

7.1: Using the Normal Distribution to Approximate the Binomial Distribution

Recall the definitions: p = probability of success, $q = 1 - p$ = probability of failure and n = sample size. When $np \geq 5$ and $nq \geq 5$ then the normal distribution is very close, numerically, to the binomial distribution.

Using the histogram way of drawing the binomial distribution, a good fit looks like that shown in Figure 7.1.

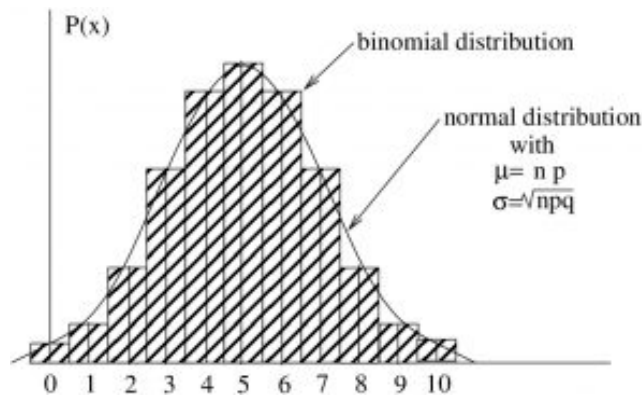


Figure 7.1: A normal distribution with mean $\mu = np$ and standard deviation $\sigma = \sqrt{npq}$ is a good fit to the binomial distribution with the same mean and standard deviation as long as $np \geq 5$ and $nq \geq 5$.

A couple of things to note about this approximation:

1. Although the values of the normal and the binomial distributions match well at x equal to integer values when $np \geq 5$ and $nq \geq 5$, the areas match not as well. A “correction for continuity” can be used to better make the areas match but we won’t be worrying about such fine details in our studies.
2. We will use the normal approximation to the binomial make inferences on proportions. In that case p , the probability of success will represent a proportion in a population.

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