Solutions to Quiz 1 Binomial and Normal Distributions 3−22−17 version 300

1) P(x> 170) implies P(x≥171)

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

n = 300 (max) p =0.6

macro $\text{binomCdf}(300,0.6,171,300) \approx 0.868367$

2) P(x>200) implies P(x≥201)

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

n = 500 (max) p =0.4

macro $\text{binomCdf}(500,0.4,201,500) \approx 0.480589$

Solutions to Quiz 1 Binomial and Normal Distributions 3−22−17 version 300

3) P(x≤ 25)

Note: No boundary adjustment is necessary

n = 60 (max) p =0.4

macro $\text{binomCdf}(60,0.4,0,25) \approx 0.656258$

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

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 = 60 (max) p =0.4 q = 1−0.4 = 0.6

np = mean = $60 \cdot 0.4 \blacktriangleright 24.$ SD = $\sqrt{npq} = \sqrt{60 \cdot 0.4 \cdot 0.6} \blacktriangleright 3.79473$

macro $\text{normCdf}(-0.5,25.5,24,3.795) \approx 0.653673$

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

Solutions to Quiz 1 Binomial and Normal Distributions 3−22−17 version 300

4) P(x= 26)

n = 80 (max) p =0.3

macro $\text{binomPdf}(80,0.3,26) \approx 0.08438$

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

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 = 80 (max) p =0.3 q = 1−0.3 = 0.7

np = mean $=80\cdot 0.3 \blacktriangleright 24.$ SD $= \sqrt{npq} = \sqrt{80\cdot 0.3\cdot 0.7} \blacktriangleright 4.09878$

macro $\text{normCdf}(25.5,26.5,24,4.099) \approx 0.086242$

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

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 300

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

mean = 900 SD = 65

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

Usual min $=900-2\cdot 65 = 770$ Usual max $= 900+2\cdot 65 = 1030$

Usual Range 770 to 1030

6) P(at most 850) = P(0<x<850) $=\text{normCdf}(0,850,900,65) = 0.220878$

7) P(no less than 875) =

P(875<x<1000000000000) $=\text{normCdf}(875,1000000000000,900,65) = 0.649739$

8) P(between 874 and 940) = P(874<x<940) $=\text{normCdf}(874,940,900,65) = 0.386271$

9) P(x > VALUE 1) = 0.17 complement to VALUE 1 probability $1-0.17 = 0.83$

P(x < VALUE 1) =0.83 $\text{invNorm}(0.83,900,65) = 962.021$ =VALUE 1

10) P(x < VALUE 2) =0.46 $\text{invNorm}(0.46,900,65) = 893.472$ =VALUE 2

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 300

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

$n = 80$ $p = 0.65$ $q = 1 - 0.65 = 0.35$

for approximating normal mean $= 80 \cdot 0.65 = 52.$ SD $= \sqrt{80 \cdot 0.65 \cdot 0.35} = 4.26615$

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

binomial macro $= \text{binomCdf}(80, 0.65, 45, 51) = 0.407731$

normal macro $= \text{normCdf}(44.5, 51.5, 52, 4.266) = 0.413982$

12) P(less than 48) = $P(0 \le x \le 47)$

binomial macro $= \text{binomCdf}(80, 0.65, 0, 47) = 0.145971$

normal macro $= \text{normCdf}(-0.5, 47.5, 52, 4.266) = 0.145746$

13) P(between 48,58) = $P(49 \le x \le 57)$

binomial macro $= \text{binomCdf}(80, 0.65, 49, 57) = 0.697999$

normal macro $= \text{normCdf}(48.5, 57.5, 52, 4.266) = 0.695364$

Solutions to Quiz 1 Binomial and Normal Distributions 3−22−17 version 300

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

$n = 80$ $p = 0.65$ $q = 1 - 0.65 = 0.35$

for approximating normal mean $= 80 \cdot 0.65 = 52.$ SD $= \sqrt{80 \cdot 0.65 \cdot 0.35} = 4.26615$

14) P(at most 60) = $P(0 \le x \le 60)$

binomial macro $= \text{binomCdf}(80, 0.65, 0, 60) = 0.979189$

normal macro $= \text{normCdf}(-0.5, 60.5, 52, 4.266) = 0.976842$

15) P(exactly 53) = $P(x = 53)$

binomial macro $= \text{binomPdf}(80, 0.65, 53) = 0.091425$

normal macro $= \text{normCdf}(52.5, 53.5, 52, 4.266) = 0.090786$

Solutions to Quiz 1 Binomial and Normal Distributions 3-22-17 version 300

16)

Question 1 find p such that when n=600 binomial can be approximated using normal

$np \geq 5$ is the key $300p \geq 5$

$$\frac{300p}{300} \geq \frac{5}{300}$$

$p \geq \frac{5}{300} = \frac{1}{60}$ So as long as $p \geq \frac{1}{60.}$ or $p \geq 0.016667$

Question 2 find n such that when p=0.06 binomial can NOT be approximated using normal

$np \geq 5$ is the key $0.06n \geq 5$

$$\frac{0.06n}{0.06} \geq \frac{5}{0.06}$$ Note 83.3333

$n \geq 83.3333$ will allow you to approximate binomial with normal

So as long as $n < 83.3333$ or n=83 is the largest size n that normal will not be allowed to approximate binomial