**Homework for Day 3** Name: Minh Ta

**Binomial distribution**

Wes plays baseball. Last year his batting average was 0.280. He worked hard over the winter to improve his batting average, and he now has a 0.300 chance of getting a hit at each at bat. What is the probability that after 250 at bats in the new season, he gets 70 or fewer hits? (70 hits out of 250 at bats is a batting average of 0.280.) Use a spreadsheet! [This is the probability that even though Wes is now a better hitter, it won’t show up in his batting average.]

The probability of Wes getting 70 or fewer hits is **0.26919**.

**Probability Theory**

1. A coin is flipped six successive times. The event space is the set of possible outcomes. Write down each event:

A: There were at least four heads in a row.

{ HHHHHH, HHHHHT, HHHHTH, HHHHTT, HTHHHH, THHHHH, THHHHT, TTHHHH }

B: There were at least five heads.

{ HHHHHH, HHHHHT, HHHHTH, HHHTHH, HHTHHH, HTHHHH, THHHHH }

C: Each head (except for the last one) was immediately followed by a tail. There are lots of these, so write small. Here are some to start your list:

{TTTTTT, TTTTTH, TTTTHT, TTTHTT, TTTHTH, TTHTTT, TTHTTH, TTHTHT, THTTTT, THTTTH, THTTHT, THTHTT, THTHTH, HTTTTT, HTTTTH, HTTTHT, HTTHTT, HTTHTH, HTHTTT, HTHTTH, HTHTHT}

= { HHHHHH, HHHHHT, HHHHTH, HTHHHH, THHHHH }

D : there are exactly two tails and they are successive

{ HHHHTT, HHHTTH, HHTTHH, HTTHHH, TTHHHH }

= { HHHHTT, TTHHHH}

= { HHHHHH, HHHHHT, HHHHTH, HTHHHH, THHHHH, THHHHT }

= { HHHTTH, HHTTHH, HTTHHH }

2. A twelve sided die is rolled with possible outcomes the integers from one through 12. A twenty-sided die is rolled at the same time, with possible outcomes the integers from 1 through 20.

How many elements are in each event below?

A: The twelve sided die has a bigger outcome than the twenty-sided die.

1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 = 66

B: The outcomes of both dies are even

6 \* 10 = 60

3. A coin is flipped six successive times. The event space is the set of possible outcomes. Each simple event has an equally likely outcome.

A: there were three heads and three tails.

|A| = 6C3 = 20

B: there were at least five heads.

|B| = 2

C: the last flip was tails.

|C| = 25 = 32

D: no two successive flips had the same result.

|D| = 2

Find each probability

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

#### Homework for Day 3

# Inferential Statistics

#### Motivation & Description of Experimental Procedure

We conducted an experiment to see if Minh can catch M&Ms with his mouth.

At home on Saturday, November 18, 2018, Minh bought a bag of M&Ms and try to throw them in the air and catch it with his mouth. There were 50 M&Ms in total. For each throw the result of the throw was recorded.

#### Null Hypothesis

Our null hypothesis is that Minh is not able to catch M&Ms with his mouth. Under this hypothesis the percentage of Minh catching M&Ms is 20%.

#### Alternative Hypothesis

Our alternative hypothesis is that Minh can catch M&Ms with his mouth with the percentage of 20% and more.

#### Test Statistic

Our test statistic is the number of M&Ms Minh successfully caught. The test statistic follows a binomial distribution, which we will learn more about later.

#### Rejection Region

We are willing to admit that Minh can catch M&Ms to some degree provided the number of successes is 19 or more.

#### Results & Significance

Minh successfully caught 8 M&Ms.

If Minh has no skill to catch M&Ms, we expect the number of successes to be this great or greater with a probability of approximately .98420.

#### Formal Conclusion

There is insufficient evidence to reject the hypothesis that Minh is not able to catch M&Ms in favor of the hypothesis that Minh has some skill to catch M&Ms with his mouth.

#### Informal Discussion

Minh cannot catch M&Ms with his mouth at all. Perhaps he should learn to catch more M&Ms with his mouth in his freetime.

#### Technical notes & documentation

Computations were performed using Excel version 16.0.4738.1000.

**Descriptive statistics**

1. Solar Irradiance

What it reveals: The graph shows that the TSI behaves like a sin curve, which also says that the sun has periods of cooler and hotter alternatively.

II. College Comparison

Interesting things I found out from this graph:

* Augustana graduates have a much better salary after attending than those from Knox College which has a gap of 28 ranks higher in usNews’ college ranking system.
* M.I.T. graduates have such a high salary after attending!