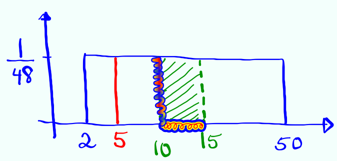
Statistics

Lecture 8

Feb 19-8:47 AM

Consider a uniform Prob. dist. for all values from 2 to 50.



1) $P(x=5) = 0$

2) $P(10 < x < 15)$

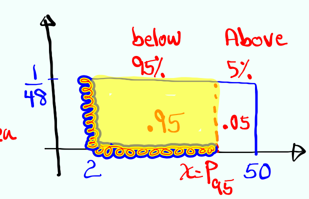
$= (15-10)\cdot\frac{1}{48}$

$= \boxed{\frac{5}{48}}$

3) Find $x = P_{95}$

95% below — Left Area .95

5% above — Right Area .05



$(x-2)\cdot\frac{1}{48} = .95$

multiply by 48

$x - 2 = 48(.95)$

$x = 2 + 48(.95)$

$\boxed{x = 47.6}$

Round to a whole #

$\boxed{x \approx 48}$

Apr 17-8:02 AM

Standard Normal Prob. Dist.:

1) We use Z, $P(Z=c)=0$

2) Dist. is symmetric, bell-shape with total area $=1$

3) Mean = Mode = Median

4) $\mu=0$, $\sigma=1$

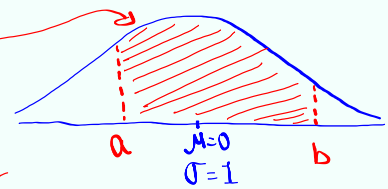
$\boxed{P(a<Z<b)}$ is the corresponding area within the bell-shape graph.

How to find it:

$\boxed{\text{2nd}}$ $\boxed{\text{VARS}}$

$\boxed{\text{normalcdf}}$

Lower
Upper
$\mu=0$
$\sigma=1$
$\boxed{\text{Paste}}$ $\boxed{\text{Enter}}$

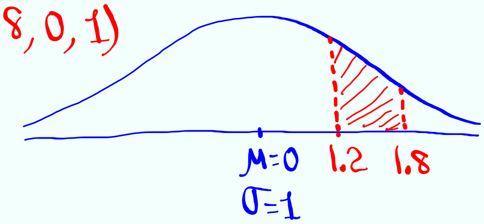


Apr 17-8:11 AM

find $P(1.2<Z<1.8)$

$= \text{normalcdf}(1.2, 1.8, 0, 1)$

$= \boxed{.079}$

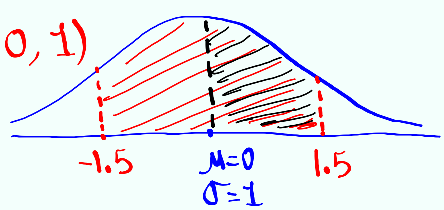


find $P(-1.5<Z<1.5)$

$= \text{normalcdf}(-1.5, 1.5, 0, 1)$

(-)

$= \boxed{.866}$



using Symmetry

$2 \cdot \text{normalcdf}(0, 1.5, 0, 1) = \boxed{.866}$

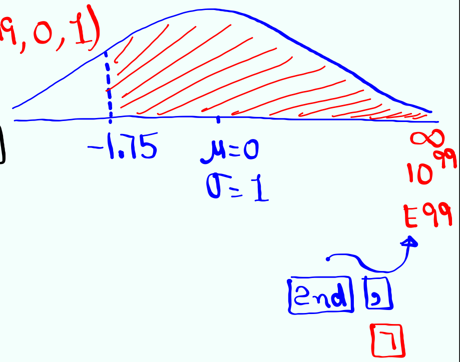
Apr 17-8:17 AM

$P(z > -1.75)$

$= \text{normalcdf}(-1.75, E99, 0, 1)$

(-)

2nd ,



$\approx \boxed{.960} \approx 96\%$

$P(z < 1.96)$

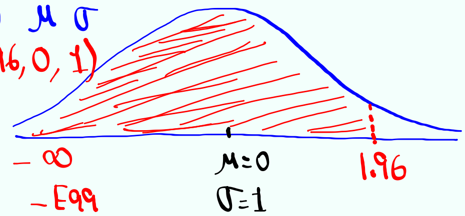
L U μ σ

$= \text{normalcdf}(-E99, 1.96, 0, 1)$

(-)

2nd ,

7

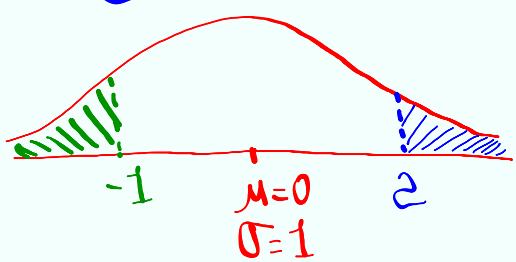


$= \boxed{.975} = 97.5\%$

Apr 17-8:24 AM

$P(z < -1 \text{ and } z > 2) = 0$

M.E.E.



$P(z < -1 \text{ OR } z > 2)$

$= 1 - P(-1 < z < 2)$

Total Area

Total Prob.

$= 1 - \text{normalcdf}(-1, 2, 0, 1) \approx \boxed{.181}$

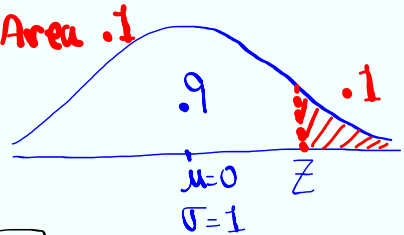
Apr 17-8:34 AM

Doing Reverse:

Find a Z-Value that Separates the top 10% from the rest.

Top 10% → Right Area .1

$1 - .1 = .9$



$Z = P_{90}$

2nd VARS invNorm

$\boxed{1.282}$

Area = .9
μ=0
σ= 1
Paste

$Z = \text{invNorm}(.9, 0, 1) = 1.282$

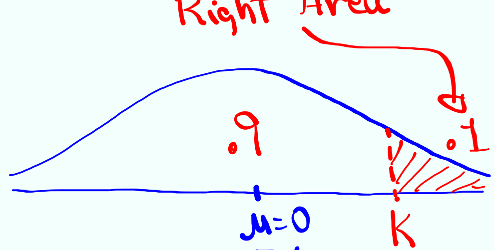
Apr 17-8:40 AM

Find K Such that $P(Z > K) = .1$

Right Area

$K = \text{invNorm}(.9, 0, 1)$

$\approx \boxed{1.282}$

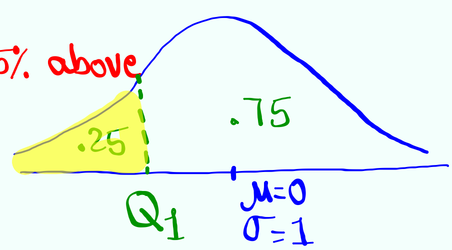


Find $Z = Q_1$

First Quartile
25% below, 75% above

$Z = Q_1 = \text{invNorm}(.25, 0, 1)$

$= \boxed{-.674}$



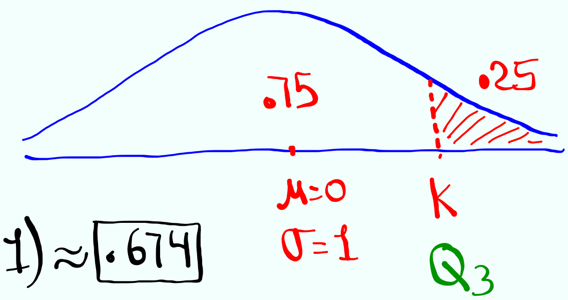
Apr 17-8:46 AM

Find K such that $P(Z < K) = .75$

Left Area

using Symmetry with last example

$K = Q_3 = .674$



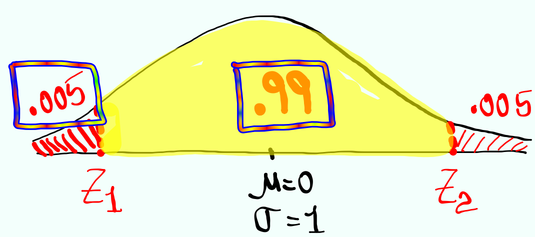
$K = \text{invNorm}(.75, 0, 1) \approx \boxed{.674}$

Apr 17-8:52 AM

Find two Z-Values (Rounded to 3-dec. Places) that Separate the middle 99% from the rest.

$1 - .99 = .01$

$.01 \div 2 = .005$



$Z_1 = \text{invNorm}(.005, 0, 1) = \boxed{-2.576}$

$Z_2 = \text{invNorm}(\boxed{.995}, 0, 1) = \boxed{2.576}$

SG 17 ✓

Apr 17-8:58 AM

Normal Prob. dist.:

1) Use x, $P(x=c)=0$

2) Dist. is symmetric, bell-shape with total area $=1$.

$\boxed{N(\mu,\sigma)}$

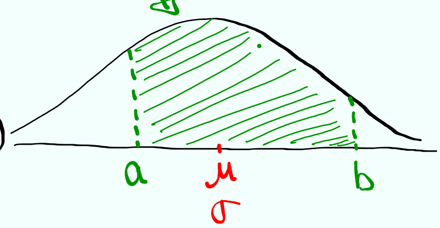
3) Mean = Mode = Median

4) μ & σ will be given.

$\boxed{P(a<x<b)}$ is the corresponding area within the graph.

How to find it:

normalcdf(L, U, μ, σ)



Apr 17-9:20 AM

Given: $N(82, 8)$

Normal Prob. Dist.

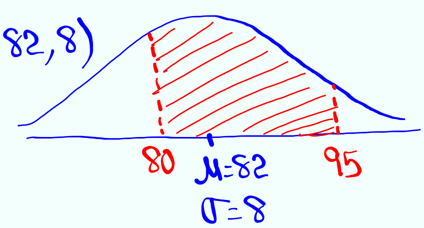
μ

σ

1) Find $P(80<x<95)$

$=$ normalcdf$(80, 95, 82, 8)$

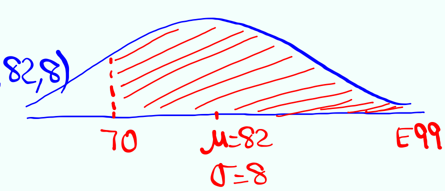
$=\boxed{.547} \approx 54.7\%$



2) $P(x>70)$

$=$ normalcdf$(70, E99, 82, 8)$

$\approx \boxed{.933}$

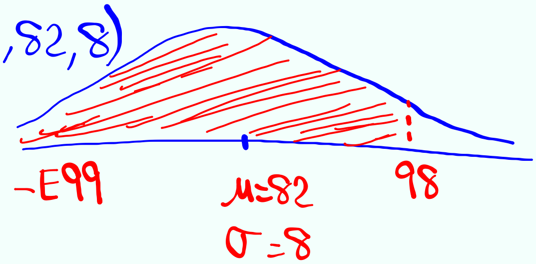


Apr 17-9:26 AM

3) $P(x < 98)$

$= \text{normalcdf}(-E99, 98, 82, 8)$

$= \boxed{.977}$

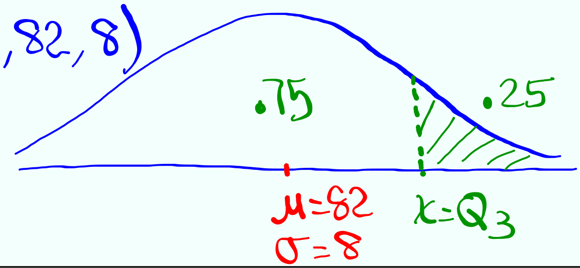


4) Find $x = Q_3$, Round to whole #.

$x = Q_3 = \text{invNorm}(.75, 82, 8)$

≈ 87.396

$\approx \boxed{87}$



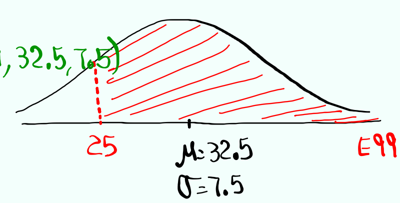
Apr 17-9:32 AM

Consider a normal Prob. dist. with the mean of 32.5 and Standard deviation of 7.5. $N(32.5, 7.5)$

1) $P(x > 25)$

$= \text{normalcdf}(25, E99, 32.5, 7.5)$

$\approx \boxed{.841}$

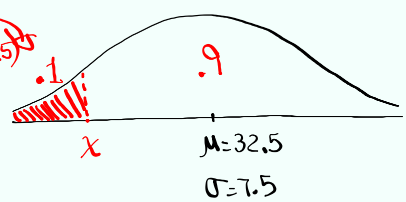


2) Find the x-Value that Separates the bottom 10% from the rest. Round to 1-dec.

$x = \text{invNorm}(.1, 32.5, 7.5)$

$= 22.888$

$\approx \boxed{22.9}$



Apr 17-9:38 AM

Salaries of nurses in So. CA are normally dist. with mean of \$6500/mo. and standard deviation of \$500/mo.

$N(6500, 500)$

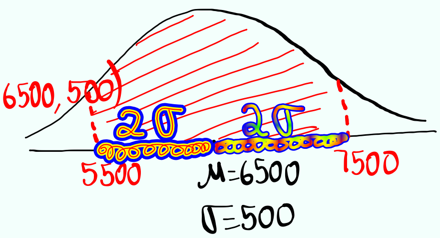
If we randomly select $\boxed{\text{one nurse}}$ find the Prob. that $\boxed{\text{his/her monthly salary}}$ is between \$5500 and \$7500.

x

$P(5500 < x < 7500)$

$= \text{normalcdf}(5500, 7500, 6500, 500)$

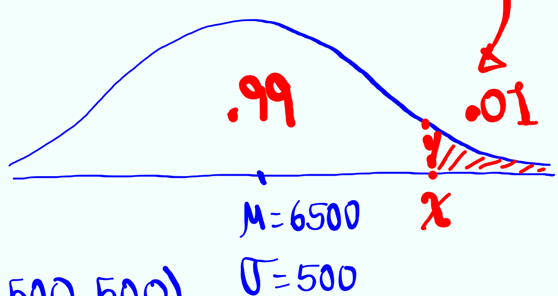
$= \boxed{.954} \approx 95.4\%$



Apr 17-9:46 AM

Find $\boxed{\text{a salary}}$ that separates the $\boxed{\text{top 1\%}}$ from the rest.

x



$x = \text{invNorm}(.99, 6500, 500)$

$= 7663.174 \approx \boxed{7663}$

Round to nearest 100 $\Rightarrow \boxed{7700}$

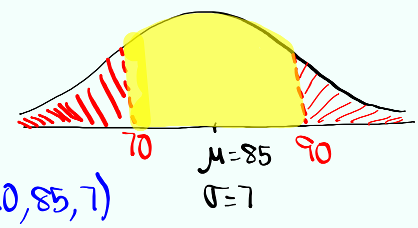
Apr 17-9:54 AM

Exam 2 Scores are usually normally dist. with mean of 85 and standard dev. of 7. $N(85, 7)$

If we randomly select one exam find the prob. that $\underset{x}{\text{Score}}$ is below 70 or above 90.

$P(x<70 \text{ OR } x>90)$

$= 1 - P(70 < x < 90)$

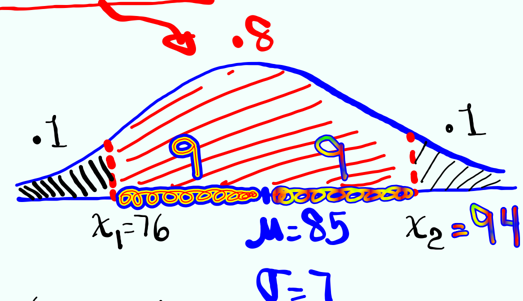


$= 1 - \text{normalcdf}(70, 90, 85, 7)$

$= \boxed{.254}$

Apr 17-9:59 AM

Find two exam scores, round to whole #, that separate the middle 80% from the rest.



$x_1 = P_{10} = \text{invNorm}(.1, 85, 7) \approx \boxed{76}$

$x_2 = P_{90} = \text{invNorm}(.9, 85, 7) \approx \boxed{94}$

SG 18√

Apr 17-10:06 AM

Consider the population of 2, 4, 6, and 8.

Store in L1, use $\boxed{\text{1 - Var Stats}}$ with L1 only to find

$\boxed{\mu = 5}$ $\sigma = 2.236$ $\boxed{\sigma^2 = 5}$

Take all Samples of $\boxed{\text{Size 2}}$ with replacement from this population.

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

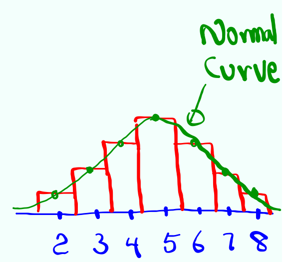
2,2	2,4	2,6	2,8	2	3	4	5
4,2	4,4	4,6	4,8	3	4	5	6
6,2	6,4	6,6	6,8	4	5	6	7
8,2	8,4	8,6	8,8	5	6	7	8

Apr 17-10:28 AM

2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

16 Means

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



List FreqList

$\bar{x} \to L2$, $P(\bar{x}) \to L3$

use $\boxed{\text{1 - Var Stats}}$ with L2 & L3 to find

$\mu = 5$ $\sigma = 1.581$ $\sigma^2 = 2.5 = \frac{5}{2}$

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

Sample Size

Apr 17-10:35 AM

Consider the population of 2, 4, 6, 8, and 10.

Store in L1, use $\boxed{\text{1-Var Stats}}$ with L1 only to find

$\boxed{\mu = 6}$ $\quad \sigma = 2.828 \quad$ $\boxed{\sigma^2 = 8}$

Take all samples of $\boxed{\text{Size } 2}$ with replacement from this population.

2,2	2,4	2,6	2,8	2,10
4,2	4,4	4,6	4,8	4,10
6,2	6,4	6,6	6,8	6,10
8,2	8,4	8,6	8,8	8,10
10,2	10,4	10,6	10,8	10,10

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

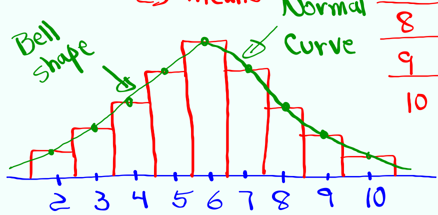
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

Apr 17-10:41 AM

2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

25 means

$\bar{x}$	$P(\bar{x})$
2	1/25
3	2/25
4	3/25
5	4/25
6	5/25
7	4/25
8	3/25
9	2/25
10	1/25



$\bar{x} \to L2$, $P(\bar{x}) \to L3$ Use $\boxed{\text{1-Var Stats}}$ with L2 & L3 to find

$\mu = 6 \quad \sigma = 2 \quad \sigma^2 = 4 = \frac{8}{2}$

$\boxed{\mu_{\bar{x}} = 6}$ $\quad$ $\boxed{\sigma^2_{\bar{x}} = \frac{8}{2}}$

Apr 17-10:48 AM

Central Limit Theorem

(CLT)

$$\boxed{\mu_{\bar{x}} = \mu} \qquad \boxed{\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}} \qquad \boxed{\sigma^2_{\bar{x}} = \frac{\sigma^2}{n}}$$

Apr 17-10:57 AM

Given $N(82, 8)$

take all Samples of Size 4,

$$\left.\begin{array}{l} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{4}} = \frac{8}{2} = 4 \end{array}\right\} \text{CLT}$$

Salaries of nurses has N.D. with

$\mu = 6500$ & $\sigma = 500$

Taking all Samples of 25 nurses,

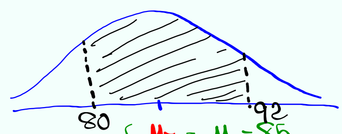
$$\left.\begin{array}{l} \mu_{\bar{x}} = \mu = 6500 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{500}{\sqrt{25}} = \frac{500}{5} = 100 \end{array}\right\} \text{CLT}$$

Apr 17-11:00 AM

Exam 2 Scores are N.D. with $\mu = 85$ and $\sigma = 10$.

If we take Sample of $\boxed{5 \text{ exams}}$ ($n=5$), Find the prob. that $\boxed{\text{their mean Scores}}$ ($\bar{x}$) is $\boxed{\text{between } 80 \text{ and } 92.}$

$P(80 < \bar{x} < 92)$



$= \text{normalcdf}(80, 92, 85, 10/\sqrt{5})$ CLT $\begin{cases} \mu_{\bar{x}} = \mu = 85 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{10}{\sqrt{5}} \end{cases}$

$\approx \boxed{.809}$

SG 19 (Pages 1-3)

SG 20 ✓

Apr 17-11:05 AM