Engineering Statistics Lecture XIV

Jonathan Bender

October 22, 2019

1 What if we want E[g(x)]?

Spoz that Brad runs a hubcap replacement business: Brad sees a lot of hubcaps laying in a ditch somewhere. Historically, Brad sells 100 hubcaps per month in the winter and doubles to 200 per month in the summer time. 6 months 100/month, 6 months 200/month.

Let X be the number of hubcaps being sold per month, random variable as described above. So, $\mu_X = 150$.

However, if Brad's profit is 100X - \$50, continue later.

$$E[g(x)] = \int_{-\infty}^{+\infty} g(x)f(x)dx \tag{1}$$

For any PDF f(x) that takes the same parameter as g(x).

2 Joint Probability

Spoz Khan is a manager at Starbucks. He has to fill three different coffees. Spoz we order 4 light brew, five regular brew, and 3 dark roast coffees.

Now: Nick works for Khan, but isn't so detail-oriented. Nick selects 3 boxes at random. What are the chances that 2 of 3 are light roast and that 1 is dark roast?

Well, let's think about this in a different way – There are three or more "random variables" x, y, and z that are the numbers of light brew, regular brew, and dark brew respectively.

If we know the number of light brew and regular brews (2 and 0 respectively), then we know that the number of dark brews is 1.

So:

$$P(X = x, Y = y) = \frac{\binom{4}{x}\binom{5}{y}\binom{3}{3-x-y}}{\binom{12}{3}}$$

$$P(2l1d) = \frac{\binom{4}{2} * \binom{5}{0} * \binom{3}{1}}{\binom{4+5+3}{3}}$$

$$\rightarrow P(2l1d) = \frac{18}{220}$$