Statistics
Summer 2021
Lecture 12

Normal Prob. dist. SG 18 & 19.

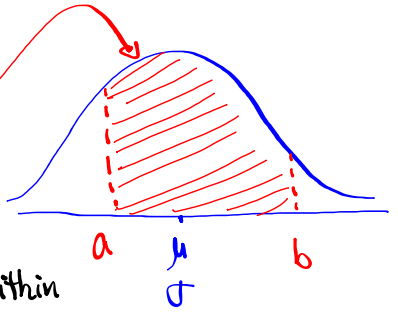
1) Use variable x, $P(x=c)=0$

2) Dist. is symmetric, bell-shaped, with total Area = 1.

3) Mean = mode = median

4) μ & σ are given in the Problem.

5) $P(a<x<b)$ is the corresponding area within the curve.



Use normalcdf(Lower, Upper, μ, σ)

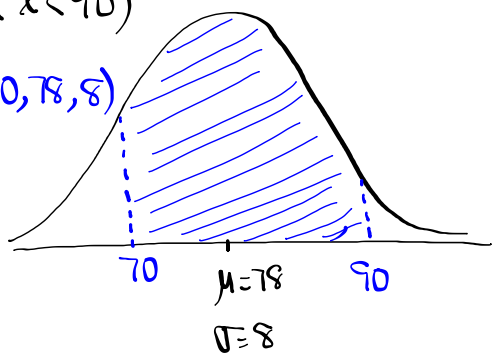
$N(\mu, \sigma)$ — Normal

Given $N(78, 8)$

Find $P(70 < x < 90)$

= normalcdf(70, 90, 78, 8)

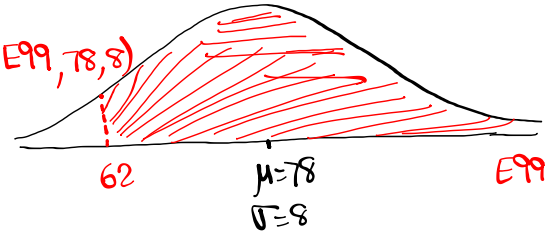
= .775



$P(x > 62)$

= normalcdf(62, E99, 78, 8)

= .977

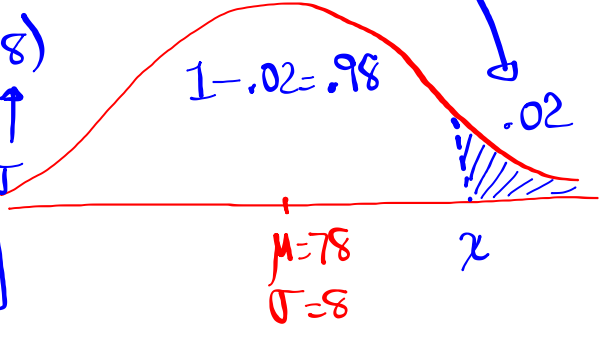


Find x-value that separates the top 2% from the rest. Round to a whole #.

x = invNorm(.98, 78, 8)

left Area, μ, σ

= 94.430 $\approx$ 94



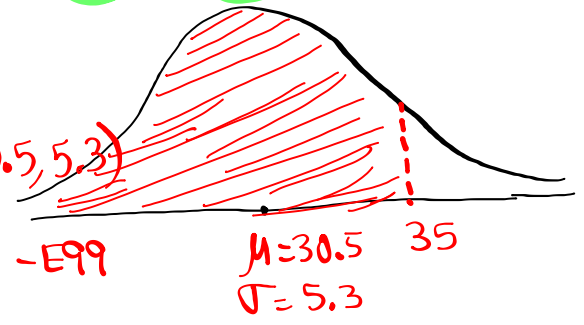
Ages of students at College are normally distributed with mean of 30.5 Yrs and Standard deviation of 5.3 Yrs. $N(30.5, 5.3)$

If we randomly select one student, find the Prob. that his/her age (x) is below 35 Yrs.

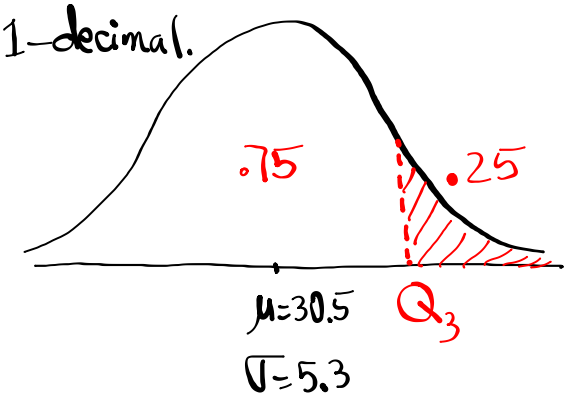
$P(x < 35)$

=normalcdf(-E99, 35, 30.5, 5.3)

$= .802$



Find Q_3 for the ages of all students at College. Round to 1-decimal.



Q_3

75% below — Left Area .75

25% above — Right area .25

$Q_3 = \text{invNorm}(.75, 30.5, 5.3) = 34.075$

≈ 34.1

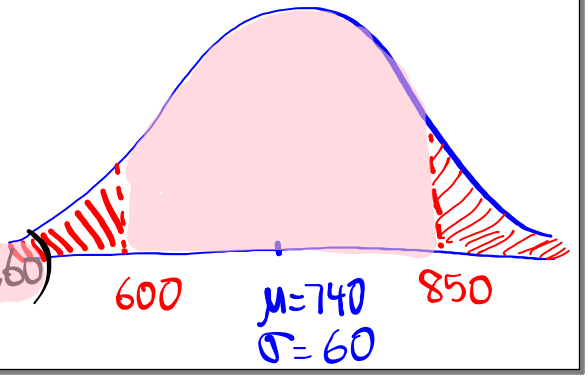
Credit Scores are normally distributed with $\mu = 740$ and $\sigma = 60$. $N(740, 60)$

If we randomly select one adult, find the Prob. that his/her credit score (x) is below 600 or above 850.

$P(x < 600 \text{ or } x > 850)$

$= 1 - \text{normalcdf}(600, 850, 740, 60)$

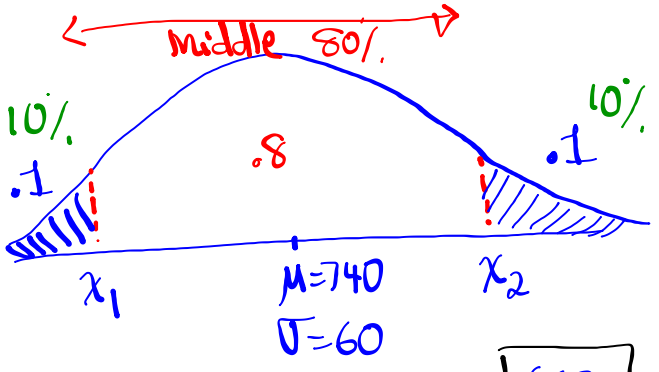
$= .043$



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

$1 - .8 = .2$

$.2 \div 2 = .1$

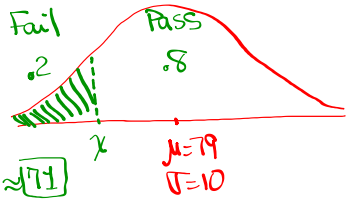


$x_1 = P_{10} = \text{invNorm}(.1, 740, 60) = 663.107 \approx \boxed{663}$

$x_2 = P_{90} = \text{invNorm}(.9, 740, 60) = 816.893 \approx \boxed{817}$

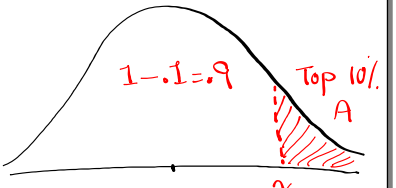
Scores on exam II are normally dist. with $\mu=79$ and $\sigma=10$.

Is bottom 20% fail the exam, find the score that separates failing & passing scores.



$x=\text{invNorm}(.2,79,10)\approx 71$

Is top 10% get A, find the minimum score for grade A.



$x=\text{invNorm}(.9,79,10)$

$=91.816$

≈ 92

SG: 18 & SG: 19

John gets 12 texts per hour (fixed interval) in average.

P(He gets no texts in an hr)

$P(x=0)=\text{PoissonPdf}(12,0)=6.144\times10^{-6}\approx 0$

P(He gets at least 5 texts in an hr)

$P(x\geq 5)=1-P(x\leq 4)=1-\text{poissoncdf}(12,4)$

Don't want: 0, 1, 2, 3, 4 — want: 5, ...

$=.992$

Prob. that any exam gets A is .45.

P(the first A happens on 3rd exam)

$P(x=3) = \text{geometpdf}(.45, 3)$

$= \boxed{.136}$

P(first A exam happens before the 5th exam)

$P(x<5) = P(x \leq 4) = \text{geometcdf}(.45, 4)$

$= \boxed{.908} \approx 91\%$

Clear all lists
Reset all lists
Store 1, 3, 5, 7 in L1.

Use 1-Var stats with L1 only to find

$\mu = 4$

$\sigma = 2.236$

Take all Samples of Size 2 with replacement from L1.

$\sigma^2(\text{exact}) = 5$

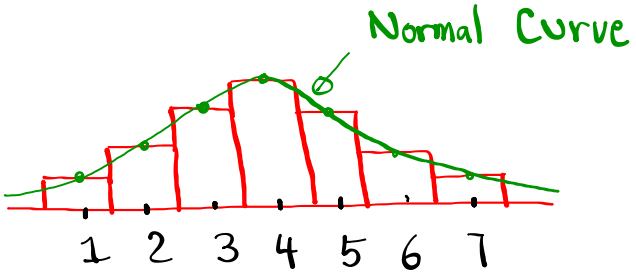
1,1	1,3	1,5	1,7
3,1	3,3	3,5	3,7
5,1	5,3	5,5	5,7
7,1	7,3	7,5	7,7

Find $\bar{x}$ of each Sample

1	2	3	4
2	3	4	5
3	4	5	6
4	5	6	7

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

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



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

Use 1-Var Stats with L2 & L3 to find

$\mu_{\bar{x}} = 4$

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

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

Clear all lists.

Store 2, 6, 10, 14, 18 in L1.

Use 1-Var Stats with L1 only to find

$\mu = 10$

$\sigma = 5.657$

σ^2 (exact) $= 32$

Take all Samples of Size 2 with replacement from L1.

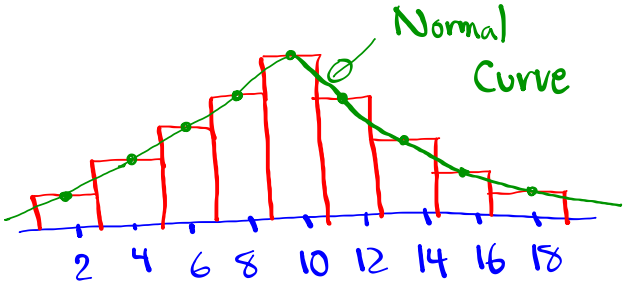
2,2	2,6	2,10	2,14	2,18
6,2	6,6	6,10	6,14	6,18
10,2	10,6	10,10	10,14	10,18
14,2	14,6	14,10	14,14	14,18
18,2	18,6	18,10	18,14	18,18

Find $\bar{x}$ of each Sample

2	4	6	8	10
4	6	8	10	12
6	8	10	12	14
8	10	12	14	16
10	12	14	16	18

$\bar{x}$	$P(\bar{x})$
2	1/25
4	2/25
6	3/25
8	4/25
10	5/25
12	4/25
14	3/25
16	2/25
18	1/25

$\bar{x}$	$P(\bar{x})$
2	1/25
4	2/25
6	3/25
8	4/25
10	5/25
12	4/25
14	3/25
16	2/25
18	1/25



$\bar{x} \rightarrow$ L2 $P(\bar{x}) \rightarrow$ L3

use 1-Var Stats with L2 & L3 to find

$\mu_{\bar{x}} = 10$ $\sigma_{\bar{x}} = 4$ $\sigma^2_{\bar{x}} = 16 = \frac{32}{2}$

Central Limit Theorem

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

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

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

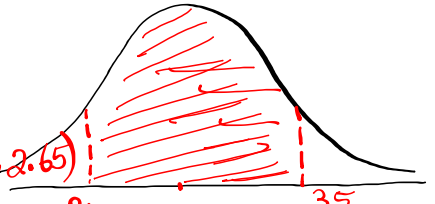
Ages of students at College are normally distributed with $\mu = 30.5$ and $\sigma = 5.3$.

If we randomly Select 4 students, Find the prob. that their mean age ($\bar{x}$) is between 25 and 35.

$P(25 < \bar{x} < 35)$

= normalcdf(25, 35, 30.5, 2.65)

= .936



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 30.5 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{5.3}{\sqrt{4}} = 2.65 \end{cases}$

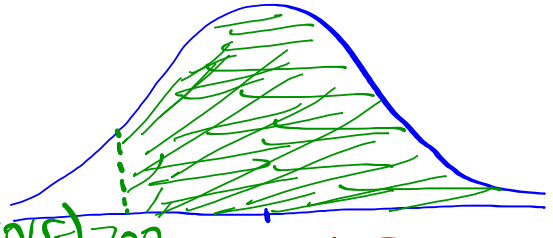
Credit Scores are normally distributed with $\mu = 740$ & $\sigma = 60$.

If we random select 5 people, find the Prob. that their mean credit score is above 700.

$P(\bar{x} > 700)$

= normalcdf(700, E99, 740, 60/$\sqrt{5}$)

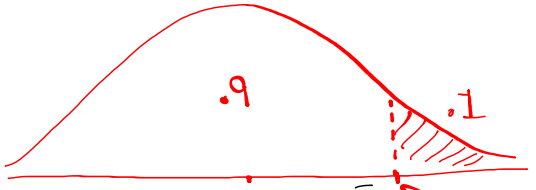
= .932



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 740 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{60}{\sqrt{5}} \end{cases}$

Salaries of nurses are normally dist. with $\mu = \$6250$ & $\sigma = \$400$.

Find P_{90} for the mean of randomly selected groups of 10 nurses. Round to whole #.



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6250 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{10}} \end{cases}$

$\bar{x} = \text{invNorm}(.9, 6250, 400/\sqrt{10})$

$\approx \boxed{6412}$

SG 21 & SG 22