## Lesson \# 19

SP2: Select and defend the choice of using either a population
or a sample of a population to answer a question. Intro to Stats and Probability (Outcomes SP 1,2,3,4,5,)

This unit is always short and interesting, and we usually save it until the very end prior to exam review. Mr. Hopper and I decided that after all of our work on equations and inequalities, we would take a break from solving and calculating and focus on data. Because let's face it, this pandemic has us all following the media and we need to understand and analyze everything we are reading, hearing, and seeing.

We are currently bombarded in the news with "stats" (or statistics(numbers))- every single day. The COVID-19 pandemic evolves every day and the media is constantly reporting information. Mr. Hopper and I are doing this unit exclusively in English because, given that we live in Sussex, most of us are watching the news and reading online news in English. \#flattenthecurve \#socialdistancing \#stayhome are prime examples.

## From Middle School, you all know that the probability of getting heads when you toss a coin is $1 / 2$ or 0.5 or $50 \%$. The probability of rolling a 6 on a regular dice is $1 / 6$ or $17 \%$ or 0.17. We call this THERORETICAL probability or what "should" happen.

Go get a coin. Toss it up in the air. Count how many times you get heads. Record this table and your results on page 60 of your notebook.

| \# of times <br> tossed | $/ 2$ times | $/ 5$ times | $/ 10$ times | $/ 25$ times |
| :--- | :--- | :--- | :--- | :--- |
| \# of times you <br> got heads |  |  |  |  |
| What Mrs. H <br> found when <br> she did the <br> experiment <br> (tossed the <br> coin) | 0 heads $/ 2$ <br> tosses of the <br> coin= $0 \%$ | $1 / 5=20 \%$ | $6 / 10=60 \%$ | $13 / 25=52 \%$ |

# We call this EXPERIMENTAL PROBABILITY. The results we find when we actually DO the experiment (i.e. toss the coin). The more times you try, the closer your probability becomes to the THEORETICAL Probability. Worked for me! Did it work for you??? 

*** Remember to change a fraction to a decimal, divide the numerator by the denominator. To change the decimal to a percent, multiply by 100.
$3 / 5=3$ divided by five $=0.6$ and $0.6 \times 100 \%=60 \%$

## Copy this in your notebook on page 60

## Three kinds of Probability

| Theoretical <br> Probability | What should happen. | Probability of picking <br> the 8 of hearts out of <br> a deck of cards is <br> $1 / 52$ (1 favorable <br> outcome- that one <br> card over the total <br> number of outcomes <br> -52 cards) = 0.02= 2\% |
| :--- | :--- | :--- |
| Experimental <br> Probability | What actually <br> happens when I do <br> the experiment | Probability of heads <br> $6 / 10=0.60=60 \%$ |
| Judgement | An Idea, a thought, a a <br> feeling... not based <br> on science! | Oh, it looks dark <br> outside, I think its <br> going to rain. OR.. <br> l'm feeling lucky so <br> I'm going to buy a <br> lotto ticket. |

Do you know what the probability of winning the lotto 649 jackpot really is?... not very good!
LOTTO MAX 1 in 28,633,528
LOTTO 6/49 1 in 13,983,816
TAG 1 in 600,000
Atlantic 491 in 13,983,816

I am almost embarrassed to write this but... I went to a psychic once with my friend for fun! ;) The psychic told me a bunch of general stuff but nothing that I really remember being specific minus... "You are going to win the lotto." Well, I left her home and went to the nearest gas station and bought a lotto ticket for that night. (I don't normally do that because I work too hard for my money to throw it away but... I had a good feeling!) When I got home, I went online and printed off the claim prize form from Atlantic Lotto and filled it out. I was sure I was going to Moncton on Monday to pick up my cheque.

The next morning, I checked my ticket. Did I win? Good question... Not a penny. LOL I was so disappointed I was so sure! WHAT KIND OF PROBABILITY MADE ME SO SURE? THEORETIC? EXPERIMENTAL? OR A SUBJECTIVE JUDGEMENT. Write down what you think.

It wasn't theoretical because that's an almost 1 in 14000000 chance.
It wasn't experimental because I had bought tickets a few other times in my life (remember I am frugal and good with my money) and had won NEVER... so experimentally that's $0 \%$ of a big win.

It was a judgement. An idea in my head planted by the psychic. And I was so sure... yet nothing. Judgements aren't science based... and it cost me five bucks! That's what we want to avoid when we are researching. We want data based on science... not "feelings."

## Is the weather an example of theoretical or experimental probability?

Actually, weather data is always experimental probability (write that in your notebook on p.60) when we listen to it on the tv or radio or read it on the weather network.com. The probability of rain is based on given the same conditions in the past we had rain _\% of the time. If it happens in the sky, Cindy Day really does know why! ©

| Mon <br> $04 / 20$ <br> Mainly sunny | Tue <br> 04/21 <br> Mainly sunny | Wed <br> $04 / 22$ <br> Mixed <br> precipitation | Thu <br> 04/23 <br> A mix of sun <br> and clouds | Fri <br> $04 / 24$ | Sat <br> Mainly sunny | Sun <br> Mainly sunny |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Meels like |  |  |  |  |  |  |

POP is defined as "Probability of precipitation."
For example, a 70\% chance of rain represents a 7 in 10 chance that precipitation will fall at some point during that period.

POP represents how likely it is that rain (or other precipitation: sleet, snow, hail, drizzle etc.) will fall from the sky during a certain time period.

## In your notebooks, complete the following:

1.On Monday, April $20^{\text {th }}$, the POP was $20 \%$. What does that mean?
2. How was the weather looking on Wednesday April $22^{\text {nd }}$ in terms of precipitation (rain, snow, ice pellets etc.)?
3. On any given day, what it the THEORETICAL probability of rain?
4. If I were going to school today and I looked out the door and decided I didn't need a coat because it wasn't going to rain, I would be basing this on what kind of probability?
5. If you had to predict what the weather would be for today? What would you say and why?

Now check your answers with mine.

1. $20 \%$ probability is low. It "probably" will not rain today, but it could.
2. $80 \%$ means it will likely rain on Wednesday, April $22^{\text {nd }}$ (keep in mind that I made this lesson on April 19 ${ }^{\text {th }}$ ). Bring an umbrella.
3. The theoretical probability of rain on any given day is $50 \%$ because it will either rain, or it will not. Theoretical probability is $1 / 2$ or 0.5 or $50 \%$.
4. Looking outside is a judgment. It is not based on science, research, or data. Again, focus on the science, not the feelings.
5. Hopefully, you googled the weather from a reputable site and are basing your answer on the POP that is based on experimental probability and past days with the exact same conditions.

## What is the difference between a population and a sample?

I think that the easiest way to explain this is to think of Costco. Mr. Hopper lives in Moncton and he is a Costco shopper. I only go to Costco when Mrs. Douthwright and I are in Moncton... and only for one reason! I hate crowds and giant shopping carts BUT I love FREE stuff! And, what is Costco known for on a Saturday afternoon? (prepandemic of course)- FREE SAMPLES! Mmm. Popcorn? Sure. Chocolate? Yes please! Pizza? Sure. Ham? Why not, it is free! Potato skins? YES! And then... can we go by the chocolate again! LOL

Point being, does Costco give me the entire bag of popcorn, or 12 " pizza or box of chocolates or whole ham to try? NO, unfortunately. ©) But they give us a SAMPLE, a small portion, of the bigger product, but enough so we know what the product tastes like.

## A SAMPLE- is a part of the population. It must be a big enough size for the results to be what we call "valid" or statistically useful. Think of costo, do they give you one piece of popcorn? No, they give you a little paper cup full so you get a sample of what is in the bag. Would one piece of popcorn describe the deliciousness of an entire bag of Smartfood Popcorn. No. The same goes in Math and life. If I poll my

students and ask what their favorite course is, can I ask only one person? Ex. Rosiewhat is your favorite course? Rosie says Math. Can I report that $100 \%$ of students surveyed reported that Math was their favorite course? No. What if I asked Rosie and Grace? No, because my sample size is too small. There are about 150 kids in grade 9 Math so I would need a much bigger sample size for my results (data, statistics) to be "valid."

A POPULATION is an entire group. It could be all the students of SRHS (700ish students). Or, all the kids in my G3 (16 students), or the entire population of Sussex, or the entire population of Canada.

## How do we decide whether to go with a population or a sample?

Great question. Ideally, we could always go with the whole population but...
realistically, we have limitations including time and money. Can I ask every student at SRHS what their favorite subject is? 700 is a lot!! I can get the same data using a sample, which is less time consuming and more cost effective if, my sample size is big enough.

## What is the best kind of sample?

The best kind of sample is known as a random sample. Every member of the population has an equal chance of being selected. The easiest way to do this is to put all names in a hat and pull names. This removes bias (or favoritism). Computer programs do this as well.

We have provincial testing at the grade 10 level for French. Can they test all the grade 10 students in every school in the whole province? No. A computer generates a random sample of grade 10 students and those students are tested and the results are GENERALIZED by school, by district and by province. We do not want to skew the results by only picking the kids who love French and are super great at it. We want data that reflects the population- tenth graders who are great at it, who are good at it, and who struggle with it.

## Here is a summary:

All the individuals in the group being studied are called a population. For example, the population in a federal election is all eligible voters, and when data is collected from each member of the population it is called a census.

Since it is often impractical to gather information about entire populations, sampling is a common statistical technique. Any group of individuals selected from the population would be referred to as a sample. For the example of a federal election a sample could be taken of 100 individuals chosen from each province or territory.

When a sample is representative of the population, the data collected from the sample leads to valid conclusions. Larger sample sizes increase the likelihood that the statistical results will approximate expected values or population characteristics.

There are many ways to select samples, with random samples the most likely to produce valid conclusions.

## Copy this into your notebook on p. 60

|  | definition | example |
| :--- | :--- | :--- |
| Population | An entire group | All the students at SRHS <br> All the citizens living inside of the <br> town of Sussex |
| Sample <br> (think of Costco) | A part (must be a <br> significant part) of <br> the population | Two classes of grade 9s, two <br> classes of grade 10s, two classes of <br> grade 11s and two classes of grade <br> 12s (one FI class \& one class of <br> English) |
| Census | The entire <br> population (of a <br> country for <br> example) | The Canadian Census is done every <br> 5 years and includes every <br> household. (cool lesson to come on <br> that!) But... It can only be done <br> every 5 years because it takes a <br> long time to compile that much data <br> and it is very expensive- personnel, <br> postage, computer IT etc. |

# In your notebooks, answer the following question in full sentences. 

1. Does the ELPA use a sample or a population? Why?

The ELPA uses the ENTIRE population of grade 9 students in the province of NB because they want data specific to each student. They want to be able to determine who exactly was successful and who was not successful, not simply a percentage of pass and fail. Mrs. Byers and Mrs. George need to know exactly who did not pass so they can work with those students and prepare them to be retested in grade 11.

HW: Google PISA Test. Describe what it is. When does it happen? Who is tested- a sample or a population? Why? What is the purpose of this data?

