#'s 92, 93, 94

(92) (a) X = the number of blacks in sample

B Success = Black → BLACK vs NON Black
I Sampling without replacement
10% condition met.
n = 1,500 is far less than 10% of American adults
N → n=1,500 fixed sample/number of trials
S → fix probability p = .12

(b) Condition for Normal approx setting
$np = 1{,}500(.12) = 180 > 10$ ✓ ← Condition
$n(1-p) = 1500(.88) = 1320 > 10$ ✓ ← met

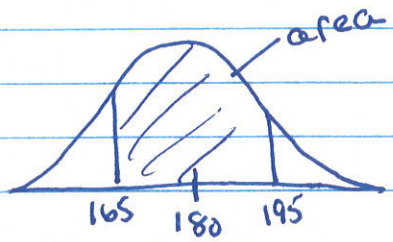
(c) $P(165 \le X \le 195)$ ⇒ FIND with following steps

$\mu_X = np = 1500(.12)$
$\mu_X = 180$

$\sigma_X = \sqrt{npq} = \sqrt{1500(.12)(.88)} = \sqrt{158.4}$

$\sigma_X = 12.59$

$N(180, 12.59)$



$P(165 \le X \le 195) = .7665$

There is about a 77% chance that a random sample would have between 165 and 195 Adult Black Americans.

STEPS
① Check normal conditions (b✓)
② find mean + S.D. and state distributions
③ SKETCH
④ write probability statement
⑤ Calc Command
normalcdf (165, 195, 180, 12.59)
⑥ write in context

#93 using binomial model

(93) Given

$P(1 \text{ or } 2) = .301 + .176 = .477$

$n = 90$ invoices in a SRS

found 29 invoices with 1ST Digit of 1 or 2.

Pg 353 #5
Bedford Law - 1ST DIGIT indicates fraud

X	1	2	...
P(x)	.301	.176	

X = the number of 1's and 2's

B 1 or 2 vs. NOT 1 or 2
I SRS
N fixed trials $n = 90$
S fixed probability $p = .477$

BINOMIAL CONDITIONS Met

$B(42.93, 4.738)$

$\mu_x = np = 90(.477) = 42.93$

$\sigma_x = \sqrt{np(1-p)} = \sqrt{90(.477)(.523)} = 4.738$

$P(X \leq 29) =$ .00208

binomcdf (90, .477, 29) = .00209
n p # successes

Power to need to give calc command

Since the probability of getting 29 invoices starting with a 1 or 2 is very small (0.2%), we have reason to be suspicious that the invoices are fake.

#93 could also be done using the normal approx.

(93) X = the number of 1's and 2's

Pg 353 #5

Bed ford law
1ST DIGIT INDICATES FRAUD

X	1	2	...
P(x)	.301	.176	

Given: $P(1 \text{ OR } 2) = .301 + .176 = .477$
$n = 90$ invoices in SRS
found 29 invoices w/ 1 or 2 as the 1st digit

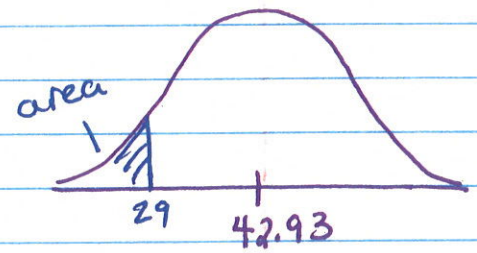
To use normal approximation check Condition:

$np = 90(.477) = 42.93 > 10$
$n(1-p) = 90(1-.477) = 47.07 > 10$

Both are > 10 so Normal Condition met

$\mu_x = np = 42.93$
$\sigma_x = \sqrt{np(1-p)} = 4.738$

$N(42.93, 4.738)$



$P(x \leq 29) = .0016$

normalcdf (−E99, 29, 42.93, 4.738)

Very small
0.16% or 0.2%

Evidence to be Suspicious invoices are fakes

(94) Binomial Conditions met

X = # of hits out of 500

B - Hit or Not his
I - Independent stated
N - fixED trials $n = 500$
S - fixed probability $p = .260$

FIND $P(X \geq .300(500)) =$

$P(X \geq 150) = 1 - P(X \leq 150) =$

$1 - .9805 = .0195$

ONLY Need to CALC for normal approx.

$\mu_X = np = 500(.260) = 130$ hits

$\sigma_X = \sqrt{500(.260)(.740)} = 9.808$ hits

$B(130, 9.808)$

Normal Condition

$np = 500(.220) = 130 > 10$ ✓

$n(1-p) = 500(.730) = 365 > 10$ ✓

$P(X \geq 150) = .0207$

normalcdf(150, E99, 130, 9.808)
↑ LB ↑ UB ↑ mean ↑ S.D.

binomcdf(500, .260, 150)
↑ n ↑ p ↑ # successes

Conclusion:
There is about a 2% chance that a typical ball player would be a 300 hitter. It could happen but the chances are low.