Math 215 - Introduction to Advanced Mathematics

Problem Set 9

Spring 2018
Due in class on Friday, April 13

For each of the following questions give your answer and then explain the reasons why your answer is correct using full sentences. Note that questions 4-6 are optional.

1. How many integers between 1 and 10,000 (inclusive) are not divisible by 4, 5, or 6?

2. A bakery sells plain, chocolate, and apple donuts. Suppose they only have 6 plain donuts, 6 chocolate donuts, and 3 apple donuts available. In how many ways can they prepare a box of a dozen donuts (the arrangement of the donuts in the box doesn't matter)?

3. Seven people arrive at a fancy party on horseback, and each checks his or her horse in at the stable. At the end of the evening, the stableboy brings each of the seven guests one of the horses at random. In how many ways could he return the horses so that no guest receives his or her own horse?

4. (**Bonus - 2 Exam Points**) n people arrive at a fancy party on horseback, and each checks his or her horse in at the stable. At the end of the evening, the stableboy brings each of the n guests one of the horses at random. In how many ways could he return the horses so that no guest receives his or her own horse?

5. (**Bonus - 2 Exam Points**) What is the probability that none of the n guests receives his or her own horse (divide the number of ways this could happen by the total number of ways he could have returned the horses)?

6. (**Bonus - 2 Exam Points**) What does this probability tend towards as the number of guests increases? That is, what is the limit of the probability as $n \to \infty$?