Math 110

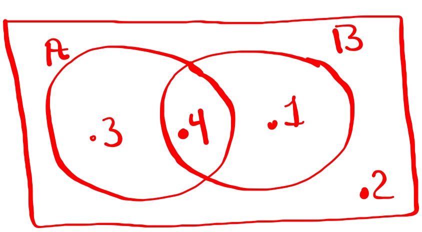
Winter 2021

Lecture 13

Class QZ 7

$P(A) = .7$ $P(B) = .5$ $P(A \text{ and } B) = .4$

1) Venn Diagram



2) $P(A \text{ or } B)$

$= .3 + .4 + .1 = \boxed{.8}$

3) $P(A|B)$

$= \frac{P(A \text{ and } B)}{P(B)} = \frac{.4}{.5} = \boxed{.8}$

Ch. 6 SG 19 – 22

Prob. dist with Continuous random Variable

- Uniform Prob. Dist. (watch the video)
- Standard Normal Dist.
- Normal dist.
- Central limit theorem
- Applications

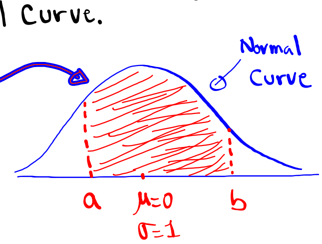
Standard Normal Prob. Dist:

1) we use z-variable, $P(z=c)=0$

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

3) Mean = Mode = Median 4) $\mu=0$, $\sigma=1$

5) $\boxed{P(a<z<b)}$ is the Corresponding area within the normal Curve.



$\boxed{2nd}\ \boxed{VARS}$

normalcdf(

with menu

Lower: a

Upper: b

$\mu:0$

$\sigma=1$

$\boxed{Paste}\ \boxed{Enter}$

No Menu

Lower, Upper, μ, σ

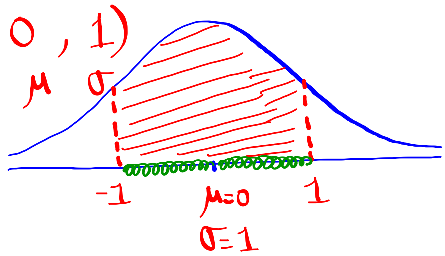
$\boxed{Enter}$

Find $P(-1 < Z < 1)$

= normalcdf(-1 , 1 , 0 , 1)

Lower upper μ σ

(−)



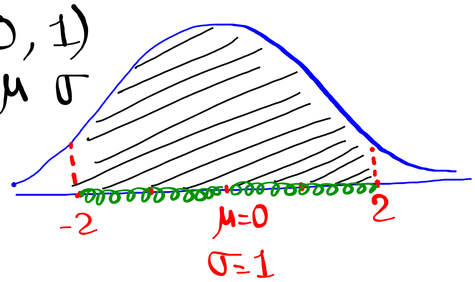
$= \boxed{.683} \approx 68\%$

Find $P(-2 < Z < 2)$

= normalcdf(-2, 2, 0, 1)

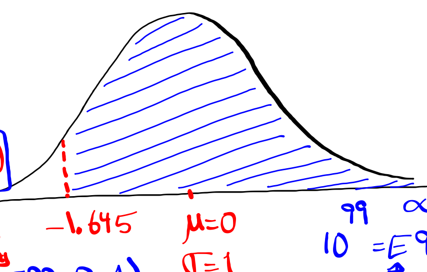
L U μ σ

(−)



$= \boxed{.954} \approx 95\%$

$P(Z > -1.645)$



$= \boxed{.950}$

(−)

2nd ,

= normalcdf(-1.645, E99, 0, 1)

L U μ σ

99 ∞

10 = E99

2nd ,

$P(Z < 1.96)$

L U μ σ

= normalcdf($-$E99, 1.96, 0, 1)

(−)

2nd ,

$= \boxed{.975}$

Find $Z = Q_3$

75% below it

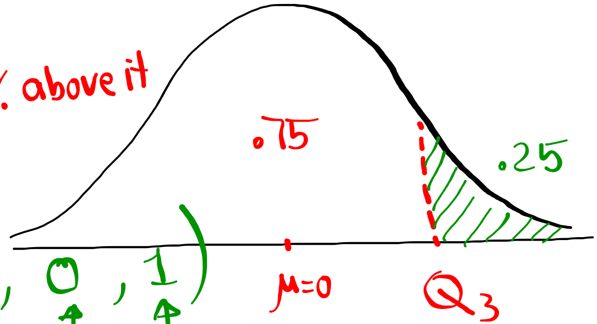
25% above it

2nd VARS

$Z = Q_3 = \text{invNorm}(.75, 0, 1)$

.75 — Left Area; 0 — μ; 1 — σ

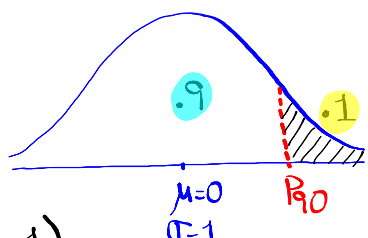
$= \boxed{.674}$



Find $Z = P_{90}$

90% below

10% above



$Z = P_{90} = \text{invNorm}(.9, 0, 1)$

.9 — Left Area; 0 — μ; 1 — σ

$= \boxed{1.282}$

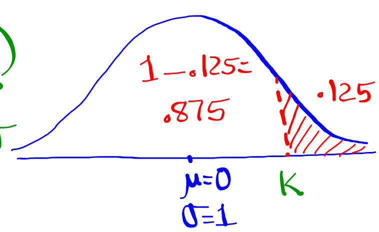
Find K such that $P(Z > K) = .125$

Right Area

$K = \text{invNorm}(.875, 0, 1)$

.875 — Left Area; 0 — μ; 1 — σ

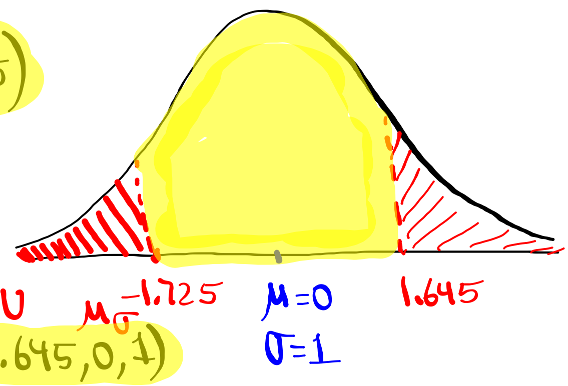
$= \boxed{1.150}$



Find $P(Z < -1.725 \text{ OR } Z > 1.645)$

$= 1 - P(-1.725 < Z < 1.645)$

↑ Total Area



L U μ σ

$= 1 - \text{normalcdf}(-1.725, 1.645, 0, 1)$

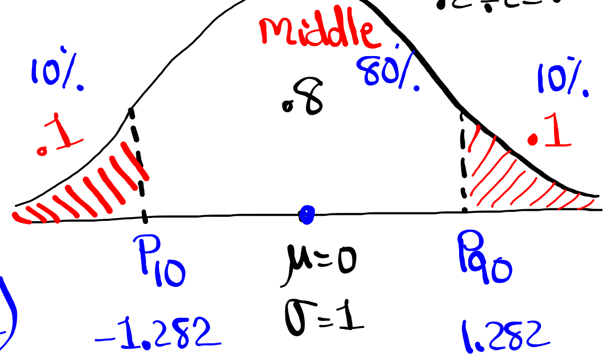
(−)

$= \boxed{.092}$

Find two Z-values that separate the middle 80% from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$



$P_{10} = \text{invNorm}(.1, 0, 1)$

$= \boxed{-1.282}$

$P_{90} = \text{invNorm}(.9, 0, 1)$

$= \boxed{1.282}$

Normal Prob. Dist. :

1) We use x- Variable, $P(x=c)=0$

2) Dist. is symmetric, Bell-shaped, with total area $=1$.

3) Mean = Mode = Median

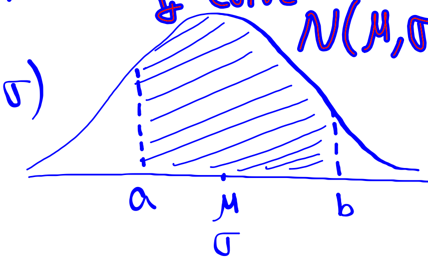
4) μ & σ are given in the problem.

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

normalcdf(a, b, μ, σ)

Normal Curve

$N(\mu, \sigma)$



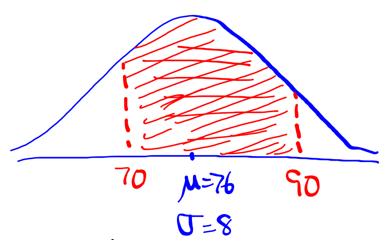
Given $N(76, 8)$

Normal μ σ

$P(70<x<90)$

$=$ normalcdf$(70, 90, 76, 8)$

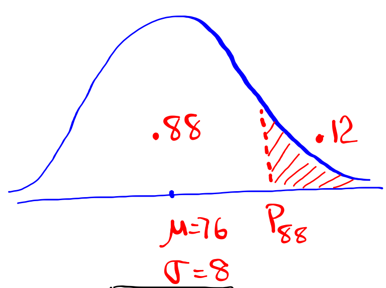
$= \boxed{.733}$



Find $x=P_{88}$, Round to a whole #.

88% Left

12% Right



$x=P_{88}=$ invNorm$(.88, 76, 8)$

Left Area μ σ

$=85.400 \approx \boxed{85}$

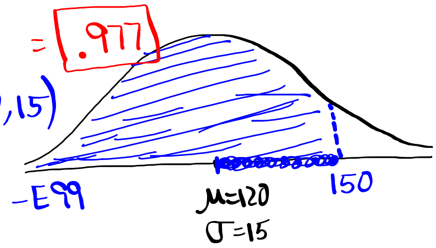
Consider a normal dist with the mean of 120 and standard deviation of 15.

$N(120, 15)$

$P(x < 150)$ $= \boxed{.977}$

$= \text{normalcdf}(-E99, 150, 120, 15)$

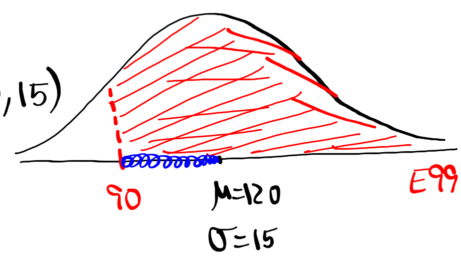
$(-)$ $\boxed{2nd}\boxed{,}$



$P(x > 90)$

$= \text{normalcdf}(90, E99, 120, 15)$

$= \boxed{.977}$

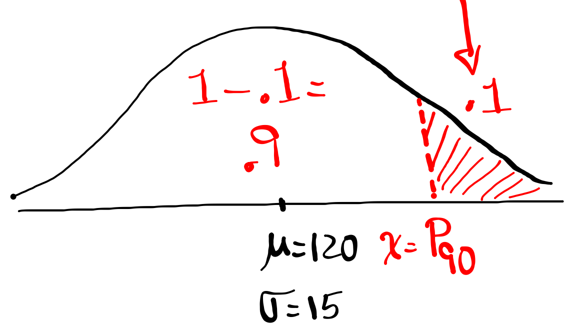


Find x value that separates the top 10% from the rest. Round to a whole #

$x = \text{invNorm}(.9, 120, 15)$

$= 139.223$

$\approx \boxed{139}$



Exam 1 results were normally distributed with the mean of 84 and standard deviation 9.

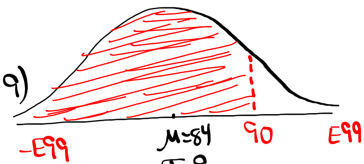
$N(84, 9)$

If I randomly select one exam, find the prob. that it is below 90.

$P(x < 90)$

$= \text{normalcdf}(-E99, 90, 84, 9)$

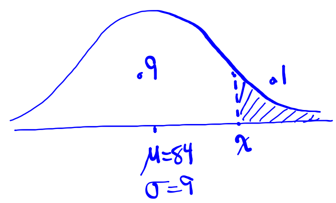
$= \boxed{.748}$



I want to give A to the top 10% of class. Find a test score that separate the top 10% from the rest.

$x = \text{invNorm}(.9, 84, 9)$

$\approx \boxed{96}$

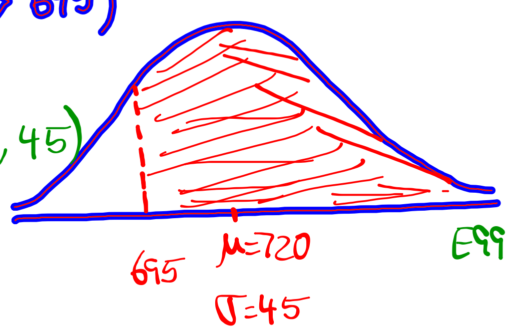


Credit scores are normally distributed with the mean of 720 and standard deviation of 45. $N(720, 45)$

If one application for a loan is randomly selected, find the prob. that its credit score is above 695. $P(x > 695)$

$= \text{normalcdf}(695, E99, 720, 45)$

$= \boxed{.711}$

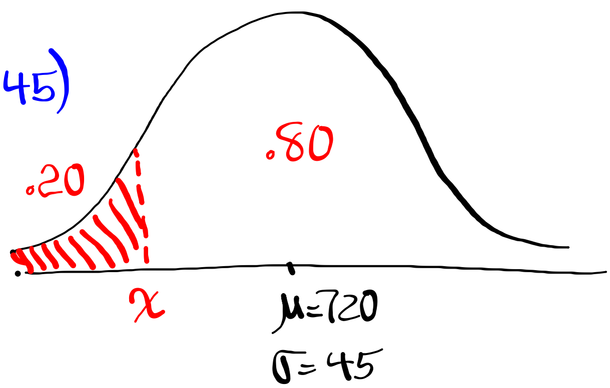


Cont.

A bank has decided to consider loan application for the top 80% of credit scores. So they are denying loan application for bottom 20%. Find the minimum credit score required.

$x = \text{invNorm}(.2, 720, 45)$

$\approx \boxed{682}$



Salary of nurses are normally distributed with the mean of \$6250 and standard deviation of \$400. $N(6250, 400)$

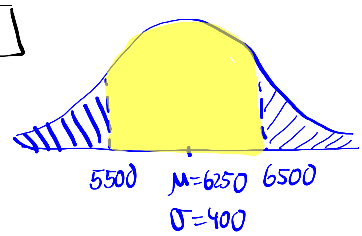
If one nurse is randomly selected, find the Prob. that his/her salary is below \$5500 or above \$6500.

$P(x<5500 \text{ or } x>6500)$

$= 1 - \text{normalcdf}(5500, 6500, 6250, 400)$

Total Area

$= \boxed{.296}$



Consider a geometric Prob. distribution with .2 prob. of success.

$P = \boxed{.2}$ $\quad q = 1-p = \boxed{.8}$ $\quad \mu = \frac{1}{p} = \boxed{5}$ $\quad \sigma^2 = \frac{q}{p^2} = \frac{.8}{.2^2} = 20$

$\sigma = \sqrt{\sigma^2} = 4.472$

$P(x=4 \text{ or } x=6) = P(x=4) + P(x=6)$
$= \text{geometpdf}(.2,4) + \text{geometpdf}(.2,6)$
$= \boxed{.168}$

P(first success occur after the 3rd trial)
$= P(x>3) = P(x \geq 4) = 1 - P(x \leq 3)$
$= 1 - \text{geometcdf}(.2,3) = \boxed{.512}$

Consider a Poisson Prob. dist with mean of 4.5.

Find

1) $P(x=4 \text{ or } x=5) = P(x=4) + P(x=5)$
$= \text{PoissonPdf}(4.5,4) + \text{PoissonPdf}(4.5,5)$
$= \boxed{.361}$

2) P(# successes is below 6)
$= P(x<6) = P(x \leq 5) = \text{PoissonCdf}(4.5,5)$
$= \boxed{.703}$