Name: _____ Date: _____

PROBABILITY - A MEASUREMENT OF UNCERTAINTY

The magazine *Discover* once had a special issue on "Life at Risk." In an article, Jeffrey Kluger describes the risks of making it through one day:

"Imagine my relief when I made it out of bed alive last Monday morning. It was touch and go there for a while, but I managed to scrape through. Getting up was not the only death-defying act I performed that day. There was shaving, for example; that was no walk in the park. Then there was showering, followed by leaving the house and walking to work and spending eight hours at the office. By the time I finished my day -- a day that also included eating lunch, exercising, going out to dinner, and going home -- I counted myself lucky to have survived in one piece."

Is this writer unusually fearful? No. He has read mortality studies and concludes "there is not a single thing you can do in an ordinary day -- sleeping included -- that isn't risky enough to be the last thing you ever do." In the *Book of Risks* by Laudan, we learn that:

- 1 out of 2 million people will die from falling out of bed.
- 1 out of 400 will be injured falling out of bed.
- 1 out of 77 adults over 35 will have a heart attack this year.
- The average American faces a 1 in 13 risk of suffering some kind of injury in home that necessitates medical attention.
- 1 out of 7000 will experience a shaving injury requiring medical attention.
- The average American faces a 1 out of 14 risk of having property stolen this year.
- 1 out of 32 risk of being the victim of some violent crime.
- The annual odds of dying in any kind of motor vehicle accident is 1 in 5800.

Where do these reported odds come from? They are simply probabilities calculated from the counts of reported accidents. Since all of these accidents are possible, that means that there is a risk to the average American that they will happen to him or her. But fortunately, you need not worry – many of these reported risks are too small to really take seriously or change your style of living.

PREVIEW

Everywhere we are surrounded by uncertainty. If you think about it, there are a number of things that you may be unsure about, such as:

- How much homework will I have on Thursday?
- How many times will Mr. Hansen say "y'all" in a week?
- How many students will get caught twerking in the hallway this month?
- will you be in college in 4 years?
- Will Mr. Hansen still be teaching at RHS in the year 2032?
- Will the U.S. government launch an attack on Syria?

A probability is simply a number between 0 and 1 that measures the uncertainty of a particular "event."

Although many events are uncertain, we possess different degrees of belief about the truth of an uncertain event. For example, most of us are pretty certain of the statement "the sun will rise tomorrow", and pretty sure that the statement "the moon is made of green cheese" is false.

We can think of a probability scale from 0 to 1.

PROBABILITY

100% or 1 - event will occur, no exceptions

50% or 0.5 – event happening or not happening is equally likely

0% or 0 – event will never occur

We would give the statement "the sun will rise tomorrow" a probability close to 1, and the statement "Earth's moon's core is made of cheese" a probability close to 0. It is harder to assign probabilities to uncertain events that have probabilities between 0 and 1. In this topic, we first get some experience in assigning probabilities. Then we will discuss three general ways of thinking about probabilities.

WARM-UP ACTIVITY – SOME QUESTIONS ON PROBABILITY

1.) List three "events" with a probability of 1 (100% chance of happening)

2.) List two events with a probability of 0 (0% chance of happening)

3.) List one event with a probability of 0.5 (50% chance of happening)

4.) Suppose you have a bag with 4 white and 8 red balls. You choose a ball at random from the bag. What is the probability that the ball you chose is white? Explain.

5.) Suppose you toss a coin 20 times and get 19 heads. What is the chance that the next toss is heads? Explain.

6.) What is the chance that you will be married when you are 25 years old? Explain.

7.) If you roll two dice, what is the probability that the sum of the two dice rolls is equal to 5? Explain.

8.) What is the chance that you will complete your college education (that is, graduate) in five years or less?

9.) When a meteorologist reports that there is a 50% chance of rain tomorrow, what does this mean?

10.) What's the chance that two people in our class have the same birthday (month and day)?