

# Discrete Random Variables

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## 4.6 Mean, Variance, and Standard Deviation of a Binomial Random Variable

1. Use the information contained within the following excerpt of a NY Times article published in 2006 to answer the question that follows: “About half of Americans born at the turn of the 20th century had blue eyes, according to a 2002 Loyola University study in Chicago. By mid-century that number had dropped to a third. Today only about one 1 of every 6 Americans has blue eyes, said Mark Grant, the epidemiologist who conducted the study.” If we randomly select groups of 40 people, find the mean and standard deviation for the number of people with blue eyes in the groups of 40.
2. College graduates often move on from their first job quickly. One survey of 456 graduates found that 78% of those polled stayed at their first full-time job less than two years. If we survey groups of 600 grads, what would the average number of recent grads that stayed at their first jobs less than two years be? What is the standard deviation? If a survey of 600 grads reveals that 450 of them left their first job before two years, is this number unusually low given the 78% reported in the original survey?
3. Selective schools generally have higher graduation rates than nonselective schools for students of all races attending university in the United States. The graduation rate for selective schools is approximately 80% (compared to just 59% at nonselective schools). If we study groups of 500 students attending selective schools, what is the average number expected to graduate from groups of 500? What is the standard deviation for the number expected to graduate? If it turns out that only 365 of a particular group graduates, does it appear that the graduation rate is possibly lower than 80%?

Answers:

1. The mean is  $\mu = 6.7$ , and the standard deviation is  $\sigma = 2.4$ .
2. The mean is  $\mu = 468$ , and the standard deviation is  $\sigma = 10.1$ . The interval  $(\mu - 2\sigma, \mu + 2\sigma) = (447.7, 488.3)$  contains 450, so it is not unusually low.
3. The mean is  $\mu = 400$ , and the standard deviation is  $\sigma = 8.9$ . The interval  $(\mu - 2\sigma, \mu + 2\sigma) = (382.1, 417.9)$  does not contain 365, so it is unusually low. This could point to an error in the reported graduation rate, since the value 365 is so far outside the interval of normal values.