

Assignment # 6.3a

6.70 Binary? "Success" = name has more than 6 letters and "Failure" = name has 6 letters or less. Independent? Because we are selecting without replacement from a small number of students, the observations are not independent. Number? $n = 4$ names are drawn. Success? The probability that a randomly chosen student's name has more than 6 letters is constant. Because the observations are not independent, this is a not binomial setting and Y would not have a binomial distribution.

6.72 Binary? "Success" = train is late and "Failure" = train is on time. Independent? Because the days were randomly selected, the arrival times are independent. Number? $n = 6$ days are selected. Success? The probability of arriving late is $p = 0.10$. This is a binomial setting and W has a binomial distribution with $n = 6$ and $p = 0.10$.

6.74 (a) A binomial distribution is *not* an appropriate choice for field goals made by the National Football League player, because given the different situations the kicker faces, his probability of success is likely to change from one attempt to another (the Success condition is not met). However, the other three conditions are met: Binary? "Success" = making the field goal and "Failure" = missing the field goal. Independent? It is reasonable to think that the outcomes of field goal attempts are independent. Number? There are $n = 20$ attempts.
(b) This is the binomial setting. We check the BINS. Binary? "Success" = making a free throw and "Failure" = missing a free throw. Independent? It is reasonable to believe that each shot is independent of the others. Number? We have a fixed number of observations ($n = 150$). Success? Each shot has probability $p = 0.8$ of being made.

6.76 Y = number of plants that die before producing any rhubarb has a binomial distribution with $n = 10$ and $p = 0.05$. $P(Y = 1) = \binom{10}{1} (0.05)(0.95)^9 = 0.3151$. There is a 0.3151 probability that exactly one of the 10 rhubarb plants will die before producing any rhubarb.

6.78 Y = number of plants that die before producing any rhubarb has a binomial distribution with $n = 10$ and $p = 0.05$.

$$P(Y \geq 3) = P(X = 3) + P(X = 4) + \dots + P(X = 10) = \binom{10}{3} (0.05)^3 (0.95)^7 + \dots = 0.0115.$$

Using technology: $P(Y \geq 3) = 1 - P(Y \leq 2) = 1 - \text{binomcdf}(\text{trials: } 10, p: 0.05, x \text{ value: } 2) = 1 - 0.9885 = 0.0115$. Because this is a small probability, it would be surprising if three or more of the plants die before producing any rhubarb.

6.80 (a) W = number of times the train is late has a binomial distribution with $n = 6$ and $p = 0.10$.

$$P(W = 2) = \binom{6}{2} (0.10)^2 (0.90)^4 = 0.0984. \text{ Using technology: } \text{binompdf}(\text{trials: } 6, p: 0.10, x \text{ value: } 2) = 0.0984.$$

$$(b) P(W \geq 2) = P(W = 2) + \dots + P(W = 6) = \binom{6}{2} (0.10)^2 (0.90)^4 + \dots = 0.1143. \text{ Using technology:}$$

$1 - \text{binomcdf}(\text{trials: } 6, p: 0.10, x \text{ value: } 1) = 1 - 0.8857 = 0.1143$. Because this probability is not very small, it would not be surprising if the train arrived late 2 or more times.

Assignment # 6.3b

(82) a) $\mu_x = 2.4$

b) $\sigma_x = 1.39$

(98) a) $P(x=3) = .128$

b) $P(x>10) = .1074$

(100) a) $\mu_x = 38$

b) $P(x \leq 3) = .0769$

(102) c — (88) No

(104) d

(94) .518% (150) (130)

$$P(X \geq 150)$$

$$1 - P(X < 150)$$

$$1 - P(X \leq 149)$$

(96) a) No

b) Yes