MATH/STAT 3360, Probability
FALL 2014
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Midterm Examination
Thursday 23rd October: 1:05–2:25 PM

Each part question (a, b, c, etc.) is worth 1 mark. You should have been provided with a formula sheet and a normal distribution table. **No other notes are permitted**. Scientific calculators are permitted, but not graphical calculators.

1. How many distict ways can the letters of the word "DISTRIBUTION" be arranged?

2. A fair coin is tossed 7 times. What is the probability that the sequence "HHTH" occurs somewhere in the 7 tosses?

3. An insurance company classifies its customers as either low risk or high risk. It estimates that low risk customers have a 1% chance of making a claim each year, while high risk customers have a 5% chance of making a claim each year. 20% of customers are high risk (and the other 80%) are low risk. Given that Mr. Jones made a claim last year, what is the probability that he is a high risk customer?

4. Calculate the probability density function of X^3, where X follows a uniform distribution on the interval $[0, 1]$.

5. A fair die is rolled twice. Are the following events independent?

   (i) The first roll is 5.

   (ii) The total is 7.

6. An insurance company pays out different levels of claims with the following probabilities:

Claim Amount	Probability
$0	0.98
$3,000	0.015
$40,000	0.005

   Find the expected value and variance of the amount claimed.

7. A Pharmaceutical company is testing the effectiveness of a new drug. It gives the drug to 20 patients. The drug passes the test if it cures at least 3 of the patients. If the probability that the drug will cure a patient is 0.2, what is the probability that it passes the test?

8. The number of cases of a rare disease in a given year follows a Normal distribution with mean 42 and variance 11^2. A hospital needs to prepare rooms specially for these patients, and wants to make sure that it has enough. How many rooms does it need to prepare so that there is a 95% chance that it has enough rooms for all the patients in a given year?

9. The time (in years) until an earthquake hits a given city follows an exponential distribution with parameter 0.04. A company builds a new building which will last either 6 years, or until the next earthquake. What is the probability that the building will be destroyed by an earthquake in the 6 years before it is demolished?