

Name:

**Instructions:**

- All answers must be written clearly.
- You may use a calculator, but you must show all your work in order to receive credit.
- Be sure to erase or cross out any work that you do not want graded.
- If you need extra space, you may use the back sides of the exam pages (if you do, please write me a note so that I know where to look).
- You must include all work to receive full credit.

1. A student claims that she can tell Friendly's ice cream from Herrells ice cream. As a test, she is given ten samples of ice cream (each sample is either from Friendly's or Herrells) and asked to identify each one. She is right eight times. What is the probability that she would be right exactly eight times if she guessed randomly for each sample?

2. Products produced by a machine has a 3 percent defective rate. What is the probability that the first defective product occurs in the fifth item inspected?

3. Phan is baking cookies. He mixes 400 raisins and 600 chocolate chips into his cookie dough and ends up with 500 cookies.
- (a) Find the probability that a randomly picked cookie will have three raisins in it.

- (b) Find the probability that a randomly picked cookie will have at least one chocolate chip in it.

- (c) Find the probability that a randomly picked cookie will have no more than two bits in it (a bit is either a raisin or a chocolate chip).

4. Let  $X$  be a random variable with probability density function

$$f_X(x) = \begin{cases} c(1 - x^6) & -1 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

(a) What is the value of  $c$ ?

(b) What is the cumulative distribution function of  $X$ ? Give the function, not just a sketch.

(c) What is  $\mathbb{P}(-2 < X < 0)$ ?

(d) What is  $\mathbb{E}[X]$ ?

(e) What is  $\text{Var}(X)$ ?



7. Suppose that we roll 2 dice 180 times. Let  $E$  be the event that we roll two fives no more than once.

(a) Find the exact probability of  $E$ .

(b) Approximate  $\mathbb{P}(E)$  using the normal distribution

(c) Approximate  $\mathbb{P}(E)$  using the Poisson distribution.