Math 227
Spring 2021
Lecture 17

Class QZ 18

Consider a binomial prob. dist with $n=125$ and $p=.6$

Let x be # of successes.

1) $P(x=80)$

$=\text{binompdf}(125,.6,80)=\boxed{.049}$

2) $P(x\leq 80)$

$=\text{binomcdf}(125,.6,80)$

$=\boxed{.842}$

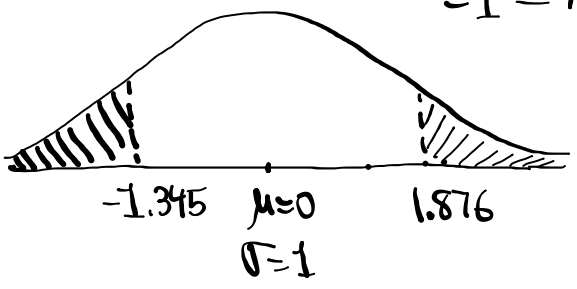
3) $P(70\leq x\leq 85)$

$=\text{binomcdf}(125,.6,85)-\text{binomcdf}(125,.6,69)=\boxed{.816}$

Find $P(Z<-1.345 \text{ OR } Z>1.876)$

$= 1 - \text{normalcdf}(-1.345, 1.876, 0, 1)$

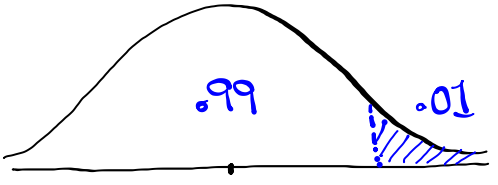
$= \boxed{.120}$



Find $Z = P_{99}$

99% fall below it

1% fall above it

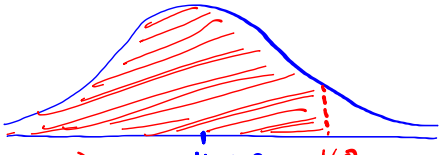


$Z = P_{99} = \text{invNorm}(.99, 0, 1) = \boxed{2.326}$

Consider a normal prob. dist with mean 128 and standard dev. 20.

Find

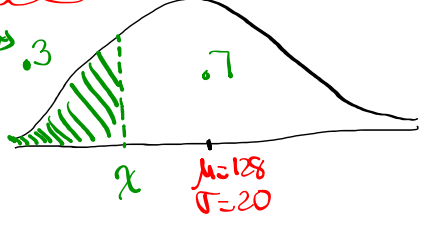
1) $P(x<160)$



$= \text{normalcdf}(-E99, 160, 128, 20)$

$= \boxed{.945}$

2) Find the value, round to a whole #, which separates the bottom 30% from the rest.



$x = \text{invNorm}(.3, 128, 20)$

$= 117.512$

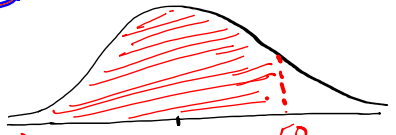
$= \boxed{118}$

Ages of nurses are normally distributed with the mean of 41.5 yrs and standard deviation of 6.8 yrs. $N(41.5, 6.8)$

If we randomly select **one nurse** find the Prob. that **his/her age** is

a) below 50 yrs.

$P(x<50)$



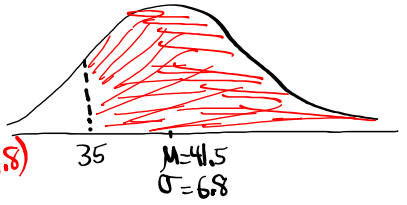
= normalcdf(−E99, 50, 41.5, 6.8) = **.894**

b) above 35 yrs.

$P(x>35)$ =

normalcdf(35, E99, 41.5, 6.8)

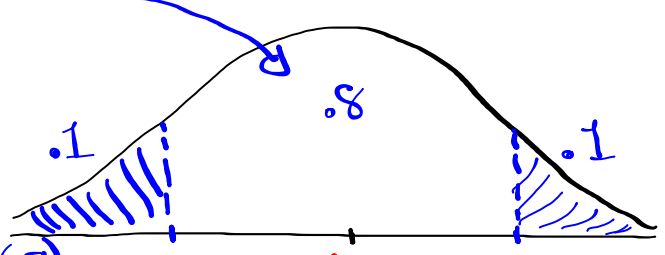
= **.830**



c) Find two ages, round to 1-decimal, that separate **the middle 80%** from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$



$x_1 = P_{10} = \text{invNorm}(.1, 41.5, 6.8)$

$\approx$ **32.8**

$x_2 = P_{90} = \text{invNorm}(.9, 41.5, 6.8)$

$\approx$ **50.2**

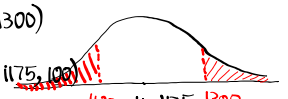
SAT scores are normally distributed with the mean of 1175 and stand. dev. of 100. $N(1175, 100)$

If one SAT exam is randomly selected,

Find the prob. that its score is below 1100 or above 1300

$P(x<1100 \text{ OR } x>1300)$

$= 1 - \text{normalcdf}(1100, 1300, 1175, 100)$



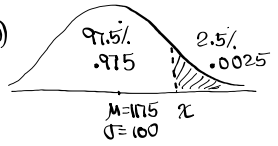
$= .332$

Find the SAT scores (round to a whole #) that separates the top 2.5% from the rest.

$x = \text{invNorm}(.975, 1175, 100)$

$= 1370.996$

≈ 1371



Do you watch Uniform Prob. Dist?

Yes → Do it again, make notes

NO → Watch it twice, and make notes

Class Qz 19

Consider a geometric prob. dist with $p=.5$

1) $\mu = \frac{1}{p} = \frac{1}{.5} = 2$

2) $P(x=3) = \text{geometpdf}(.5,3)$

$= .125$

3) $P(x<4) = P(x \le 3)$

$= \text{geometcdf}(.5,3) = .875$

1) Clear all lists.

2) Reset all lists.

3) Store 2, 4, 6, 8 in L1

4) Use L1 to find → $\mu = 5$, $\sigma = 2.236$, $\sigma^2(\text{exact}) = 5$

5) 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

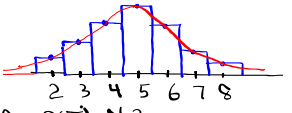
6) Find $\bar{x}$ of each sample.

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

7) Complete this chart:

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

8) Draw Prob. dist. histogram for $\bar{x}$ & $P(\bar{x})$.



9) $\bar{x} \to$ L2, $P(\bar{x}) \to$ L3. Use L2 & L3 to find

$\mu = 5$ $\sigma = 1.581$ $\sigma^2(\text{exact}) = \frac{5}{2}$

Clear all lists.

Store 1, 3, 5, 7, 9 in L1.

Use L1 to find → $\mu = 5$, $\sigma = 2.828$, $\sigma^2(\text{exact}) = 8$

Take all samples of size 2 with replacement from this list.

1,1	1,3	1,5	1,7	1,9
3,1	3,3	3,5	3,7	3,9
5,1	5,3	5,5	5,7	5,9
7,1	7,3	7,5	7,7	7,9
9,1	9,3	9,5	9,7	9,9

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

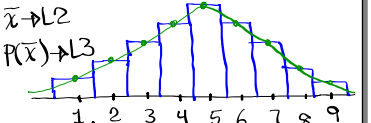
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9

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

Draw Prob. dist. histogram for $\bar{x}$ & $P(\bar{x})$

$\bar{x} \to$ L2

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



Use L2 & L3 to find

$\mu = 5$ $\sigma = 2$ $\sigma^2(\text{exact}) = 4 = \frac{8}{2}$

Central Limit Theorem

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

$$\sigma^2_{\bar{x}} = \frac{\sigma^2}{n}$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

Make Sure to watch the video on Uniform Prob. Dist, and make notes.

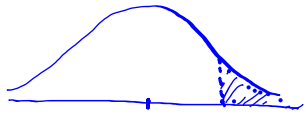
t-Dist:

1) Bell-Shape, Symmetric

2) Total Area = 1

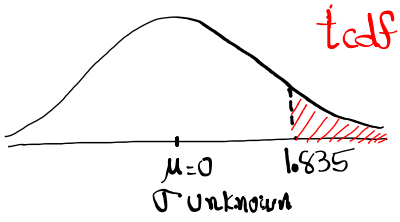
3) $\mu = 0$, σ Unknown

4) It Comes with degrees of freedom



tcdf(Lower, Upper, df)

Find $P(t > 1.835)$ with $df = 10$



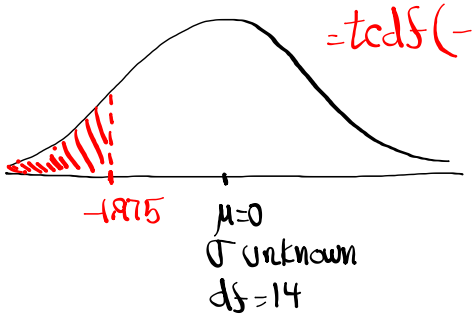
tcdf(1.835, E99, 10)

= .048

Find $P(t < -1.975)$ with $df = 14$.

$= tcdf(-E99, -1.975, 14)$

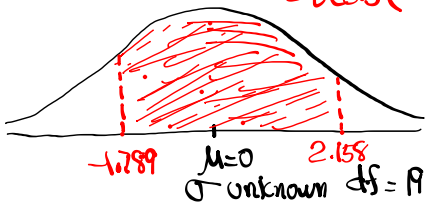
$= \boxed{.034}$



Find $P(-1.789 < t < 2.158)$ with $df = 19$

$= tcdf(-1.789, 2.158, 19)$

$= \boxed{.933}$



Degrees of Freedom:

Do laundry on Sunday → 7 clean shirt

Monday → 7 choices

Tuesday → 6 "

Wednesday → 5 "

⋮

Sunday → Clean 1 shirt (0 choices)

6 days → Choices

$\boxed{df = 6}$

Class Qz 20

Consider a Poisson Prob. dist with the mean of 9 on a fixed interval.

1) $\sigma^2 =$

2) $\sigma =$

3) $P(x \geq 8)$