Statistics

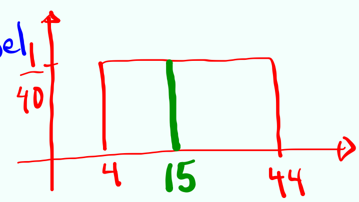
Lecture 10

Feb 19-8:47 AM

(SG 17)

Consider a Uniform Prob. dist. for all Values from 4 to 44.

1) Draw & label



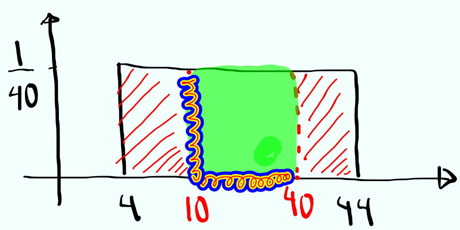
2) Find $P(x=15)$

Line

$=\boxed{0}$

3) Find $P(x<10 \text{ or } x>40) = 1 - P(10<x<40)$

↑ Total Area (Prob.)



$= 1 - (40-10)\cdot\frac{1}{40}$

$= 1 - \frac{30}{40} = \frac{10}{40} = \boxed{\frac{1}{4}}$

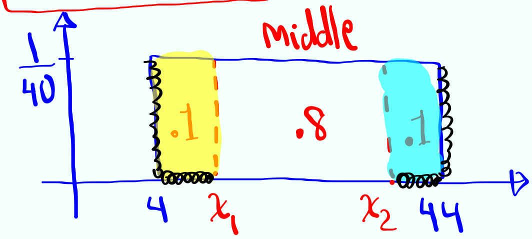
Jan 27-4:37 PM

4) Find two values that separate the middle 80% from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$

distance = Right - Left



$(x_1 - 4) \cdot \frac{1}{40} = .1$

$x_1 - 4 = 40(.1)$

$x_1 - 4 = 4$

$\boxed{x_1 = 8}$

$(44 - x_2) \cdot \frac{1}{40} = .1$

$44 - x_2 = 40(.1)$

$44 - x_2 = 4$

$44 - 4 = x_2$

$\boxed{x_2 = 40}$

Jan 27-4:43 PM

Standard Normal Prob. Dist.

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

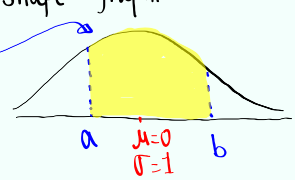
2) Dist. is symmetric, bell-shaped with total area equal to 1.

3) Mean, mode, median are the same.

4) Mean $\mu = 0$, Standard deviation $\sigma = 1$

$N(0,1)$

$P(a < Z < b)$ is the corresponding area on the bell-shape graph.



How to find it:

[2nd] [VARS]

[normalcdf(]

Lower : a

Upper : b

$\mu = 0$

$\sigma = 1$

[Paste] [Enter]

Jan 27-4:50 PM

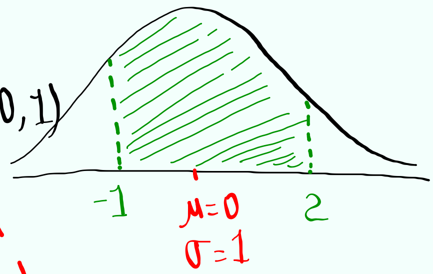
$P(-1 < Z < 2)$

[2nd] [VARS]

normalcdf(-1, 2, 0, 1)

(−)

= .819



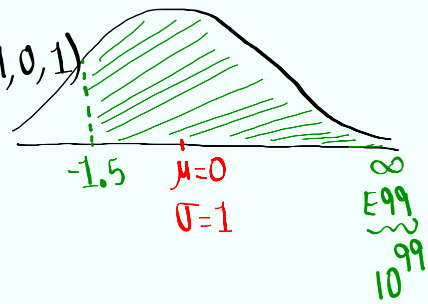
$P(Z > -1.5)$

= normalcdf(-1.5, E99, 0, 1)

[2nd] [,]

[7]

= .933



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$P(Z < 1.645)$

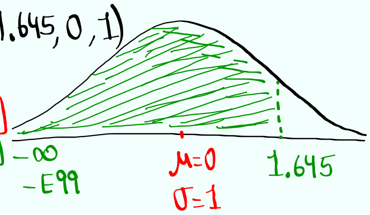
= normalcdf(-E99, 1.645, 0, 1)

(−)

[2nd] [,]

[7]

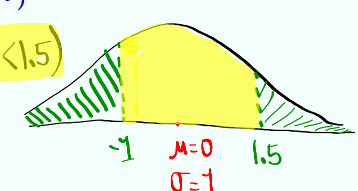
= .950



$P(Z < -1 \text{ or } Z > 1.5)$

= 1 − P(-1 < Z < 1.5)

Total Area



= 1 − normalcdf(-1, 1.5, 0, 1)

= .225

$P(Z < -1 \text{ and } Z > 1.5)$ = 0

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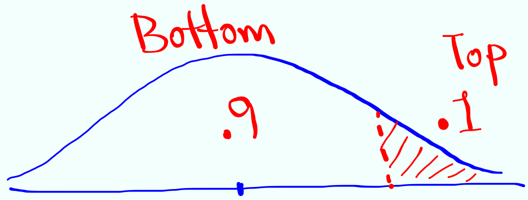
Doing reverse: Find a z-Value that separates the top 10% from the rest.

$1 - .1 = .9$



$\mu = 0$

$\sigma = 1$

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

(2nd) (VARS)

↑ left Area, ↑ μ, σ

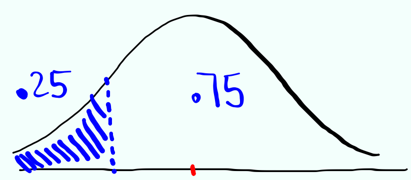
= **1.282**

Jan 27-5:12 PM

Find $z = Q_1$

25% below — Left Area .25

75% above — Right area .75



$= \text{invNorm}(.25, 0, 1) = $ **−.674**

↑ Left Area, μ, σ

$Q_3 = .674$ by Symmetry

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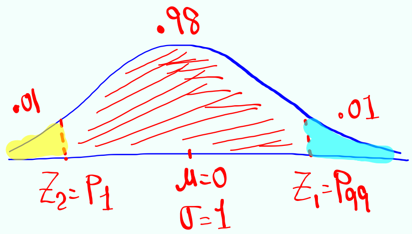
Find two Z-Values that Separate the middle 98% from the rest.

$1 - .98 = .02$

$.02 \div 2 = .01$



$Z_1 = P_{99} = \text{invNorm}(.99, 0, 1) = \boxed{2.326}$

↑ Left Area

$\boxed{Z_2 = P_1 = -2.326}$ Symmetry

SG 17 ✓

Jan 27-5:22 PM

Normal Prob. dist: (SG 18)

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

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

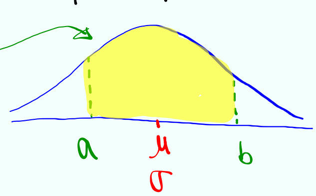
3) Mean, mode, median are the same.

4) Mean μ and standard deviation σ are given in the problem.

$N(\mu, \sigma)$

$P(a < x < b)$ is the corresponding area within the bell-shape graph.

Use normalcdf to find it.



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Given $N(82, 5)$

N ← Normal Prob. Dist.

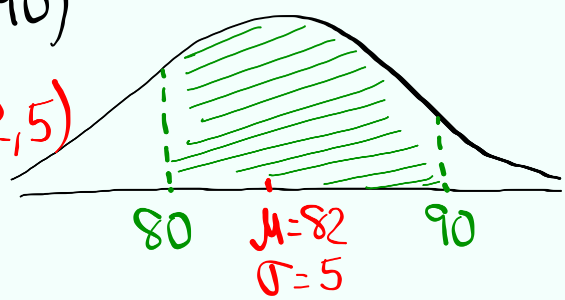
82 ← μ

5 ← σ

find $P(80 < x < 90)$

$= \text{normalcdf}(80, 90, 82, 5)$

$= \boxed{.601}$



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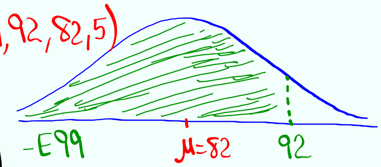
$P(x < 92)$

$= \text{normalcdf}(-E99, 92, 82, 5)$

(−) [2nd] [,] [7]



$= \boxed{.977}$

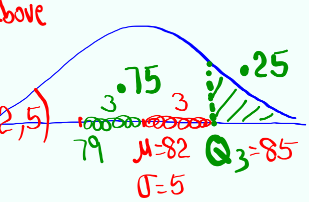
find $x = Q_3$, Round to whole #.

75% below, 25% above

$x = Q_3 = \text{invNorm}(.75, 82, 5)$

$= 85.372$

$\approx \boxed{85}$



Can you guess Q1? 79

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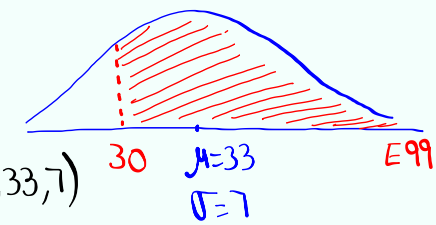
Ages of College Students has a normal dist. with mean of 33 yrs and Standard deviation of 7 yrs. $N(33,7)$

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

a) more than 30 yrs.
>30

$P(x>30)$



$=$ normalcdf$(30, E99, 33, 7)$

$=$ **.666**

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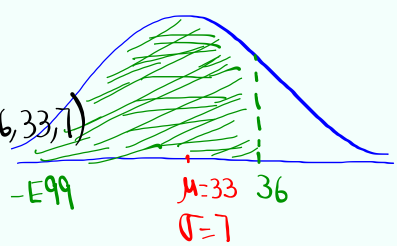
b) less than 36 yrs.

$P(x<36) =$

normalcdf$(-E99, 36, 33, 7)$

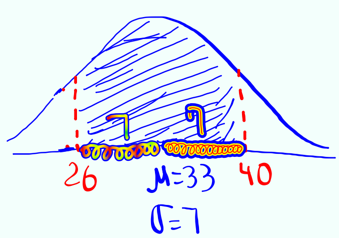


$=$ **.666**

c) between 26 and 40.

$P(26<x<40)$

$=$ normalcdf$(26, 40, 33, 7)$



$=$ **.683** $\approx 68\%$ ← Empirical Rule 68% Range

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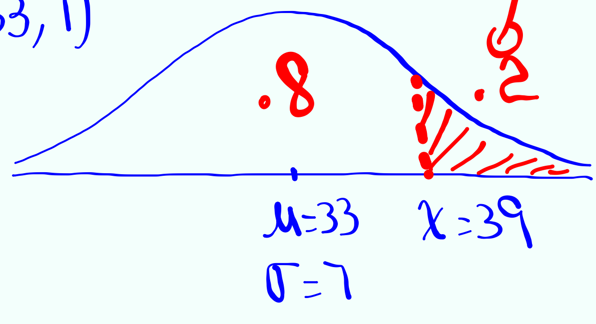
Find the age, rounded to whole #, that separates the top 20% from the rest.

$x = \text{invNorm}(.8, 33, 7)$

$= 38.891$

$\approx \boxed{39}$



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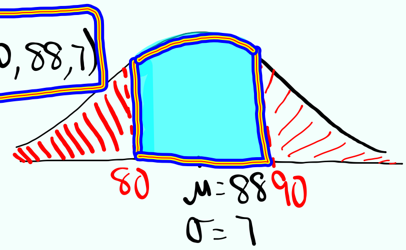
Exam Scores are normally dist. with mean of 88 and Standard dev. of 7. $N(88, 7)$

if we randomly Select one exam, find the prob. that Score (x) is below 80 or above 90.

$P(x < 80 \text{ OR } x > 90)$

$= 1 - \text{normalcdf}(80, 90, 88, 7)$

$= \boxed{.514}$



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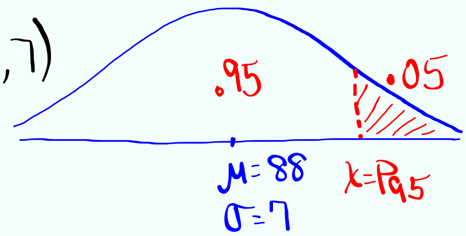
Find $x = P_{95}$, Round to whole #.

95% below — 5% above

$x = \text{invNorm}(.95, 88, 7)$

$= 99.514$

$\approx \boxed{100}$



SG 18

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Consider the Population of 2, 4, 6, and 8.

Clear all lists

Reset all lists

Store data in L1

Use [1-Var Stats] to find

$\mu = \bar{x} = 5$

$\sigma = \sigma_x = 2.236$

$\sigma^2 = 5$

Find all Samples of Size 2 with replacement.

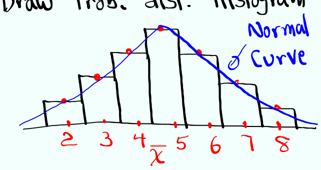
2,2	2,4	2,6	2,8
4,2	4,4	4,6	4,8
6,2	6,4	6,6	6,8
8,2	8,4	8,6	8,8

Find $\bar{x}$ of each Sample.

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

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



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$\bar{x} \to L2$

$P(\bar{x}) \to L3$

Use 1-Var Stats

with L2 & L3

↑ List ↑ FreqList

$\mu = 5$

$\sigma = 1.581$

$\sigma^2 = 2.5 = \frac{5}{2}$

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Clear all lists.

Store 2, 4, 6, 8, and 10 in L1.

Use 1-Var Stats with L1 only to find

$\mu = \bar{x} = 6$ $\sigma = \sigma_x = 2.828$ $\sigma^2 = 8$

take all samples of size 2 with replacement

2,2	2,4	2,6	2,8	2,10
4,2	4,4	4,6	4,8	4,10
6,2	6,4	6,6	6,8	6,10
8,2	8,4	8,6	8,8	8,10
10,2	10,4	10,6	10,8	10,10

Find $\bar{x}$ of each sample:

2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

$\bar{x}$	$P(\bar{x})$
2	1/25
3	2/25
4	3/25
5	4/25
6	5/25
7	4/25
8	3/25
9	2/25
10	1/25

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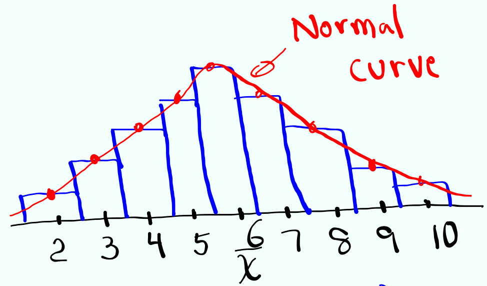
$\bar{x}$	$P(\bar{x})$
2	1/25
3	2/25
4	3/25
5	4/25
6	5/25
7	4/25
8	3/25
9	2/25
10	1/25

Draw Prob. dist. histogram



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

use 1-Var Stats with L2 & L3.

$\mu = \bar{x} = 6$ $\sigma = \sigma_x = 2$ $\sigma^2 = 4 = \frac{8}{2}$

SG 19 (Pages 1 & 3) ✓