Statistics

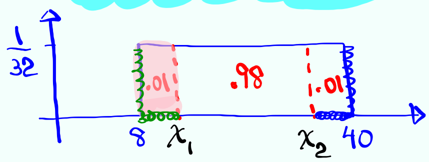
Lecture 19

Feb 19-8:47 AM

Consider a uniform Prob. dist. for all values from 8 to 40. Find two values that separate the middle 98% from the rest. Round to one-decimal.

$1 - .98 = .02$

$.02 \div 2 = .01$



$(x_1 - 8) \cdot \frac{1}{32} = .01$

$x_1 - 8 = 32(.01)$

$x_1 = 8 + .32$

$x_1 = 8.32$

$\boxed{x_1 = 8.3}$

$(40 - x_2) \cdot \frac{1}{32} = .01$

$40 - x_2 = 32(.01)$

$40 - x_2 = .32$

$40 - .32 = x_2$

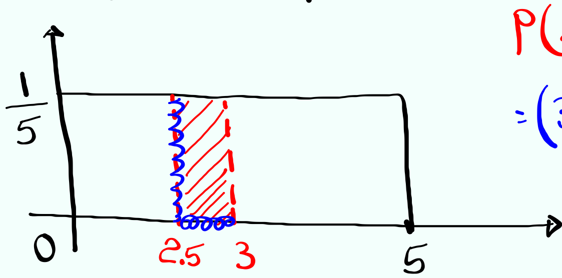
$x_2 = 39.68$

$\boxed{x_2 = 39.7}$

Apr 28-1:50 PM

wait time at a local store to see the Cashier is 5 minutes and it has a uniform Prob. dist.

what is the prob. that a wait time to see the cashier falls between 2.5 and 3 minutes.



$P(2.5 < x < 3)$

$= (3 - 2.5) \cdot \frac{1}{5}$

$= \frac{.5}{5} = \boxed{\frac{1}{10}} = .1$

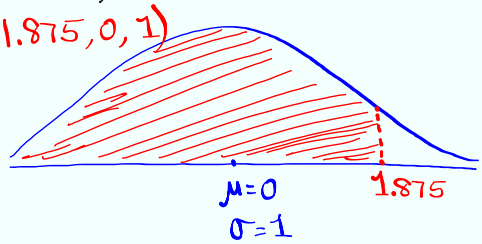
Apr 28-1:58 PM

Consider a Standard Normal Prob. dist.,

find $P(Z < 1.875)$

$= \text{normalcdf}(-E99, 1.875, 0, 1)$

$= \boxed{.970}$

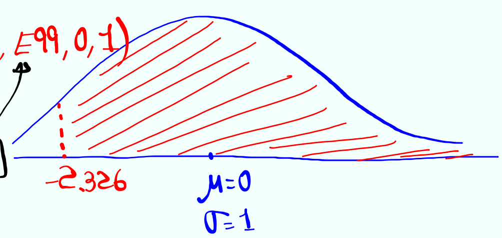


find $P(Z > -2.326)$

$= \text{normalcdf}(-2.326, E99, 0, 1)$

(−)

2nd ,



$= \boxed{.990}$

Apr 28-2:04 PM

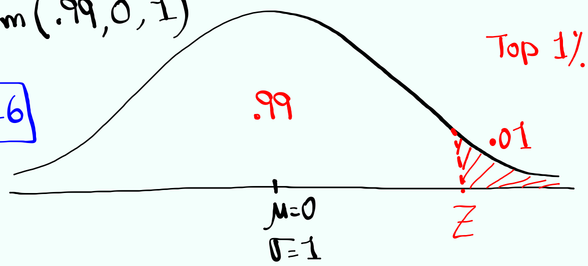
find $Z = P_{99}$

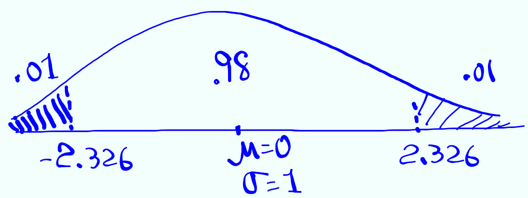
99% below → Left Area = .99

1% above → Right Area .01

$Z = \text{invNorm}(.99, 0, 1)$

$= \boxed{2.326}$



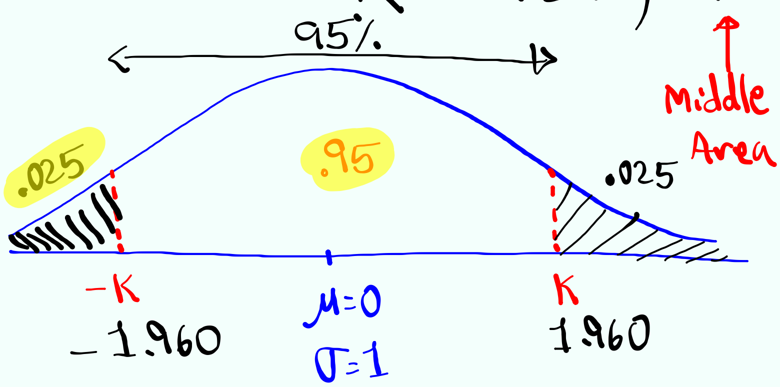


Apr 28-2:10 PM

find K Such that $P(-K < Z < K) = .95$

$1 - .95 = .05$

$.05 \div 2 = .025$



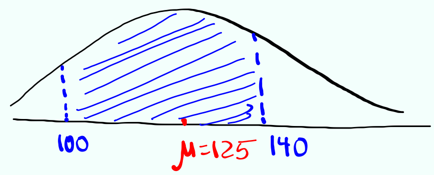
$K = \text{invNorm}(.975, 0, 1) \approx \boxed{1.960}$

Apr 28-2:14 PM

Given $N(125, 15)$

- N ← Normal Prob. Dist.
- 125 ← $\mu = 125$
- 15 ← $\sigma = 15$

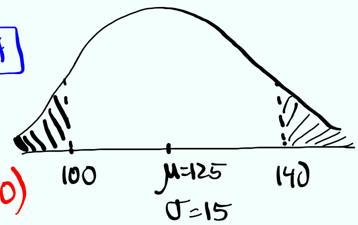
$P(100 < x < 140)$



= normalcdf(100, 140, 125, 15)

= **.794**

$P(x < 100$ OR $x > 140)$



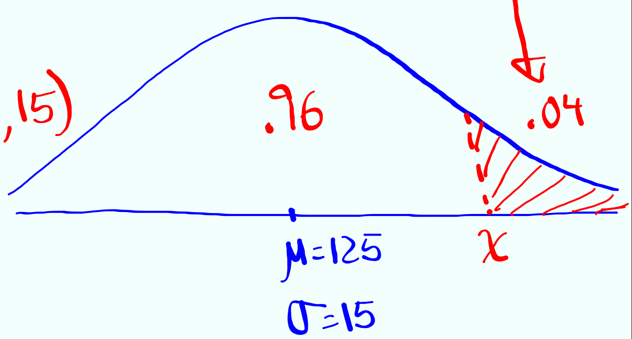
$= 1 - P(100 < x < 140)$

$= 1 - .794 =$ **.206**

Apr 28-2:18 PM

Find a value that separates the top 4% from the rest.

$x = \text{invNorm}(.96, 125, 15)$



$\approx$ **151**

Apr 28-2:24 PM

Salaries of nurses are normally dist. with the mean of \$7250 and standard deviation of \$400. $N(7250, 400)$

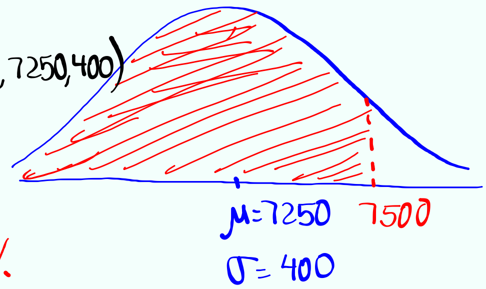
If we randomly select one nurse, find the prob. that he/she makes less than \$7500.

$P(x < 7500)$

$= \text{normalcdf}(-E99, 7500, 7250, 400)$

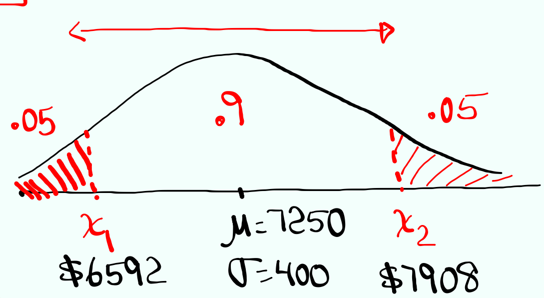
$= \boxed{.734} \approx 73.4\%$

$\approx 73\%$



Apr 28-2:27 PM

Find two salaries that separate the middle 90% from the rest.



$x_1 = P_5 = \text{invNorm}(.05, 7250, 400)$

≈ 6592

$x_2 = P_{95} = \text{invNorm}(.95, 7250, 400)$

≈ 7908

Apr 28-2:33 PM

Consider the population of 4, 6, 8, and 10.

Store in L1

Use [1-Var Stats] with L1 only.

Find

$\mu = 7$ $\sigma = 2.236$ $\sigma^2 = 5$

Take all Samples of Size 2 with replacement.

4,4	4,6	4,8	4,10
6,4	6,6	6,8	6,10
8,4	8,6	8,8	8,10
10,4	10,6	10,8	10,10

Find $\bar{x}$ of each Sample.

4	5	6	7
5	6	7	8
6	7	8	9
7	8	9	10

Apr 28-2:40 PM

4	5	6	7
5	6	7	8
6	7	8	9
7	8	9	10

16 Means

$\bar{x}$	$P(\bar{x})$
4	1/16
5	2/16
6	3/16
7	4/16
8	3/16
9	2/16
10	1/16

$\bar{x} \rightarrow L2$

$P(\bar{x}) \rightarrow L3$

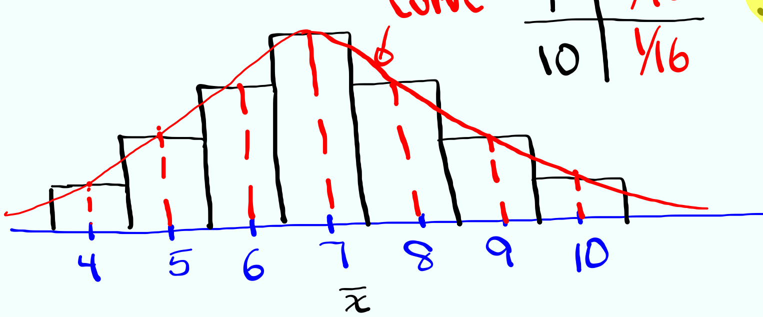
Use [1-Var Stats] with L2 & L3.

$\mu_{\bar{x}} = 7$

$\sigma_{\bar{x}} = 1.581$

$\sigma_{\bar{x}}^2 = \frac{5}{2}$

Normal Curve



Apr 28-2:46 PM

Central Limit Theorem

$$\mu_{\bar{x}} = \mu$$

$$\sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

Salaries of nurses are normally dist. with $\mu = 7250$ & $\sigma = 400$.

If we take all samples of size 4,

$\mu_{\bar{x}} = \mu = 7250$ $\quad\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{4}} = 200$

CLT

Apr 28-2:54 PM

math exams scores are N.D. with $\mu = 82$ and $\sigma = 10$.

If we take all samples of size 3,

$\mu_{\bar{x}} = \mu = 82$ $\quad\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{3}} \approx 5.774$

Apr 28-2:57 PM

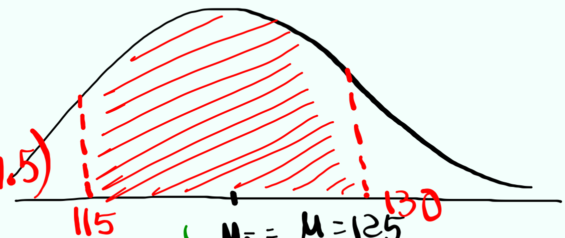
Given $N(125, 15)$

If we take samples of size 4,

1) $P(115 < \bar{x} < 130)$

$= \text{normalcdf}(115, 130, 125, 7.5)$

$= \boxed{.656}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 125 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{15}{\sqrt{4}} = 7.5 \end{cases}$

Apr 28-3:00 PM

2) For randomly selected group of 9,

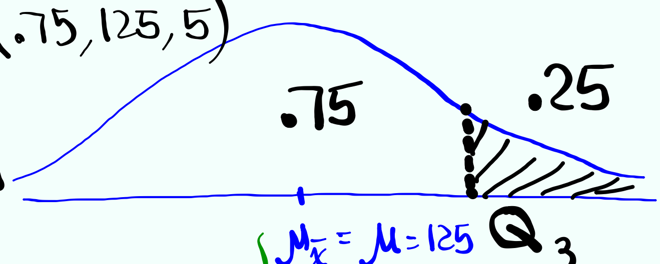
find $\bar{x} = Q_3$

75% below — 25% above

$\bar{x} = Q_3 = \text{invNorm}(.75, 125, 5)$

$= \boxed{128.372}$

≈ 128



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 125 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{15}{\sqrt{9}} = 5 \end{cases}$

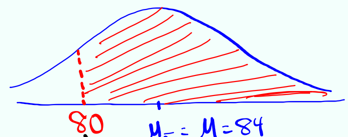
Apr 28-3:04 PM

Scores of math exams are normally dist. with $\mu = 84$ and $\sigma = 6$.

If we randomly select 2 exams, find the prob. that their mean score is

a) above 80.

$P(\bar{x} > 80)$



$\mu_{\bar{x}} = \mu = 84$

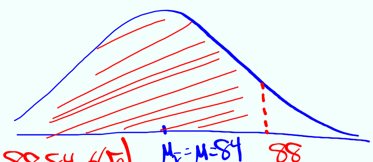
$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{2}}$

$= \text{normalcdf}(80, E99, 84, 6/\sqrt{2})$

$= \boxed{.827}$

b) below 88.

$P(\bar{x} < 88)$



$\mu_{\bar{x}} = \mu = 84$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{2}}$

$= \text{normalcdf}(-E99, 88, 84, 6/\sqrt{2})$

$= \boxed{.827}$

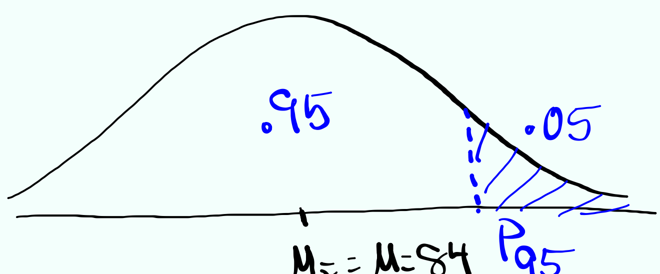
Apr 28-3:08 PM

Find 95th percentile for the mean of randomly selected group of 4 exams.

→ P_{95}

95% below

5% above



$\mu_{\bar{x}} = \mu = 84$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{4}} = 3$

$\bar{x} = \text{invNorm}(.95, 84, 3)$

$\approx \boxed{89}$

Apr 28-3:16 PM

I randomly selected 20 students.

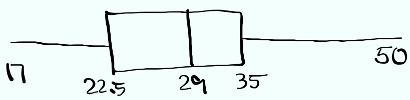
Here are their ages

17	27	32	40	30
18	25	20	42	50
36	28	25	29	34
29	18	19	33	48

Use 1-Var Stats with L1

$\bar{x} = 30$

$S = 9.668$



$n = 20$

Min = 17

$Q_1 = 22.5$

Med. = 29

$Q_3 = 35$

Max = 50

IQR = $Q_3 - Q_1 = 12.5$

Upper fence = $Q_3 + 1.5(IQR) = 53.75$

Lower fence = $Q_1 - 1.5(IQR) = 3.75$

NO outliers

$$S^2 = \frac{1776}{19}$$

Apr 28-3:21 PM

25 tickets sold at \$8 each.

One ticket drawn

Owner of this tickets gets a gift card worth \$50.

Find expected value per ticket sold.

Net	P(Net)
8 − 50	1/25
8 − 0	24/25

$\mu = E.V. = \bar{x}$

\$6

Apr 28-3:30 PM

A fair Coin is tossed 400 times.

Find usual Range for # of tails.

$n = 400$ → $\mu \pm 2\sigma$

$p = .5$ $\quad \mu = np = 200$ $\quad 200 \pm 2(10)$

$q = .5$ $\quad \sigma^2 = npq = 100$ $\quad \Rightarrow$ **180 to 220**

$\sigma = \sqrt{\sigma^2} = 10$

SG 17 – 20 ✓

Apr 28-3:34 PM