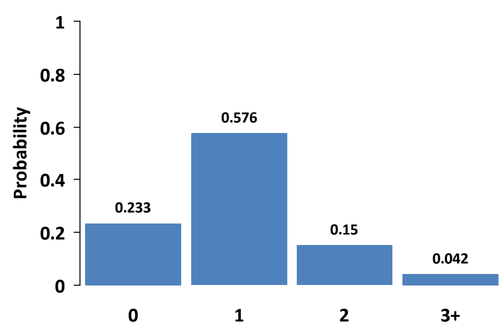
Discrete Random Variable

Number of Times American Men (Age 25+) Have Been Married



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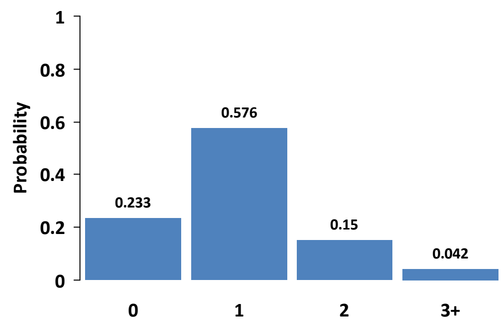
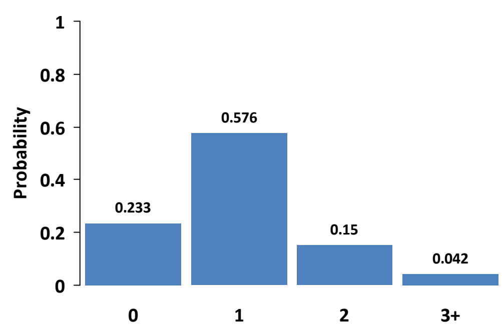


$$E(Y) = \mu_Y = \sum_{i=1}^{k} Y_i p\left(Y_i\right)$$

$$\sigma_Y^2 = \sum_{i=1}^{k} \left(Y_i - \mu_Y\right)^2 p(Y_i)$$

Number of Times American Men (Age 25+) Have Been Married



$$E(Y) = \mu_Y = (0 \times 0.233) + (1 \times 0.576) + (2 \times 0.150) + (3 \times 0.042) = 1.002$$

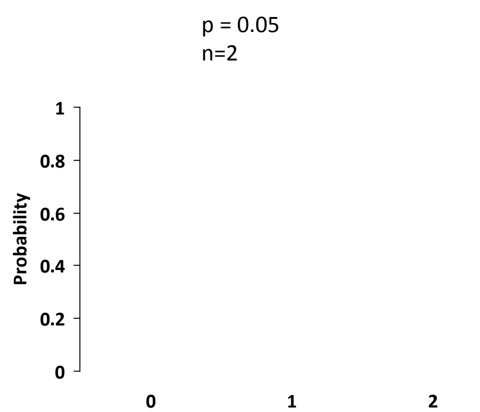
$$\sigma_Y^2 = (0 - 1.002)^2 (0.233) + (1 - 1.002)^2 (0.576)$$

$$+ (2 - 1.002)^2 (0.150) + (3 - 1.002)^2 (0.042) = 0.551$$

$$\sigma_Y = 0.742$$

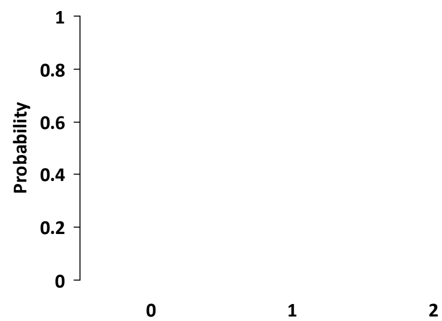
Binomial Random Variable

Number of Flight Delays Out of 2 Flights, Where P(Delay) = 0.05 for Any Flight



Number of Flight Delays Out of 2 Flights, Where P(Delay) = 0.05 for Any Flight

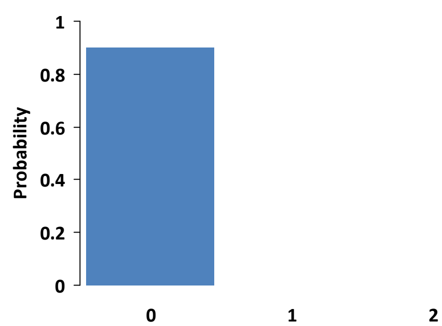
p = 0.05
n=2



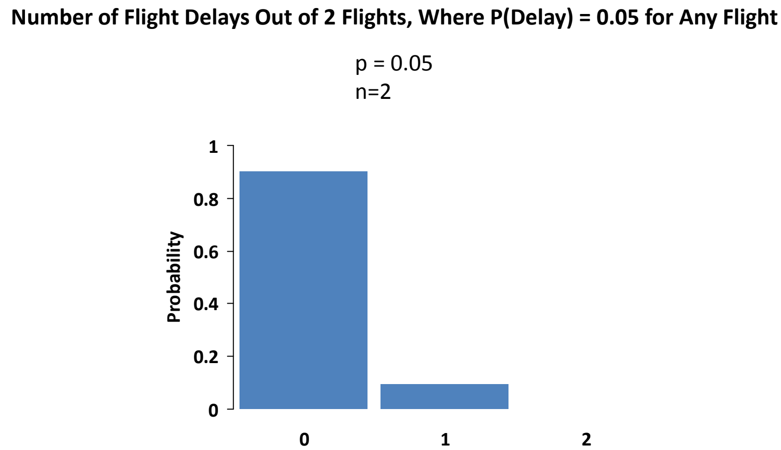
$$P(Y = k) = \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k}$$

Number of Flight Delays Out of 2 Flights, Where P(Delay) = 0.05 for Any Flight

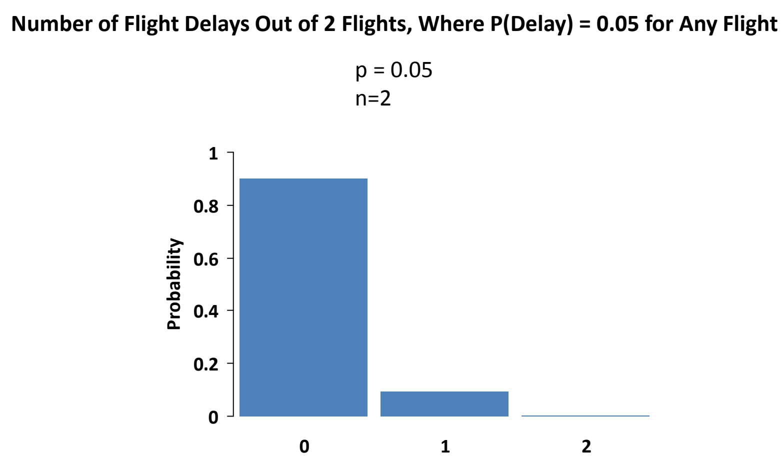
p = 0.05
n=2



$$P(Y = 0) = \frac{2!}{0!(2-0)!} 0.05^0 (1-0.05)^{2-0} = 0.9025$$



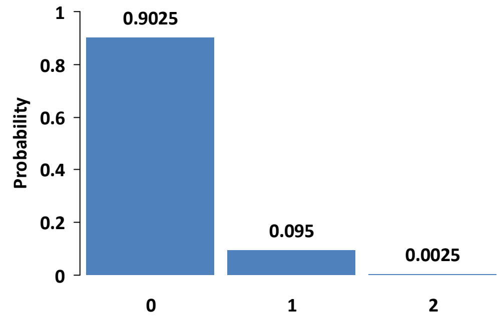
$$P(Y=1)=\frac{2!}{1!(2-1)!}0.05^{1}(1-0.05)^{2-1}=0.095$$



$$P(Y=2)=\frac{2!}{2!(2-2)!}0.05^{2}(1-0.05)^{2-2}=0.0025$$

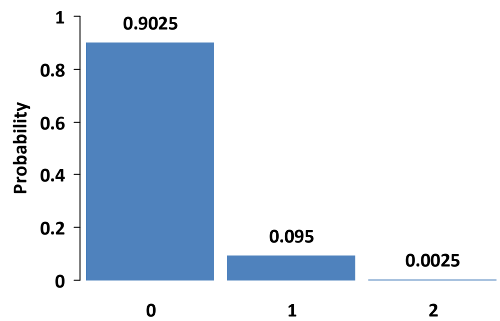
Number of Flight Delays Out of 2 Flights, Where P(Delay) = 0.05 for Any Flight

p = 0.05
n=2



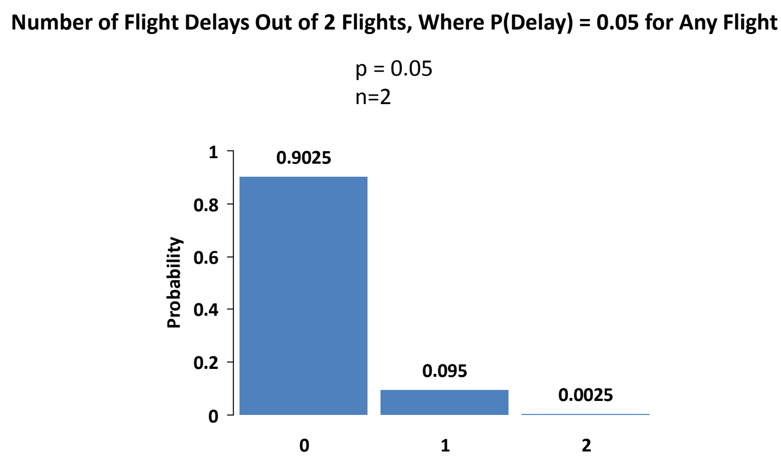
Number of Flight Delays Out of 2 Flights, Where P(Delay) = 0.05 for Any Flight

p = 0.05
n=2



$$E(Y) = \mu_Y = np$$

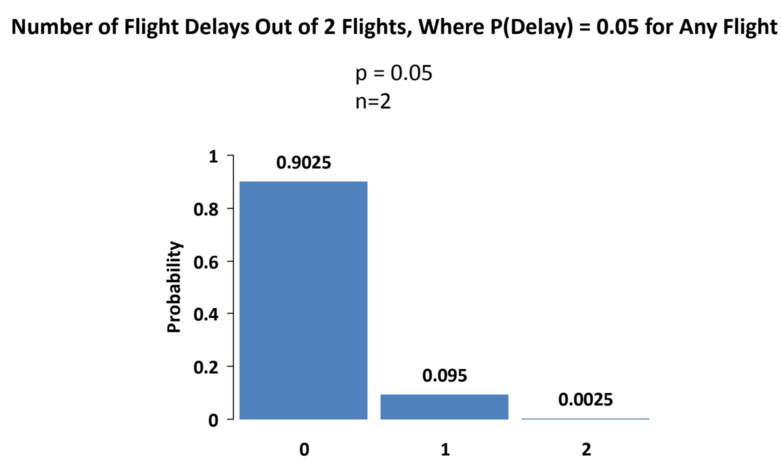
$$\sigma_Y^2 = np(1-p)$$



$$E(Y) = \mu_Y = np = 0.05 \times 2 = 0.1$$

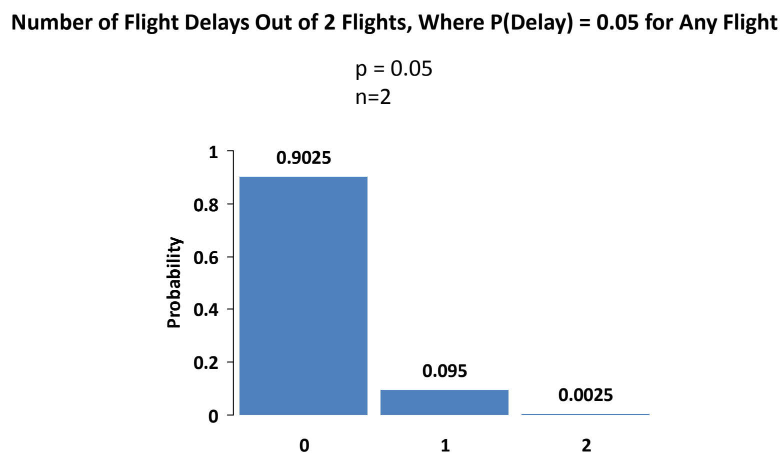
$$\sigma_Y^2 = np(1 - p) = 2 \times 0.05 \times 0.95 = 0.095$$

$$\sigma_Y = 0.308$$



$$E(Y) = \mu_Y = \sum_{i=1}^{k} Y_i p(Y_i)$$

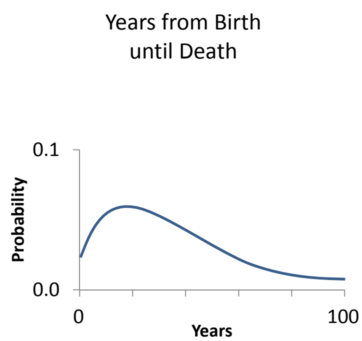
$$\sigma_Y^2 = \sum_{i=1}^{k} (Y_i - \mu_Y)^2 p(Y_i)$$

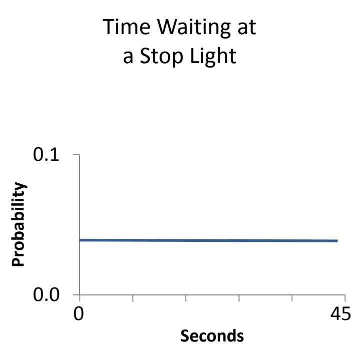


$$E(Y) = \mu_Y = \sum_{i=1}^{k} Y_i p(Y_i) = 0.10$$

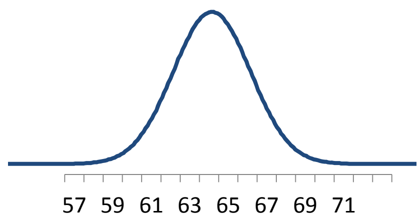
$$\sigma_Y^2 = \sum_{i=1}^{k} (Y_i - \mu_Y)^2 p(Y_i) = 0.095$$

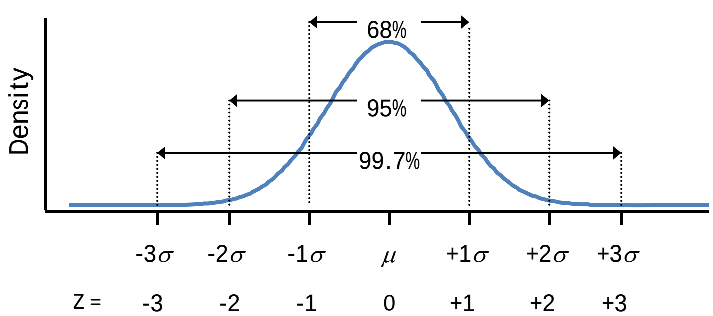
Continuous Random Variable


Years from Birth
until Death
0.1
Probability
0.0
0
100
Years


Time Waiting at
a Stop Light
0.1
Probability
0.0
0
45
Seconds

Height in Inches
Women Age 18-45 in 2013

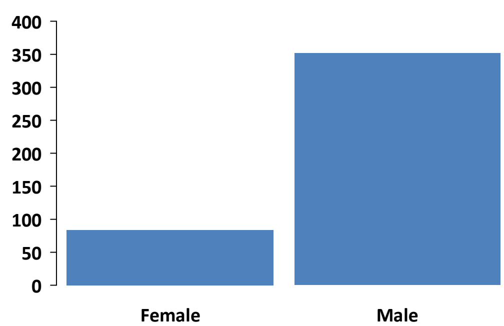




Sampling Distributions

Proportion Female Among Members of US House of Representatives

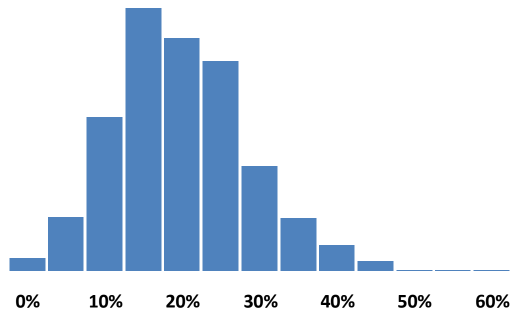
p = 0.19



Proportion Female Among Members of US House of Representatives

p = 0.19

I drew a random sample of 20 members, and found the proportion female. Then I repeated that a total of 1,000 times. Here is a histogram of the 1,000 sample proportions.

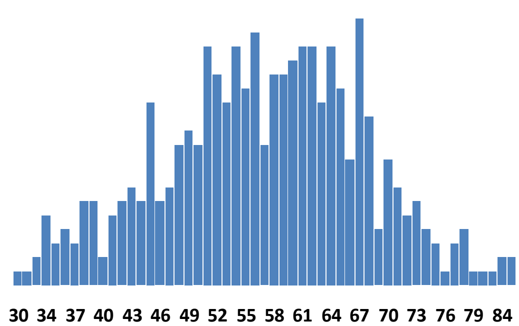


Mean of sampling distribution = p = 0.19

Standard deviation of sampling distribution = $\sqrt{(p(1-p))/n} = \sqrt{(0.19(0.81))/20} = 0.088$

Ages of Members of US House of Representatives

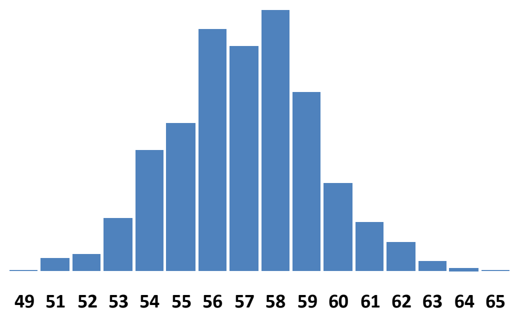
μ = 56.9
σ = 10.7



Ages of Members of US House of Representatives

$\mu = 56.9$
$\sigma = 10.7$

I drew a random sample of 20 members, and found their mean age. Then I repeated that a total of 1,000 times. Here is a histogram of the 1,000 sample means.



Mean of sampling distribution = $\mu = 56.9$
Standard deviation of sampling distribution = $\sigma/\sqrt{n} = 10.7/\sqrt{20} = 2.39$