Statistics

Lecture 11

Feb 19-8:47 AM

SG 17-20

Prob. dist. with Continuous Variable

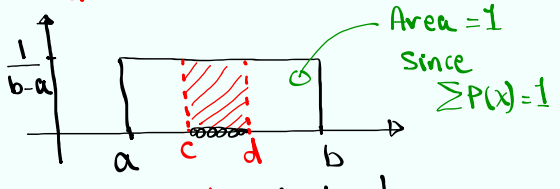
Measureable

1) Uniform Prob. dist:

Let x be a continuous random variable for all values from a to b with Prob. dist $P(x)$.

a) $P(x=c)=0$

b) Graph of prob. dist. is a rectangular shape as displayed below

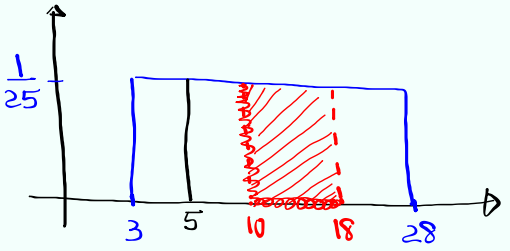


c) $P(c<x<d) = (d-c)\cdot\frac{1}{b-a}$

Jul 16-4:31 PM

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

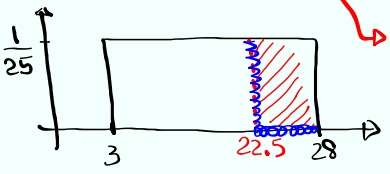
Width $= \frac{1}{b-a} = \frac{1}{28-3} = \frac{1}{25}$



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

2) $P(10 < x < 18) = (18-10) \cdot \frac{1}{25} = \frac{8}{25} = .32$

3) $P(x > 22.5)$

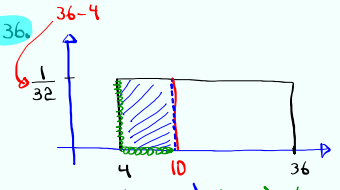


$= (28-22.5) \cdot \frac{1}{25} = \frac{5.5}{25} = \frac{11}{50} = .22$

Jul 16-4:38 PM

Consider a uniform Prob. dist. for all values from 4 to 36.

1) Draw & label.



2) $P(x=10) = 0$ (Line)

3) $P(x < 10) = (10-4) \cdot \frac{1}{32} = \frac{6}{32} = \frac{3}{16}$

4) Find $x = Q_3$ (75% below, 25% above)

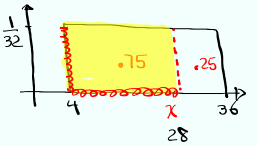
$(x-4) \cdot \frac{1}{32} = .75$

Multiply by 32

$x - 4 = 32(.75)$

$x = 4 + 32(.75)$

$x = 28$

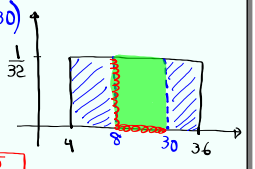


5) Find $P(x<8 \text{ OR } x>30)$

$= 1 - P(8 < x < 30)$ (Total Prob. = 1)

$= 1 - (30-8) \cdot \frac{1}{32}$

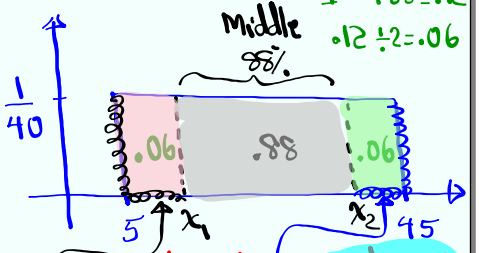
$= 1 - \frac{22}{32} = \frac{10}{32} = \frac{5}{16}$



Jul 16-4:44 PM

Consider a Uniform Prob. dist. for all values from 5 to 45.

1) Draw and label.



$1 - .88 = .12$

$.12 \div 2 = .06$

2) Find two values x_1 & x_2 that separate the middle 88% from the rest.

$(x_1 - 5) \cdot \frac{1}{40} = .06$

$x_1 - 5 = 40(.06)$

$x_1 = 5 + 40(.06)$

$\boxed{x_1 = 7.4}$

$(45 - x_2) \cdot \frac{1}{40} = .06$

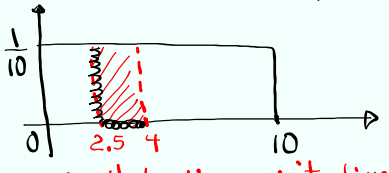
$45 - x_2 = 40(.06)$

$45 - 40(.06) = x_2$

$\boxed{x_2 = 42.6}$

Jul 16-4:57 PM

Arriving time for a local bus has a uniform Prob. dist. and it stops every 10 mins.

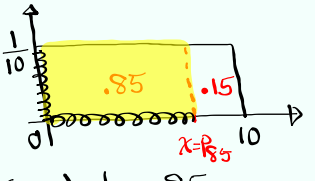


1) What is the prob. that your wait time is between 2.5 to 4 minutes?

$P(2.5 < x < 4) = (4 - 2.5) \cdot \frac{1}{10} = \frac{1.5}{10} = \frac{15}{100} = \boxed{.15}$

2) Find $x = P_{85}$

85% below, 15% above



$(x - 0) \cdot \frac{1}{10} = .85$

$x = 10(.85)$

$\boxed{x = 8.5}$ minutes

SG 17 Pages 1 & 2

Jul 16-5:05 PM

Standard Normal Prob. dist

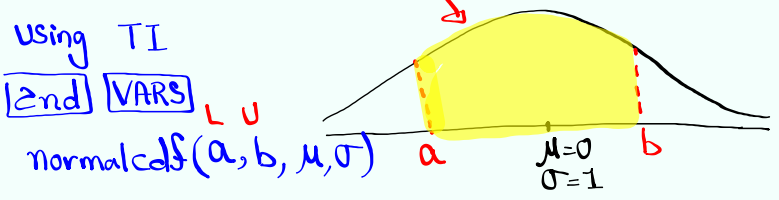
1) use Z - Variable, $P(Z=c)=0$

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

3) Mean = Mode = Median

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

5) $P(a<Z<b)$ is the Corresponding area within the bell-Shape graph.



Using TI

2nd VARS

L U

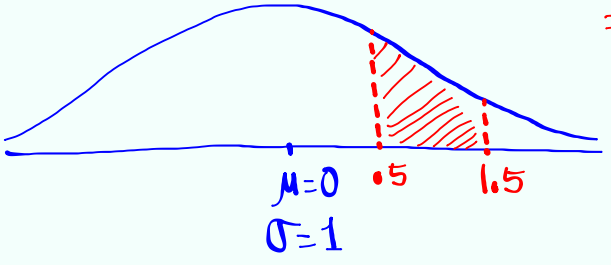
normalcdf(a, b, μ, σ)

Jul 16-5:14 PM

Find $P(.5<Z<1.5)$

= normalcdf(.5, 1.5, 0, 1)

= .242

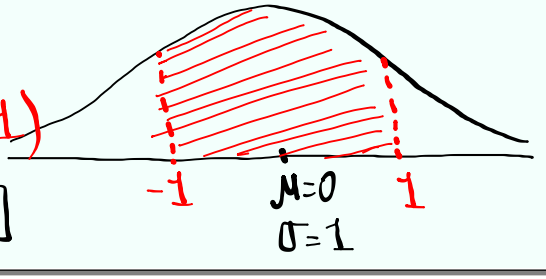


Find $P(-1<Z<1)$

= normalcdf(−1, 1, 0, 1)

(−)

= .683



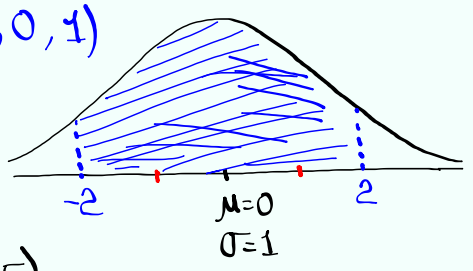
Jul 16-5:21 PM

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

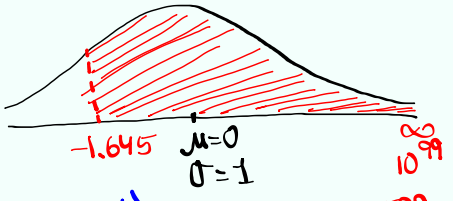
= normalcdf(−2, 2, 0, 1)

(−)

= .954



Find $P(Z > -1.645)$



normalcdf(−1.645, E99, 0, 1)

(−) 2nd 9

2nd 9

7

= .950

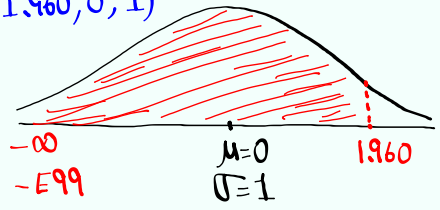
Jul 16-5:27 PM

Find $P(Z < 1.960)$

= normalcdf(−E99, 1.960, 0, 1)

(−) 2nd 9

= .975

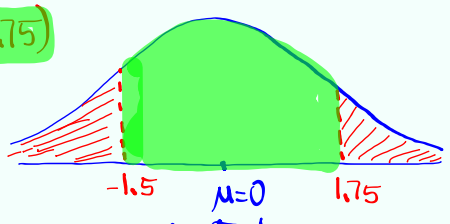


Find $P(Z < -1.5 \text{ OR } Z > 1.75)$

= 1 − P(−1.5 < Z < 1.75)

Total Area

(−)



= 1 − normalcdf(−1.5, 1.75, 0, 1)

= .107

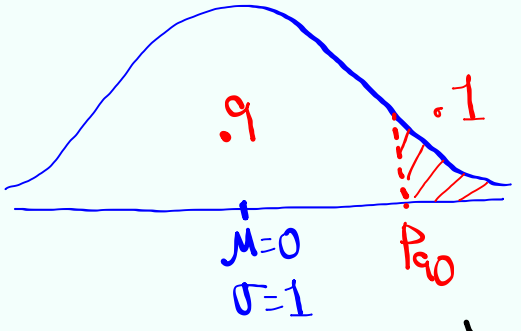
Jul 16-5:35 PM

Doing Reverse

Find $z = P_{90}$

90% below

10% above



2nd VARS invNorm(.9 , 0 , 1)

↑ Left Area, μ, σ

= 1.282

Jul 16-5:43 PM

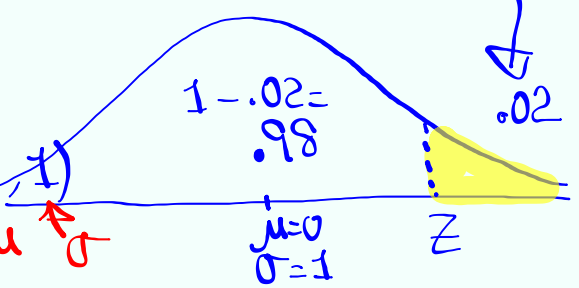
Find a z-Value, Round to 3-decimal places, that Separates the top 2% from the rest.

Left Area

z=invNorm(.98, 0, 1)

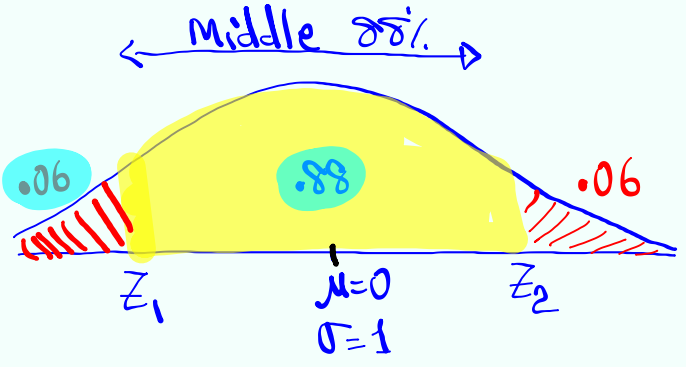
μ σ

= 2.054 ✓



Jul 16-5:47 PM

Find two Z-values, round to 3-dec. places, that separate the middle 88% from the rest.



$1 - .88 = .12$

$.12 \div 2 = .06$

SG 17

$Z_1 = P_6 = \text{invNorm}(.06, 0, 1) = \boxed{-1.555}$

$Z_2 = P_{94} = \text{invNorm}(.94, 0, 1) = \boxed{1.555}$

Jul 16-6:01 PM

Normal Prob. dist.: SG 18

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

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

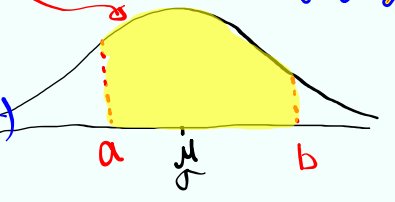
3) Mean = Mode = Median

4) μ & σ are given in the Problem

5) $P(a<x<b)$ is the Corresponding area within the graph $N(\mu,\sigma)$

use TI Command

normalcdf(a, b, μ, σ)



Jul 16-6:07 PM

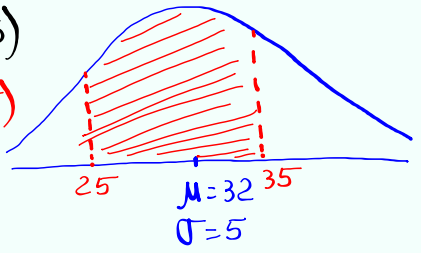
Given $N(32, 5)$ — $\sigma = 5$, $\mu = 32$

Normal Prob. Dist.

Find $P(25 < x < 35)$

= normalcdf(25, 35, 32, 5)

= .645

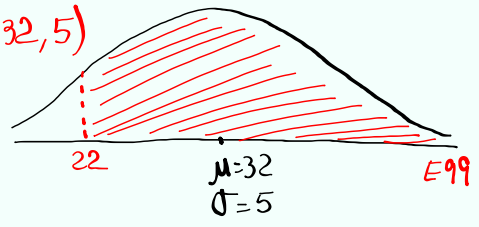


Find $P(x > 22)$

= normalcdf(22, E99, 32, 5)

= .977

2nd [,]



Jul 16-6:13 PM

Consider a normal Prob. dist. with the mean of 82 and standard deviation of 10

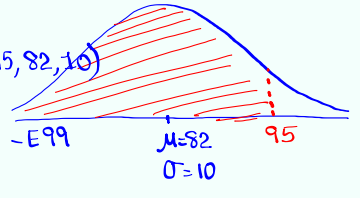
$N(82, 10)$

Find $P(x < 95)$

= normalcdf(−E99, 95, 82, 10)

(−) 2nd [,]

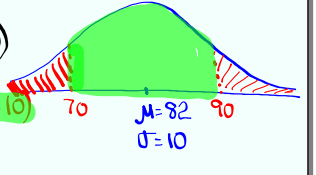
= .903



$P(x < 70 \text{ OR } x > 90)$

= 1 − normalcdf(70, 90, 82, 10)

= .327

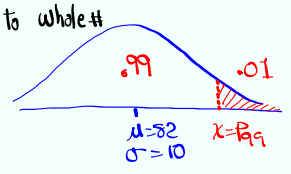


Find $x = P_{99}$, Round to whole #

x = invNorm(.99, 82, 10)

≈ 105.263

≈ 105



Jul 16-6:19 PM

Ages of students at colleges are normally dist. with mean of 31.5 yrs and standard deviation of 6.5 yrs.

$N(31.5, 6.5)$

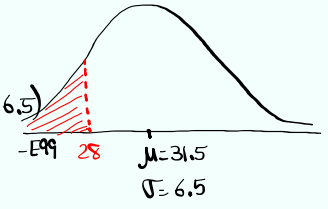
If we randomly select one student, find the prob. that his or her age is

a) below 28 yrs.

$P(x < 28)$

=normalcdf(-E99, 28, 31.5, 6.5)

= .295

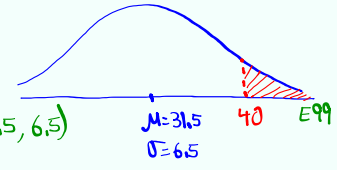


b) more than 40 yrs.

$P(x > 40)$

=normalcdf(40, E99, 31.5, 6.5)

= .095

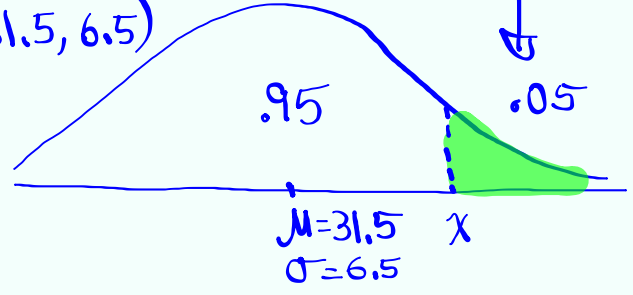


Jul 16-6:31 PM

Find an age that separates the top 5% from the rest. Round to 1-dec.

$x = invNorm(.95, 31.5, 6.5)$

$\approx$ 42.2 yrs



Jul 16-6:40 PM

Speed of Cars on the Street next to Campus are normally dist. with mean of 44 mph and Standard dev. of 8 mph.

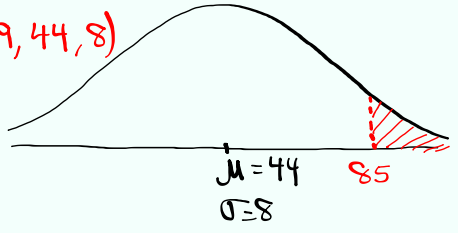
$N(44, 8)$

If one car is randomly Selected, find the Prob. that its speed is more than 85 mph.

$P(x > 85)$

= normalcdf(85, E99, 44, 8)

= 1.490×10^{-7}



Jul 16-6:43 PM

Find two speeds, rounded to whole #, that Separate the middle 90% from the rest.

x_1 = invNorm(.05, 44, 8)

= 31

x_2 = invNorm(.95, 44, 8) = 57

SG 18 ✓

Jul 16-6:49 PM

Consider a binomial Prob. dist with $n = 250$ & $P = .6$

1) $q = 1 - P = \boxed{.4}$

2) $\mu = np = 250(.6) = 150$

3) $\sigma^2 = npq = 250(.6)(.4) = \boxed{60}$

4) $\sigma = \sqrt{\sigma^2} = \sqrt{60} \approx 7.746 \approx \boxed{8}$

5) Usual Range (95%) $= \mu \pm 2\sigma = 150 \pm 2(8)$
$= 150 \pm 16$
$= \boxed{134 \text{ To } 166}$

6) $P(134 \le x \le 166) = \text{binomcdf}(250, .6, 166) -$
$\text{binomcdf}(250, .6, 133)$
Reduce by 1
$= \boxed{.967}$

Jul 16-6:56 PM

Pay me \$10, draw a Card from a full-deck
if you have a face Card, I give You \$50.
Is this a good game for me?

Net	P(Net)	
10 − 50 (40)	12/52	Face
10 − 0	40/52	Face

Net → L1
P(Net) → L2
E.V. $\mu = \bar{x}$ −1.54

Bad game for the house,
good game for player.

with \$40 return, house makes \$.77
Per play.

Jul 16-7:02 PM