Statistics
Spring 2023
Lecture 31

Feb 19-8:47 AM

SG 17

Consider a geometric Prob. dist with $P = .75$.

1) $q = 1 - P = 1 - .75 = .25$ 2) $\mu = \frac{1}{P} = \frac{1}{.75} = 1.\overline{3} = 1.333$

3) $\sigma^2 = \frac{q}{p^2} = \frac{.25}{.75^2} = .\overline{4} = .444$ 4) $\sigma = \sqrt{\sigma^2} = .\overline{6} = .667$

Round μ & σ to whole numbers, then find

$\mu \to 1$ $\sigma \to 1$

5) 68% Range

$\mu \pm \sigma = 1 \pm 1 \Rightarrow$ 0 to 2

6) Usual Range

95% Range

$\mu \pm 2\sigma \Rightarrow$ -1 to 3

Let x be the trial when first success takes place, find

7) $P(x = 2) = \text{geometpdf}(.75, 2) = .188$

8) $P(x < 3) = P(x \leq 2) = \text{geometcdf}(.75, 2) = .938$

9) $P(x > 2) = P(x \geq 3) = 1 - P(x \leq 2)$

2 3

$= 1 - \text{geometcdf}(.75, 2)$

$= 1 - .938 = .062$

Apr 11-7:15 AM

Suppose You work at a call center and You get in average 9 calls per hour.

Average $\mu = 9$

Fixed-Interval → Per hour } Poisson Prob. Dist.

1) $\sigma^2 = \mu = \boxed{9}$

2) $\sigma = \sqrt{\sigma^2} = \sqrt{9} = \boxed{3}$

3) 68% Range

$\mu \pm \sigma = 9 \pm 3$

$\Rightarrow \boxed{6 \text{ to } 12}$

4) 95% Range

Usual Range

$\mu \pm 2\sigma = 9 \pm 2(3)$

$= 9 \pm 6 \Rightarrow \boxed{3 \text{ to } 15}$

Let x be # of calls in the fixed interval,

5) $P(x = 8 \text{ or } x = 10) = P(x=8) + P(x=10)$

$=$ PoissonPdf(9, 8) + PoissonPdf(9, 10)

$= \boxed{.250}$

6) $P(x < 10) = P(x \leq 9) =$ poissoncdf(9, 9) $= \boxed{.587}$

7) $P(6 \leq x \leq 12) = P(x \leq 12) - P(x \leq 5)$

$=$ Poissoncdf(9, 12) − Poissoncdf(9, 5)

$= \boxed{.760} \approx 76\%$

8) $P(x > 5) = P(x \geq 6) = 1 - P(x \leq 5)$

$= 1 -$ poissoncdf(9, 5)

$= \boxed{.884} \approx 88\%$

SG 17

Apr 11-7:28 AM

Now let's take on prob. dist. for continuous random variable.

Discrete → countable

Continuous → Measureable

1) Uniform Prob. dist.

2) Standard normal Prob. dist. } SG 18

3) Normal Prob. dist.

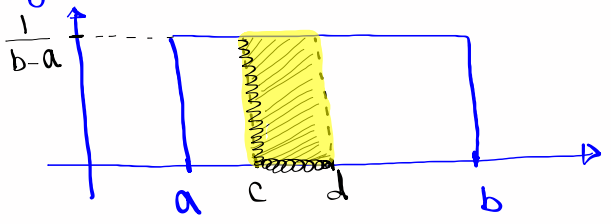
Apr 11-7:46 AM

Uniform Prob. dist.:

Let x be a continuous random variable with Uniform Prob. dist.

1) $P(x=c)=\boxed{0}$

2) for all values from a to b, graph is rectangular as shown below.



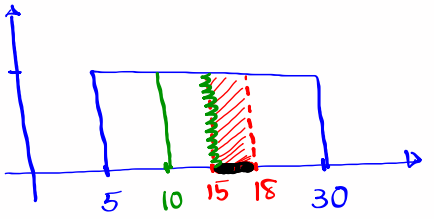
3) $P(c<x<d)$ is the shaded area above.

$= (d-c)\cdot\frac{1}{b-a}$

Apr 11-7:50 AM

Consider a Uniform Prob. dist. for all values from 5 to 30.

$b-a \rightarrow 30-5$

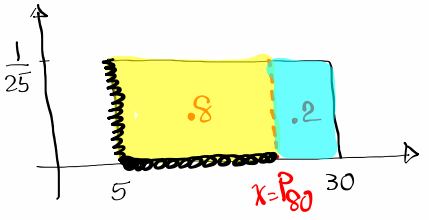


1) $P(x=10)=0$ — line; Zero area

2) $P(15<x<18) = (18-15)\cdot\frac{1}{25} = \frac{3}{25} = .12$

3) $x = P_{80}$

80% below (Left Area) & 20% above (Right area)



$(x-5)\cdot\frac{1}{25} = .8$

$x-5 = 25(.8)$

$x-5 = 20$

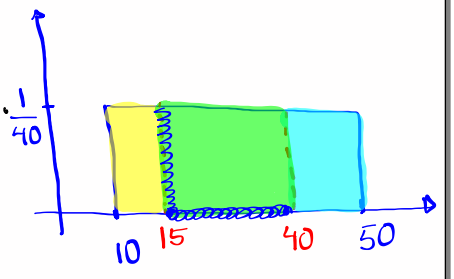
$x = 20+5$

$\boxed{x=25}$

Apr 11-7:56 AM

Consider a Uniform Prob. dist. for all values from 10 to 50.

1) Draw & clearly label.



2) $P(x=15)=0$

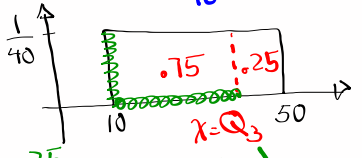
3) $P(x<15 \text{ or } x>40) = 1 - P(15<x<40)$

↑ Total Area = Total Prob.

$= 1-(40-15)\cdot\frac{1}{40} = 1-\frac{25}{40} = \frac{3}{8}$

4) $x = Q_3$

75% below, 25% above



$(x-10)\cdot\frac{1}{40} = .75$

$x-10 = 40(.75)$

$x = 40$

Apr 11-8:06 AM

Class QZ 9:

Consider a binomial Prob. dist. with $n=50$ and $p=.8$.

Let x be # of successes,

1) $P(x=45) = \text{binompdf}(50, .8, 45) = .030$

2) $P(x \le 45) = \text{binomcdf}(50, .8, 45) = .982$

3) $P(x \ge 40) = 1 - P(x \le 39) = 1 - \text{binomcdf}(50, .8, 39) = .584$

Apr 11-8:16 AM