

NAME AND NETID:

**Question 1.** Let  $X$  be a random variable, and answer the following questions based on the probability distribution table below.

$x$	0	1	3	4	5	7	8	10
$\mathbb{P}(X = x)$	0.15	0.10	0.15	0.20	0.20	0.05	0.05	0.10

1. Calculate  $\mathbb{P}(4 \leq X \leq 7)$ . **[1]**
2. Calculate the expected value  $\mathbb{E}(X)$ . **[2]**
3. Calculate the standard deviation  $\sigma_X$ . **[3]**

**Question 2.** Let  $X$  be a binomial random variable following a binomial distribution. It measures the number of days a factory has an accident in 2023. If the expected value is 5.12, then determine the probability that there is an accident any given day. **[1]**

**Question 3.** A doll factory takes a sample of thirteen dolls and records the masses. Determine the median and sample standard deviation of the dolls' masses: **[3]**

8.0kg, 7.8kg, 7.9kg, 8.0kg, 8.1kg, 8.0kg, 7.8kg, 8.1kg, 7.9kg, 8.0kg, 7.8kg, 8.0kg, 7.9kg.

**Bonus Question.** Suppose  $X$  is a normal random variable with  $\mu = 50$  and  $\sigma = 15$ . Find the values of  $\mathbb{P}(X < 55)$ ,  $\mathbb{P}(X > 45)$ , and  $\mathbb{P}(45 < X < 55)$ . [4]