Solutions to Test Review 4-3-17

1) binomial distribution n = 400 p =0.64 P(x<340) MUST ADJUST because NO EQUALITY

P(0≤ x ≤ 339)=binomCdf(400,0.64,0,339) ≈ 1.

2) binomial distribution n = 600 p =0.45 P(x≤305) NO ADJUST because EQUALITY

P(0≤ x ≤ 305)=binomCdf(600,0.45,0,305) ≈ 0.99817

3) binomial distribution n = 80 p =0.75 P(x>62) MUST ADJUST because NO EQUALITY

P(63≤x≤80)=binomCdf(80,0.75,63,80) ≈ 0.263575

normal distribution n = 80 p =0.75 P(x>62)

MUST ADJUST because approximating BINOMIAL

mean =$80\cdot 0.75$ ▸ 60. SD =$\sqrt{80\cdot 0.75\cdot 0.25}$ ▸ 3.87298

P(62.5≤x≤80.5)=normCdf(62.5,80.5,60,3.8730) ≈ 0.259303

4) binomial distribution n = 20 p =0.56 P(x=9) MUST ADJUST because NO EQUALITY

P(x=9)=$\text{binomPdf}(20,0.56,9) \approx 0.108862$

normal distribution n = 20 p =0.56 P(8.5<x<9.5)

MUST ADJUST because approximating BINOMIAL

mean =$20 \cdot 0.56$ ▸ 11.2 SD =$\sqrt{20 \cdot 0.56 \cdot 0.44}$ ▸ 2.21991

P($8.5 \le x \le 9.5$)=$\text{normCdf}(8.5,9.5,11.2,2.2199) \approx 0.109957$

5) normal distribution mean =500 SD = 50

usual range mean $\pm$ 2SD

500−2(50) to 500+2(50)

500 −100 to 500+100

400 to 600

6) normal distribution mean =500 SD = 50

P(x<475) NO ADJUST necessary BECAUSE NORMAL

P(0<x<475)=normCdf(0,475,500,50) = 0.308538

7) normal distribution mean =500 SD = 50

P(x>575) NO ADJUST necessary BECAUSE NORMAL

P(575<x<100000000)=normCdf(575,100000000,500,50) = 0.066807

8) normal distribution mean =500 SD = 50

P(490<x<540) NO ADJUST necessary BECAUSE NORMAL

P(490<x<540)=normCdf(490,540,500,50) = 0.367404

9) normal distribution mean =500 SD = 50

P(x<LOW)=0.15 LOW =invNorm(0.15,500,50) ▸ 448.178

The highest value is 448.178 kg

10) normal distribution mean =500 SD = 50

P(x>HIGH)=0.20 $1-0.20 = 0.80$

HIGH =$\text{invNorm}(0.8,500,50)$ ▸ 542.081

The highest value is 542.081 kg

11) binomial distribution n = 2000 p = 0.25 q = 1−0.25 = 0.75

P(480≤x≤505) NO BINOMIAL ADJUST BECAUSE EQUALITY

P(480≤x≤505)=$\text{binomCdf}(2000,0.25,480,505)$ ▸ 0.468552

normal distribution mean =$2000\cdot 0.25$ ▸ $500.$ SD = $\sqrt{2000\cdot 0.25\cdot 0.75}$ ▸ 19.3649

P(480≤x≤505) NORMAL ALWAYS ADJUSTS TO APPROXIMATE BINOMIAL

P(479.5<x<505.5)=$\text{normCdf}(479.5,505.5,500,19.3649) = 0.466915$

12) binomial distribution n = 2000 p = 0.25 q = 1−0.25 = 0.75

P(x=502) NO BINOMIAL ADJUST BECAUSE EQUALITY

P(x=502)=binomPdf(2000,0.25,502) ▸ 0.020461

normal distribution mean =2000·0.25 ▸ 500. SD = $\sqrt{2000\cdot 0.25\cdot 0.75}$ ▸ 19.3649

P(x=502) NORMAL ALWAYS ADJUSTS TO APPROXIMATE BINOMIAL

P(501.5<x<502.5)=normCdf(501.5,502.5,500,19.3649) = 0.020489

13) binomial distribution n = 2000 p = 0.25 q = 1−0.25 = 0.75

P(x<495) BINOMIAL ADJUST BECAUSE NO EQUALITY

P(0≤x≤494)=binomCdf(2000,0.25,0,494) ▸ 0.389721

normal distribution mean =2000·0.25 ▸ 500. SD = $\sqrt{2000\cdot 0.25\cdot 0.75}$ ▸ 19.3649

P(0≤x≤494) NORMAL ALWAYS ADJUSTS TO APPROXIMATE BINOMIAL

P(−0.5<x<494.5)=normCdf(-0.5,494.5,500,19.3649) = 0.388198

14) binomial distribution n = 2000 p = 0.25 q = 1−0.25 = 0.75

P(475<x<520) BINOMIAL ADJUST BECAUSE NO EQUALITY

P(476≤x≤519)=$\text{binomCdf}(2000,0.25,476,519)$ ▸ 0.740596

normal distribution mean =$2000\cdot 0.25$ ▸ 500. SD = $\sqrt{2000\cdot 0.25\cdot 0.75}$ ▸ 19.3649

P(476≤x≤519) NORMAL ALWAYS ADJUSTS TO APPROXIMATE BINOMIAL

P(475.5<x<519.5)=$\text{normCdf}(475.5,519.5,500,19.3649) = 0.740123$

15) binomial distribution n = 2000 p = 0.25 q = 1−0.25 = 0.75

P(x≥496) NO BINOMIAL ADJUST BECAUSE EQUALITY

P(496≤x≤2000)=$\text{binomCdf}(2000,0.25,496,2000)$ ▸ 0.590291

normal distribution mean =$2000\cdot 0.25$ ▸ 500. SD = $\sqrt{2000\cdot 0.25\cdot 0.75}$ ▸ 19.3649

P(496≤x≤2000) NORMAL ALWAYS ADJUSTS TO APPROXIMATE BINOMIAL

P(495.5<x<2000.5)=$\text{normCdf}(495.5,2000.5,500,19.3649) = 0.591878$

16A) FOR np ≥ 5 to work we know n=500

$500p \geq 5$

$\frac{500p}{500} \geq \frac{5}{500}$

p≥ 0.01

✓✓ $500 \cdot 0.01$ ▸ $5.$

16B) FOR np < 5 to work we know p=0.13

$n(0.13) < 5$

$\frac{0.13p}{0.13} < \frac{5}{0.13}$

p< 38.4615

p=38

✓✓ $38 \cdot 0.13$ ▸ 4.94

$P = \frac{min+max}{2}$ $E = \frac{max-min}{2}$

17) given INTERVAL NOTATION (19.5,43.9)

$p = \frac{19.5+43.9}{2} \rightarrow 31.7$ $E = \frac{43.9-19.5}{2} \rightarrow 12.2$

CONJUNCTION NOTATION $19.5<p<43.9$

TOLERANCE NOTATION 31.7 ± 12.2

18) given CONJUNCTION NOTATION $12.6<p<78.8$

$p = \frac{12.6+78.8}{2} \rightarrow 45.7$ $E = \frac{78.8-12.6}{2} \rightarrow 33.1$

INTERVAL NOTATION (12.6,78.8)

TOLERANCE NOTATION 45.7 ± 31.1

$P = \frac{min+max}{2}$ $E = \frac{max-min}{2}$

19) p =75.45 E =3.42

min =75.45−3.42 = 72.03 max = 75.45+3.42 = 78.87

INTERVAL NOTATION (72.03,78.87)

CONJUNCTION NOTATION 72.03<p<78.87

TOLERANCE NOTATION 75.45 ± 3.42

20) given TOLERANCE NOTATION 79.8 ± 9.6

p = 79.8 E =9.6

min =79.8−9.6 = 70.2 max = 79.8+9.6 = 89.4

INTERVAL NOTATION (70.2,89.4)

CONJUNCTION NOTATION 70.2<p<89.4

21−27)

x = 175 n = 420 $p=\frac{175}{420.}$ ▸ 0.416667 $q=1-\frac{175}{420.}$ ▸ 0.583333

CL =54% = 0.54 ALPHA $1-0.54$ ▸ 0.46 $\frac{1}{2}ALPHA=\frac{0.46}{2}$ ▸ 0.23

$CV=\text{invNorm}(0.23)$ ▸ -0.738847 =0.7388

$E=0.7388\cdot\sqrt{\frac{0.4167\cdot 0.5833}{420}}=0.017773$

min $0.4167-0.0178$ ▸ 0.3989 max $0.4167+0.0178$ ▸ 0.4345

INTERVAL NOTATION (0.3989, 0.4345)

CONJUNCTION NOTATION $0.3989 < p < 0.4345$

TOLERANCE NOTATION 0.4167 ± 0.0178

28−34)

x = 954 n = 1800 $p=\frac{954}{1800.} \blacktriangleright 0.53$ $q=1-\frac{954}{1800.} \blacktriangleright 0.47$

CL =99% CV =2.575

$$E=2.575\cdot\sqrt{\frac{0.53\cdot 0.47}{1800}}=0.030292$$

min $0.53-0.0303 \blacktriangleright 0.4997$ max $0.53+0.0303 \blacktriangleright 0.5603$

INTERVAL NOTATION (0.4997, 0.5603)

CONJUNCTION NOTATION $0.4997 < p < 0.5603$

TOLERANCE NOTATION 0.53 ± 0.0303

35) p =84.5% = 0.845 q = $1-0.845 = 0.155$

CL =78% = 0.78 ALPHA =$1-0.78 = 0.22$ $\frac{1}{2}ALPHA = \frac{0.22}{2} = 0.11$

CV =$\text{invNorm}(0.11)$ ▸ -1.22653 E= 0.028

$$n = \frac{CV^2 pq}{E^2} = \frac{(1.2265)^2 \cdot 0.845 \cdot 0.155}{(0.028)^2} = 251.309$$ ROUND UP TO 252

36) p =5.4% = 0.054 q = $1-0.054 = 0.946$

CL =99% CV =2.575 E= 0.084

$$n = \frac{CV^2 pq}{E^2} = \frac{(2.575)^2 \cdot 0.054 \cdot 0.946}{(0.084)^2} = 48.0044$$ ROUND UP TO 49

37) p =???

CL =72% = 0.72 ALPHA $=1-0.72 = 0.28$ $\frac{1}{2}ALPHA = \frac{0.28}{2} = 0.14$

CV $=\text{invNorm}(0.14) \blacktriangleright -1.08032$ E= 0.084

$$n = \frac{CV^2 pq}{E^2} = \frac{(1.08)^2 \cdot 0.25}{(0.084)^2} = 41.3265$$ ROUND UP TO 42

38) p =???

CL =90% CV =1.645 E= 0.04

$$n = \frac{CV^2 pq}{E^2} = \frac{(1.645)^2 \cdot 0.25}{(0.04)^2} = 422.816$$ ROUND UP TO 423