

**LO 1.** Define the standardized (Z) score of a data point as the number of standard deviations it is away from the mean:  $Z = \frac{x-\mu}{\sigma}$ .

**LO 2.** Use the Z score

- if the distribution is normal: to determine the percentile score of a data point (using technology or normal probability tables)
- regardless of the shape of the distribution: to assess whether or not the particular observation is considered to be unusual (more than 2 standard deviations away from the mean)

**LO 3.** Depending on the shape of the distribution determine whether the median would have a negative, positive, or 0 Z score.

**LO 4.** Assess whether or not a distribution is nearly normal using the 68-95-99.7% rule or graphical methods such as a normal probability plot.

\* *Reading: Section 4.1 of OpenIntro Statistics*

\* *Test yourself: True/False: In a right skewed distribution the Z score of the median is positive.*

**LO 5.** If X is a random variable that takes the value 1 with probability of success  $p$  and 0 with probability of success  $1 - p$ , then  $X$  is a Bernoulli random variable.

**LO 6.** The geometric distribution is used to describe how many trials it takes to observe a success.

**LO 7.** Define the probability of finding the first success in the  $n^{th}$  trial as  $(1 - p)^{n-1}p$ .

- $\mu = \frac{1}{p}$
- $\sigma^2 = \frac{1-p}{p^2}$
- $\sigma = \sqrt{\frac{1-p}{p^2}}$

**LO 8.** Determine if a random variable is binomial using the four conditions:

- The trials are independent.
- The number of trials,  $n$ , is fixed.
- Each trial outcome can be classified as a success or failure.
- The probability of a success,  $p$ , is the same for each trial.

**LO 9.** Calculate the number of possible scenarios for obtaining  $k$  successes in  $n$  trials using the choose function:  $\binom{n}{k} = \frac{n!}{k!(n-k)!}$ .

**LO 10.** Calculate probability of a given number of successes in a given number of trials using the binomial distribution:  $P(k = K) = \frac{n!}{k!(n-k)!} p^k (1 - p)^{(n-k)}$ .

**LO 11.** Calculate the expected number of successes in a given number of binomial trials ( $\mu = np$ ) and its standard deviation ( $\sigma = \sqrt{np(1 - p)}$ ).

**LO 12.** When number of trials is sufficiently large ( $np \geq 10$  and  $n(1 - p) \geq 10$ ), use normal approximation to calculate binomial probabilities, and explain why this approach works.

\* *Reading: Section 4.2 and 4.3 of OpenIntro Statistics*

\* *Test yourself:*

1. *True/False: We can use the binomial distribution to determine the probability that in 10 rolls of a die the first 6 occurs on the 8th roll.*
2. *True / False: If a family has 3 kids, there are 8 possible combinations of gender order.*
3. *True/ False: When  $n = 100$  and  $p = 0.92$  we can use the normal approximation to the binomial to calculate the probability of 90 or more successes.*