Statistics

Lecture 17

Feb 19-8:47 AM

SG 17

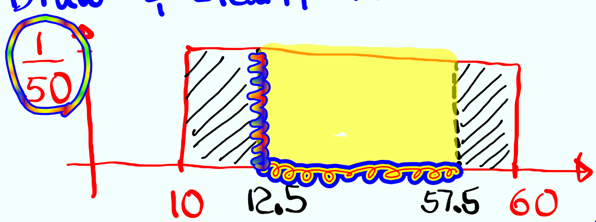
Consider a uniform Prob. dist. for

$10 \le x \le 60$.

1) Draw & clearly label.

2) $P(x=20) = \boxed{0}$

Line



3) $P(x < 12.5 \text{ or } x > 57.5)$

$= 1 - P(12.5 < x < 57.5) = 1 - (57.5 - 12.5) \cdot \frac{1}{50}$

Total Area

$= 1 - \frac{45}{50} = \frac{5}{50} = \boxed{\frac{1}{10}} = \boxed{.1}$

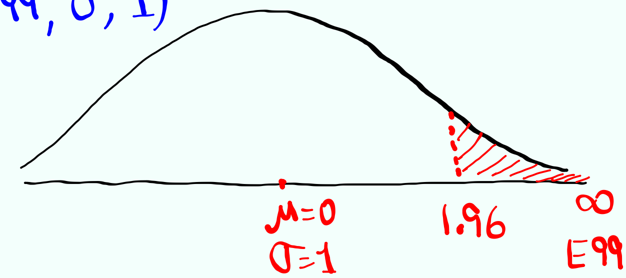
Nov 3-10:35 AM

find $P(Z > 1.96)$

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

$\boxed{2nd}\ \boxed{,}$

$= \boxed{.025}$

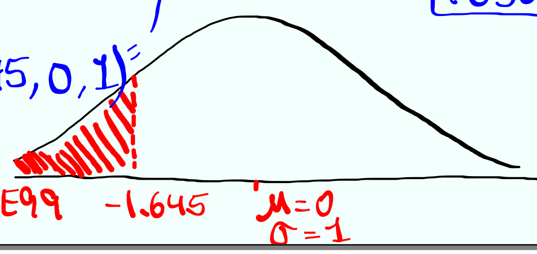


find $P(Z < -1.645)$

$= \text{normalcdf}(-E99, -1.645, 0, 1) = \boxed{.050}$

(−)

$\boxed{2nd}\ \boxed{,}$

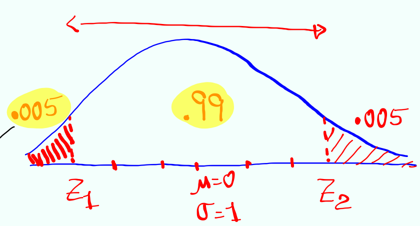


Nov 3-10:43 AM

find two z-values, Round to 3-decimal places, that separate the $\boxed{\text{middle } 99\%}$ from the rest.

$1 - .99 = .01$

$.01 \div 2 = \boxed{.005}$

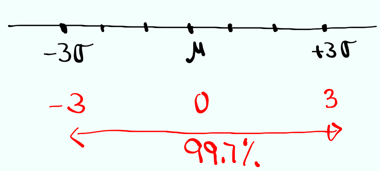


$Z_1 = \text{invNorm}(.005, 0, 1) = \boxed{-2.576} \approx -3$

$Z_2 = \text{invNorm}(.995, 0, 1) = \boxed{2.576} \approx 3$

Empirical Rule:
99.7% Range

$\mu \pm 3\sigma$



Nov 3-10:50 AM

SG 18

Normal Prob. Dist.:

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

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

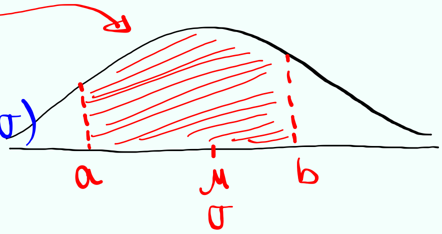
3) Mean = Mode = Median

4) μ & σ are given in the problem.

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

How to find it:

normalcdf(L, U, μ, σ)



$N(\mu, \sigma)$

Nov 3-10:59 AM

Given $N(72, 8)$

Normal Prob. Dist.

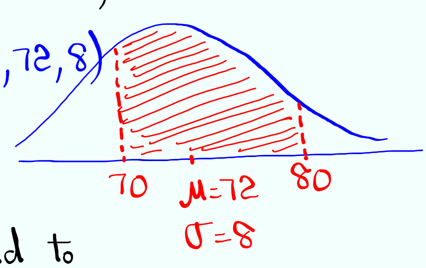
μ

σ

Find $P(70<x<80)$

$=$ normalcdf$(70, 80, 72, 8)$

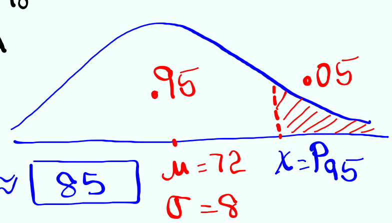
$= \boxed{.440}$



Find $x = P_{95}$, Round to whole #

95% below

Left area = .95



$x = $ invNorm$(.95, 72, 8) \approx \boxed{85}$

Nov 3-11:04 AM

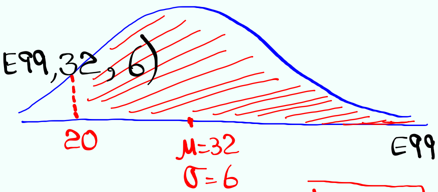
Consider a normal Prob. dist. with mean of 32 and standard dev. of 6.

$N(32, 6)$

$P(x > 20)$

$= \text{normalcdf}(20, E99, 32, 6)$

$\approx \boxed{.977}$

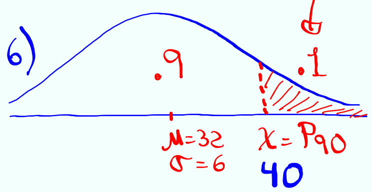


Find a value that separates the $\boxed{\text{top } 10\%}$ from the rest. Round to whole #.

Right Area

$x = \text{invNorm}(.9, 32, 6)$

$\approx \boxed{40}$

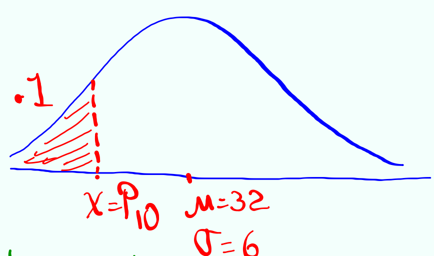


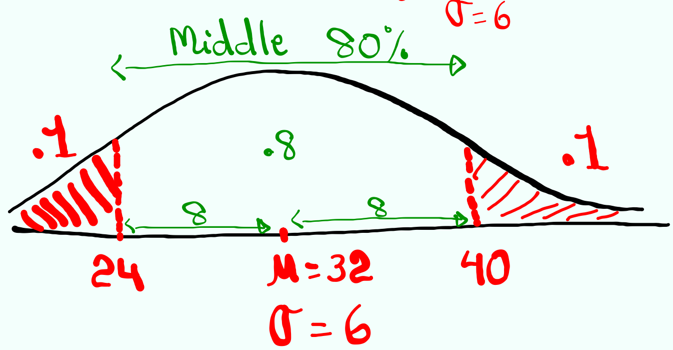
Nov 3-11:11 AM

Find a value that separates the $\boxed{\text{bottom } 10\%}$ from the rest. Round to whole #.

$x = \text{invNorm}(.1, 32, 6)$

$\approx \boxed{24}$





Nov 3-11:20 AM

Salaries of nurses in LA county has a normal dist. with mean of \$7200/month and standard dev. of \$400.

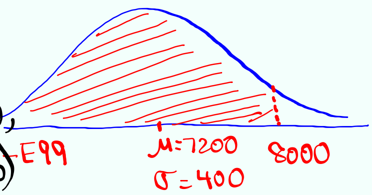
$N(7200, 400)$

If we randomly select one nurse, find the prob. that $\underbrace{\text{his/her salary}}_{x}$ is below \$8000/month.

$P(x < 8000)$

$= \text{normalcdf}(-E99, 8000, 7200, 400)$

$= \boxed{.977}$

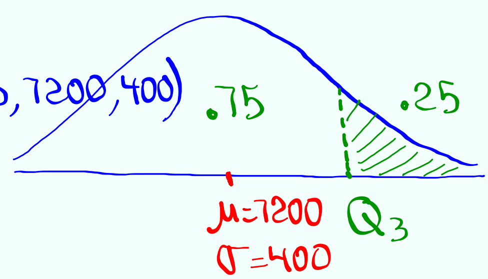


Nov 3-11:26 AM

Find Q_3 for the monthly salaries of nurses in LA county. Round to whole #.

$Q_3 = \text{invNorm}(.75, 7200, 400)$

$\approx \boxed{\$7470}$



SG 18 ✓

Nov 3-11:34 AM

SG 19

Clear all lists.

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

Use $\boxed{\text{1-Var Stats}}$ with L1 only, find

$\mu = \bar{x} = \boxed{5}$ $\quad \sigma = \sigma_x = \boxed{2.236}$ $\quad \sigma^2 = \boxed{5}$

$\boxed{\text{VARS}}$ $\boxed{\text{5: Statistics}}$ $\boxed{\text{4: } \sigma_x}$ $\boxed{x^2}$ $\boxed{\text{Enter}}$

Take all Samples of Size 2 with replacement from 2,4,6,8.

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

16 Samples of Size 2.

Nov 3-11:40 AM

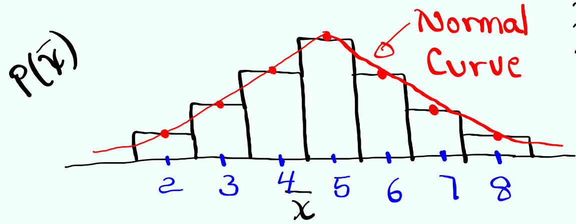
Find $\boxed{\bar{x}}$ of each Sample:

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

Draw Prob. dist. Hist.



$\bar{x} \to L2$

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

Use $\boxed{\text{1-Var Stats}}$ with L2 & L3

$\mu_{\bar{x}} = \boxed{5}$ $\quad \sigma_{\bar{x}} = 1.581$ $\quad \sigma_{\bar{x}}^2 = 2.5 = \boxed{\frac{5}{2}}$

Nov 3-11:48 AM

Clear all lists.

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

Use $\boxed{\text{1-Var Stats}}$ with L1 only to find

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

Take all Samples of Size 2 from 2,4,6,8,10 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

25 Samples of Size 2.

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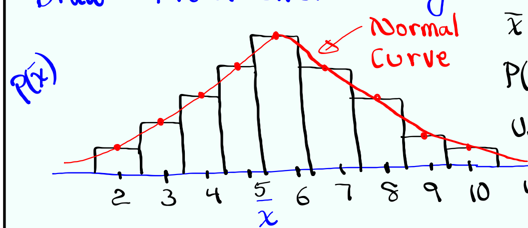
Find $\bar{x}$ of these Samples

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

Draw Prob. dist. Histogram



$\bar{x} \to L2$

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

Use $\boxed{\text{1-Var Stats}}$ with L2 & L3

$\mu_{\bar{x}} = \boxed{6}$ $\sigma_{\bar{x}} = 2$ $\sigma_{\bar{x}}^2 = 4 = \boxed{\frac{8}{2}}$

Nov 3-12:06 PM

Central Limit Theorem

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

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

$\boxed{\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}}$

Given $N(40, 8)$

If we take all Samples of Size 4,

$\mu_{\bar{x}} = \mu = \boxed{40}$

CLT

$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{8}{\sqrt{4}} = \dfrac{8}{2} = \boxed{4}$

CLT

Nov 3-12:17 PM

Exam Scores are normally dist. with mean of 84 and standard dev. of 12.

$N(84, 12)$

If we randomly Select all Samples of Size 16,

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

CLT

$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{12}{\sqrt{16}} = \dfrac{12}{4} = \boxed{3}$

CLT

Nov 3-12:22 PM

Salaries of nurses in LA County has

$\mu = \$7200$ / month , $\sigma = \$400$ / month.

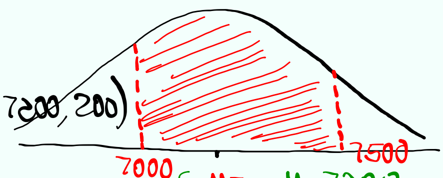
If we take a group of $\boxed{\text{4 nurses}}$ ($n=4$)

Find the prob. that $\boxed{\text{their mean}}$ ($\bar{x}$) Salary

is $\boxed{\text{between \$7000 and \$7500}}$.

$P(7000 < \bar{x} < 7500)$

$= \text{normalcdf}(7000, 7500, 7200, 200)$



$\approx \boxed{.775}$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 7200 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{400}{\sqrt{4}} = 200 \end{cases}$

Nov 3-12:25 PM