**Name:**_____ **10/15/2018**

**Math 173 Introduction to Probability and Statistics** **Quiz 1**

1. Provide formulas for the following.
   (a) The number of ways to choose and arrange $r$ distinct objects from a collection of $n$ distinct objects, i.e. $\mathrm{P}_r^n$.

   (b) The number of ways to choose $r$ distinct objects from a collection of $n$ distinct objects, i.e. $\mathrm{C}_r^n$.

2. How many different ways can a committee of 7 people choose a president, vice-president, and secretary?

3. How many ways can Noah select 2 elephants and 2 mice from a group of 5 elephants and 7 mice?

4. A teacher has given her class a list of 8 problems to study, and a student knows how to answer 6 of these problems. The teacher will randomly select 4 of the 8 problems to make the exam, with each problem being worth the same number of points.

   (a) How many distinct exams can the teacher possibly make?

   (b) What is the probability that the student can solve all 4 problems on the exam?

   (c) What is the probability that the student can solve *at least* 3 problems on the exam?

5. An experiment can result in none, one, or both of the events $A$ and $B$ with the probabilities shown in the following table.

| | $A$ | $A^c$ |
|---|---|---|
| $B$ | .22 | .38 |
| $B^c$ | .18 | .22 |

   (a) (4 points) Find $P(A|B)$.

   (b) (4 points) Find $P(B|A)$.

   (c) (2 points) Are $A$ and $B$ independent events? Explain briefly.

   (d) (2 points) Are $A$ and $B$ mutually exclusive events? Explain briefly.

6. City crime records show that 15% of all crimes are violent and 85% are nonviolent, involving theft, forgery, and so on. Additionally, 90%of violent crimes are reported versus 60% of nonviolent crimes.

   (a) What is the overall reporting rate for crimes in the city?

   (b) If a crime in progress is reported to the police, what is the probability that the crime is violent?

7. Suppose a lottery ticket costs \$5 to purchase. 5% of these tickets win \$10, 1% of these tickets win \$100, and the rest of the tickets do not win anything. Fill out the following chart for the probability distribution of the random variable $x =$*expected gain from buying one lottery ticket*, and calculate the *expected value* (i.e. *mean value*) for $x$.

| $x$ | $p(x)$ |
|---|---|
| | |