Math 8 Tripp

Name: _____**KEY**_____

Chapter 7 – Data Analysis

Test Date: _____

To do:

7.1 – Averages
- Complete Notes ◯

7.2 – Mean and Range
- Complete Notes ◯

7.3 – Median
- Complete Notes ◯
- Quiz 1 ◯

7.4 – Mode
- Complete Notes ◯

7.5 – Conclusions
- Quiz 2 ◯

7.6 – Probability
- Complete Notes ◯

7.7 – Theoretical Probability
- Complete Notes ◯

7.8 – Multiple Events
- Complete Notes ◯
- Quiz 1 ◯

Assignment # 4 (Units 7 & 8) ◯

Write Unit Test ◯

Math 8 **Lesson 7.1 – Averages** Tripp

The **average** is a term which is used often to try and best represent the "central tendency" (or "typical value") of a set of numbers.

What number best represents the group of numbers?

If I could throw away my data and replace it with only one “average” value, what would it be?

3 common ways to determine an average:

Mean – **sum all values and divide the sum by the number of values (most common)**

Median – **place the numbers in numerical order and find the middle number (helpful with extreme values)**

Mode – **count the frequency of each number and pick the most common one (like voting).**

Math 8 **Lesson 7.2 – Mean and Range** Tripp

Mean is the **average**. The mean is computed by **adding/summing** all of the numbers in the data set together and **dividing** by the number of elements contained in the data set.

Example:

Data set = 2, 5, 9, 3, 5, 4, 7

$$Mean = \frac{sum}{\#\ of\ values} = \frac{35}{7} = 5$$

****Disadvantage of using mean is that if any number is extreme (outlier) then the mean will be stretched and less accurate****

Range is the **spread**. The range for a data set is the **difference** between the largest value and the smallest value contained in the data set.

Example:

Data set = 2, 5, 9, 3, 5, 4, 7

Range = largest – smallest = 9 – 2 = 7

Lesson 7.3 - Median

Median is the **middle value**. First you should reorder the data set from the **least** to **greatest**, then if the number of elements are **odd,** the median is the element in the **middle** of the data set. If the number of elements are **even**, then the median is the **average** of the two middle terms.

Examples:

Data set = 2, 5, 9, 3, 5, 4 ,7

Reordered: 2, 3, 4, 5, 5, 7, 9

Median (middle): 5

Data set = 2, 5, 9, 3, 5, 4

Reordered: 2, 3, 4, 5, 5, 9

Median (middle): $\frac{4+5}{2} = 4.5$

Lesson 7.4 - Mode

Mode is the most **frequently occurring**. The mode for a data set is the element that occurs the most. It is not uncommon for a data set to have more than one mode. This happens when two or more elements occurs with equal frequency in the data set.

Examples:

Data set = 2, 5, 9, 3, 5, 4, 7

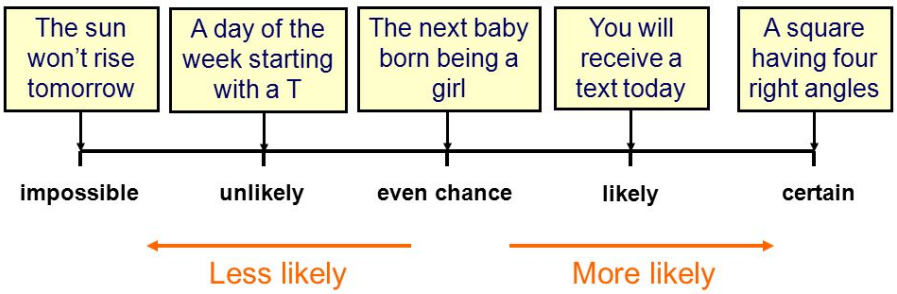
Mode: 5 (appears twice)

Data set = 2, 5, 2, 3, 5, 4, 7

Mode(s): 2 and 5 (each appear twice)

Math 8 **Lesson 7.6 - Probability** Tripp

Probability is **how likely** it is that something happens (or the chance that something happens).



Probability is all around us in our daily lives. Here are a few examples of where:

Answers may vary: weather, elections, chance of city bus arriving on time.

Let's do some practice with theoretical probability. Consider flipping a quarter.

a) What are the chances of getting heads?

½ (50%)

b) What are the chances of getting either head OR tails?

1 (100%)

c) What are the chances of getting <u>neither</u> head NOR tails?

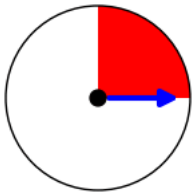
0

d) What are the chances of getting tails?

½ (50%)

Practice

1. Consider spinning the spinner on the right.



a) What are the possible results (outcomes)? Red, white

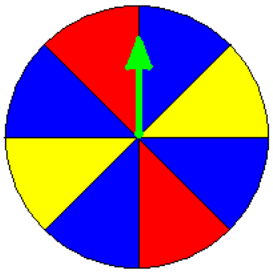
b) What is the probability of getting white (unshaded)? ¾

c) What is the probability of getting red (shaded)? ¼

d) What is the probability of getting blue? 0

e) What is the probability of getting either red OR white? 1 (100%)

2. Consider spinning the new spinner on the right.



a) What are the possible results (outcomes)? R, B, Y

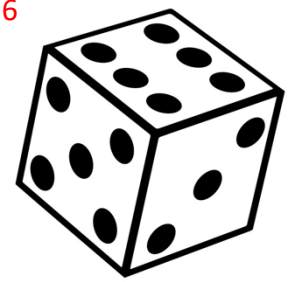
b) What is more probable: blue or red? Blue

c) What is more probable: red or yellow? Equal

d) What is more probable: yellow or green? Yellow

e) If you had to guess which colour you would land on, you would guess…

3. Consider rolling a die.



a) What are the possible results (outcomes)? 1, 2, 3, 4, 5, 6

b) What is the probability of rolling a six? 1/6

c) What is the probability of rolling a one? 1/6

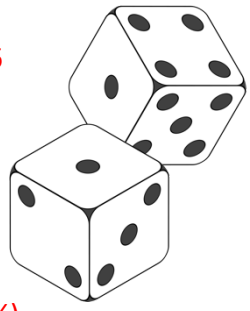
d) What is the probability of rolling a seven? 0

e) What is the probability of rolling a total greater than one? 5/6

f) What is the probability of rolling a number less than 10? 1 (100%)

4. Consider rolling <u>two dice</u>.

a) What are the possible results (outcomes) of the sum of two dice? 2, 3, … , 12



b) What's the probability of rolling a snake-eyes (two ones)? 1/36

c) What's the probability of rolling a total of 12? 1/36

d) What's the probability of rolling a total of 1? 0

e) What's the probability of rolling a total greater than 1? 1 (100%)

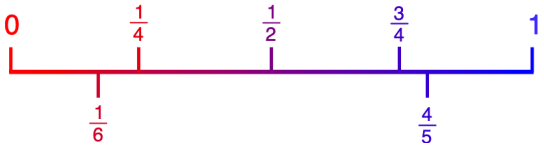
f) What's the probability of rolling a total greater than 2? 35/36

Numbers can be used to show the probability of something happening:

- Impossible is **zero**

  The probability of an event will not be less than 0. This is because 0 is impossible (sure that something will not happen).
- Certain is **one**. The probability of an event will not be more than 1. This is because 1 represents 100% certainty.

Fractions can be used to represent probabilities, as well as **decimals** or **percentages**.



Math 8 **Lesson 7.7 – Theoretical Probability** Tripp

There are two different kinds of probability, **experimental** probability and **theoretical** probability. We will be looking at **theoretical** probability.

Theoretical Probability is the likelihood of getting a certain outcome. It is calculated by taking the number of **favourable** outcomes (the outcome you're looking for) divided by the number of all **possible** outcomes.

$$\text{Theoretical Probability} = \frac{\text{Number of favorable (desired) outcomes}}{\text{Total number of possible outcomes}}$$

Example: **Toss a coin 100 times, how many Heads will come up?**

Probability says that heads have a one out of two (equal to $\frac{1}{2}$) chance so we would expect heads half the time or 50 heads. However, when you actually try it out you might get 48 heads, or 55 heads… or anything really, but in most cases it will be a number near 50.

Practice:

1. Your sock drawer is a mess. Twelve black socks and six red socks are mixed together. What are the chances that, without looking, you pick out a red sock? What are the chances of picking a black sock?

   Red: 6/18 = 1/3 and black: 12/18 = 2/3

2. If you are rolling a regular die, what is the probability of rolling an even number?

   Favourable outcomes: 2, 4, 6 → P(even) = 3/6 = ½

3. You spin a spinner numbered 1-8, what is the probability that you will land on a number that is less than 3?

   Favourable outcomes: 1, 2 → P(less than 3) = 2/8 = ¼

4. You are visiting a kennel that has three German shepherds, four Labrador retrievers, two Chihuahuas, three poodles, and five West Highland terriers. When you arrive, the dogs are taking a walk. What is the probability of seeing a German shepherd first?

   Favourable outcomes: 3 (out of 17) → P(German shep.) = 3/17

5. A charity raffle sold 100 tickets for a new car. If you bought 2 tickets, what is the probability that you'll win?

   P(win) = 2/100 = 1/50

Lesson 7.8 – Multiple Events

Two events are said to be independent of each other if the probability that one event occurs in no way affects the probability of the other event occurring.

Example of an **independent** event:

- If I roll a die, then roll a second die, the result of one event does not depend on the result of the other. The two events don't affect each other in any way. These two events are said to be independent events.

Example of a **Non-Independent** event (also called a **dependent** event):

- If you pick a card from a deck, then choose another card (without replacing the first) the events are NOT independent because the card that was removed on the first pick has an effect on the probability of the second pick.

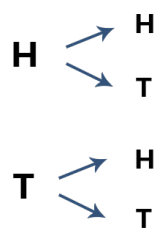
We've looked at flipping coins. We've looked at rolling a die. What if we do **both**?

a) What are the possible outcomes?

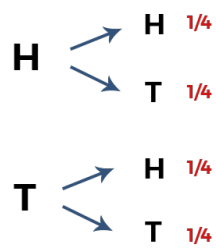
Let's look at **Probability Trees** as a way to keep all of these outcomes organized.

<u>Example</u>: What is the probability of getting one head and one tail when two coins are flipped at the same time?

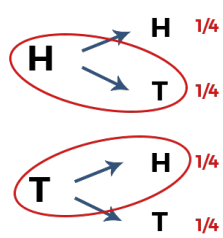
Here is the probability tree the first column represents the outcomes of the first coin:



Then if we multiple down the branches, we get the individual probabilities of each branch (outcome) occurring:



And then we select the branches that give us what we want: one head and one tail (which is the same as one tail and one head). So those two branches are the HT branch and the TH branch:



And when we add up those probabilities, we get $\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$, or 50%. So, there is a 50% chance of getting one head and one tail when two coins are flipped.

Practice:

1. A coin and a die are thrown at random
    a. Use a probability tree to show all the possible outcomes.

    b. What's the probability of getting a head and an odd number?

    c. What's the probability of getting a head or tail and an odd number?

2. A coin is flipped three times in a row and the results (e.g., heads, tails, heads) are recorded.
    a. Use a probability tree to show all the possible outcomes.

    b. What's the probability of getting 3 of the same (3 heads or 3 tails)?

    c. What's the probability of getting only one tail in the outcome?