# Statistics

# Lecture 29

Feb 19-8:47 AM

## More on Binomial Prob. dist.

SG 16

Consider a binomial Prob. dist. with $n = 80$ and $p = .75$.

1) $q = 1 - p = 1 - .75 = \boxed{.25}$ 2) $np = 80(.75) = \boxed{60}$

3) $npq = 80(.75)(.25) = \boxed{15}$ 4) $\sqrt{npq} = \sqrt{15} \approx \boxed{4}$

5) $P(x = 65)$ = binompdf$(80, .75, 65) = \boxed{.047}$

6) $P(x \leq 65)$ = binomcdf$(80, .75, 65) = \boxed{.926}$

at most

Total Prob.

7) $P(x \geq 65) = 1 - P(x \leq 64)$

$= 1 -$ binomcdf$(80, .75, 64)$

$= \boxed{.121}$

at least

we don't want | we want

64 65

Oct 17-8:52 AM

I flip a coin 100 times.

It is a loaded coin & P( Tails) = .6 per flip.

1) $n = 100$ 2) $p = .6$ 3) $q = .4$

4) $np = 100(.6) = 60$ 5) $npq = 100(.6)(.4) = 24$ 6) $\sqrt{npq} = \sqrt{24} \approx 5$

7) P( $\underbrace{\text{exactly}}$ 55 tails) $= P(x = 55)$

$= \text{binompdf}(100, .6, 55) = \boxed{.048}$

8) P( $\underbrace{\text{fewer than}}$ 55 tails)

$P(x < 55) = P(x \le 54) = \text{binomcdf}(100, .6, 54) = \boxed{.131}$

54 55

9) P( more than 55 tails) $= P(x > 55) = P(x \ge 56)$

we don't we want

55 56

55 56

$= 1 - P(x \le 55)$

$= 1 - \text{binomcdf}(100, .6, 55)$

$= \boxed{.821}$

Oct 17-9:03 AM

I flipped a fair coin 400 times.

Success is to land tails.

1) $n = 400$ 2) $p = .5$ 3) $q = .5$

4) $np = 400(.5) = 200$ 5) $npq = 400(.5)(.5) = 100$ 6) $\sqrt{npq} = \sqrt{100} = 10$

7) P( it lands tails $\underbrace{\text{between 180 and 220}}$, inclusive)

$P(180 \le x \le 220) = P(x \le 220) - P(x \le 179)$

179 180 220

$= \text{binomcdf}(400, .5, 220) - \text{binomcdf}(400, .5, 179)$

$= \boxed{.960}$

Oct 17-9:13 AM

You are taking a multiple-choice exam with 80 questions.

Each question has 5 choices but only one Correct choice.

You are making random guesses.

Success is to guess correctly.

1) $n = 80$ 2) $p = \frac{1}{5} = .2$ 3) $q = \frac{4}{5} = .8$

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

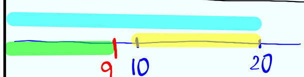
5) $npq = 80(.2)(.8) = \boxed{12.8}$

6) $\sqrt{npq} = \sqrt{12.8} \approx 3.6$ Round to 1-dec.

7) P( we guess between 10 and 20 Correct answers, inclusive)

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

Reduce by 1




$= \text{binomcdf}(80, .2, 20) - \text{binomcdf}(80, .2, 9)$

$= \boxed{.865}$

Oct 17-9:22 AM

Mean $\mu = np$

Variance $\sigma^2 = npq$

Standard dev. $\sigma = \sqrt{\sigma^2}$

Binomial Prob. Dist.

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

1) $q = 1 - P = \boxed{.2}$ 2) $\mu = np = 400(.8) = \boxed{320}$

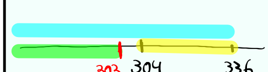
3) $\sigma^2 = npq = 400(.8)(.2) = \boxed{64}$ 4) $\sigma = \sqrt{\sigma^2} = \sqrt{64} = \boxed{8}$

5) 68% Range $\mu \pm \sigma = 320 \pm 8 \Rightarrow \boxed{312 \text{ to } 328}$

6) 95% Range $\mu \pm 2\sigma = 320 \pm 2(8)$

Usual Range $= 320 \pm 16 \Rightarrow \boxed{304 \text{ to } 336}$

7) $P(304 \le x \le 336) = P(x \le 336) - P(x \le 303)$




$= \boxed{.961}$ ≈96%

$= \text{binomcdf}(400, .8, 336) - \text{binomcdf}(400, .8, 303)$

Oct 17-9:30 AM

Prob. of Success in a binomial Prob. dist. is .4.

Consider 125 trials

1) $n = 125$ 2) $p = .4$ 3) $q = .6$

4) $\mu = np = 125(.4) = \boxed{50}$

5) $\sigma^2 = npq = 125(.4)(.6) = \boxed{30}$

6) $\sigma = \sqrt{\sigma^2} = \sqrt{30} \approx 5.5$

7) Usual Range

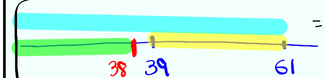
$\underbrace{\text{95\% Range}}$

$\mu \pm 2\sigma = 50 \pm 2(5.5)$

$= 50 \pm 11$

$\Rightarrow \boxed{39 \text{ to } 61}$

8) $P(39 \le x \le 61) = P(x \le 61) - P(x \le 38)$




$= \text{binomcdf}(125, .4, 61)$

$- \text{binomcdf}(125, .4, 38)$

Reduce by 1

$= \boxed{.965} \approx 96.5\%$

Oct 17-9:44 AM