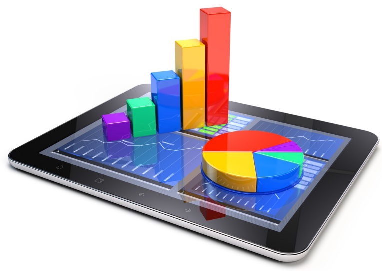
Statistics

Spring 2023

Lecture 29



Feb 19-8:47 AM

Class QZ 8

50 tickets are Sold at \$10 each.

One ticket drawn randomly.

The owner of the ticket wins a tablet worth \$200.

Complete the chart below for fundraisers, then find the expected Value per ticket.

Net	P(Net)	
10-200	1/50	Winning TKT
10 - 0	49/50	Losing TKTs

clear all lists

Net → L1

P(Net) → L2

$\boxed{\text{1-Var Stats}}$ with L1 & L2

$E.V. = \mu = \bar{X}$

\$ 6

Mar 29-6:46 AM

More on binomial Prob. dist.: (SG 16)

Mean $\mu = np$

Variance $\sigma^2 = npq$

Standard deviation $\sigma = \sqrt{\sigma^2}$

Suppose Success is to land tails when a Fair coin is tossed 400 times.

1) $n = \boxed{400}$ 2) $p = \boxed{.5}$ 3) $q = \boxed{.5}$

4) $\mu = np = 400(.5) = \boxed{200}$ 5) $\sigma^2 = npq = 400(.5)(.5) = \boxed{100}$

6) $\sigma = \sqrt{\sigma^2} = \sqrt{100} = \boxed{10}$

By empirical rule

68% Range $= \mu \pm \sigma = 200 \pm 10 \Rightarrow \boxed{190 \text{ to } 210}$

95% Range $= \mu \pm 2\sigma = 200 \pm 2(10) \Rightarrow \boxed{180 \text{ to } 220}$

Usual Range

Mar 29-7:35 AM

Suppose You are making random guesses on a multiple-choice exam with 80 questions. Each question has 5 choices with only one Correct choice. Assume Success is guessing a Correct answer.

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) $\sigma = \sqrt{\sigma^2} = \sqrt{12.8} \approx \boxed{3.578}$

Round μ & σ to a whole #, then

$\mu \rightarrow 16$, $\sigma \rightarrow 4$

7) 68% Range

$= \mu \pm \sigma = 16 \pm 4$

$\Rightarrow \boxed{12 \text{ To } 20}$

8) Usual Range

95% Range

$= \mu \pm 2\sigma = 16 \pm 2(4)$

$\Rightarrow \boxed{8 \text{ To } 24}$

Mar 29-7:41 AM

9) P(guess exactly 20 correct answers)

$P(x = 20) = \text{binompdf}(\overset{n}{80}, \overset{p}{.2}, \overset{x}{20})$

$= \boxed{.057}$

10) P(guess at most 20 correct answers)

$P(x \leq 20) = \text{binomcdf}(\overset{n}{80}, \overset{p}{.2}, \overset{x}{20}) = \boxed{.893}$

11) P(guess at least 20 correct answers)

Total Prob.

$P(x \geq 20) = 1 - P(x \leq 19)$

$= 1 - \text{binomcdf}(80, .2, 19)$

we don't want | we want

19 20

$= \boxed{.163}$

12) P(guess between 10 and 20 correct answers, inclusive)

$P(10 \leq x \leq 20) = P(x \leq 20) - P(x \leq 9)$

$= \text{binomcdf}(80, .2, 20) -$

$\text{binomcdf}(80, .2, 9)$

9 10 20

$= \boxed{.865}$

Mar 29-7:50 AM

Consider a binomial Prob. dist. with $n = 250$ and $P = .6$.

1) $q = 1 - P$

$= \boxed{.4}$

2) $\mu = np$

$= 250(.6)$

$= \boxed{150}$

3) $\sigma^2 = npq$

$= 250(.6)(.4)$

$= \boxed{60}$

4) $\sigma = \sqrt{\sigma^2} = \sqrt{60}$

$\approx \boxed{7.746}$

$\to 150$

$\to 8$

Round μ & σ to a whole #, then find the 99.7% range according to empirical rule.

$\mu \pm 3\sigma = 150 \pm 3(8) \Rightarrow \boxed{126 \text{ To } 174}$

Mar 29-8:03 AM

Let x be # of Successes,

6) $P(x = 100) = \text{binompdf}(\overset{n}{250}, \overset{p}{.6}, \overset{x}{100}) = \boxed{8.1 \times 10^{-11}}$

7) $P(x < 160) = P(x \leq 159) = \text{binomcdf}(250, .6, 159)$

$= \boxed{.890}$

159 160

8) $P(x > 145) = P(x \geq 146) = 1 - P(x \leq 145)$

Don't want

$= 1 - \text{binomcdf}(250, .6, 145)$

$= \boxed{.720}$

145 146

total Prob.

9) $P(145 \leq x \leq 155) = P(x \leq 155) - P(x \leq 144) = \boxed{.522}$

$= \text{binomcdf}(250, .6, 155)$

$- \text{binomcdf}(250, .6, 144)$

144 145 155

Mar 29-8:09 AM

Consider a binomial Prob. dist. with $n = 120$ and $p = \frac{1}{3}$.

1) $q = 1 - p = 1 - \frac{1}{3} = \boxed{\frac{2}{3}}$

2) $\mu = np = 120\left(\frac{1}{3}\right) = \boxed{40}$

3) $\sigma^2 = npq = 120\left(\frac{1}{3}\right)\left(\frac{2}{3}\right) = \boxed{\frac{80}{3}}$

4) $\sigma = \sqrt{\sigma^2} = \sqrt{\frac{80}{3}} = \boxed{5.164}$

$\to 40$

$\to 5$

Round μ & σ to a whole #, then find

5) Usual Range $= \mu \pm 2\sigma = 40 \pm 2(5)$

"95% Range"

$\Rightarrow \boxed{30 \text{ to } 50}$

Let x be # of Successes,

6) $P(30 \leq x \leq 50) = P(x \leq 50) - P(x \leq 29)$

$= \text{binomcdf}(120, 1/3, 50)$

$- \text{binomcdf}(120, 1/3, 29)$

29 30 50

SG 16

$= \boxed{.959}$ $\approx 96\%$

Mar 29-8:20 AM