

Problem 1

$$1) P(x < 34) = P(x \leq 33) = \text{binomCdf}(200, 0.2, 0, 33) = 0.123895$$

$$2) P(x > 25) = \text{binomCdf}(400, 0.6, 25, 400) \approx 1.$$

Note mean $400 \cdot 0.6 \triangleright 240$. SD = $\sqrt{400 \cdot 0.6 \cdot 0.4} \triangleright 9.79796$ This is nearly all of the meaningful values

$$3) P(x > 27) = P(x \geq 28) = \text{binomCdf}(70, 0.7, 28, 70) \approx 1.$$

Note mean $70 \cdot 0.7 \triangleright 49$. SD = $\sqrt{70 \cdot 0.7 \cdot 0.3} \triangleright 3.83406$ This is nearly all of the meaningful values

$$P(x \geq 28) = P(27.5 < x < 70.5) = \text{normCdf}(27.5, 70.5, 49, 3.834) \triangleright 1.$$

$$4) P(x = 5) = \text{binomPdf}(30, 0.2, 5) \approx 0.172279$$

Note: Mean = $np = 30 \cdot 0.2 \triangleright 6$. SD = $\sqrt{30 \cdot 0.2 \cdot 0.8} \triangleright 2.19089$

$$P(x = 5) = P(4.5 < x < 5.5) = \text{normCdf}(4.5, 5.5, 6, 2.191) \triangleright 0.162951$$

mean = 1100 SD = 105

5) usual range is within 2 SD of mean

$1100 - 2 \cdot 105 \blacktriangleright 890$ $1100 + 2 \cdot 105 \blacktriangleright 1310$ So usual range is 890 to 1310

6) $P(x < 1050) = P(0 < x < 1050) = \text{normCdf}(0, 1050, 1100, 105) \blacktriangleright 0.316969$

7) $P(x > 1080) = P(1080 < x < 10,000,000,000) = \text{normCdf}(1080, 10^{10}, 1100, 105) = 0.575532$

8) $P(1000 < x < 1200) = P(1000 < x < 1200) = \text{normCdf}(1000, 1200, 1100, 105) = 0.659096$

9) $P(x > \text{VALUE1}) = 0.11$ has the same value as $P(x < \text{VALUE1}) = 0.89$

$\text{invNorm}(0.89, 1100, 105) = 1228.79$

10) $P(x < \text{VALUE2}) = 0.38$ has the same value as $P(x < \text{VALUE}) = 0.38$

$\text{invNorm}(0.38, 1100, 105) = 1067.92$

$$n = 2000 \quad p = 0.15 \quad q = 0.85 \quad \text{mean} = 2000 \cdot 0.15 \quad \blacktriangleright \quad 300. \quad \text{SD} = \sqrt{2000 \cdot 0.15 \cdot 0.85} \quad \blacktriangleright \quad 15.9687$$

$$11) P(285 \leq x \leq 315) = \text{binomCdf}(2000, 0.15, 285, 315) \quad \blacktriangleright \quad 0.66831$$

SINCE WE ARE APPROXIMATING BINOMIAL WITH NORMAL THERE IS A CC ADJUST of 0.5

$$P(285 \leq x \leq 315) = P(284.5 \leq x \leq 315.5) = \text{normCdf}(284.5, 315.5, 300, 15.969) = 0.668268$$

$$12) P(x < 315) = P(x \leq 314) = P(0 \leq x \leq 314) = \text{binomCdf}(2000, 0.15, 0, 314) \quad \blacktriangleright \quad 0.818418$$

SINCE WE ARE APPROXIMATING BINOMIAL WITH NORMAL THERE IS A CC ADJUST of 0.5

$$P(x < 315) = P(x \leq 314) = P(0 \leq x \leq 314) = \text{normCdf}(0, 314.5, 300, 15.969) = 0.818418$$

$$13) P(308 < x < 318) = P(309 \leq x \leq 317) = \text{binomCdf}(2000, 0.15, 309, 317) \quad \blacktriangleright \quad 0.158602$$

SINCE WE ARE APPROXIMATING BINOMIAL WITH NORMAL THERE IS A CC ADJUST of 0.5

$$P(309 \leq x \leq 317) = P(308.5 \leq x \leq 317.5) = \text{normCdf}(308.5, 317.5, 300, 15.969) = 0.160698$$

$$n = 2000 \quad p = 0.15 \quad q = 0.85 \quad \text{mean} = 2000 \cdot 0.15 \quad \text{SD} = \sqrt{2000 \cdot 0.15 \cdot 0.85}$$

$$14) P(x \geq 306) P(306 \leq x \leq 2000) = \text{binomCdf}(2000, 0.15, 306, 2000) \blacktriangleright 0.362854$$

SINCE WE ARE APPROXIMATING BINOMIAL WITH NORMAL THERE IS A CC ADJUST of 0.5

$$P(306 \leq x \leq 2000) = P(305.5 \leq x \leq 2000.5) = \text{normCdf}(305.5, 2000.5, 300, 15.969) = 0.365266$$

$$15) P(x=309) = \text{binomPdf}(2000, 0.15, 309) \blacktriangleright 0.021078$$

SINCE WE ARE APPROXIMATING BINOMIAL WITH NORMAL THERE IS A CC ADJUST of 0.5

$$P(308.5 \leq x \leq 309.5) = P(308.5 \leq x \leq 309.5) = \text{normCdf}(308.5, 309.5, 300, 15.969) = 0.021311$$

16) $n = 400$ find smallest p that you can approximate with normal

$$np \geq 5$$

$$400p \geq 5$$

$$\frac{400p}{400} \geq \frac{5}{400}$$

$$p \geq 0.0125$$

16) $p = 0.08$ find largest p that you can NOT approximate with normal

$$n(p) < 5$$

$$0.08n < 5$$

$$\frac{0.08n}{0.08} < \frac{5}{0.08} \rightarrow 62.5$$

$$p < 62.5$$

$$p = 62$$