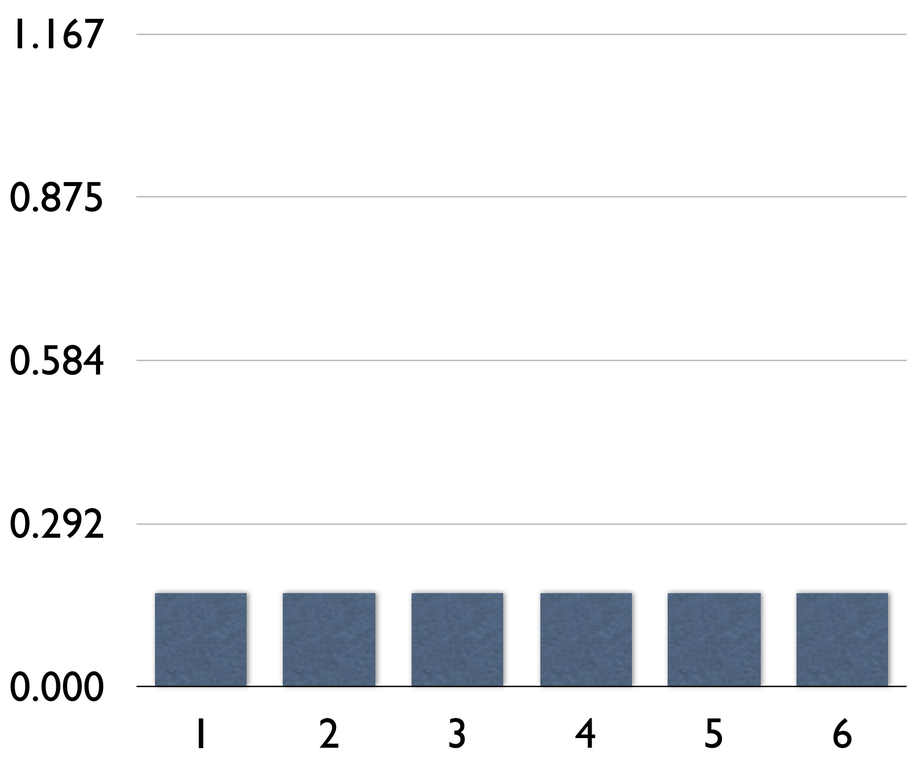
Probability Mass Functions

Psychology 3256

Introduction

- You can plot the probability of any given score for a variable
- p(all events) = 1
- area under the curve = 1

Die roll



The Normal Distribution

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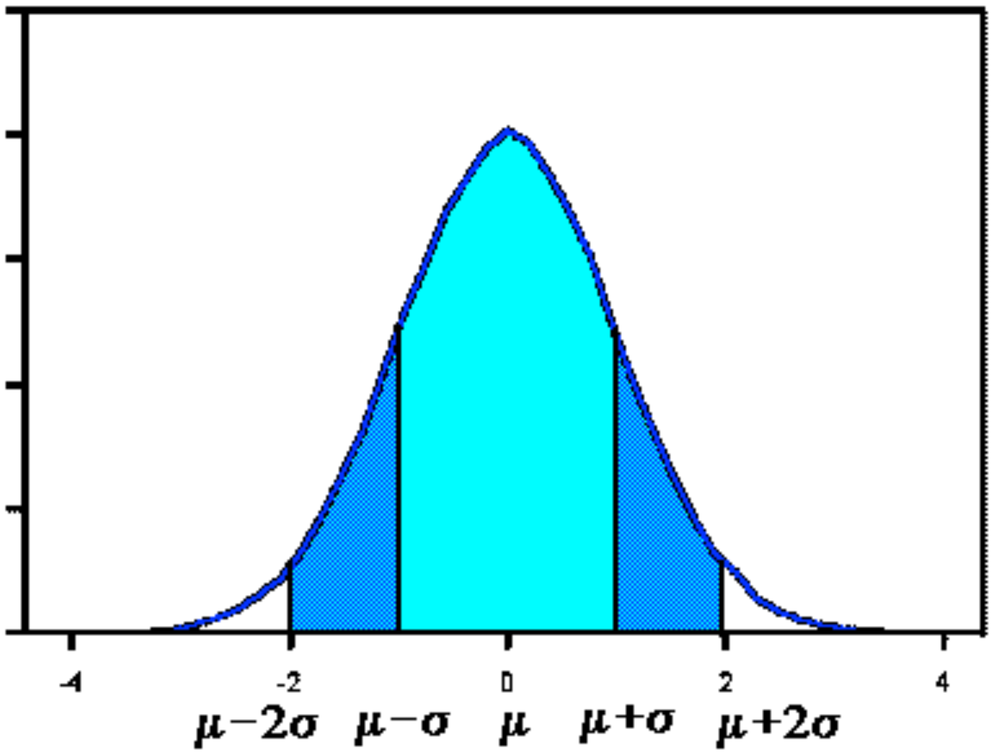
  - bell shaped



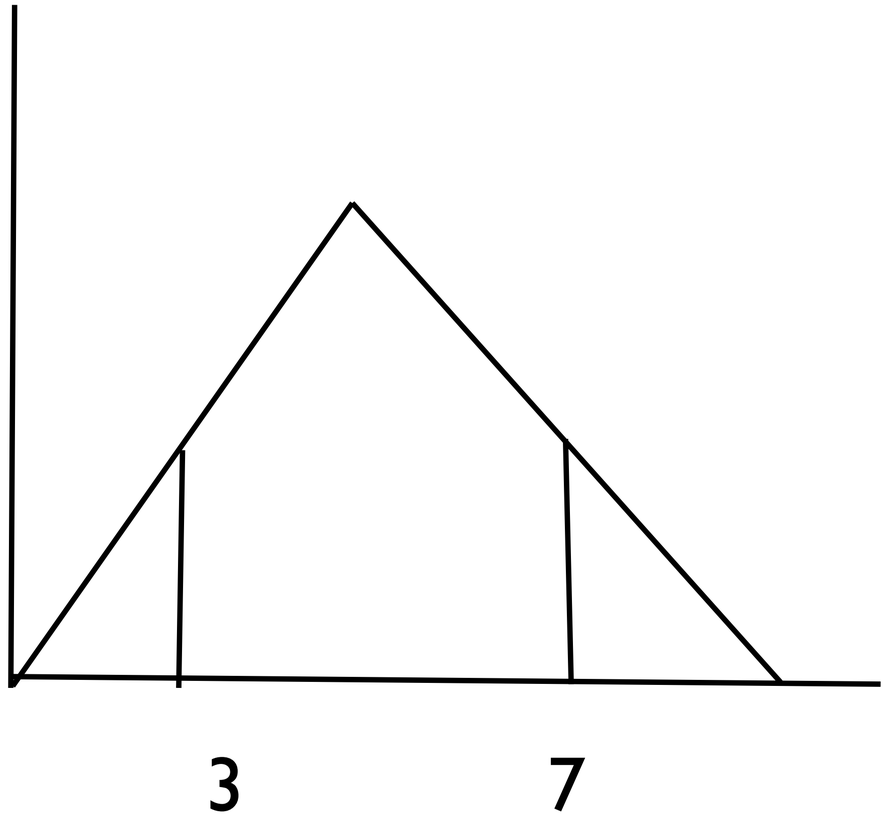
Why is this useful?

- Many variables are assumed to be normal in the population
- Therefore we can use standard techniques
- Sampling distributions are normal (CLT)

$$\bar{x} \rightarrow N(\mu_x, \sigma / \sqrt{n})$$

properties

p(3<x<7)=
area between
f(3) and f(7)



The area under a curve

- Well in this case that is pretty easy, just simple geometry
- If it is not a common shape, well, then umm, who here has taken calculus?

$$\int_{x=3}^{x=7} f(x)$$

But I don’t know calculus!

- Well, that’s your loss
- Sucks to be you

Meanwhile, back at the normal distribution

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}}(e)^{-(x-\mu)/2\sigma^2}$$

- So you just take the integral of the function
- Say you want the probability of an IQ between 95 and 107 you just take the integral, easy!

OK, it can be made a little easier

- If we make the mean 0 and the variance 1 (a standard normal distribution) we then get a somewhat simpler equation

$$f(x) = \frac{1}{\sqrt{2\pi}}(e)^{-(x)/2}$$

Still....

- Basically this is why we standardize our data using the z distribution to make it N(0,1)

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{95 - 100}{15} = -.32$$

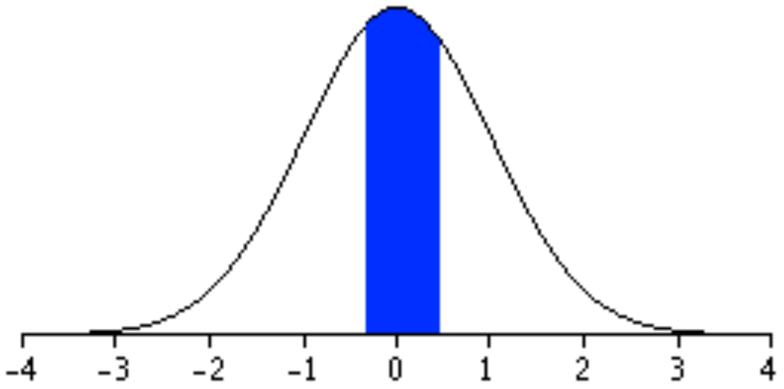
$$z = \frac{107 - 100}{15} = .466$$

$$p(-.32 < z < .466) = .310$$

Someone did the calculus for you

- So now you can just look it up in a z table
- or, you can use this handy dandy web tool
- http://www.davidmlane.com/hyperstat/z_table.html

Normal Distribution



Mean 0 Sd 1

- Above 1
- Below 1
- Between -0.32 and 0.466
- Outside -1 or 1

Shaded area: 0.304908

Conclusions

- Some poor person did the calculus for you
- We now just look it up in a table, or we use a handy web tool like I showed you
- This is not that scary, you already know how to do this, but now you know WHY