Statistics

Spring 2023

Lecture 10

Feb 19-8:47 AM

Class QZ 3

Use the chart below

x	P(x)
2	.1
4	.25
6	.3
8	.25
10	.1

1) $P(X=10)$

$=1-[.1+.25+.3+.25]=.1$

2) Find

$\mu = 6$ ✓

$\sigma = 2.280 = 2$ ✓ } Round to whole #

$\sigma^2 = \frac{26}{5}$ ✓ } Reduced fraction

X → L1 List

P(x) → L2 Freq List

1-Var Stats L1, L2 enter

VARS

5: Statistics | 4: σ_x

χ^2 | MATH | 1: ▶Frac

Enter

SG 18 & 19

Please refresh your browser, get the latest SG 18 & SG 19.

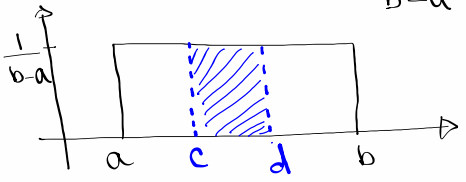
Apr 11-9:00 PM

Working with Continuous random Variable and prob. dist.: SG 18

Uniform Prob. dist.

Let x be a Continuous random variable for all values from a to b.

Graph is rectangular with length from a to b and width of $\frac{1}{b-a}$

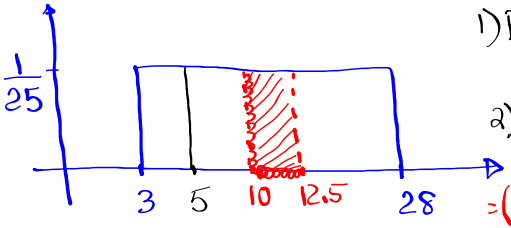


$P(x=c)=0$ → Line → Zero Area.

$P(c<x<d)=(d-c)\cdot\frac{1}{b-a}$

Apr 18-6:55 PM

Consider a Uniform Prob. dist. for all values from 3 to 28.



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

2) $P(10<x<12.5)$

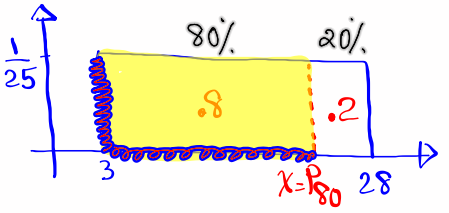
$=(12.5-10)\cdot\frac{1}{25}$

$=2.5\cdot\frac{1}{25}=.1$

3) find $x=P_{80}$

80% below

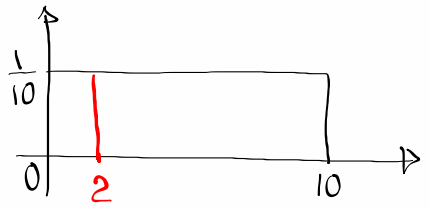
20% above



$(x-3)\cdot\frac{1}{25}=.8$ $\quad x-3=25(.8)$ $\quad x=23$

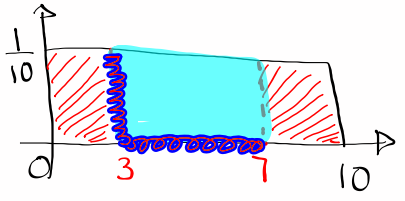
Apr 18-7:00 PM

wait time at express lane at local grocery store is less than 10 minutes and has a uniform Prob. dist.



1) $P(x=2)=0$

2) $P(x<3 \text{ or } x>7)$



$= 1 - P(3<x<7)$ ← Total Prob.

$= 1 - (7-3)\cdot\frac{1}{10} = 1 - \frac{4}{10} = \frac{6}{10} = \frac{3}{5}$

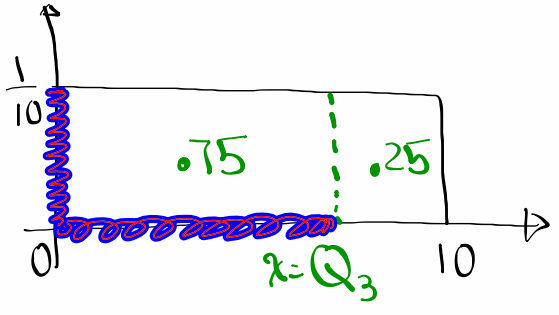
$= .6$

Apr 18-7:06 PM

3) Find $x = Q_3$.

75% below

25% above



$(x-0)\cdot\frac{1}{10} = .75$

$x = 10(.75)$

$x = 7.5$

Apr 18-7:11 PM

Standard Normal Prob. dist

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

2) Graph is Symmetric, Bell-Shape, with total area 1.

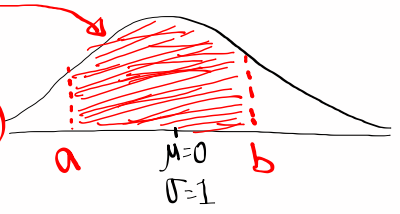
3) Mean = Mode = Median

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

5) $P(a<Z<b)$ is the shaded area below

2nd VARS

normalcdf(L, U, μ, σ)



Apr 18-7:14 PM

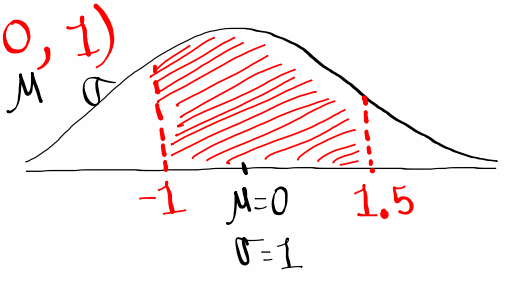
$P(-1<Z<1.5)$

= normalcdf(−1, 1.5, 0, 1)

L U μ σ

(−) 7

= .775



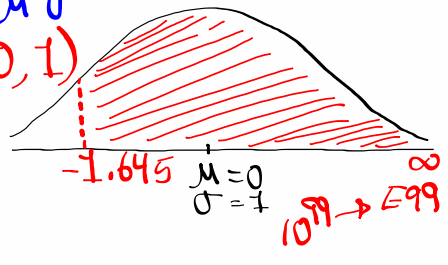
$P(Z>-1.645)$

= normalcdf(−1.645, E99, 0, 1)

L U μ σ

(−) 7 2nd 9

= .950

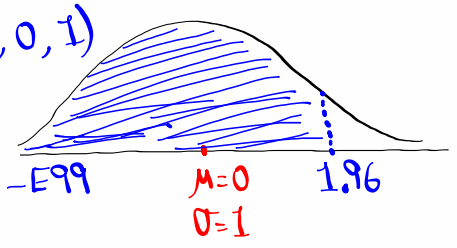


Apr 18-7:19 PM

$P(Z < 1.96)$

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

2nd [ ]



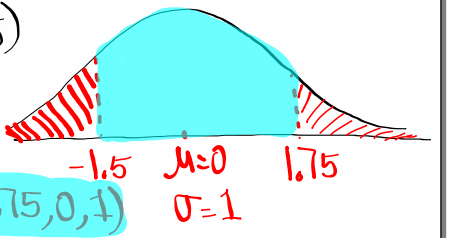
= .975

$P(Z < -1.5$ OR $Z > 1.75)$

= 1 − P(−1.5 < Z < 1.75)

Total Prob.

= 1 − normalcdf(−1.5, 1.75, 0, 1)



= .107

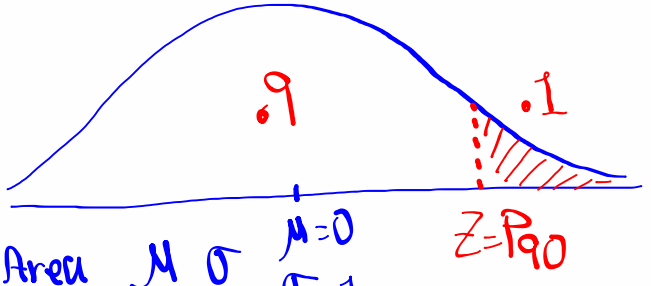
Apr 18-7:26 PM

Now doing reverse:

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

90% below
10% above

2nd [VARS]



Z = invNorm(LeftArea, μ, σ)

Z = invNorm(.9 , 0 , 1)

= 1.282

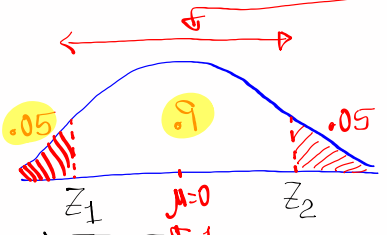
SG 18✓

Apr 18-7:34 PM

Find two z-values that separate the middle 90% from the rest. Round to 3-decimal places.

$1 - .9 = .1$

$.1 \div 2 = .05$



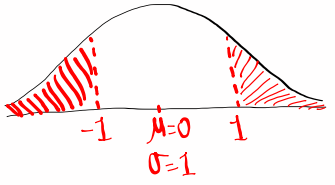
$z_1 = \text{invNorm}(.05, 0, 1) = \boxed{-1.645}$ $\sigma=1$

$z_2 = \text{invNorm}(.95, 0, 1) = \boxed{1.645}$

$P(z<-1$ **and** $z>1)$

M.E.
No overlap

$= \boxed{0}$



Apr 18-7:39 PM

Normal Prob. dist.: SG 19

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

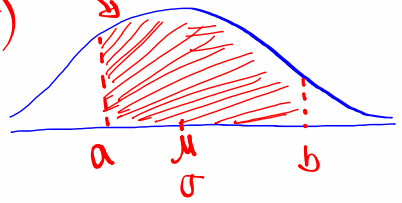
2) Graph is Symmetric, bell-shape with total area = 1.

3) Mean = Mode = Median

4) μ & σ are both given in the Problem.

5) $\boxed{P(a<x<b)}$ is the shaded area below

normalcdf(L, U, μ, σ)



$N(\mu, \sigma)$ ← Normal

Apr 18-7:59 PM

Given $N(78, 10)$ — Normal Prob. Dist. — μ, σ

Find $P(70 < x < 95)$

normalcdf(L, U, μ, σ)

normalcdf(70, 95, 78, 10)

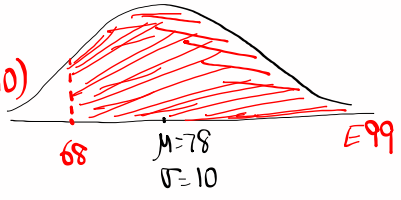
$= .744$

Find $P(x > 68)$

normalcdf(68, E99, 78, 10)

2nd [9]

$= .841$



Apr 18-8:04 PM

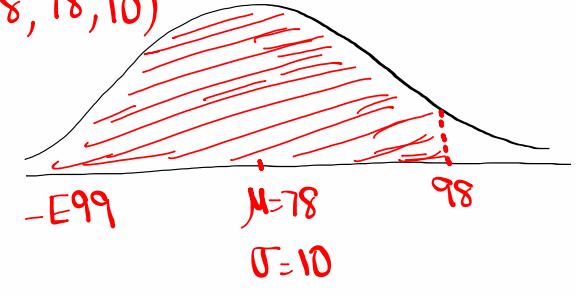
3) $P(x < 98)$

normalcdf(L, U, μ, σ)

normalcdf((-)E99, 98, 78, 10)

(-) 2nd [9]

$= .977$



4) Find $x = Q_3$, Round to a whole #

Left Area — 75% below — 25% above

$x = Q_3 = \text{invNorm}(.75, 78, 10) = 84.745 \approx 85$

Apr 18-8:12 PM

Exam Scores are normally dist. with the mean of 84 and standard deviation of 7.

$N(84,7)$

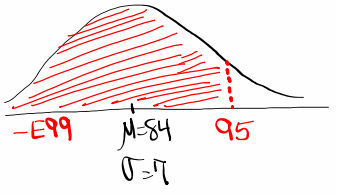
If we randomly select one exam, find the Prop. tha Score (x) is

a) below 95.

$P(x<95)$

=normalcdf(-E99,95,84,7)

= .942

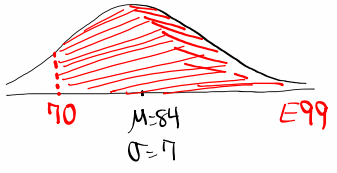


b) above 70

$P(x>70)$

=normalcdf(70,E99,84,7)

= .977



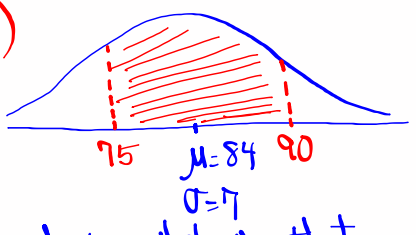
Apr 18-8:18 PM

c) between 75 and 90.

$P(75<x<90)$

=normalcdf(75,90,84,7)

= .705

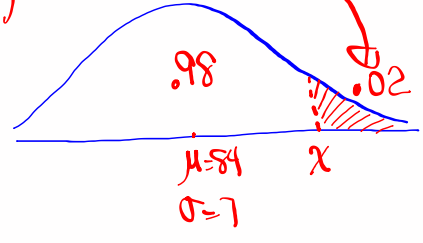


Find exam Score, round to whole #, that Separates the top 2% from the rest.

x=invNorm(.98,84,7)

↑ Left Area

= 98.376 ≈ 98



Apr 18-8:27 PM

Ages of nurses are normally dist. with the mean 38 yrs and stand. dev. of 8 yrs.

$N(38, 8)$

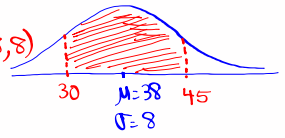
If we randomly select one nurse, find the prob. that his/her age (x) is

a) between 30 and 45 yrs.

$P(30 < x < 45)$

= normalcdf(30, 45, 38, 8)

= .651 ≈ 65%

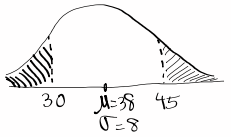


b) below 30 or above 45.

$P(x < 30 \text{ OR } x > 45)$

$= 1 - P(30 < x < 45)$

$= 1 - .651 = .349$



c) below 30 and above 45.

$P(x < 30 \text{ and } x > 45) = 0$

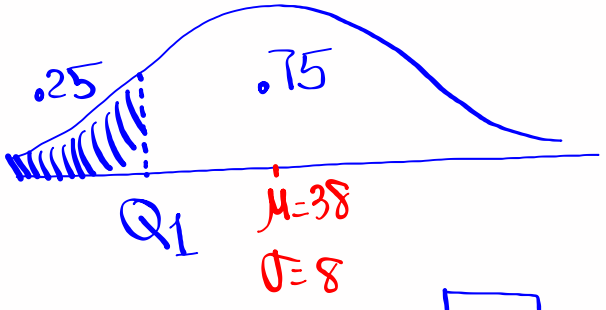
M.E.E.

Apr 18-8:33 PM

Find Q_1 for ages of nurses. Round to a whole #.

25% below

75% above



$Q_1 = \text{invNorm}(.25, 38, 8) = 32.604 \approx 33$

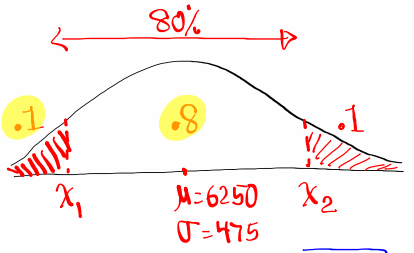
Apr 18-8:41 PM

Salaries of nurses are normally dist. with the mean of \$6250/mo. and standard dev. of \$475/mo. $N(6250, 475)$

Find two Salaries that Separate the middle 80% from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$



$x_1 = \text{invNorm}(.1, 6250, 475) = 5641.263 \approx \boxed{5641}$

$x_2 = \text{invNorm}(.9, 6250, 475) = 6858.737 \approx \boxed{6859}$

SG 19 ✓

Apr 18-8:45 PM

Clear all lists.

Store 2, 4, 6, and 8 in L1

Use [1-Var Stats] with L1 only to find

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

VARS
5: Statistics
4: $\sigma_{\bar{x}}$ x^2
Enter

Take all Samples of Size 2 with replacement from this list

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

Now find $\bar{x}$ of each Sample

2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

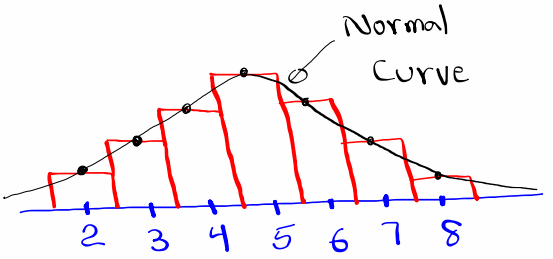
16 means

$\bar{x}$	$P(\bar{x})$
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

Apr 18-8:54 PM

$\bar{x}$	$P(\bar{x})$
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

Draw Prob. dist. histogram



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

Use [1-Var Stats] with L2 list & L3 FreqList

$\mu = \bar{x} = 5$ $\sigma = \sigma_{\bar{x}} = 1.581$ $\sigma^2 = \sigma_{\bar{x}}^2 = 2.5 = \frac{5}{2}$

You can start SG 20

Apr 18-9:03 PM

Class QZ 4

Consider a binomial prob. dist. with $n = 250$ & $p = .6$

1) Find $\mu = np = 250(.6) = 150$

2) Find $P(x = 165) = \text{binompdf}(250, .6, 165) = .008$

3) Find $P(x \leq 170) = \text{binomcdf}(250, .6, 170) = .996$

Apr 18-9:09 PM