Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 200

1) P(x> 15) implies P(x≥16)

Note: this boundary adjustment is due to discrete nature of binomial

n = 200 (max) p =0.7

macro $\text{binomCdf}(200,0.7,16,200) \approx 1.$

This cannot be 1 because it is possible for this NOT to happen

2) P(x≤122)

Note: NO boundary adjustment is necessary

n = 400 (max) p =0.3

macro $\text{binomCdf}(400,0.3,0,122) \approx 0.61005$

Solutions to Quiz 1 Binomial and Normal Distributions 3−22−17 version 200

3) P(x<32) implies P(x≤31)

Note: this boundary adjustment is due to discrete nature of binomial

n = 50 (max) p =0.6

macro $\text{binomCdf}(50,0.6,0,31) \approx 0.664387$

Since we are approximating binomial IT determines the boundaries and what we need to make the continuity correction on

Note: these boundary adjustments are due to using continuous to approximate discrete

n = 50 (max) p =0.6 q = 1−0.6 = 0.4

np = mean $=50\cdot 0.6 \blacktriangleright 30.$ SD $= \sqrt{npq} = \sqrt{50\cdot 0.6\cdot 0.4} \blacktriangleright 3.4641$

macro $\text{normCdf}(-0.5,31.5,30,3.464) \approx 0.667502$

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 200

4) P(x= 11)

n = 30 (max) p =0.4

macro $\text{binomPdf}(30,0.4,11) \approx 0.139619$

Since we are approximating binomial IT determines the boundaries and what we need to make the continuity correction on

Note: these boundary adjustments are due to using continuous to approximate discrete

n = 30 (max) p =0.4 q = 1−0.4 = 0.6

np = mean $=30\cdot 0.4 \blacktriangleright 12.$ SD $= \sqrt{npq} = \sqrt{30\cdot 0.4\cdot 0.6} \blacktriangleright 2.68328$

macro $\text{normCdf}(10.5,11.5,12,2.683) \approx 0.138027$

This cannot be zero because it is possible for this to happen

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 200

ALL these problems are normally distributed, no adjustment of boundaries is necessary

mean = 800 SD = 55

5) Usual range is within two standard deviations of the mean

Usual min $=800-2\cdot 55 = 690$ Usual max $= 800+2\cdot 55 = 910$

Usual Range 690 to 910

6) P(more than 820) =

P(820<x<1000000000000) =normCdf(820,1000000000000,800,55) = 0.358065

6) P(less than 750) = P(0<x<750) =normCdf(0,750,800,55) = 0.181651

8) P(between 700 and 795) = P(700<x<795) =normCdf(700,795,800,55) = 0.429264

9) P(x > VALUE 1) = 0.11 complement to VALUE 1 probability $1-0.11 = 0.89$

P(x < VALUE 1) =0.89 invNorm(0.89,800,55) = 867.459 =VALUE 1

10) P(x < VALUE 2) =0.34 invNorm(0.34,800,55) = 777.315 =VALUE 2

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 200

ALL these problems are binomially distributed, to make an approximation using normal distribution adjustment of boundaries is necessary

$n = 400$ $p = 0.75$ $q = 1-0.75 = 0.25$

for approximating normal mean $= 400 \cdot 0.75 = 300$. SD $= \sqrt{400 \cdot 0.75 \cdot 0.25} = 8.66025$

11) P(between and including 305,320) = $P(45 \le x \le 51)$

binomial macro =binomCdf(400,0.75,305,320) = 0.296337

normal macro =normCdf(304.5,320.5,300,8.66) = 0.292699

12) P(more than 290) = $P(291 \le x \le 400)$

binomial macro =binomCdf(400,0.75,291,400) = 0.863297

normal macro =normCdf(290.5,400.5,300,8.66) = 0.863679

13) P(between 298,304) = $P(299 \le x \le 303)$

binomial macro =binomCdf(400,0.75,299,303) = 0.226348

normal macro =normCdf(298.5,303.5,300,8.66) = 0.225708

Solutions to Quiz 1 Binomial and Normal Distributions 3−22−17 version 100

ALL these problems are binomially distributed, to make an approximation using normal distribution adjustment of boundaries is necessary

$n = 400$ $p = 0.75$ $q = 1-0.75 = 0.25$

for approximating normal mean $= 400 \cdot 0.75 = 300$. SD $= \sqrt{400 \cdot 0.75 \cdot 0.25} = 8.66025$

14) P(at most 290) = $P(0 \le x \le 290)$

binomial macro $=\text{binomCdf}(400, 0.75, 0, 290) = 0.136703$

normal macro $=\text{normCdf}(-0.5, 290.5, 300, 8.66) = 0.136321$

15) P(exactly 302) = $P(x=302)$

binomial macro $=\text{binomPdf}(400, 0.75, 302) = 0.045112$

normal macro $=\text{normCdf}(301.5, 302.5, 300, 8.66) = 0.044831$

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 200

16)

Question 1 find p such that when n=200 binomial can be approximated using normal

$np \geq 5$ is the key $\quad 200p \geq 5$

$$\frac{200p}{200} \geq \frac{5}{200}$$

$p \geq \frac{5}{200} = \frac{1}{40}$ So as long as $p \geq \frac{1}{40.}$ or $p \geq 0.025$

Question 2 find n such that when p=0.04 binomial can NOT be approximated using normal

$np \geq 5$ is the key $\quad 0.04n \geq 5$

$$\frac{0.04n}{0.04} \geq \frac{5}{0.04}$$ Note $125.$

$n \geq 125.$ will allow you to approximate binomial with normal

So as long as $n < 125.$ or n=124 is the largest size n that normal will not be allowed to approximate binomial