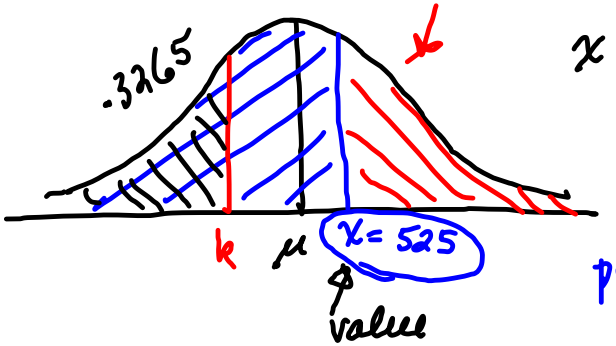
Know x or z & want probability

normalcdf (low, high, μ, σ)

Know prob (area) and want z or x

invNorm (area to left, μ, σ)



525

x variable

$\mu = 500$

$\sigma = 20$

probability = area

$P(x \le 525) = \text{normalcdf}(-E99, 525, 500, 20)$

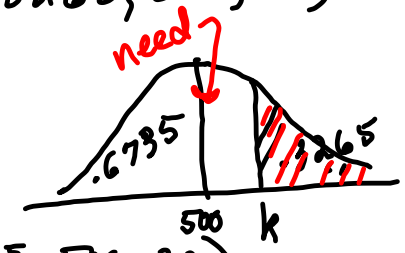
$\approx .8944$

$\rightarrow P(x < k) = .3265$ given

use .3265

$k = \text{invNorm}(.3265, 500, 20)$

≈ 491.01



$\rightarrow P(x > k) = .3265$

use 1 − .3265

$k = \text{invNorm}(.6735, 500, 20)$

≈ 508.99

$\bar{x}$ and $\hat{p}$ are

unbiased - $\mu_{\bar{x}} = \mu$, $\mu_{\hat{p}} = p$

consistent -

$\sigma_{\hat{p}}$, $\sigma_{\bar{x}}$ decreases as n increases

n is sample size

$\bar{x}$ population not normal

sampling dist is approximately normal if $\frac{n}{N} \leq .05$ ←

also $n \geq 30$

$\hat{p}$ sampling distribution is approximately normal if $np > 5$ and $nq > 5$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ $\qquad$ $\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$

Sampling error $\qquad$ $\hat{p} - p$

$\bar{x} - \mu$

#7.78

R C C R C

Arson Accident Accident Arson Accident

A B C D E

a) What proportion were due to arson?

$$P(\text{arson}) = \frac{2}{5} = .40$$

b) How many samples of 3 can be selected?

$${}_5C_3 = \frac{5!}{2!\,3!} = \frac{5 \cdot 4}{2 \cdot 1} = 10$$

c)

		$\hat{p}$	$\hat{p}$	f	rel f.	sampling error $\hat{p}-p$
ABC	RCC	.33				
ABD	RCR	.67	0	1	.10	−.40
ABE	RCC	.33	.33	6	.60	−.07
ACD	RCR	.67	.67	3	.30	.27
ACE	RCC	.33				
ADE	RRC	.67				
BCD	CCR	.33				
BCE	CCC	.00				
BDE	CRC	.33				
CDE	CRC	.33				

$\hat{p} \cdot f$

0

1.98

2.01

3.99

$\mu_{\hat{p}} = \frac{4}{10} = .40$

EX 7-10 pg 325

38% of Americans are very satisfied with their lives

r/s $1000 = n$ $p = .38$

Find $P(.40 < \hat{p} < .42)$

$np = 1000(.38) = 380$

$nq = 1000(.62) = 620$

$\mu_{\hat{p}} = p = .38$

$$\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(.38)(.62)}{1000}} \approx .015349267$$

= normalcdf (.40, .42, .38, .0153493)

$\approx .0917$

The probability of $\hat{p}$ being between .40 and .42 is .0917

$p = \mu_{\hat{p}} = .38$ $\sigma_{\hat{p}} = .015349$

pg 326
7-11 Maureen Webster is running for mayor. She claims she is favored by 53% of all voters. (assume this is true)

Find the probability that less than 49% will vote for Maureen.

$\mu_{\hat{p}} = .53$

$n = 400$

$.53(400) = 212$

$.47(400) = 188$

$\sigma_{\hat{p}} = \sqrt{\frac{(.53)(.47)}{400}} \approx .024955$

$P(\hat{p} < .49)$

$P(\hat{p} < .49) = \text{normalcdf}(-E99, .49, .53, .024955)$

$\approx .0545$

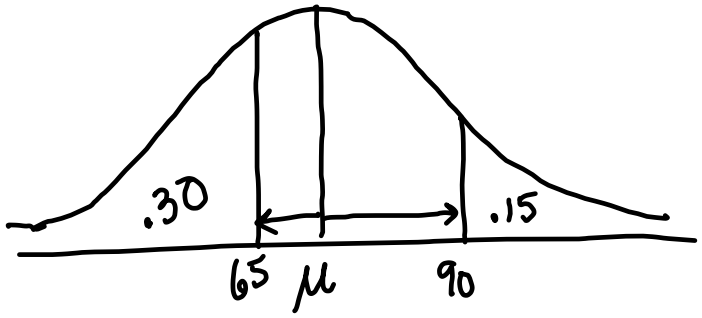
7.104
pg 330

$n = 300$

30% < 65

15% > 90

σ



$z_{65} = \text{invNorm}(.30) \approx -.5244$

$z_{90} = \text{invNorm}(.85) \approx 1.0364$

$.5244$

1.5608 ←

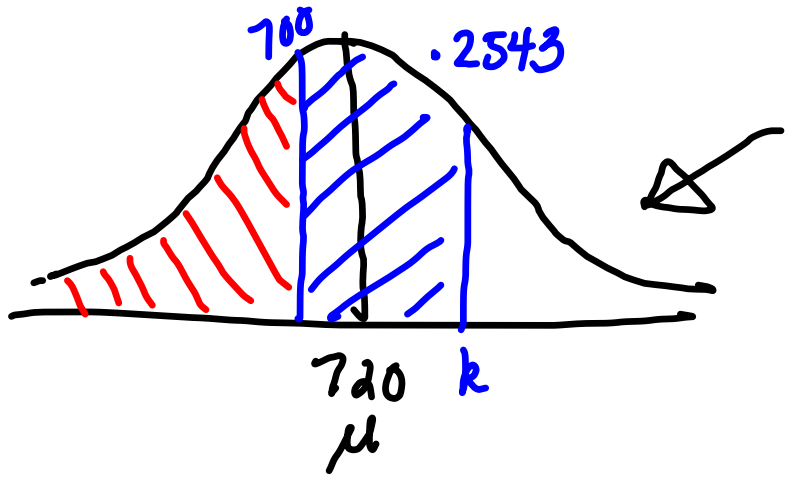
$\sigma = \frac{90 - 65}{1.5608}$

$\sigma = \frac{25}{1.5608} \approx 16.0174$

$\mu = 65 + .5244(16.0174) \approx 73.40$

OR $\mu = 90 - 1.0364(16.0174) \approx 73.40$

3 b) Find k s.t. $P(700 < x < k) = .2543$



$\sigma = 82$

$P(x < 700) = \text{normalcdf}(-E99, 700, 720, 82)$

$\approx .4037$

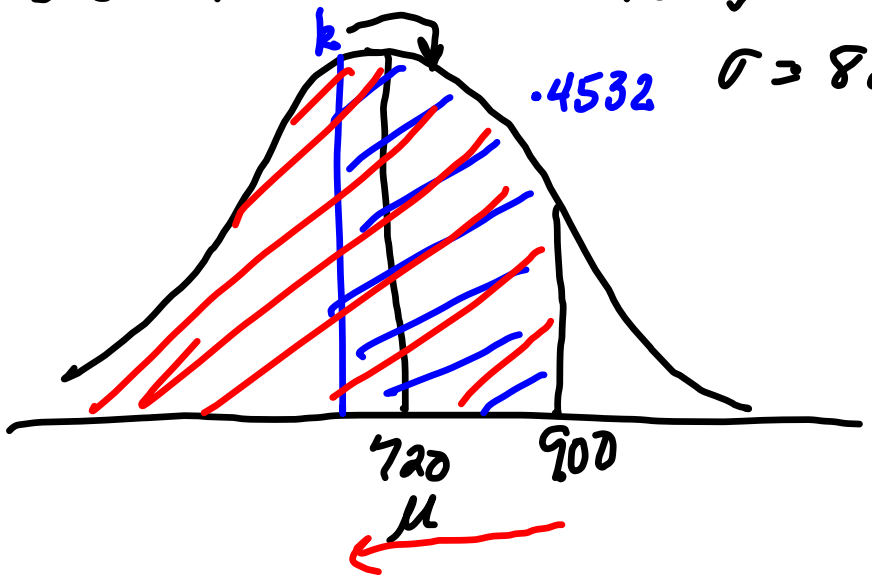
total area below k is $.4037 + .2543$

$= .6580$

$k = \text{invNorm}(.6580, 720, 82)$

$k \approx 753.37$

3d k s.t $P(k < x < 900) = .4532$



$P(x < 900) = \text{normalcdf}(-E99, 900, 720, 82)$

$\approx .9859$

$.9859 - .4532 = .5327$

$k = \text{invNorm}(.5327, 720, 82)$

≈ 726.73

(4.) warranty - 40000 miles

$\mu = 72000$

$\sigma = 12000$

a) $P(x < 40000) =$

normalcdf(-E99, 40000, 72000, 12000)

$\approx .0038$ .38% will fail before 40000 miles.

b) $P(x > 100000)$

= normalcdf(100000, E99, 72000, 12000)

$\approx .0098$ .98% will last longer than 100,000 miles.