

Name: _____
 (Please Print.)

Do all your work on this exam. Correct answers must be supported by your calculations and reasoning where appropriate.

- I have a drawer with 38 white socks and 62 green socks. If I put on two socks at random, what is the probability that I am wearing a matching pair?

Problem	Points	Score
1	8	
2	8	
3	8	
4	8	
5	8	
6	8	
7	8	
8	8	
9	8	
Total	72	

- Ten friends, including Nadine and Bernie, go to see a movie. They sit in 10 adjacent seats in one row. What is the probability that Nadine and Bernie sit beside each other?

3. A store has 2 employees. Employee A serves 60% of the customers and enters an incorrect price for 1% of those customers. Employee B serves 40% and enters an incorrect price for 3% of those customers. If a customer complains to the manager because of an incorrect price charged, what is the probability that employee B served the customer?

Fun Question: Match the holiday celebration with the country.

Luciadagen _	Duvali _	Kakizone _	Feast of the Radishes _	Yalda _
(a) India	(b) Mexico	(c) Iran	(d) Japan	(e) Sweden

4. Let X be a random variable with probability density function $f(x) = \begin{cases} \frac{1}{2}x & \text{if } 0 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$

(a) Compute the probability distribution of X .

(b) Compute the probability distribution function of $Y = X^2 + 1$.

(c) Compute the probability density function of $Y = X^2 + 1$.

5. Let X and Y be jointly distributed random variables with joint probability density function

$$f(x, y) = \begin{cases} 1 & \text{if } 0 < y < 2x, \ 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

(a) Sketch the region where $f(x, y)$ is nonzero.

(b) Compute the marginal probability density function $f_X(x)$.

(c) Compute the conditional probability density function $f_{Y|X}(y|x)$.

6. Let X be the random variable with probability mass function $f(x) = pq^{x-1}$, for $x = 1, 2, 3, \dots$ and $f(x) = 0$ otherwise. Compute the moment generating function of X . (Hint: After a little algebra you should be able to use $\sum_{x=1}^{\infty} ar^{x-1} = \frac{a}{1-r}$ if $|r| < 1$.)

7. A multiplex movie theatre has 6 movies, including *Halloween X*, playing. Patrons randomly and independently choose a movie to see. If 20 patrons attend on a particular day, what is the probability that at least 2 of them have to suffer through *Halloween X*?

8. The Bernoullis host the Newton family for Thanksgiving. Twelve Bernoullis and 8 Newtons are present. Unfortunately the Bernoullis' pet cat has contaminated three of the twenty dinner plates with salmonella. The plates are distributed at random.

(a) What is the probability that only Newtons get food poisoning?

(b) What is the probability that at least two Newtons get sick?

9. (a) State the Central Limit Theorem.

