Statistics

Lecture 16

Feb 19-8:47 AM

Consider a binomial Prob. dist with

$n = 175$ and $P = .8$.

1) $q = 1 - P$
$= \boxed{.2}$

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

3) $\sigma^2 = npq$
$= 175(.8)(.2)$
$= \boxed{28}$

4) $\sigma = \sqrt{\sigma^2}$
$= \sqrt{28} \approx \boxed{5}$

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

6) Usual Range $\quad \mu \pm 2\sigma = 140 \pm 2(5)$
"95% Range"
$= 140 \pm 10$
$\Rightarrow \boxed{130 \text{ to } 150}$

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7) P(exactly 150 Successes)

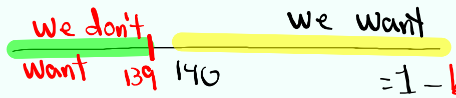
$P(x=150) = \text{binompdf}(175, .8, 150) = \boxed{.012}$

8) P(fewer than 150 Successes)

$P(x<150) = P(x \le 149) = \text{binomcdf}(175, .8, 149) = \boxed{.967}$

9) P(at least 140 Successes)

$P(x \ge 140) = 1 - P(x \le 139)$



$= 1 - \text{binomcdf}(175, .8, 139)$

$= \boxed{.545}$

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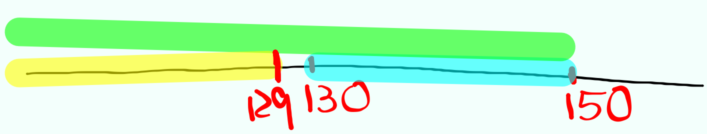
10) P(# of Successes is between 130 and 150, inclusive) =

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

Reduce by 1

$\approx \boxed{.953}$

$\approx 95\%$



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You are making random guesses on a multiple-choice exam with 80 questions.

Each question has 5 choices with only one correct choice.

Success is to guess correctly.

1) $n = 80$

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

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

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

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

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

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

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8) P(guess $\underbrace{\text{at most 25}}$ Correct Ans.)

$P(x \leq 25) = \text{binomcdf}(80, .2, 25) = \boxed{.994}$

9) P(guess correctly $\underbrace{\text{at least 10}}$ Correct ans).

$P(x \geq 10) = 1 - P(x \leq 9) = 1 - \text{binomcdf}(80, .2, 9)$

we don't | we want

9 10

$= \boxed{.971}$

10) P(guess correctly between 8 and 24 ans, inclusive) =

$P(8 \leq x \leq 24) = \text{binomcdf}(80, .2, 24) - \text{binomcdf}(80, .2, 7)$

7 8 24

$= \boxed{.983}$

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4 Quarters, 8 Nickels, Take 2 Coins

No replacement

NN $\rightarrow$ 10 ¢ $\quad P(10¢) = \frac{8}{12} \cdot \frac{7}{11} = \frac{56}{132}$

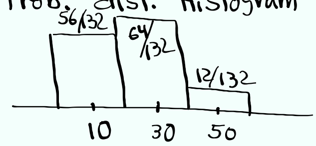
NQ

QN $\rightarrow$ 30 ¢ $\quad P(30¢) = 2 \cdot \frac{8}{12} \cdot \frac{4}{11} = \frac{64}{132}$

QQ $\rightarrow$ 50 ¢ $\quad P(50¢) = \frac{4}{12} \cdot \frac{3}{11} = \frac{12}{132}$

Total¢	P(Total¢)
10	56/132
30	64/132
50	12/132

Prob. dist. Histogram



Total $\rightarrow$ L1

P(Total) $\rightarrow$ L2

Use $\boxed{\text{1 – Var Stats}}$

with L1 & L2

$\mu = \bar{x} = 23.\overline{3}$

$\sigma = 12.713$

$n = 1$

σ^2 (Reduced frac) $= \frac{16000}{99}$

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(SG 17)

Geometric Prob. dist.

It is similar to binomial prob dist.

except

1) there is no n.

2) x is the number that first success happens

$p \rightarrow$ Prob. of Success $\quad p + q = 1$

$q \rightarrow$ Prob. of failure $\rightarrow q = 1 - p$

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

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

Oct 21-1:22 PM

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

$q = 1 - p = 1 - .5 = .5$ $\quad \sigma = \sqrt{\sigma^2} = \sqrt{2}$

$\mu = \frac{1}{p} = \frac{1}{.5} = 2$ $\quad = 1.414$

$\approx \boxed{1}$

$\sigma^2 = \frac{q}{p^2} = \frac{.5}{.5^2} = 2$

95% Range

$\mu \pm 2\sigma \Rightarrow 2 \pm 2(1)$

P(First Success happens on 3rd trial) $= \boxed{0 \text{ to } 4}$

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

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

Using TI Command

$P(x=3) = $ geomet pdf$(.5, 3) = \boxed{}$

Oct 21-1:26 PM

Consider flipping a loaded coin that has prob. of .6 to land tails.

Success is to land tails.

$p = .6$ $\quad q = .4$ $\quad \mu = \frac{1}{p} = \frac{1}{.6} = 1.\overline{6}$

≈ 2

$\sigma^2 = \frac{q}{p^2} = \frac{.4}{.6^2} = 1.\overline{1} \approx 1$

68% Range

$\mu \pm \sigma$

$2 \pm 1 \Rightarrow \boxed{1 \text{ to } 3}$

P(it lands tails on 2nd or 4th trial)

$P(x=2 \text{ or } x=4) = $ geometpdf$(.6, 2)$ + geometpdf$(.6, 4)$

$= \boxed{.2784}$

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P(it lands tails $\underbrace{\text{before the fifth}}$ toss)

$P(x<5) = P(x \le 4)$

$= \text{geometcdf}(.6, 4) = \boxed{.9744}$

P(it lands tails $\underbrace{\text{after the 2nd}}$ toss)

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

we don't   we want

2 3

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

$= \boxed{.16}$

Oct 21-1:38 PM

Prob. that a quarterback completes a pass in a game is .65.

$P = .65 \qquad q = .35$

$\mu = \frac{1}{p} = \frac{1}{.65} = 1.538 \approx 2$

$\sigma^2 = \frac{q}{p^2} = \frac{.35}{.65^2} = .828 \qquad \sigma = \sqrt{\sigma^2}$

$\approx .910 \approx 1$

95% Range $\mu \pm 2\sigma \Rightarrow \boxed{0 \text{ to } 4}$

P(First Completion happens $\underbrace{\text{on}}$ 3rd attempt)

$P(x=3) = \text{geometpdf}(.65, 3) = \boxed{.080}$

P(First Completions happens on or before 4th pass) $= P(x \le 4)$

$= \text{geometcdf}(.65, 4) = \boxed{.985}$

Oct 21-1:45 PM

Poisson Prob. Dist.

SG 17

The $\underbrace{\text{average \# of successes on a fixed interval}}_{\mu}$ is given.

μ (Calc & Some books use λ) Lambda

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

$e \approx 2.718$

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

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Consider a poisson prob. dist with $\mu = 9$ on a fixed interval.

1) $\sigma^2 = \mu = 9$

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

3) Usual Range $\mu \pm 2\sigma$
$= 9 \pm 2(3) \Rightarrow \boxed{3 \text{ to } 15}$

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

5) $P(x \leq 10) = \text{Poissoncdf}(9, 10) = \boxed{.706}$

Oct 21-1:57 PM

The average # of pets that come for care from $\boxed{\text{8:00 AM to 12:00 Noon}}$ is 6.

Fixed interval

1) P(# of pets during that shift is 8)

$P(x=8) = \text{poissonpdf}(6,8) = \boxed{.103}$

2) P($\boxed{\text{at most 10}}$ pets come in for care during that shift)

$P(x \leq 10) = \text{PoissonCdf}(6, 10) = \boxed{.957}$

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Ricky works at a answering Service Center. He gets in $\underbrace{\text{average}}$ 25 Calls Per $\boxed{\text{Shift.}}$

$\mu = \lambda = 25$

Fixed interval

$\sigma^2 = \mu = 25$ $\quad$ $\sigma = \sqrt{\sigma^2} = \sqrt{25} = 5$

95%

Usual Range $\quad \mu \pm 2\sigma \Rightarrow \boxed{15 \text{ to } 35}$

P(He gets only 10 Calls on a shift)

$P(x=10) = \text{PoissonPdf}(25, 10) = \boxed{3.650 \times 10^{-4}}$

P(He gets between 15 and 35 Calls, inclusive, during his shift)

$P(15 \leq x \leq 35) = \text{Poissoncdf}(25, 35) - \text{Poissoncdf}(25, 14) = \boxed{.965}$

96.5%

SG 17 ✓

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