

PROBABILITY DISTRIBUTIONS AND STATISTICS

1. An experiment consists of choosing a sample of 3 marbles from a jar that contains 3 blue and 4 green marbles. Let X be the number of blue marbles in the sample.
 - (a) Find the probability distribution table for the number of blue marbles in the sample.
 - (b) Draw the probability histogram for the number of blue marbles in the sample.
 - (c) What is the expected number of blue marbles in the sample?
 - (d) Find the range, mean, median, mode and standard deviation for the number of blue marbles in the sample.

2. A diamond ring is insured for \$3000. The annual premium is \$110 and there is a 0.5% chance that the ring will need to be replaced in a year. What is the insurance company's expected gain?

3. You play a game where you get \$50 if you have exactly two kings when dealt 4 cards. What is should be charged play this game if it is a fair game (expected value is 0)?

4. From a bush bearing a new kind of starfruit a sample of fruit is chosen and the number of seeds in each fruit is counted. The table below shows the results of this experiment:

Number of starfruit	12	11	10	9	8	7	6
Number of seeds	0	4	6	10	11	12	15

Find the mean, median, mode, standard deviation, range and IQR of this data.

5. A new medicine is effective in 70% of the people who take it. If 10 of your patients are given this medicine,
 - (a) Find the probability distribution table for the number of patients that find it effective.
 - (b) What is the expected number of patients that find it effective? What is the standard deviation?

If 1000 patients are given this medicine, use the normal curve approximation to the binomial distribution to find the probability that

- (c) more than 710 patients find the medicine effective.
 - (d) Fewer than 685 patients find the medicine effective.
 - (e) between 680 and 720 patients find the medicine effective.
6. Given that X is a normal random variable with $\mu=50$ and $\sigma=5$,
 - a) Find $P(X>57)$
 - b) Find $P(35<X<45)$
 - c) Find $P(X<40)$
 - d) Find a value c such that $P(X<c) = 0.4$
 - e) Find a value c such that $P(X>c) = 0.7$
 - f) Find a value c such that $P(50-c<X<50+c) = 0.20$

7. A probability distribution has a mean of 10 and a standard deviation of 1.5. Use Chebychev's theorem to estimate
 - (a) the probability that a randomly chosen data point is between 7 and 13.
 - (b) the value of c so that 60.9375% of the data is in the range $10 - c$ to $10 + c$.