

Probability Distributions

Binomial and Normal Distribution review + Geometric Distribution

BINOMIAL DISTRIBUTION

A binomial distribution has the following characteristics:

- The experiment has a fixed number of trials, n .
- Each experiment has two possible outcomes – success or failure
- The n trials are all independent.
- The probability of success, p , is the same for each trial.

Example:

Suppose that the county health department states that 18% of students will test positive for the H1N1 virus. What is the probability that exactly 3 of the 10 students test positive for H1N1?

Example:

What is the probability that at most 4 students test positive?

What is the mean and standard deviation of this distribution?

Remember that:

$$\mu = np$$

$$\sigma = \sqrt{np(1-p)}$$

CALCULATOR:

Binompdf(n, p, x) – the probability of exactly x occurring

Binomcdf(n, p, x) – the probability of less than or equal to x occurring

GEOMETRIC DISTRIBUTION:

A geometric distribution has the same properties as a binomial experiment with one exception. Instead of a fixed number of trials, a geometric experiment continues until success occurs.

A geometric experiment has the following characteristics:

- Each experiment has two possible outcomes – success or failure
- The n trials are all independent.
- The probability of success, p , is the same for each trial.

Examples of a geometric experiment:

- Roll a pair of dice until you get doubles.
- Attempt a 3-point shot until you make one.
- Keep placing a \$1 bet on a number 15 in roulette until you win.

Example:

From the H1N1 problem....what is the probability that we would have to test three or fewer students before we find one testing positive?

General Formula:

CALCULATOR:

Geompdf(p,x) – probability we find the first success at the x trial

Geomcdf(p,x) – probability that we find the first success at or before the x trial

NORMAL DISTRIBUTION:

Example:

We are collecting data on the time it takes to grade an exam. For a particular teacher, the mean grading time is 15.8 minutes and the standard deviation is .707 minutes. It is normally distributed. What is the probability that a randomly selected exam takes less than 15 minutes to grade?

CALCULATOR:

Normalcdf(lower bound, upper bound, mean, standard deviation)

We don't use normalpdf.

Example: The mean of a normally distributed data set of test scores is 71. The standard deviation is 4.2. Find the 88th percentile score.

CALCULATOR:

Invnorm(percent) – will give you z-score associated with the percent entered