

1. For the probability function

|        |      |      |     |     |     |
|--------|------|------|-----|-----|-----|
| $x$    | 1    | 2    | 3   | 4   | 5   |
| $p(x)$ | 0.15 | 0.25 | 0.3 | 0.2 | 0.1 |

- (a) compute the mean
  - (b) compute the variance
  - (c) plot the distribution in R
2. For the probability distribution in Exercise 1,
- (a) what is the probability of observing a value less than or equal to 2?
  - (b) what is the probability of observing a value greater than 3?
  - (c) what is the probability of observing a value within one standard deviation of the mean?
3. For a binomial with  $N = 15$  and  $\theta = 0.6$ , what is the probability of observing exactly 2 successes?
4. A coin is rigged so that when it is flipped, the probability of observing “heads” is 0.7. If the coin is flipped three times, which is the more likely outcome: exactly three heads, or two heads and a tail?
5. The Department of Agriculture reports that 75% of all people who invest in the futures market lose money. Suppose you are friends with 5 futures traders, each of whom invests independently of the other. Use a binomial distribution to compute the probability that:
- (a) all five lose money
  - (b) all five make money
  - (c) at least two lose money
6. Suppose that for a thesis, a colleague has planned 4 independent replications of a basic finding, but has done so quite badly, because their small samples only guarantee power of 30%. When your colleague reports the results of their thesis, he reports a statistically significant effect in each of the 4 replications. A faculty member suggests that it is very likely that your colleague has committed scientific misconduct. Why?
7. If  $X$  is normally distributed with mean  $\mu = 20$  and standard deviation  $\sigma = 9$ , determine:
- (a)  $P(X < 22)$
  - (b)  $P(X > 17)$
  - (c)  $P(2 < X < 38)$
8. Assuming that the scores on a math achievement test are normally distributed with mean  $\mu = 68$  and standard deviation  $\sigma = 10$ :
- (a) what is the probability of getting a score greater than 78?
  - (b) how high must someone score to be in the top 10%?
9. Suppose the winnings of gamblers in Las Vegas are normally distributed with mean  $\mu = -300$  (the typical person loses \$300), and standard deviation  $\sigma = 100$ . Determine the probability that a gambler does NOT lose any money.
10. If  $X$  is normally distributed with mean  $\mu = 100$  and standard deviation  $\sigma = 15$ , determine  $c$  so that

$$P(\mu - c\sigma < X < \mu + c\sigma) = 0.8$$