Statistics
Spring 2023
Lecture 28

Feb 19-8:47 AM

Class QZ 7

Given the chart below

x	P(x)
1	.15
2	.25
3	.35
4	.25

1) Find $P(x=4)$

$= 1 - [.15 + .25 + .35] = 1 - .75 = .25$

2) Find

$\mu = 2.7$

$\sigma = 1.005$ Round to 3-decimal

$\sigma^2 = \frac{101}{100}$ Reduced fraction

VARS | 5: Statistics | ▼: σ_x

x^2 | MATH | 1: ▶Frac | Enter

x → L1

P(x) → L2

1-Var Stats with L1 & L2

Mar 28-7:05 AM

SG 16

Binomial Prob. dist:

1) n independent events

2) Each event has only two outcomes

$P(\text{Success}) = p$ $\quad P(\text{Failure}) = q$

$p + q = 1$

$q = 1 - p$

p & q remain unchanged for all events

3) x is # of Successes. $x = 0, 1, 2, 3, \ldots, n$

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

ex: $n = 10$, $p = .6$, find $P(x = 7)$

$q = 1 - p = 1 - .6 = \boxed{.4}$

$n - x = 10 - 7 = \boxed{3}$

$$P(x=7) = {}_{10}C_7 \cdot (.6)^7 \cdot (.4)^3 = 120 \cdot (.6)^7 \cdot (.4)^3 \approx \boxed{.215}$$

(n, x, p, q)

Mar 28-7:37 AM

Consider a binomial prob. dist. with $n = 20$ and $p = .5$. Find $P(x = 12)$

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

$n - x = 20 - 12 = \boxed{8}$

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

$$P(x=12) = {}_{20}C_{12} \cdot (.5)^{12} \cdot (.5)^8$$

(n, x, p, q)

$$= 125970 \cdot (.5)^{12} \cdot (.5)^8 \approx \boxed{.120}$$

Mar 28-7:45 AM

You are taking a multiple-choice exam with 25 questions and making random guesses. Each question has 4 choices but only one correct choice.

$n = 25$, $P = \frac{1}{4} = .25$ $\quad q = \frac{3}{4} = .75$

Find P(guessing exactly 10 correct answers) $\quad x = 10$

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

$P(x=10) = {}_{25}C_{10} \cdot (.25)^{10} \cdot (.75)^{15} = .042$

(n, x, p, q)

Now using TI Command

2nd VARS ↓↓ binompdf

$n \rightarrow$ Trials: 25

P: .25

x Value: 10

Paste Enter

Your work

$P(x=10) = \text{binompdf}(25, .25, 10) = .042$

No menu

binompdf(25, .25, 10) enter

Mar 28-7:49 AM

You flip a fair coin 100 times.

Suppose landing tails is a success.

$n = 100$ $\quad P = .5$ $\quad q = .5$

P(lands exactly 60 tails) = n P x

$P(x = 60) = \text{binompdf}(100, .5, 60) = .011$

P(lands at most 60 tails):

$P(x \leq 60) = \text{binomcdf}(100, .5, 60) = .982$

0, 1, 2, 3, - - -, 60

P(lands fewer than 60 tails):

$P(x < 60) = P(x \leq 59)$

$= \text{binomcdf}(100, .5, 59)$

$= .972$

Mar 28-7:59 AM

A loaded Coin is tossed 100 times.

Success is to land tails.

Suppose P(tail) = .6 per toss.

$n = 100$ $p = .6$ $q = .4$

P(exactly 60 tails) = P($x = 60$)

= binompdf(100, .6, 60)

= .081

P(at most 70 tails) = P($x \leq 70$)

= binomcdf(100, .6, 70)

= .985

P(at least 70 tails) = P($x \geq 70$)

= 1 − P($x \leq 69$)

↑ Total Prob. 1

we don't want 69 | 70 we want

= 1 − binomcdf(100, .6, 69)

= .025

Mar 28-8:08 AM

You are making random guesses on every question on a multiple-choice exam with 100 questions. each question has 5 choices with only one correct choice.

$n = 100$ $p = \frac{1}{5} = .2$ $q = \frac{4}{5} = .8$

P(exactly 25 correct Ans.) =

P($x = 25$) = binompdf(100, .2, 25) = .044

P(less than 25 correct Ans.) =

P($x < 25$) = P($x \leq 24$) = binomcdf(100, .2, 24)

≈ .869

P(more than 25 correct ans.) = Total Prob.

P($x > 25$) = P($x \geq 26$) = 1 − P($x \leq 25$)

we don't want 25 | 26 we want

= 1 − binomcdf(100, .2, 25)

= .087

Quiz tomorrow on expected Value at start of class

Mar 28-8:17 AM