Statistics

Lecture 28

Feb 19-8:47 AM

Binomial Prob. dist.: SG 16

1) n independent events

2) Each event has only two outcomes.

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

$p + q = 1$

p & q remain unchanged for all events.

3) x is # of Successes

$n - x$ is # of failures

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

Oct 16-8:48 AM

Suppose we have a binomial Prob. dist with $n=8$, $p=.3$, $\rightarrow q=1-p$, $q=.7$

Find $P(x=5) = {}_8C_5 \cdot (.3)^5 \cdot (.7)^3$ ($x=5$, $n-x=3$)

$P(x) = {}_nC_x \cdot p^x \cdot q^{n-x} = \boxed{.047}$

Find $P(x=4) = {}_8C_4 \cdot (.3)^4 \cdot (.7)^4 = \boxed{.136}$

(n, x, p, q)

Oct 16-8:54 AM

I flip a fair coin 10 times.

$n=10$, $p=.5$, $q=.5$

Find P(exactly 4 Tails)

$P(x=4) = {}_{10}C_4 \cdot (.5)^4 \cdot (.5)^6 = \boxed{.205}$

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

Find P(exactly 3 tails)

$P(x=3) = {}_{10}C_3 \cdot (.5)^3 (.5)^7 = \boxed{.117}$

${}_{10}C_3$ $\quad .5^3$

Oct 16-9:01 AM

You are taking a quiz with 12 questions. $n=12$

All questions are multiple-choice.

Each question has 4 choices but only one correct choice. $P=\frac{1}{4}=.25$ $q=\frac{3}{4}=.75$

You are making random guesses.

P(exactly 5 correct answers)

$P(x=5) = {}_{12}C_5 \cdot (.25)^5 \cdot (.75)^7 =$ .103

${}_nC_x \cdot p^x \cdot q^{n-x}$

Now using TI Command

2nd VARS ↓ binompdf

Menu

n → Trials: 12

P: .25

x: 5

Paste

Enter

No Menu

n P x

12, .25, 5

Enter

P(x=5) = binompdf(12, .25, 5) = .103

Oct 16-9:08 AM

Prob. of full recovery from certain surgery is .9. $P=.9$ $q=.1$ $n=40$

If we randomly select 40 patients,

1) P(exactly 35 have full recovery)

$P(x=35) = \text{binompdf}(40, .9, 35) = .165$

2) P(at most 35 have full recovery)

$P(x \leq 35) = \text{binomcdf}(40, .9, 35) = .371$

Oct 16-9:19 AM

You flip a coin 100 times

$n = 100$

$P(\text{Tails}) = .6$ $\quad p = .6 \quad q = .4$

1) $P(\text{exactly } 65 \text{ tails}) = P(x = 65)$
$= \text{binompdf}(100, .6, 65)$
$= \boxed{.049}$

2) $P(\text{at most } 65 \text{ tails}) = P(x \leq 65)$
$= \text{binomcdf}(100, .6, 65)$
$= \boxed{.870}$

3) $P(\text{fewer than } 55 \text{ tails}) = P(x \leq 54)$
$= \text{binomcdf}(100, .6, 54)$
$= \boxed{.131}$

Oct 16-9:27 AM

Consider a binomial Prob. dist. with
$n = 400$ & $P = .8$

1) $P(x = 325) = \text{binompdf}(400, .8, 325) = \boxed{.042}$

2) $P(x \leq 330) = \text{binomcdf}(400, .8, 330) = \boxed{.907}$

3) $P(x < 315) = P(x \leq 314) = \text{binomcdf}(400, .8, 314)$
$= \boxed{.244}$

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

5) $np = 400(.8) = \boxed{320}$

6) $npq = 400(.8)(.2) = \boxed{64}$

7) $\sqrt{npq} = \sqrt{64} = \boxed{8}$

Oct 16-9:35 AM

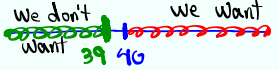
You are taking a True-false test with 100 questions. You are making random guesses.

1) $n = 100$ 2) $p = .5$ 3) $q = .5$

4) $np = 100(.5) = \boxed{50}$ 5) $npq = 100(.5)(.5) = \boxed{25}$ 6) $\sqrt{npq} = \sqrt{25} = \boxed{5}$

7) P(at least 40 Correct Ans) $\geq$

$= P(x \geq 40) = 1$ (Total Prob.) $- P(x \leq 39)$

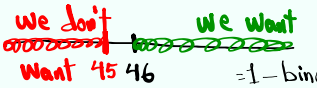


$= 1 - \text{binomcdf}(100, .5, 39)$

$= \boxed{.982}$

P(more than 45 Correct Ans.) > 45

$P(x > 45) = P(x \geq 46) = 1 - P(x \leq 45)$



$= 1 - \text{binomcdf}(100, .5, 45)$

$= \boxed{.816}$

Oct 16-9:45 AM