☐ **1.** A multiple choice quiz has 5 questions, each of which has 4 choices for the answer (a, b, c, or d), exactly one of which is correct. If you answer totally at random, what is the probability that you get 4 or more answers correct?

☐ **2.** A die has 6 faces numbered 1, 2, 2, 3, 3, 3. Assuming the die is fair and each face is equally likely to be rolled, what are the mean and variance of a roll of the die?

☐ **3.** The probability mass function of a discrete random variable X is given in the table below. Calclulate $E(X)$.

x	1	2	3	4
$P(X = x)$	0.1	0.2	0.3	0.4

☐ **4.** A continuous random variable has the probability density function given below. Find the cumulative distribution function of the random variable.

$$f(x) = \begin{cases} 2xe^{-x^2} & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$$

☐ **5.** Let X be a normally distributed random variable with mean 2.2 and standard deviation 0.6.

a) Calculate $P(X = 1)$

b) Calculate $P(X \geq 1)$

☐ **6.** A random variable X is normally distributed with mean $\mu = 200$ and variance $\sigma^2 = 25$. Calculate $P(196 < X \leq 206)$.

☐ **7.** Let Z be a standard normal random variable. Calculate $P(|Z| < 1)$.

☐ **8.** Let X be a continuous random variable with cumulative distribution function

$$F(x) = \begin{cases} 1 - \frac{1}{x^3} & \text{if } x > 1 \\ 0 & \text{otherwise} \end{cases}$$

Calculate the expected value of X.

☐ **9.** Let X be a continuous random variable with probability density function

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

Calculate the variance of X.

☐ **10.** Let X be a continuous random variable with probability density function

$$f(x) = \begin{cases} 5(1-x)^4 & \text{if } 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

Find the cumulative distribution function of X.

☐ **11.** Analysis of data collected by the Pacific Northwest Seismic Network shows that the number of earthquakes per year in the pacific northwest is a Poisson random variable with a mean of 2.6. What is the probability of 2 or more earthquakes in a year?

☐ **12.** A baker has analyzed her sales records and discovered that the number of customers who come to her shop to buy a cake in a day is a Poisson random variable with parameter $\lambda = 2$. Suppose the baker has made 3 cakes. Let X be the number of cakes she sells. Calculate the expected value of X.

☐ **13.** The temperature reading of a thermocouple (in °C) is a normally distributed random variable with mean equal to the actual temperature, and standard deviation σ. How small must σ be in order to ensure that 99% of all readings are within 0.5°C of the actual temperature?

Challenge 1. A baker has analyzed her sales records and discovered that the number of customers who come to her shop to buy a cake in a day is a Poisson random variable with parameter $\lambda = 2$. Suppose the baker has made 3 cakes. Let X be the number of cakes she sells. Calculate the expected value of X.

Challenge 2. The lifetime of a printer costing \$200 is exponentially distributed with a mean of 2 years. The manufacturer will pay a full refund if the printer fails in its first year of operation. No refund is given for later failures. Calculate the mean refund for a printer.