Statistics

Lecture 18

Feb 19-8:47 AM

Bryan claims that 1 out of 40 smog inspection has a fail result.

1) $p = \frac{1}{40} = \boxed{.025}$

2) $q = \frac{39}{40} = \boxed{.975}$

3) $\mu = \frac{1}{p} = \frac{1}{.025} = \boxed{40}$

4) $\sigma^2 = \frac{q}{p^2} = \frac{.975}{.025^2} = 1560$

5) $\sigma = \sqrt{\sigma^2} = \sqrt{1560} \approx \boxed{39.5} \approx 40$

6) 68% Range

$\mu \pm \sigma = 40 \pm 40$

$= \boxed{0 \text{ to } 80}$

7) P(First fail test happens on 30th test)

$P(x=30) = \text{geometpdf}(.025, 30) = \boxed{.012}$

8) P(first fail test happens after the 30th test)

$P(x>30) = P(x \geq 31) = 1 - P(x \leq 30)$

we don't want 30 | 31 we want

$= 1 - \text{geometcdf}(.025, 30)$

$= \boxed{.468}$

Nov 21-7:22 AM

I misspell words in average 5 per class meeting.

$\mu = 5$ (average 5); fixed interval (per class meeting)

1) $\mu = \boxed{5}$

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

3) $\sigma = \sqrt{\sigma^2} = \sqrt{5} \approx 2.236 \approx \boxed{2}$

4) Usual Range $\mu \pm 2\sigma = 5 \pm 2(2) = 5 \pm 4$

$\Rightarrow \boxed{1 \text{ To } 9}$

5) P(make $\boxed{\text{exactly } 4}$ Spelling errors in a class meeting)

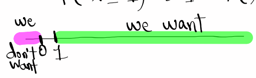
$P(x = 4) = \text{PoissonPdf}(5, 4) = \boxed{.175}$

6) P(make $\boxed{\text{at most } 8}$ Spelling errors in a class meeting)

$P(x \le 8) = \text{poissoncdf}(5, 8) = \boxed{.932}$

7) P(make $\boxed{\text{at least } 1}$ Spelling errors in a class meeting)

$P(x \ge 1) = 1 - P(x = 0)$



$= 1 - \text{Poissonpdf}(5, 0)$

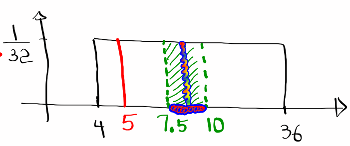
$= \boxed{.993}$

SG 17 ✓

Nov 21-7:32 AM

Consider a Uniform Prob. dist For all values From 4 To 36.

$36 - 4 \rightarrow 32$



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

line, Zero Area

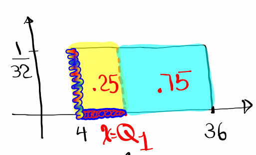
2) $P(7.5 < x < 10)$

$= (10 - 7.5) \cdot \frac{1}{32} = \frac{2.5}{32}$

$= \boxed{\frac{5}{64}}$

3) Find $x = Q_1$, Round To 1-decimal.

25% below, 75% above



$(x - 4) \cdot \frac{1}{32} = .25$

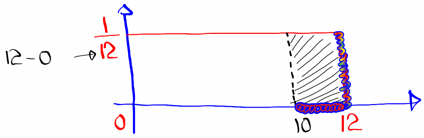
Multiply by 32, then Solve for x.

$x - 4 = 32(.25)$

$x - 4 = 8 \rightarrow \boxed{x = 12}$

Nov 21-7:44 AM

Wait time to get gas at the local Costco has uniform Prob. dist with the maximum wait time of 12 minutes.



1) P(Your wait time $\boxed{\text{exceeds } 10}$ minutes)

$P(x>10) = (12-10)\cdot\frac{1}{12} = \frac{2}{12} = \boxed{\frac{1}{6}}$

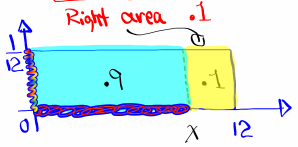
2) Find the $\overset{x}{\boxed{\text{wait time}}}$, round to whole minute, that separates the $\boxed{\text{top } 10\%}$ from the rest.

$(x-0)\cdot\frac{1}{12} = .9$

Multiply by 12, then solve for x.

$x - 0 = 12(.9)$

$x = 10.8$ $\quad x = 11$



10% chance that your wait time exceeds 11 minutes.

Nov 21-7:53 AM

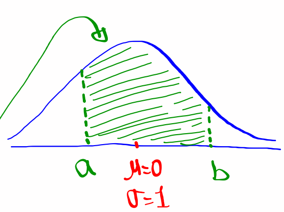
Standard Normal Prob. dist:

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

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

3) Mean = Mode = Median

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



$P(a < Z < b)$

How to find it:

$\boxed{\text{2nd}}$ $\boxed{\text{VARS}}$ $\boxed{\text{normalcdf(}}$ $L, U, \mu, \sigma)$

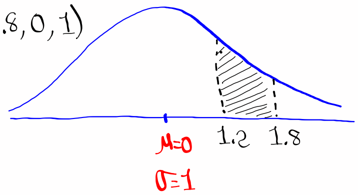
Drawing, labeling, Shading, and Full TI Command required.

Nov 21-8:04 AM

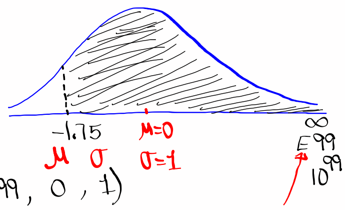
$P(1.2 < Z < 1.8)$

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

$= \boxed{.079} \approx 8\%$



$P(Z > -1.75)$



L U μ σ

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

(−)

2nd ,

$= \boxed{.9599} \approx \boxed{.960} \approx 96\%$

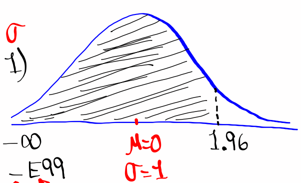
Nov 21-8:09 AM

$P(Z < 1.96)$

L U μ σ

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

$= \boxed{.975}$

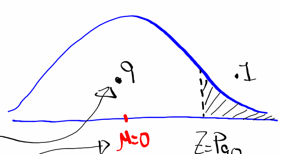


Now doing reverse:

Find $Z = P_{90}$, Round to 3-decimal Places.

90% below
Left Area
.9

10% above
Right Area
.1



$Z = \text{invNorm}(\text{Left Area}, \mu, \sigma)$

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

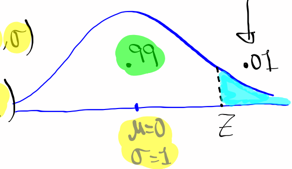
Nov 21-8:17 AM

Find a $\boxed{Z\text{-value}}$ round to 3-decimal places, that separates the top 1% from the rest.

$Z = \text{invNorm}(\text{Left Area}, \mu, \sigma)$

$= \text{invNorm}(.99, 0, 1)$

$= \boxed{2.326}$

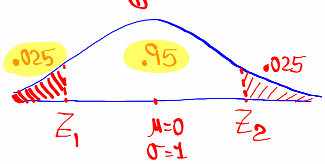


Nov 21-8:28 AM

Find two Z-values, Round to 3-decimal places, that separate the $\boxed{\text{middle } 95\%}$ from the rest.

$1 - .95 = .05$

$.05 \div 2 = .025$



$Z_1 = \text{invNorm}(.025, 0, 1)$

$= \boxed{-1.960}$

$Z_2 = \text{invNorm}(.975, 0, 1)$

$= \boxed{1.960}$

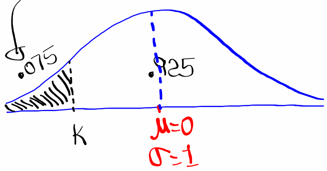
Nov 21-8:32 AM

find K such that $P(Z<K)=.075$. Round to 3-decimal places.

Left Area

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

$=\boxed{-1.440}$

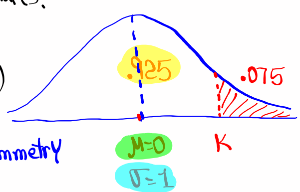


find K such that $P(Z>K)=.075$. Round to 3-decimal places.

Right Area

$K=\text{invNorm}(.925,0,1)$

$=\boxed{1.440}$ By Symmetry



SG 18 ✓

Nov 21-8:37 AM

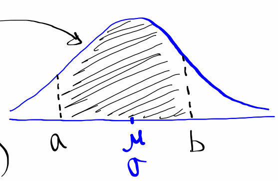
Normal Prob. dist.: SG 19

1) use x, $P(x=c)=0$
2) Graph is bell-shape, Symmetric with total Area 1.
3) Mean = Mode = Median
4) μ & σ are given in the problem.

$P(a<x<b)$

How to find it:

normalcdf(L,U,μ,σ)



$N(\mu,\sigma)$

Normal, Mean, Standard Deviation

Nov 21-9:04 AM

Given $N(74, 6)$

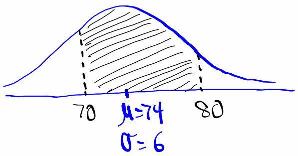
Normal Prob. Dist.

$\mu = 74$

$\sigma = 6$

$P(70 < x < 80)$

$= \text{normalcdf}(70, 80, 74, 6)$

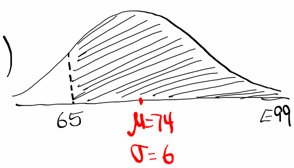


$= \boxed{.589} \approx 58.9\% \approx 59\%$

$P(x > 65)$

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

$= \text{normalcdf}(65, E99, 74, 6)$



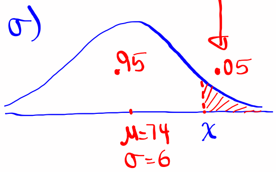
$= \boxed{.933}$

Nov 21-9:09 AM

Find $\boxed{x \text{ value}}$, Round to a whole number, that separates the $\boxed{\text{top } 5\%}$ from the rest.

$x = \text{invNorm}(\text{Left Area}, \mu, \sigma)$

$x = \text{invNorm}(.95, 74, 6)$



$= 83.869$

≈ 84

Nov 21-9:15 AM

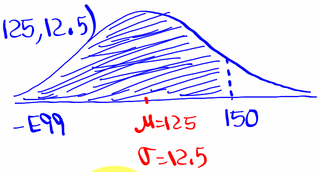
Consider a normal Prob. dist. with the mean of 125 and Standard deviation of 12.5.

$N(125, 12.5)$

1) Find $P(x < 150)$

$= \text{normalcdf}(-E99, 150, 125, 12.5)$

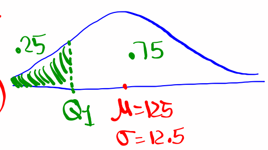
$= \boxed{.977}$



Find $x = Q_1$, Round to a whole #.

25% below

75% above



LA μ σ

$x = Q_1 = \text{invNorm}(.25, 125, 12.5)$

$= 116.569 \approx \boxed{117}$

Nov 21-9:20 AM

Salaries of nurses are normally dist with mean of \$6500 and standard deviation of \$500.

$N(6500, 500)$

If we randomly Select one nurse, find the Prob. that his/her Salary is below \$6000 $\boxed{\text{or}}$ above \$7000

x

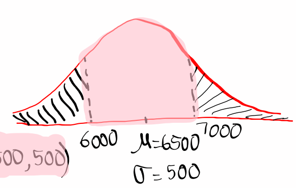
$x < 6000$

$x > 7000$

$P(x < 6000 \text{ OR } x > 7000)$

$= 1 - P(6000 < x < 7000)$

Total Area



$= 1 - \text{normalcdf}(6000, 7000, 6500, 500)$

$= \boxed{.317} \approx \boxed{32\%}$

Nov 21-9:27 AM

Find $\boxed{\text{a Salary}}$ (x), Round up to a whole #, that Separates the $\boxed{\text{top 2\%}}$ from the rest.

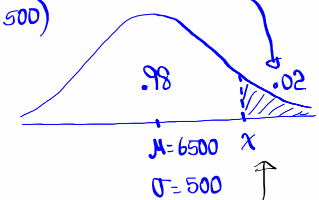
Right Area

$x = \text{invNorm}(.98, 6500, 500)$

$= 7526.874$

$= 7527$

\$7527



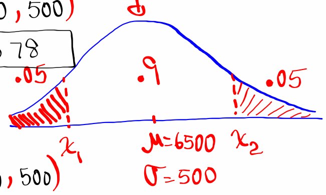
Nov 21-9:35 AM

Find two Salaries, Round to whole #, that Separate the $\boxed{\text{middle 90\%}}$ from the rest.

$x_1 = \text{invNorm}(.05, 6500, 500)$

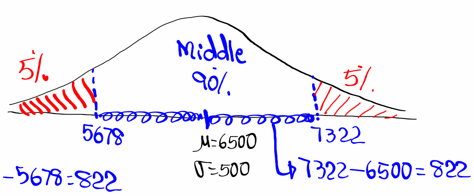
$\approx \boxed{5678}$

Left Area



$x_2 = \text{invNorm}(.95, 6500, 500)$

$\approx \boxed{7322}$



$6500 - 5678 = 822$

$7322 - 6500 = 822$

SG 20 ✓

Nov 21-9:39 AM