Statistics

Lecture 30

Feb 19-8:47 AM

Consider a binomial Prob. dist. with

$n=175$ and $p=.8$.

1) $q = 1 - p$

$= 1 - .8 = \boxed{.2}$

2) $\mu = np = 175(.8) = \boxed{140}$

3) $\sigma^2 = npq = 175(.8)(.2)$

$= \boxed{28}$

4) σ, Round to a whole #

$\sigma = \sqrt{\sigma^2} = \sqrt{28} = 5.292$

$\approx \boxed{5}$

5) 68% Range $= \mu \pm \sigma = 140 \pm 5 \Rightarrow \boxed{135 \text{ to } 145}$

6) Usual Range "95% Range" $= \mu \pm 2\sigma = 140 \pm 2(5) \Rightarrow \boxed{130 \text{ to } 150}$

7) P($\underbrace{\text{exactly } 150}$ Successes)

$P(x = 150) = \text{binompdf}(175, .8, 150) = \boxed{.012}$

8) P($\underbrace{\text{fewer than } 150}$ Successes)

$P(x < 150) = P(x \leq 149)$

$\text{binomcdf}(175, .8, 149) = \boxed{.967}$

9) P($\underbrace{\text{at least } 145}$ Successes)

$P(x \geq 145) = 1 - P(x \leq 144)$

we don't

we want

144 145

$= 1 - \text{binomcdf}(175, .8, 144)$

$= \boxed{.199}$

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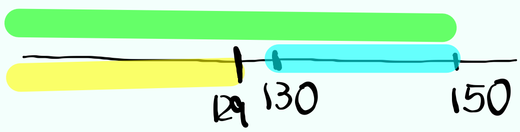
10) P(number of Successes is between 130 and 150, inclusive).

$P(130 \le x \le 150) = \text{binomcdf}(175, .8, 150) - \text{binomcdf}(175, .8, 129)$

Reduce by 1



$= \boxed{.953} \approx 95\%$

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You are taking an exam and making random guesses on all 80 multiple-choice questions. Each question has 5 choices but only one Correct choice.

Success is to guess Correct ans.

1) $n = \boxed{80}$

2) $p = \frac{1}{5} = \boxed{.2}$

3) $q = \frac{4}{5} = \boxed{.8}$

4) $\mu = np$
$= 80(.2)$
$= \boxed{16}$

5) $\sigma^2 = npq$
$= 80(.2)(.8)$
$= \boxed{12.8}$

6) $\sigma = \sqrt{\sigma^2}$
$= \sqrt{12.8}$
$= 3.578$
Round-up to whole #
$= \boxed{4}$

7) 95% Range

$\mu \pm 2\sigma$
$= 16 \pm 2(4)$
$= 16 \pm 8 \rightarrow \boxed{8 \text{ to } 24}$

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8) P(Guess Correctly between 8 and 24 questions, inclusive)

$P(8 \le x \le 24) = \text{binomcdf}(80, .2, 24)$

$- \text{binomcdf}(80, .2, 7)$

Reduce by 1

$= \boxed{.983} \approx 98\%$

Oct 21-9:16 AM

SG 17

Geometric Prob. Dist.

It is very similar to binomial prob. dist. except

1) There is no n.

2) x is the number where first Success happens.

$P(x) = p \cdot q^{x-1}$, $x = 1, 2, 3, 4, \ldots$

$p + q = 1$, $q = 1 - p$

$\mu = \frac{1}{p}$ $\sigma^2 = \frac{q}{p^2}$, $\sigma = \sqrt{\sigma^2}$

Oct 21-9:21 AM

Consider a geometric Prob. dist with $p = .5$

$q = 1 - p = 1 - .5 = \boxed{.5}$

$\mu = \frac{1}{p} = \frac{1}{.5} = \boxed{2}$ $\quad \sigma^2 = \frac{q}{p^2} = \frac{.5}{.5^2} = \boxed{2}$

$\sigma = \sqrt{\sigma^2} = \sqrt{2} \approx 1.414$

$P(x = 3) = (.5)(.5)^{3-1} = (.5)(.5)^2 = \boxed{.125}$

First success takes place on 3rd trial.

$P(x) = p \cdot q^{x-1}$

using TI Command

$P(x = 3) = \text{geometpdf}(\overset{p}{.5}, \overset{x}{3}) = .125$

$P(x \le 3) = \text{geometcdf}(.5, 3) = \boxed{.875}$

Oct 21-9:26 AM

Prob. that any quarterback make a Completion on a pass in NFL is .6

$p = .6$ $\quad q = .4$

$\mu = \frac{1}{p} = \frac{1}{.6} = 1.\bar{6} \approx \boxed{2}$ $\quad \sigma^2 = \frac{q}{p^2} = \frac{.4}{.6^2} = 1.\bar{1}$

$\sigma = \sqrt{\sigma^2} = \sqrt{1.\bar{1}} = 1.054 \approx \boxed{1}$

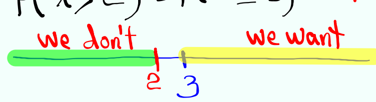
Usual Range $\mu \pm 2\sigma = 2 \pm 2(1) \approx 0$ to 4

P(First completion happens on 4th pass)

$P(x = 4) = \text{geometpdf}(.6, 4) = \boxed{.0384}$

P(First Completion happens after 2nd Pass)

$P(x > 2) = P(x \ge 3) = 1 - P(x \le 2)$



$= 1 - \text{geometcdf}(.6, 2)$

$= \boxed{.16}$

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Poisson Prob. Dist.

SG 17

The average # of Successes in a fixed interval is given. $\rightarrow \mu$ (Calc λ Lambda)

$$P(x) = \frac{\mu^x \cdot e^{-\mu}}{x!} \quad x = 0, 1, 2, 3, \ldots$$

$$e \approx 2.718$$

$$\sigma^2 = \mu \quad \& \quad \sigma = \sqrt{\sigma^2}$$

Oct 21-9:45 AM

Consider a Poisson Prob. dist with $\mu = 9$ in a fixed interval.

$$P(x = 10) = \text{Poissonpdf}(\overset{\lambda=\mu}{9}, \overset{x}{10}) = \boxed{.119}$$

$$P(x \leq 12) = \text{Poissoncdf}(9, 12) = \boxed{.876}$$

Oct 21-9:48 AM

Fixed Interval

From $\boxed{\text{11:00 AM to 2:00 PM}}$, You get 400 customers in Average.

$\mu = 400$

P(get 250 customers in that shift)

$P(x=250) = \text{Poisson Pdf}(400, 250)$

$= \boxed{1.9 \times 10^{-16}} \approx 0$

$\sigma^2 = \mu = 400 \qquad \sigma = \sqrt{\sigma^2} = \sqrt{400} = 20$

$P(x \leq 440) = \text{Poissoncdf}(400, 440) = \boxed{.977}$

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