UNIT 9: Probability and Statistics

Math Power 9 - Chapter 9

NAME: _____

MATH 9
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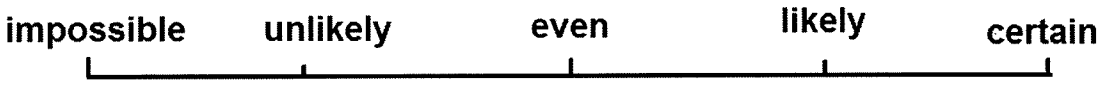
Rundle Academy

INTRODUCING PROBABILITY

L.O. To understand how to describe the probability of a single event.

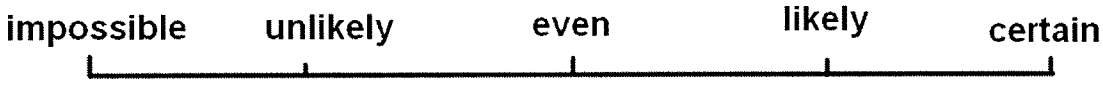
Probability is how <u>likely</u> something is to happen.



Look at the <u>probability</u> chart.
Can you think of an event that would be <u>unlikely</u>?
Can you think of an event that is <u>likely</u>?

For instance, if I had a coin with both sides the **<u>same;</u>**

The probability of getting heads would be impossible!
The probability of getting a tail would be certain!



Try using the words to describe probability:

Have a look at the statements below and try to decide if they are;

impossible unlikely even likely certain

a) You buy a lottery ticket and win the jackpot.

b) You toss an ordinary coin and get heads

c) Christmas will be on the 25th December this year

d) You grow another nose today.

e) It will rain in the first week of November.

Beads in the bag! What is the probability?

BEAD BAG

A game is played where 7 beads with the digits 1 to 7 on are placed in a bag.
The first bead is taken out of the bag and the idea of the game is to guess whether the number on the next bead to be taken out of the bag will be **higher** or **lower** than the previous one.

In each case choose an appropriate word from the following list to complete each sentence:

1. Certain
2. Likely
3. Unlikely
4. Impossible

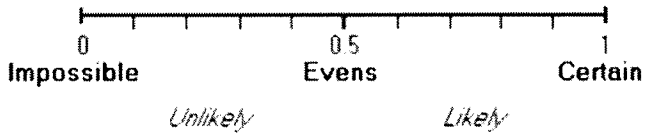
Remember there is only one of each number, 1 - 7 each time.

1. 
   If the first bead is **7**, the chance of the 2nd bead being **lower** than 7 is ...

2. 
   If the second bead is **1** the chance of the 3rd bead being **lower** than 2 is ...

L.O. To understand how to calculate the probability of a single event.

Words like **certain** and **likely** do not mean the same to everyone. We need to be more *precise* about how likely something is to happen.
The probability of an outcome can have a value between 0 and 1. It may be shown as a **decimal, a fraction or as a percentage.**



Look at the probability chart. It shows a scale from 0 to 1. 0 means impossible and 1 is certain.
Most events are somewhere between the two!

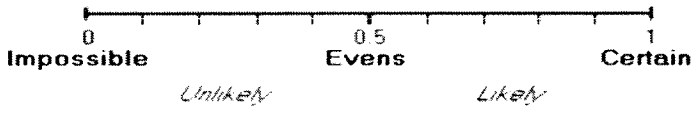
Using a die in Probability.

When you throw a fair dice there are six possible outcomes: 1, 2, 3, 4, 5 or 6. There are three ways of getting an odd number (1, 3 or 5)

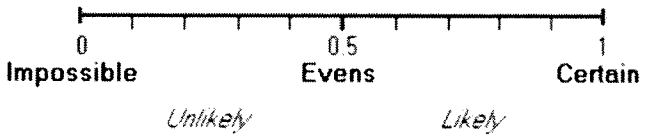
So the probability of getting an odd number =

Therefore, what is the probability of getting an even number?

How could you show this on the chart?



What is the probability of these events?



a) Rolling the number 1.

b) Rolling the number 5.

c) Rolling the number 4.

The probability may be the same but does it work out this way in practise?

With your partner, roll the die 100 times and record your results.

9.1 Probability Formula - NOTES

Probability is the likelihood of an event occurring.

Probability should always be a number between zero and one. If the probability is zero, there is no chance of it happening and if it is one then it is a certain event.

We use the following formula to calculate probability:

$$P(a) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Always leave your answer in **REDUCED FRACTION FORM** unless asked otherwise.

EXAMPLES:

1. What is the probability of getting a tail when tossing a coin?

2. What is the probability of getting a 3 when rolling a die? What about a 7?

3. You have a bag of marbles. It has 4 red marbles, 2 green marbles and 1 black marble. What is the probability of getting a red marble? A green? A black?

HOMEWORK: Text Pg. 349 #1-7, 9, 10, 11ac

9.2 Experimental Probability - NOTES

Last class we learnt about "*theoretical or mathematical*" probability.

Sometimes, we will actually perform an experiment to find the probability of something happening, this is the "**experimental probability**" or "**relative frequency**".

We still use the same formula:

$$P(a) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

EXAMPLES:

1. Experiment with spinner and dice on website

http://www.shodor.org/interactivate/activities/expprobability/?

2. A student tossed a cup in the air and their results are outlined i table below:

Outcome	Landed on it's top	Landed on it's bottom	Landed on it's side
Frequency	15	21	16

Determine the relative frequency of each outcome

HOMEWORK: Worksheet 9.2

Math 9 **9.3 Notes Sample Spaces** **Date:**

Sample Space -

Two ways of creating a sample space

Creating a sample space using a grid

Example 1 A 6-sided black die and a 6-sided green die are rolled together.

a) Create a sample space for this experiment
b) Event A is the sum of the two dice will greater than 10, Determine P(A)

Solution

Black Die

Green Die	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Creating a sample space using a tree diagram

Example 2 List the sample space for tossing a penny, a nickel, and a dime

a) List all possible outcomes (tree diagram)
b) Determine the probability of getting heads on all three coins
c) Determine the probability of getting at least one head on all three coins

Math 9 9.4 Notes Independent and Dependent Events Date:

Independent Events

The outcome of one event is not affected by the other outcome of the other.

Ex. If you flip a coin once and then pick up the same coin and flip it again. (the first flip does not affect the second)

To find the probability of two independent events both occurring, multiply the probability of the first event by the probability of the second event.

$$P(A \text{ and } B) = P(A) \times P(B)$$

Dependant Events

The outcome of one event is directly affected by the outcome of the other

Ex. If you pull a marble from a bag and then DO NOT replace it before pulling the second. (the number of marbles in the bag on the second pull has changed)

To find the probability of two dependent events both occurring, multiply the probability of *A* and the probability of *B* after *A* occurs.

$$P(A \text{ and } B) = P(A) \times P(B \text{ following } A)$$

Example 1 Find the probability of tossing two dice and getting a 3 on each one.

These events are _____.

Example 2 A box contains a nickel, a penny, and a dime. Find the probability of choosing first a dime and then, without replacing the dime, choosing a penny.

These events are _____.

HOMEWORK: Worksheet 9.4

Math 9 **9.5 Notes Measures of Central Tendency** **Date:**

I. Mean

The **mean** is the *average*. To calculate it, you add all the "statistics" together and then divide by the number of "statistics" that there are.

II. Median

The **median** is the *middle* (a good way to remember is that both words have the same number of letters). To calculate it, you must put all the "statistics" in order (usually from smallest to largest but it doesn't really matter if you do it the opposite way) and then you count in from both ends until you find the middle. If it is just one number (odd number of "statistics") then this is your **median**. If it is two numbers (even number of "statistics") then you must find the average between these two numbers (add them together and divide by 2)

III. Mode

The **mode** is the "statistic" that occurs *most* often (to remember this, both words are 4 letters and start with "mo"). You can have more than one mode (i.e. two or more of the "statistics" occur more than the others) or no mode at all (i.e. all the "statistics" occur the same number of times)

IV. Range

The **range** is difference between the largest "statistic" and the smallest "statistic". To calculate this, you just subtract largest from smallest.

Ex. Find the mean, median, mode and range of the following sets of data.

a) 16, 17, 10, 13, 20, 18, 13, 14, 18

b) 1, 6, 2, 4, 4, 5, 3, 5, 2, 1, 7, 6, 7, 3

HOMEWORK: Worksheet 9.5

Math 9 **9.6 Notes Scatter Plots/Line of Best Fit** **Date:**

I. Scatter Plots

There are many ways you can be asked to draw a scatter plot and you need to decide what is the correct axis for each set of data.

***Manipulated/Independent* variable is on the x-axis and *Responding/Dependant* variable is on the y-axis.**

Here are some tips:

- "plot variable A verses variable B" - the first variable (A) is on the *y-axis* and B is on the *x-axis*
- In a table, the data on top (horizontal table) or on the far right (vertical table) is on the *y-axis*
- Basically the "first" set of data given goes on the *y-axis*

II. Line of Best Fit

Is a line that "averages" the data. It is a straight line drawn on your graph with an "even number" (or as close as possible) of data on either side of it. It does NOT have to go through the origin (0,0).

Ex. See text pg. 334 (work through activity and copy the example into your notes)

HOMEWORK: Worksheet 11.4

Math 9 9.7 Notes Relationships in Data Date:

I. Relationships

Up to this point when you have done graphing, you are generally given one set of varying data. In this unit we will be given two sets of data and be asked to find the "relationship" between them. We can generally do this just by looking at the "shape" of the data once it has been plotted on a grid.

When describing the relationship, you must say what is happening to BOTH sets of data.

EXAMPLES:

Increasing relationship Decreasing Relationship

No relationship

II. Continuous or Discontinuous

The data can be CONTINUOUS, meaning that there is a solid line between each set of points and all the data between the points is "viable" to the relationship.

DISCONTINUOUS means that the points are not connected and the data between the points is not "viable" in the relationship.

EXAMPLES:

Continuous Discontinuous

III. Interpolation/Extrapolation

To **interpolate** a graph means that you are reading the graph as it is already laid out and not changing it.

To **extrapolate** a graph means that you are extending it (either before or after) and reading outside the original data points.

IV. Correlation

The "closer" or "more congested" the points are to one another, the stronger the correlation is (use the words strong or weak).

EXAMPLES:

Strong Weak

HOMEWORK: Worksheet 9.7

Math 9 **9.8 Notes Collecting Data** **Date:**

I. SAMPLING A POPULATION

In a Gallop poll conducted by phone, 1026 Canadians of 18 years of age or older were asked this question:

Would you say that your standard of living is higher, lower or the same as the standard of living of your parents?

All of the people eligible for a survey make up the POPULATION. When a population is very large a SAMPLE of the population is surveyed. The 1026 people surveyed represent a sample of all the Canadians 18 years or older.

Sometimes we will use a REPRESENTATIVE sample if we only want to include a certain population (i.e. if you wanted to know the most popular music among the students at school, then you would not include the teachers). We may also use a STRATIFIED sample if we want to consider different "groups" of people (i.e. if there are 300 females and 350 males in the school, you may include 30 females and 35 males in your sample). If the entire population is surveyed it is called a CENSUS.

When sampling, we must choose a sample whose characteristics are similar to the entire population. We must sample carefully to ensure that it is an UNBIASED sample, the members of the sample must be as varied as the members of the population. We should also make it a RANDOM sample, ensuring all members have an equal chance of being chosen.

II. WRITING A SURVEY

The way a question is asked sometimes encourages a particular answer. This is called a BIASED question. Some questions, while not biased are difficult to interpret.

To find out whether parents think that calculators should be permitted on math tests, a researcher wrote these two questions:

Question 1: Should students be allowed to use calculators on math tests?

Question 2: Should math tests include some questions for which calculators are permitted?

To which question might you expect more people to answer yes?
Which question is better?

When writing questions for a survey, consider the following:

- will everyone understand the question?
- will everyone interpret the questions the same?
- will it be easy to tally and organize the results?

Questions may be in the following formats:

- Yes or No
- Multiple Choice
- Fill in the Blank
- Short Answer

HOMEWORK: Worksheet 9.6 (answer in full sentences)