Statistics

Lecture 20

Feb 19-8:47 AM

Class QZ 10

1) Consider a geometric Prob. dist with $p=.75$

Find $P(x \leq 4)$

$P(x \leq 4) =$ geometcdf(.75,4) = .996 ✓

2) Consider a poisson Prob. dist. with $\mu=6$

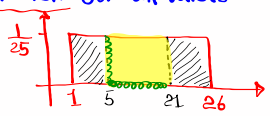
Find $P(x \geq 4)$

we don't want 3 | we want 4

$P(x \geq 4) = 1 - P(x \leq 3) = 1 -$ poissoncdf(6,3) = .849 ✓

Nov 22-9:40 AM

Consider a uniform Prob. dist. for all values from 1 to 26.



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

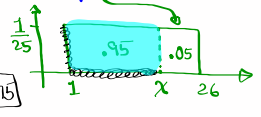
2) $P(x<5 \text{ or } x>21) = 1 - (21-5)\cdot\frac{1}{25} = 1 - \frac{16}{25} = \boxed{\frac{9}{25}} = \boxed{.36}$

3) Find $\boxed{x}$ that separates the $\boxed{\text{top } 5\%}$ from the rest.

$(x-1)\cdot\frac{1}{25} = .95$

$x - 1 = 25(.95)$

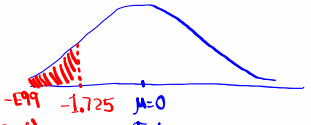
$x = 25(.95) + 1$ $\quad \boxed{x = 24.75}$



Nov 27-7:23 AM

Find $P(Z < -1.725)$

$N(0,1)$

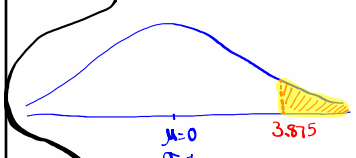


= normalcdf(−E99, −1.725, 0, 1)

= $\boxed{.042}$

Find twice the area to the right of $Z = 3.875$

$N(0,1)$



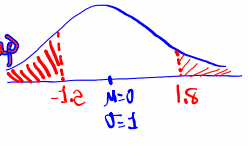
2 * normalcdf(3.875, E99, 0, 1) $\approx \boxed{1.1 \times 10^{-4}}$

$P(Z < -1.2 \text{ and } Z > 1.8)$

$N(0,1)$

No overlap

= $\boxed{0}$

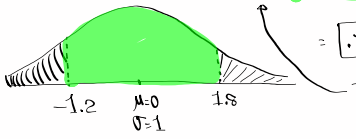


Nov 27-7:30 AM

$P(Z < -1.2 \text{ OR } Z > 1.8)$

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

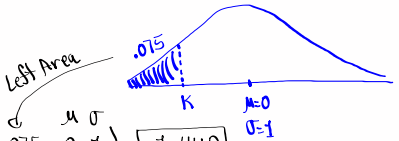
$= .154 = 15.4\% \approx 15\%$



Total Area
Total Prob.

Find K Such that $P(Z < K) = .075$

N(0,1) Left Area

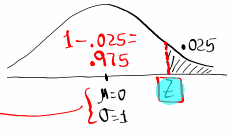


$K = \text{invNorm}(.075, 0, 1) = -1.440$

Find Z

97.5% below, 2.5% above

.975 Left Area, .025 Right Area



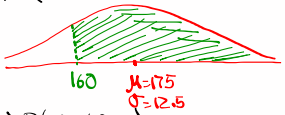
$Z = \text{invNorm}(.975, 0, 1) = 1.960$

SG 18 ✓

Nov 27-7:38 AM

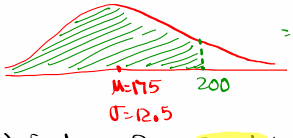
Given $N(175, 12.5)$

1) $P(x > 160) = \text{normalcdf}(160, E99, 175, 12.5)$



$= .885$

2) $P(x < 200) = \text{normalcdf}(-E99, 200, 175, 12.5)$

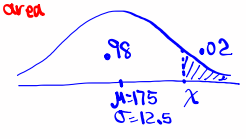


$= .977$

3) Find $x = P_{98}$, Round to whole #.

98% below .98 Left Area

2% above .02 Right area



$x = \text{invNorm}(.98, 175, 12.5)$

$= 200.672 \approx 201$

Nov 27-8:00 AM

Teacher's ages in LAUSD are normally dist. with the mean of 42.5 Yrs and standard deviation of 8.5 Yrs. $N(42.5, 8.5)$

If we randomly select one teacher from LAUSD, x

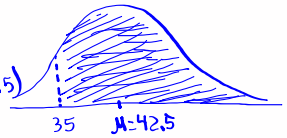
find the Prob. that his/her age is

a) more than 35 Yrs

$P(x > 35)$

= normalcdf(35, E99, 42.5, 8.5)

= .811

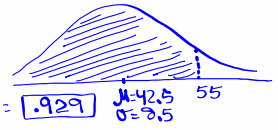


b) less than 55 Yrs.

$P(x < 55)$

= normalcdf(-E99, 55, 42.5, 8.5)

= .929

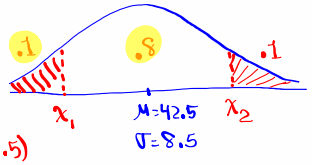


Nov 27-8:09 AM

Find two ages, round to one decimal, that separates the middle 80% from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$



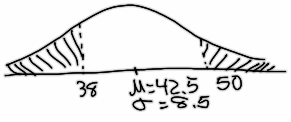
$x_1 = \text{invNorm}(.1, 42.5, 8.5)$

$= 31.607 \approx 31.6$

$x_2 = \text{invNorm}(.9, 42.5, 8.5) = 53.393 \approx 53.4$

Find P(age is below 38 and age is above 50)

No overlap



0

SE 19 ✓

Nov 27-8:17 AM

Clear & Reset all lists

Store 3, 6, and 9 in L1.

Use [1-Var Stats] with [L1] to Find

$\mu = 6$ $\sigma = 2.449$ $\sigma^2 = 6$

Take all Samples of Size 2 with replacement From this data.

3,3	3,6	3,9
6,3	6,6	6,9
9,3	9,6	9,9

Now Find $\bar{x}$ for each Sample

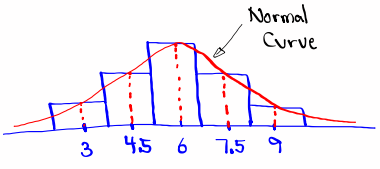
3, 4.5, 6, 4.5, 6, 7.5, 6, 7.5, 9 — 9 Means

$\bar{x}$	$P(\bar{x})$
3	1/9
4.5	2/9
6	3/9
7.5	2/9
9	1/9

Nov 27-8:38 AM

$\bar{x}$	$P(\bar{x})$
3	1/9
4.5	2/9
6	3/9
7.5	2/9
9	1/9

Draw Prob. dist. histogram



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

Use [1-Var Stats] with [L2 & L3] to Find

$\mu_{\bar{x}} = 6$ $\sigma_{\bar{x}} = 1.732$ $\sigma^2_{\bar{x}} = 3 = \frac{6}{2}$

Nov 27-8:45 AM

Central – Limit Theorem

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

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

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

Ex: $N(75, 8)$, Consider all Samples of Size 4

$\mu_{\bar{x}} = \mu = 75$ $\qquad$ $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{4}} = \frac{8}{2} = 4$

Ex: $N(120, 15)$, Consider all Samples of Size 5.

$\mu_{\bar{x}} = \mu = 120$ $\qquad$ $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{15}{\sqrt{5}} = 6.708$

$\sigma_{\bar{x}}^2 = \frac{\sigma^2}{n} = \frac{15^2}{5} = 45$

check $\sqrt{45} = 6.708$

Nov 27-8:53 AM

Exam Scores are normally distributed with mean of 80 and standard dev. of 10.

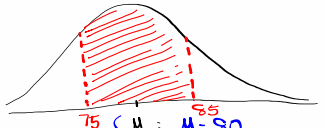
$N(80, 10)$

If we randomly select 4 exams ($n = 4$) find the Prob. that their mean ($\bar{x}$) Score is between 75 and 85.

$P(75 < \bar{x} < 85)$

= normalcdf(75, 85, 80, 5)

= .683



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 80 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = 5 \end{cases}$

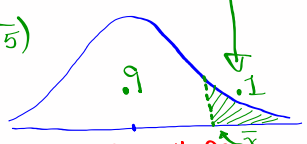
Nov 27-9:00 AM

Find the mean $\bar{x}$ for randomly selected groups of $n=5$ 5 exams that separates the top 10% from the rest. Round to a whole #.

$\bar{x} = \text{invNorm}(.9, 80, 10/\sqrt{5})$

$= 85.731$

$\approx \boxed{86}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 80 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}} \end{cases}$

Nov 27-9:06 AM

Ages of students are N.D. with $\mu = 32.5$ & $\sigma = 6.5$

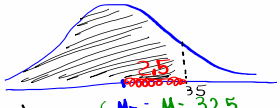
If we randomly select $n=3$ 3 students, find the prob. that their mean $\bar{x}$ age is

a) below 35 Yrs.

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

$= \text{normalcdf}(-E99, 35, 32.5, 6.5/\sqrt{3})$

$= \boxed{.747}$

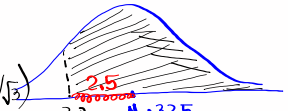


CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32.5 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6.5}{\sqrt{3}} \end{cases}$

b) more than 30 Yrs.

$= \text{normalcdf}(30, E99, 32.5, 6.5/\sqrt{3})$

$= \boxed{.747}$



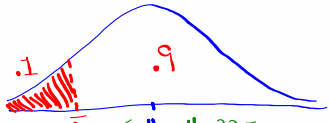
$\mu_{\bar{x}} = 32.5$

$\sigma_{\bar{x}} = \frac{6.5}{\sqrt{3}}$

Nov 27-9:11 AM

Find the mean age $\bar{x}$ round to 1-decimal, that separates the bottom 10%. from the rest.

↳ for 3 students



$\bar{x}$

$\bar{x} = \text{invNorm}(.1, 32.5, 6.5/\sqrt{3})$ CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32.5 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6.5}{\sqrt{3}} \end{cases}$

$= 27.691$

$\approx \boxed{27.7}$

SG 27 ✓

Exam III is this weekend! SG 1-23

I will finish SG 22 & 23 by Wednesday.

Nov 27-9:18 AM