Statistics

Lecture 18

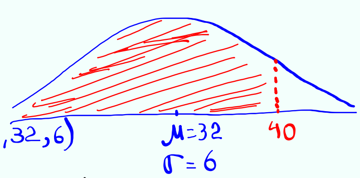
Feb 19-8:47 AM

Ages of students are normally distributed with the mean of 32 Yrs and standard deviation of 6 Yrs. $N(32, 6)$

If we randomly select one student, find the prob. that his/her age is

a) below 40 Yrs.

$P(x < 40)$



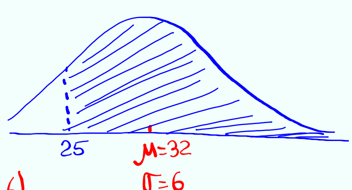
$= \text{normalcdf}(-E99, 40, 32, 6)$

(-) 2nd 9 ,

$\boxed{.909} = 90.9\% \approx 91\%$

b) above 25 Yrs.

$P(x > 25)$



$= \text{normalcdf}(25, E99, 32, 6)$ $\boxed{.878}$

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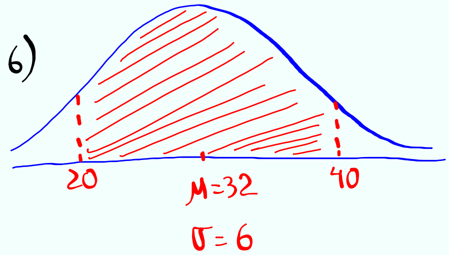
c) between 20 and 40 Yrs.

$P(20 < x < 40)$

$= \text{normalcdf}(20, 40, 32, 6)$

$= \boxed{.886}$

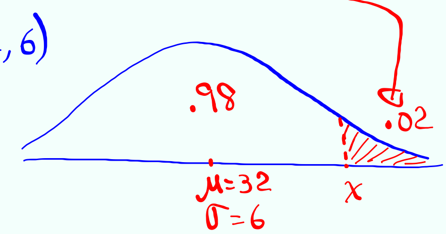


Find the age, rounded to whole number, that separates the top 2% from the rest.

$x = \text{invNorm}(.98, 32, 6)$

$= 44.322$

≈ 44



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Clear all lists

Store 2, 4, 6, and 8 in L1.

Use 1-Var Stats with L1 to find

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

Take all samples with size 2 with replacement from this data.

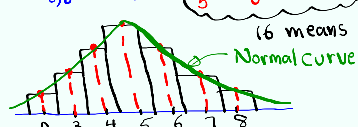
2,2	2,4	2,6	2,8
4,2	4,4	4,6	4,8
6,2	6,4	6,6	6,8
8,2	8,4	8,6	8,8

Find $\bar{x}$ of each Sample

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



Prob. dist. histogram

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

Use 1-Var Stats with L2 & L3 (L2: List, L3: Freqlist)

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

$\boxed{\mu_{\bar{x}} = 5}$ $\sigma_{\bar{x}} = 1.581$ $\boxed{\sigma^2_{\bar{x}} = \frac{5}{2}}$

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Clear all lists.

Store 2, 4, 6, 8, and 10 in L1.

Use 1-Var Stats with L1 only.

$\mu = 6$ $\sigma = 2.828$ $\sigma^2 = 8$

Take all samples of Size 2 with replacement.

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

Now 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

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

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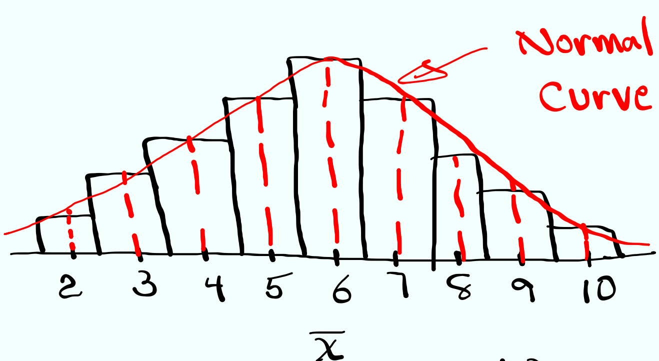

$\bar{x} \to L2$, $P(\bar{x}) \to L3$

List FreqList

Use 1-Var Stats with L2 & L3

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

$\mu_{\bar{x}} = 6$ $\sigma_{\bar{x}} = 2$ $\sigma_{\bar{x}}^2 = 4$

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Central Limit Theorem

CLT

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

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

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

Exam Scores are normally dist.

$\mu = 84$ & $\sigma = 10$

If we randomly select 4 exams,

$\mu_{\bar{x}} = \mu = 84$ $\quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = \frac{10}{2} = 5$

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Salaries of nurses are normally dist.

with $\mu = 7200$ and $\sigma = 400$.

If we randomly select groups of 16 nurses,

$\mu_{\bar{x}} = \mu = 7200$ $\quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{16}} = \frac{400}{4} = 100$

By CLT

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Ages of students are normally dist with $\mu = 32$ and $\sigma = 6$.

If we randomly select groups of 4 students

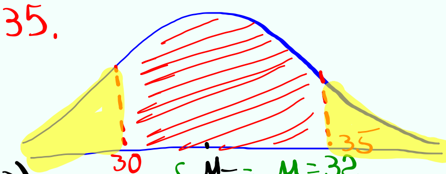
Find the prob. that their mean age ($\bar{x}$) is

a) between 30 and 35.

$P(30 < \bar{x} < 35)$

$= \text{normalcdf}(30, 35, 32, 3)$

$= \boxed{.589}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{4}} = \frac{6}{2} = 3 \end{cases}$

b) below 30 or above 35.

$P(\bar{x} < 30 \text{ OR } \bar{x} > 35) = 1 - .589 = \boxed{.411}$

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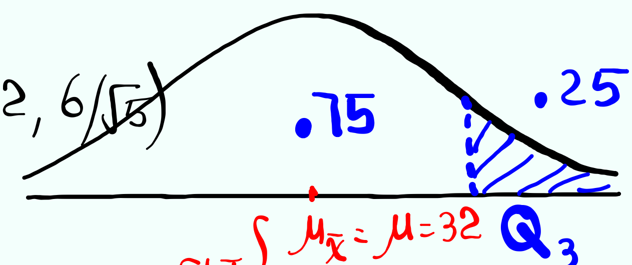
Find $\bar{x} = Q_3$, round to whole number, for randomly selected groups of 5 students.

$\bar{x} = \text{invNorm}(.75, 32, 6/\sqrt{5})$

$= 33.810$

$\approx \boxed{34}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{5}} \end{cases}$

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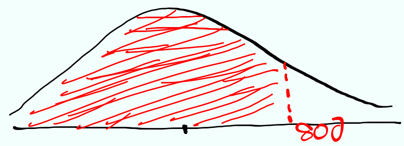
Credit Scores are normally dist with
$\mu = 760$ and $\sigma = 75$.
If we randomly Select 3 people, Find the Prob. that their mean credit score is

a) below 800.



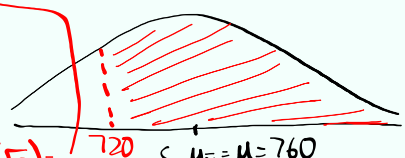
$P(\bar{x} < 800)$

$= \text{normalcdf}(-E99, 800, 760, 75/\sqrt{3})$

$= \boxed{.822}$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 760 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{75}{\sqrt{3}} \end{cases}$

b) more than 720.



$= \text{normalcdf}(720, E99, 760, 75/\sqrt{3}) =$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 760 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{75}{\sqrt{3}} \end{cases}$

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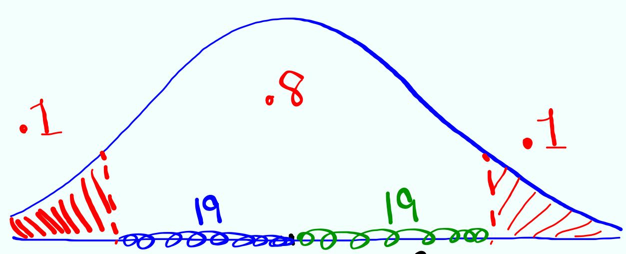
c) For randomly selected groups of 25, find two mean Credit Scores that separate the middle 80% from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$



$\bar{x}_1 = 741$ $\mu_{\bar{x}} = \mu = 760$ $\bar{x}_2 = 779$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{75}{\sqrt{25}} = \frac{75}{5} = 15$

$\bar{x}_1 = \text{invNorm}(.1, 760, 15)$

$\approx \boxed{741}$

$\bar{x}_2 = \text{invNorm}(.9, 760, 15)$

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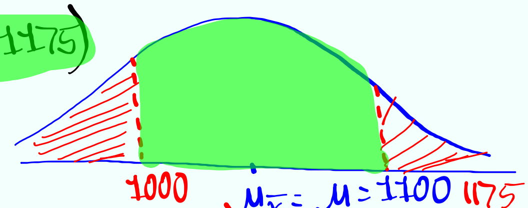
SAT Scores are N.D. $\mu = 1100$ & $\sigma = 100$

If we randomly select 10 SAT exams, find the prob. that their mean score ($\bar{x}$) is below 1000 or above 1175.

$P(\bar{x} < 1000 \text{ OR } \bar{x} > 1175)$

$= 1 - P(1000 < \bar{x} < 1175)$



$\mu_{\bar{x}} = \mu = 1100$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{10}}$

$= 1 - \text{normalcdf}(1000, 1175, 1100, 100/\sqrt{10})$

$= \boxed{.010}$

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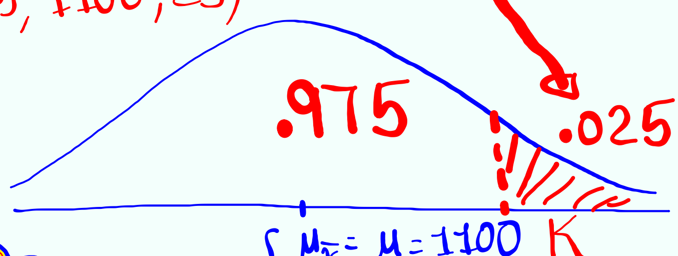
Find K such that $P(\bar{x} > K) = .025$ for randomly selected groups of 16 SAT exams.

$K = \text{invNorm}(.975, 1100, 25)$

$\approx \boxed{1149}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 1100 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{16}} = \frac{100}{4} = 25 \end{cases}$

SG 19-20 ✓

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Consider the Sample below

65	72	55	83	100
97	52	78	100	63

Store in L1

Use **1-Var Stats** with L1 only.

$\bar{x} = 76.5$

$S = S_x = 18.155$

$S^2 = \frac{5933}{18}$

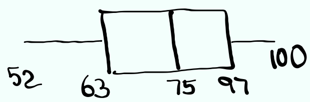
Min = 52

$Q_1 = 63$

Med = 75

$Q_3 = 97$

Max = 100



$IQR = Q_3 - Q_1 = 34$

Upper Fence $= Q_3 + 1.5(IQR) = 148$

Lower Fence $= Q_1 - 1.5(IQR) = 12$

No Outliers

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Complete the chart below

class limits	class MP	class F
18 – 30	24	5
31 – 43	37	12
44 – 56	50	8

class MP → L1

class F → L2

$\bar{x} = 38.56$

$S = 9.434$

$S^2 = \frac{13351}{150}$

$n = 25$

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