**MATH 3305** Exam 2 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You must show legible and sufficient work for credit. **Circle your final answers. Make sure they answer the question(s) asked.**

1. Ten percent of the components manufactured by a certain process are defective. A component is chosen at random. Find the probability that it is defective. [8]
2. Is this a discrete or continuous random variable?
3. What is the underlying distribution?
4. Setup and solve the probability problem

[i.e. The probability that it is defective is\_\_\_\_\_\_\_]

1. The maximum patent life for a new drug is 17 years. Subtracting the length of time required by the FDA for testing and approval of the drug provides the actual patent life for the drug—the length of time that the company has to recover the R&D costs and to make a profit. The distribution of the lengths of the actual patent lives for new drugs is given below: [12]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Years, *y* | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| *p(y)* | 0.15 | 0.1 | 0.14 | 0.2 | 0.18 | 0.12 | 0.11 |

1. Show that p(y) meets the criteria for a probability distribution
2. Find the mean patent life for a new drug
3. When a motorist stops at a red light at a certain intersection, the waiting time for the light to turn green, in seconds, is between (0,30). Hint: It is **equally-likely to turn green at any time** during this interval. Find the probability that the waiting time is between 10 and 15 seconds. [8]
4. Is this a discrete or continuous random variable?
5. What is the underlying distribution?
6. Write out the distribution function:
7. Setup and solve the probability problem

4. A multiple-choice test has 5 questions, each with five possible answers, only one of which is correct. Suppose that one of the students who takes the test answers each of the questions with an independent random guess. What is the probability that he answers at least three questions correctly? [8]

1. Is this a discrete or continuous random variable?
2. What is the underlying distribution? AND what are the pertinent parameters?
3. Setup and solve the probability problem

5. Beginning at 12:00 midnight, a computer center is up for one hour and then down for two hours on a regular cycle. A person who is unaware of this schedule dials the center at a random time between 12:00 midnight and 5:00 am. What is the probability that the center is up when the person’s call comes in? [8]

1. Is this a discrete or continuous random variable?
2. What is the underlying distribution? AND what are the pertinent parameters?
3. Setup and the probability problem [You may want to draw a sketch.]

6. The average number of claims made per day to the ABC Insurance Company for damages is 3.1. What is the probability that in any given day, fewer than 2 claims will be made? [8]

1. Is this a discrete or continuous random variable?
2. What is the underlying distribution?
3. Setup and the probability problem

7. The percentage of impurities per batch in a chemical product is a random variable Y with density function



A batch with more than 50% impurities can not be sold. Determine the probability that a randomly selected batch cannot be sold because of excessive impurities. [12]

8. The probability that a salesperson will sell a magazine subscription to someone who has been randomly selected from directory is 0.1. If the salesperson calls 6 individuals today, what is the probability that there will be exactly 2 subscriptions sold? [8]

1. Is this a discrete or continuous random variable?
2. What is the underlying distribution? AND what are the pertinent parameters?
3. Setup and solve the probability problem

9. The lifetime of a certain kind of battery is a random variable with mean 300 hours and standard deviation of 33 hours. What is the probability that a randomly selected battery will have a lifetime of more than 320 hours? [8]

1. Is this a discrete or continuous random variable?
2. What is the underlying distribution? AND what are the pertinent parameters?
3. Setup and solve the probability problem

10. Suppose the random variable x is continuous and has the following cumulative distribution function [10]



1. Find the probability density function *f(x)*.
2. Find P (X > 5).

11. Let random variable X be the length of the side of a square.

Let Y be the area of the square, i.e. Y =X2. [10]

Suppose that X has the probability density function,



1. What is the mean of X?
2. What is the expected value of the area, E(Y)?
3. What is the variance of X?
4. Find P(x<.5).

