MATH 362—Work Sheet 03

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Due on February 13, 2021

Name: ______________________________

1. (1 point) Suppose I have N students and I go around and ask everyone their birthdays. What is the size of the sample space Ω in this experiment?

365^N

2. (1 point) Continuing Question 1, If B is the event that no one has the same birthday. Describe in words what B^c represents.

At least 2 students have the same birthday

3. (2 points) Since asking people their birthdays can be a little personal. Instead imagine that I ask everyone what their astrological sign (`https://en.wikipedia.org/wiki/Astrological_sign`) is. Assuming there are 40 people in my class. What's the probability that at least three people have the same sign? Explain your answer.

100%, 40 people, 12 signs

4. (1 point) What's the difference between a Tarot reading and being dealt a five card hand?

Order matters in a Tarot reading

5. (3 points) In a state lottery, 5 distinct numbers are drawn from the numbers 1,2,. . . ,40 uniformly at random.

   (a) (1 point) Describe a sample space Ω and a probability measure P to model this experiment.

$\Omega = \{\text{size 5 subsets of } \{1,2,\ldots,40\}\}$

$P(x \in \Omega) = \frac{1}{|\Omega|} = \frac{1}{\binom{40}{5}}$

(b) (2 points) What is the probability that out of five picked numbers exactly three will be even?

$$\frac{\binom{20}{3}\binom{20}{2}}{\binom{20}{5}}$$

6. (2 points) Suppose that a bag of scrabble tiles contains 5 `E`'s, 4 `A`'s, 3 `N`'s, and 2 `B`'s. Suppose I draw 4 tiles from the bag without replacement uniformly at random. Let C be the event that I draw two `E`'s, one `A` and one `N`.

   (a) (1 point) Compute $P(C)$ by imagining that the tiles are drawn one by one as an ordered sample.

$$\frac{5}{14} \cdot \frac{4}{13} \cdot \frac{4}{12} \cdot \frac{3}{11}$$

   (b) (1 point) Compute $P(C)$ by imagining that the tiles are drawn all at once as an unordered sample.

$$\frac{\binom{3}{1}\binom{4}{1}\binom{5}{2}}{\binom{14}{4}}$$

7. (1 point) What's the probability of a full house?

$$\frac{\binom{13}{1}\binom{4}{3}\binom{12}{1}\binom{4}{2}}{\binom{52}{5}}$$