution, and compare normally distributed data.

Once we organize data into a histogram, we can see how the data has been distributed. A very special kind of distribution is called **normal distribution.**

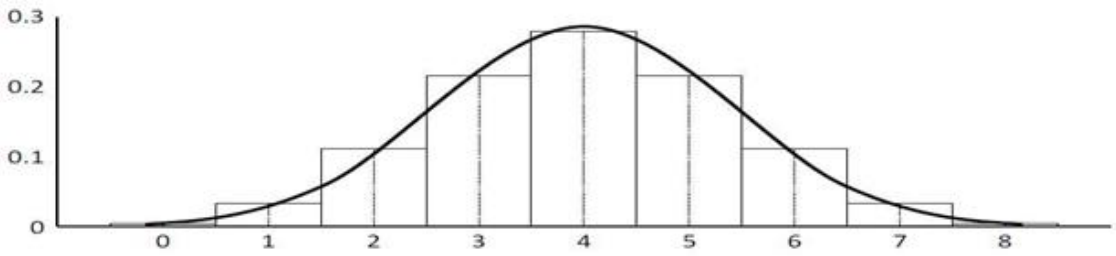


Looking at the left the first (purple) histogram represents normal distribution. Can you list any characteristics of this histogram?

Q

- What causes the difference between the graph with one peak vs the one with two peaks?
- What causes the second graph to have its one peak not in the center but on the right side?
- What causes the last graph to be flat?

Let's look at this in more detail:



Imagine a histogram with many more bars; the shape of the combined bars will become a ***bell curve***, the shape of all normal distributions.

Normal Distribution

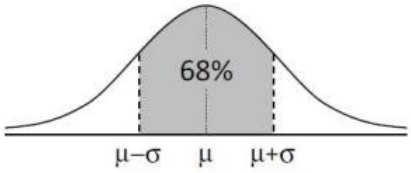
Data that, when graphed as a histogram or a frequency polygon, results in a unimodal symmetric distribution about the mean. The curve is referred to as a normal curve or bell curve.

68-95-99 RULE

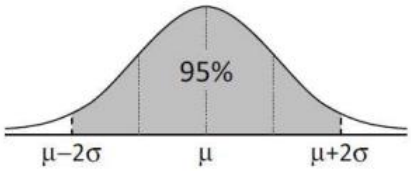
This rule estimates areas under the normal distribution graph in special regions.

For every normal curve with mean, σ, and standard deviation , σ.:

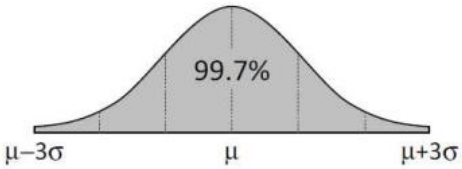
- About 68% of the data is within 1 standard deviation of the mean.



- About 95% of the data is within 2 standard deviation of the mean.



- About 99.7% of the data is within 3 standard deviation of the mean.



The graph of a normal distribution depends on two factors:

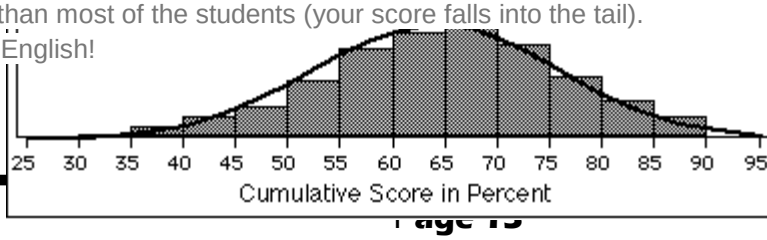
- the mean, μ, which is a measure of central tendency and
- the standard deviation, σ, which is a measure of dispersion.

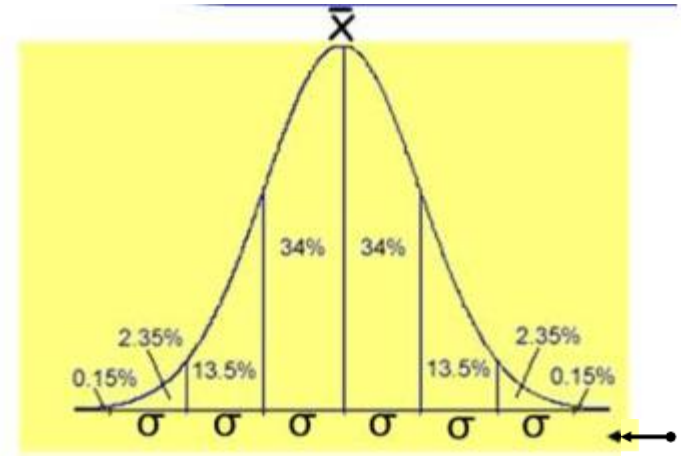
Remember, the total area under the graph must be 1.

Many groups follow this type of pattern. That's why it's widely used in business, statistics and in government bodies like the FDA:

- Heights of people.
- Measurement errors.
- Blood pressure.
- Points on a test.
- IQ scores.
- Salaries.

For example, if you get a score of 90 in Math and 95 in English, you might think that you are better in English than in Math. However, in Math, your score is 2 standard deviations above the mean. In English, it's only one standard deviation above the mean. It tells you that in Math, your score is far higher than most of the students (your score falls into the tail). Based on this data, you actually performed better in Math than in English!





The normal distribution has certain properties:

1) 68% of the data are within one standard deviation of the mean.
2) 95% of the data are within two standard deviations of the mean.
3) 99.7% of the data are within three standard deviations of the mean.

Example #1:

The speeds of 1000 cars were recorded by photo radar. If the data collected was normally distributed with mean of 105 km/h and a standard deviation of 10 km/h, determine:

a) The percentage of cars traveling between 105 and 115 km/h

b) The percentage of cars traveling less than 95 km/h

c) Number of cars traveling between 85 and 105 km/h

Example #2:

Shirley wants to buy a new cell phone. She researches the cell phone she is considering buying and finds the following data on its longevity in years.

2.0	2.4	3.3	1.7	2.5	3.7	2.0	2.3	2.9	2.2	2.3	2.7	2.5	2.7	1.9	2.4	2.6
2.7	2.8	2.5	1.7	1.1	3.1	3.2	3.1	2.9	2.9	3.0	2.1	2.6	2.6	2.2	2.7	1.8
2.4	2.5	2.4	2.3	2.5	2.6	3.2	2.1	3.4	2.2	2.7	1.9	2.9	2.6	2.7	2.8	

a) Find the mean, median and mode.

b) Organize the data into a frequency table.

	Tally	**Frequency**

C) Find the standard deviation

	FREQ	**Midpoint (x)**	**Midpoint x freq**	**$(x - \bar{x})$**	**$(x - \bar{x})^2$**	**$(x - \bar{x})^2$ x freq.**
	Total: N = _____		$\bar{x}$			$\bar{x}$ = σ = √____ = _____

c) Is the data normally distributed?

d) If she does choose this cell phone what are the chances that it will last more than 3 years?

In Summary

- Graphing a set of grouped data can help you determine whether the shape of the frequency polygon can be approximated by a normal curve.
- You can make reasonable estimates about data that approximates a normal distribution, because data that is normally distributed has special characteristics.
- Normal curves can vary in two main ways: the mean determines the location of the centre of the curve on the horizontal axis, and the standard deviation determines the width and height of the curve.

- The curve is called a bell curve
- The curve is symmetrical
- The mean, median and mode are equal (or close) and fall at the center of the curve
- The total area under the curve is 1
- Generally, measurements of living things (mass, height and length) have normal distribution
- Normal distribution can be helpful in answering probability questions

ASSIGNMENT 5 **P 251 #1-3, 6, 7, 10, 11, 13, 14, 15, 16**

5.5: Day 6 Z SCORES

GOAL Use z-scores to compare data, make predictions, and solve problems.

Z-scores
A standardized value that indicates the number of standard deviations of a data value above or below the mean. A z-score indicates the position of a data value on a standard normal distribution.

Standard Normal Distribution
A normal distribution that has a mean of zero and a standard deviation of one.

$$z = \frac{x - \bar{x}}{\sigma}$$

where x is a data value
$\bar{x}$ is the mean
σ is the standard deviation

In order to compare any different normal distribution curves, we must standardize the normal distribution. We use z-scores to do this.

Example 1:
Determine the z-score for the value of x: $\mu = 165$, $\sigma = 48$, $x = 36$

Example 2:
Determine the percent of the data to the left of a z-score of 1.24

Example 2:
Determine the percent of the data to the right of a z-score of -2.35

Example 3:
Determine the percent of data between z-scores of -2.88 and -1.47

Example 4:
IQ tests are sometimes used to measure a person's intellectual capacity at a particular time. IQ scores are normally distributed, with a mean of 100 and a standard deviation of 15. If a person scores 119 on an IQ test, how does this score compare with the scores of the general population?

Example 5:
Athletes should replace their running shoes before the shoes lose their ability to absorb shock. Running shoes lose their shock absorption after a mean distance of 640 km, with a standard deviation of 160 km. Zack is an elite runner and wants to replace his shoes at a distance when only 25% of people would replace their shoes. At what distance should he replace his shoes?

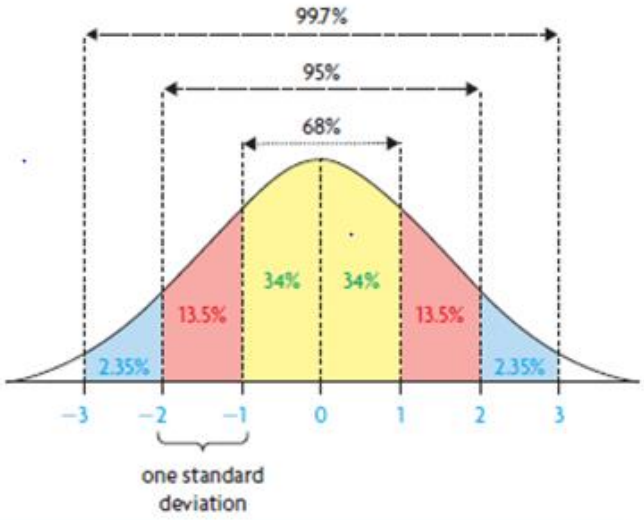
Example 6:
The ABC Company produces bungee cords. When the manufacturing process is running well, the lengths of the cords produced are normally distributed, with a mean of 45.2 cm and a standard deviation of 1.3 cm. Bungee cords that are shorter than 42.0cm or longer than 48.0cm are rejected by the quality control workers. If 20000 bungee cords are manufactures each day, how many bungee cords would you expect the quality control workers to reject?

Example 7:

A manufacturer of personal music players has determined that the mean life of the player is 32.4 months, with a standard deviation of 6.3 months. What length of warranty should be offered if the manufacturer wants to restrict repairs to less than 1.5% of all of the players sold?

Key Ideas

- The standard normal distribution is a normal distribution with mean, μ, of 0 and a standard deviation, σ, of 1. The area under the curve of a normal distribution is 1.
- *Z*-scores can be used to compare data from different normally distributed sets by converting their distributions to the standard normal distribution.



Need to Know

- A *z*-score indicates the number of standard deviations that a data value lies from the mean. It is calculated using this formula:

$$z = \frac{x - \mu}{\sigma}$$

- A positive *z*-score indicates that the data value lies above the mean. A negative *z*-score indicates that the data value lies below the mean.
- The area under the standard normal curve, to the left of a particular *z*-score, can be found in a *z*-score table or determined using a graphing calculator.

ASSIGNMENT 6

Pg 264 1-11, 13, 15, 16, 17, 21 Two of 19, 20, 22-24

5.6: Day 7 CONFIDENCE INTERVALS

GOAL Use the normal distribution to solve problems that involve confidence intervals.

Often it is impractical to survey an entire population. For example, if a light bulb company wants to test the number of hours that a light bulb will burn before failing, it cannot test every bulb. Propose a method that the company could use to determine the longevity of its light bulbs.

Margin of Error

The possible difference between the estimate of the value you're trying to determine, as determined from a random sample, and the true value for the population; the margin of error is generally expressed as a plus or minus percent, such as ±5%

Confidence Interval

The interval in which the true value you're trying to determine is estimated to lie, with a stated degree of probability; the confidence interval may be expressed using ± notation, such as 54.0% ± 3.5%, or ranging from 50.5% to 57.5%

Confidence Level

The likelihood that the result for the "true" population lies within the range of the confidence interval; surveys and other studies usually use a confidence level of 95%, although 90% or 99% is sometimes used.

Example 1:

FN 20.6 & 7 Normal Distributions, Standard Deviation, Z Scores, Confidence Levels & Margin of Error

A poll determined that 58% of people living in Canada know that the cost of living for the average Inuit is 50% higher than the cost of living for other Canadians. The results of the survey are considered accurate within ±3.1 percent points, 19 times out of 20.

a) State the confidence level

b) Determine the confidence interval

c) The population of Canada was 33.5 million at the time of the survey. State the range of the number of people who knew that the cost of living for Inuit is higher than for others.

Example 2:

A telephone survey of 600 randomly selected people was conducted in an urban area. The survey determined that 76% of people, from 18 to 34 years of age, have a social networking account. The results are accurate within plus or minus 4%, 19 times out of 20.

a) What is the margin of error?

b) What is the confidence interval?

c) What is the confidence level?

d) If the total population of people 18 to 34 years in that urban area is 92500, how many people can I expect to have a social networking account?

Example 3:

To meet regulation standards, baseballs must have a mass from 142.0 g to 149.0 g. A manufacturing company has set its production equipment to create baseballs that have a mean mass of 145.0 g. To ensure that the production equipment continues to operate as expected, the quality control engineer takes a random sample of baseballs each day and measures their mass to determine the mean mass. IF the mean mass of the random sample is 144.7 g to 145.3 g, then the production equipment is running correctly. If the mean mass of the sample is outside the acceptable level, the production equipment is shut down and adjusted. The quality control engineer refers to the chart shown on the next page when conducting random sampling.

a) What is the confidence interval and margin of error the engineer is using for quality control tests?

Confidence Level	Sample Size Needed
99%	110
95%	65
90%	45

b) Interpret the table

c) What is the relationship between confidence level and sample size?

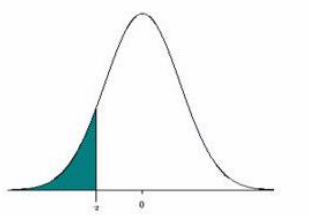
Key Ideas

- It is often impractical, if not impossible, to obtain data for a complete population. Instead, random samples of the population are taken, and the mean and standard deviation of the data are determined. This information is then used to make predictions about the population.
- When data approximates a normal distribution, a confidence interval indicates the range in which the mean of a sample of data would be expected to lie if other samples of the same size were taken, to a stated degree of accuracy. This confidence interval can then be used to estimate the range of the mean for the population.
- Sample size, confidence level, and population size determine the size of the confidence interval for a given confidence level.

ASSIGNMENT 7

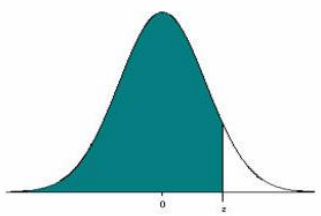
Pg 274 #1-6, 9, 10, 11

Table of Standard Normal Probabilities for Negative Z-scores



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table of Standard Normal Probabilities for Positive Z-scores



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Note that the probabilities given in this table represent the area to the LEFT of the z-score.
The area to the RIGHT of a z-score = 1 – the area to the LEFT of the z-score

-bound Maritimersexpect to find a job in their
v study.
ARCHIVE

"This is where we need to have a discussion, not only what post-secondary institutions are contributing, but how we can sustain the economy," she said. "The variable in this equation that needs to be stronger is the economy."

The arm's-length commission is set up to provide advice to the region's education departments.

It surveyed more than 5,000 Grade 12 students across 175 Maritime high schools to record the new data. The survey has a margin of error of plus or minus 1.4 per cent, 19 times out of 20.

Duguay said retention of post-secondary students in the Maritimes is relatively

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BLANCHFIELD
ANADIAN PRESS

A • The Supreme Court of Canada
he Harper government's tough-
ne agenda a serious blow Tuesday
king down a law requiring manda-
inimum sentences for gun crimes.
-3 ruling, penned by Chief Justice
y McLachlin, said the statute was
titutional as it upheld a 2013 On-
urt of Appeal ruling that labelled
cruel and unusual.
court said the mandatory min-
sentence could ensnare people
ttle or no moral fault" and who
tle or no danger to the public." It
an example, a person who inher-
firm and does not immediately
nse for the weapon.
Court of Appeal concluded,
ous a 'cavernous disconnect' be-
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m of imprisonment," Mc-
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ter Peter MacKay said in
stat the government will

RIME, B2

Only 1 in 3 university-bound Maritimers expect job in home province, study says

Survey polled more than 5,000 Grade 12 students across 175 Maritime high schools

ADAM HURAS
LEGISLATURE BUREAU

FREDERICTON • Two thirds of university-bound Maritimers say they don't expect to find a job in their home province, a survey by the Maritime Provinces Higher Education Commission suggests.

Even fewer expect to be able find a full-time job in their hometown, the economy and a growing rural exodus to blame.

In a report titled Higher Education Expectations, the commission says nine out of 10 Maritime high school students surveyed intend to seek higher education.

But what students expect from their university degree at home isn't much.

Once they have finished a post-secondary program, 63 per cent of university-bound students surveyed "definitely expect" that they will be able to find a job that is closely related to their program.

A total of 33 per cent expect to find a job in their home province, the report suggests.

Expectations about being able to find a job close to home are then even more measured, roughly 14 per cent of the university-bound students saying they expect to be able find a full-time job in their hometown.

"There has been a lot of discussion about the need to go out west," Maritime Provinces Higher Education Commission CEO Mireille Duguay said. "A lot of students also come from rural areas, and they know what's been happening. The depopulation of rural areas is a very real phenomenon.

"They have lived through it so they know that there is not a great likelihood to be able to say, 'I would be able to come back' based on what has happened to their older siblings and friends."

She added: "What we are hearing these students tell us is that they are mobile, they are willing to move, they'll go where they are needed to work. They're not telling us they will move. Moving is not their first choice."

Duguay said the main question is "whether the economy can absorb those graduates with decent earnings."

"This is where we need to have a discussion, not only what post-secondary institutions are contributing, but how we can sustain the economy," she said. "The variable in this equation that needs to be stronger is the economy."

The arm's-length commission is set up to provide advice to the region's education departments.

It surveyed more than 5,000 Grade 12 students across 175 Maritime high schools to record the new data. The survey has a margin of error of plus or minus 1.4 per cent, 19 times out of 20.

Duguay said retention of post-secondary students in the Maritimes is relatively

PLEASE SEE → EDUCATION, B2

A total of 33 per cent of university-bound Maritimersexpect to find a job in their home province, according to a new study.
PHOTO: JAMES WEST/THE DAILY GLEANER ARCHIVE

the climate change action p
up last year by the former To
ment.

Gallant said on Tuesday h
to beef up the action plan ar
is leaving the Quebec City fo
plenty of ideas gleaned from
provinces. However, he did n
which ideas he preferred.

"I think we all have a role to
lant said.

"For us in New Brunswick
jobs is the priority. I assume i
ity across the country for C
We have to do that in a respo
We have to ensure that havir
plan to combat climate cha
of that strategy and is a part o
for economic growth."

The goal of the provincial
torial get-together was to
adians how their leaders we
to fight the effects of clima
but the meeting also served t
their differences.

While provinces such as O
Quebec are working on cap
carbon emissions, Saskatch
mier Brad Wall told his peer
ada, as a whole, should be f
creating clean coal technolo

He suggested that zeroing
ducing man-made greenh
emissions – the cause of clima
and rising world temperature
ing to scientists – is "playing o
gins."

Wall noted Canada accoun
than two per cent of the worl
greenhouse gas emissions.

Gallant said that while inn
important to finding soluti
mate change, he believes th
New Brunswick needs to be
ways for people to become mo
efficient.

"We have to do better when
to our peak energy generation
said.

"New Brunswickers have t
stand the importance of t

PLEASE SEE → CLIMATE, B2

ANSWERS

PART B:

1. a) mean b) median c) mode d) mean e) mode
2. a) 41 b) 496.6 c) 480 d) 496 e) yes
3. a) 9 b) 72.5 c) 72 d) 72.5
4. a) 23, 57 b) 71.8, 72.6 c) 73, 73 d) 73, 73