Statistics

Lecture 13

Feb 19-8:47 AM

Class QZ 6

x	P(x)
1	.1
2	.15
3	.2
4	.25
5	.3

Find

1) $\mu = 3.5$ ✓

2) $\sigma \approx 1.32$ ✓ } Round to 2-dec.

3) $\sigma^2 = \frac{7}{4}$ ✓ } Reduced fraction

$x \to L1$, $P(x) \to L2$

STAT → CALC

1:1-Var Stats

List : L1

FreqList : L2

Calculate

VARS

5: Statistics

4: $\sigma\bar{x}$ x^2

Math 1:▶Frac

Enter

$\mu \approx 4$ $\sigma \approx 1$

Usual Range $\mu \pm 2\sigma = 4 \pm 2(1)$

→ 2 to 6

Mar 23-8:43 PM

Consider a binomial prob. dist. with $n=15$ and $p=.4$

1) $q = 1-p = \boxed{.6}$

2) $\mu = np = 15(.4) = \boxed{6}$

3) $\sigma^2 = npq = 15(.4)(.6) = \boxed{3.6}$

4) $\sigma = \sqrt{\sigma^2} = \sqrt{3.6} = 1.897 \approx \boxed{2}$

5) P(exactly 8 successes)

$P(x=8)$

By formula

$P(x) = {}_nC_x \cdot p^x \cdot q^{n-x}$

$= {}_{15}C_8 \cdot (.4)^8 (.6)^7$

$= \boxed{.118}$

using TI Command

$P(x=8) = \text{binompdf}(15, .4, 8)$

$= \boxed{.118}$

6) P(at most 8 successes)

$P(x \le 8) = \text{binomcdf}(15, .4, 8) = \boxed{.905}$

Mar 25-6:56 PM

Consider guessing on a multiple choice exam with 50 questions. $n=50$

Each question has 5 choices, only one correct answer. $p = \frac{1}{5} = .2$ $q = \frac{4}{5} = .8$

1) $\mu = np = 50(.2) = \boxed{10}$

2) $\sigma^2 = npq = 50(.2)(.8) = \boxed{8}$

3) $\sigma = \sqrt{\sigma^2} = \sqrt{8} \approx \boxed{3}$

4) Usual Range $\mu \pm 2\sigma = 10 \pm 2(3) \Rightarrow \boxed{4 \text{ to } 16}$

5) P(guess at least 8 correct answers)

$P(x \ge 8) = 1 - P(x \le 7) = 1 - \text{binomcdf}(50, .2, 7)$

$= 1 - .8959$

$= \boxed{.1041}$

We don't want $x \le 7$ | we want 7 8

Mar 25-7:06 PM

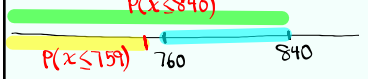
Suppose you flip a fair coin 1600 times and landing tails is a success.

1) $n = 1600$ 2) $p = .5$ 3) $q = .5$

4) $\mu = np = 800$ 5) $\sigma^2 = npq = 400$ 6) $\sigma = \sqrt{\sigma^2} = 20$

7) Find its usual Range (95%) $\mu \pm 2\sigma$
$= 800 \pm 2(20)$
$= 800 \pm 40$
$=$ 760 to 840

8) P(get between 760 and 840, inclusive, tails)
$P(760 \le x \le 840) = P(x \le 840) - P(x \le 759)$



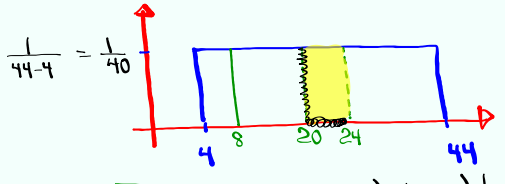
= binomcdf(1600, .5, 840) − binomcdf(1600, .5, 759) = .957
≈ 96%

SG 16 ✓

Mar 25-7:15 PM

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

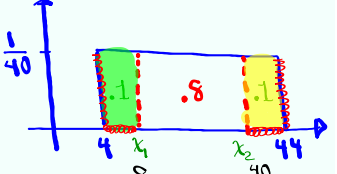
$\frac{1}{44-4} = \frac{1}{40}$



$P(x = 8) = 0$ Line

$P(20 < x < 24) = (24-20)\cdot\frac{1}{40}$
$= \frac{4}{40} = \frac{1}{10}$

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



$(x_1 - 4)\cdot\frac{1}{40} = .1$
$x_1 - 4 = 40(.1)$
$x_1 = 4 + 4$
$x_1 = 8$

$(44 - x_2)\cdot\frac{1}{40} = .1$
$44 - x_2 = 40(.1)$
$44 - x_2 = 4$
$44 - 4 = x_2$
$x_2 = 40$

Mar 25-7:26 PM

Standard Normal Prob. Dist.:

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

2) Data dist. is symmetric, and bell-shape with total area 1.

3) Mean = Mode = Median

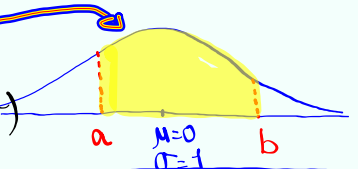
$N(0,1)$

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

5) $P(a<Z<b)$ is the Corresponding area as Shown below

2nd VARS

normalcdf(L, U, μ, σ)



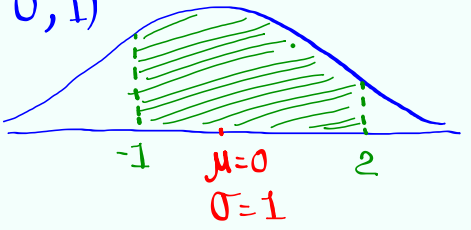
Drawing, Labeling, Shading, full TI Command required.

Mar 25-7:37 PM

$P(-1<Z<2)$

= normalcdf(−1, 2, 0, 1)

(−)



= .819

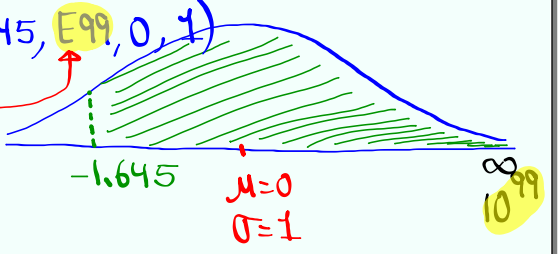
$P(Z>-1.645)$

= normalcdf(−1.645, E99, 0, 1)

(−)

2nd ,

1



= .950

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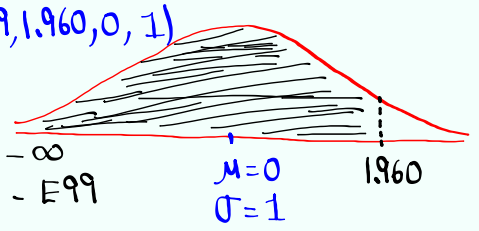
$P(Z < 1.960)$

= normalcdf(−E99, 1.960, 0, 1)

(−)

2nd [)

= .975

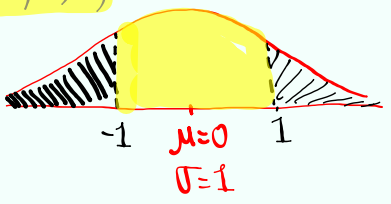


$P(Z < -1 \text{ OR } Z > 1)$

= 1 − normalcdf(−1, 1, 0, 1)

Total Area

= .317



Mar 25-7:51 PM

Doing Reverse:

Find $Z = P_{90}$

90% below

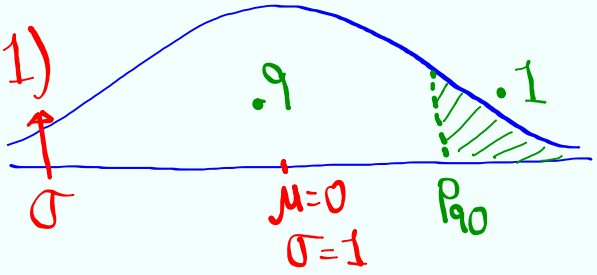
10% above

2nd VARS

invNorm(.9, 0, 1)

left Area μ σ

≈ 1.282



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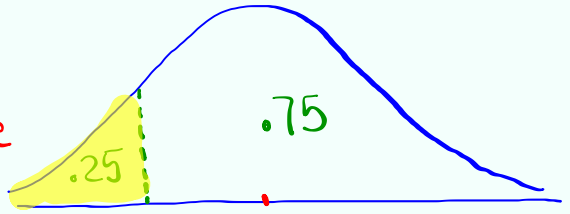
find $z = Q_1$

25% below
75% above



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

$= \boxed{-.674}$

Mar 25-8:02 PM

Normal Prob. dist.

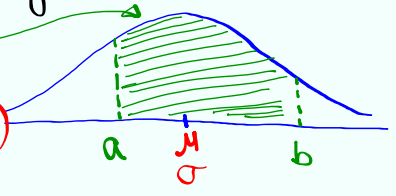
1) use x, $P(x=c)=0$.

2) Data dist. is symmetric and bell-shape with total area 1.

3) Mean = Mode = Median $N(\mu,\sigma)$

4) μ & σ are given in the Problem.

5) $P(a<x<b)$ is the area of the shaded region below



use normalcdf(L,U, μ, σ)

Mar 25-8:05 PM

Given $N(82, 10)$

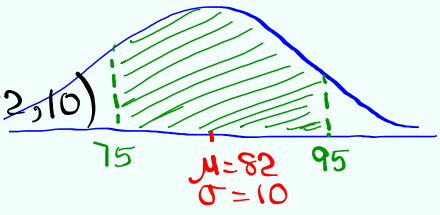
Normal Prob. Dist.

μ σ

$P(75 < x < 95)$

= normalcdf(75, 95, 82, 10)

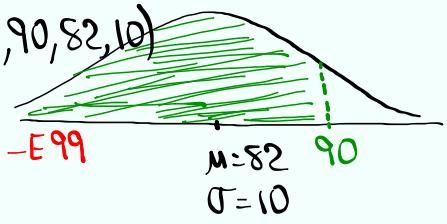
= .661



$P(x < 90)$

= normalcdf(−E99, 90, 82, 10)

= .788



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Find $x = Q_3$, Round to whole #

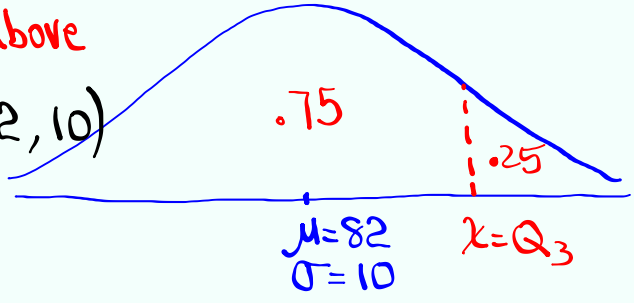
75% below

25% above

invNorm(.75, 82, 10)

≈88.745

≈ 89



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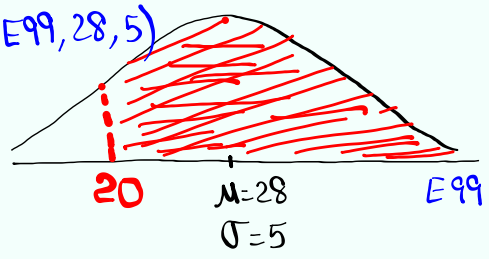
Ages of all students at college are normally dist. with mean of 28 yrs and standard dev. of 5 yrs.

$N(28, 5)$

If we randomly select one student, find the prob. that his/her age is above 20 yrs. $P(x > 20)$

= normalcdf(20, E99, 28, 5)

= .945



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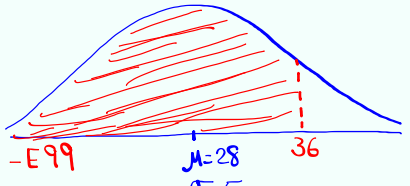
Find the prob. that his/her age is below 36 yrs.

$P(x < 36)$



= normalcdf(-E99, 36, 28, 5)

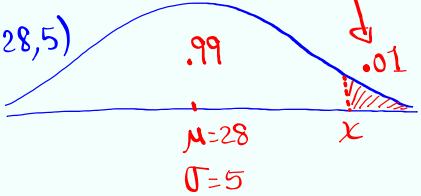
= .945

Find the age (x), rounded to whole #, that separates the top 1% from the rest.

x = invNorm(.99, 28, 5)

≈ 39.632

≈ 40



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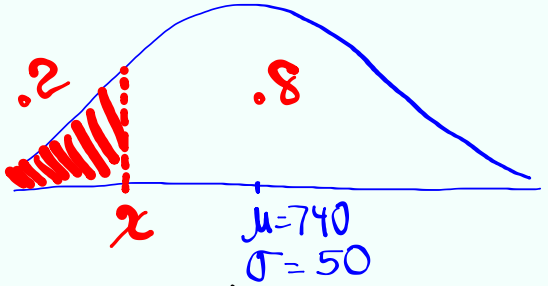
Credit Scores are normally dist with $\mu = 740$ and $\sigma = 50$.

Find a credit Scores, round to whole #, that Separates the **bottom 20%** from the rest.



$x = \text{invNorm}(.2, 740, 50) = 697.919$

$\approx$ **698**

Mar 25-8:36 PM

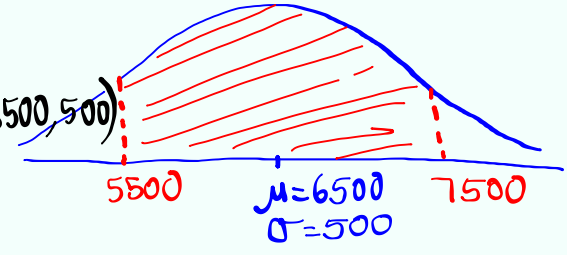
Salaries of nurses are normally dist. with $\mu = 6500$ & $\sigma = 500$

Find the prob. that a randomly Selected nurse makes between 5500 & 7500.

$P(5500 < x < 7500)$

= normalcdf(5500, 7500, 6500, 500)

$\approx$ **.954**



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Class QZ 7

open notes

Consider a binomial Prob. dist with $n = 400$ & $P = .5$

Find

1) $\mu = np$
$= 400(.5)$
$= \boxed{200}$

2) $\sigma^2 = npq$
$= 400(.5)(.5)$
$= \boxed{100}$

3) $\sigma = \sqrt{\sigma^2}$
$= \sqrt{100}$
$= \boxed{10}$

Mar 25-8:47 PM