7. The shell of the land snail Linocolaria marfensiana has two possible color forms: streaked and pallid. In a certain population of these snails, 60% of the individuals have streaked shells. Suppose a random sample of ten snails is to be chosen from the population: let \( \hat{p} \) be the sample proportion of streaked snails.

This problem is binomial with \( n = 10 \) and \( p = .6 \)

7a. \( P(\hat{p} = .5) = (252)(.6^5)(.4^5) = .2007 \)
7b. \( P(\hat{p} = .6) = (210)(.6^6)(.4^4) = .2508 \)
7c. \( P(\hat{p} = .7) = (120)(.6^7)(.4^3) = .2150 \)
7d. \( P(.5 \leq \hat{p} \leq .7) = .2007 + .2508 + .2150 = .6665 \)
7e. The percentage of samples in which \( \hat{p} \) is within +/- .1 of \( p = .6 \) is .6665 (same as in part 7d)

18. The heights of a certain population of corn plants follows a normal distribution with mean 145 cm and standard deviation 22 cm.

18a. What percentage of the plants are between 135 and 155 cm tall?
\[ Z = \frac{155-145}{22} = .45 \text{ and the corresponding area is .6736} \]
\[ Z = \frac{135-145}{22} = -.45 \text{ and the corresponding area is .3264} \]
So .6736 - .3264 = .3472, or 34.72% of the plants.

18b. Suppose we were to choose at random from the population a large number of samples of 16 plants each. In what percentage of the samples would the sample mean height be between 135 cm and 155 cm?
So \( n = 16 \) making \( \sigma_{\bar{y}} = \frac{22}{\sqrt{16}} = 5.5 \)
\[ Z = \frac{155-145}{5.5} = 1.82 \text{ and the corresponding area is .9656} \]
\[ Z = \frac{135-145}{5.5} = -1.82 \text{ and the corresponding area is .0344} \]
So .9656 - .0344 = .9312, or 93.12% of the plants.

18c. If \( \bar{Y} \) represents the mean height of a random sample of 16 plants from the population, what is \( P(135 \leq \bar{Y} \leq 155) \)?
.9312 (from part b)

18d. If \( \bar{Y} \) represents the mean height of a random sample of 36 plants from the population, what is \( P(135 \leq \bar{Y} \leq 155) \)?
So \( n = 36 \) making \( \sigma_{\bar{y}} = \frac{22}{\sqrt{36}} = 3.67 \)
\[ Z = \frac{155-145}{3.67} = 2.72 \text{ and the corresponding area is .9967} \]
\[ Z = \frac{135-145}{3.67} = -2.72 \text{ and the corresponding area is .0033} \]
So .9967 - .0033 = .9934, or 99.34% of the plants.
33. In the United States, 44% of the population has type O blood. Suppose a random sample of 12 persons is taken. Find the probability that 6 of the persons will have type O blood (and 6 will not).

33a. Using the binomial distribution formula:
We will let type O blood = success so \( j = 6 \). We have \( n = 12 \) and \( p = .44 \)
\[ P(\text{type O blood}) = (924)(.44^6)(.56^6) = .2068 \]

33b. Using the normal approximation with continuity correction
mean = \((n)(p) = (12)(.44) = 5.28\)
standard deviation = \(\sqrt{(n)(p)(1-p)} = \sqrt{(12)(.44)(.56)} = 1.72\)
So \( P(X = 6) = P(5.5 < X < 6.5) \)
\[ Z = (5.5-5.28)/1.72 = .13 \text{ and the corresponding area is .5517} \]
\[ Z = (6.5-5.28)/1.72 = .71 \text{ and the corresponding area is .7580} \]
So .7580 - .5517 = .2063

49. Consider taking a random sample of size 25 from a population in which 42% of the people have type A blood. What is the probability that the sample proportion with type A blood will be greater than .44? Use the normal approximation to the binomial with continuity correction.

For the normal approximation to the sampling distribution of \( \hat{p} \), the mean \( p = .42 \) and the standard deviation is \(\sqrt{\frac{(p)(1-p)}{n}} = \sqrt{\frac{(.42)(.58)}{25}} = .0987\)
Continuity correction: \((1/2)(1/25) = .02\)
\[ Z = (.46-.42)/.0987 = .405 \text{ and the corresponding area is } 1 - .6590 = .3410. \]