

Solution

1.2

a. Binomial distribution with $n = 100$ and $\pi = 0.25$.

b. $\mu = n\pi = 25$ and $sd = \sqrt{n\pi(1-\pi)} = 4.33$. $P(\text{correct responses} \geq 50) = 6.638502e-08$, so it is surprising if the student made at least 50 correct responses.

c. Multinomial distribution with $n = 100$ and $\pi_1 = \pi_2 = \pi_3 = \pi_4 = 0.25$.

d. $E(n_j) = n\pi_j = 25$ and $var(n_j) = n\pi_j(1-\pi_j) = 18.75$. $cov(n_j, n_k) = -n\pi_j\pi_k = -6.25$ and $corr(n_j, n_k) = \frac{cov(n_j, n_k)}{\sqrt{var(n_j)var(n_k)}} = \frac{-6.25}{18.75} = 0.333$