Statistics

Lecture 16

Feb 19-8:47 AM

1) Find $_{15}C_8 = \boxed{6435}$

15 $\boxed{\text{Math}}$ $\boxed{\rightarrow}$ PRB $\boxed{\downarrow}$ $\boxed{_nC_r}$ 8 $\boxed{\text{enter}}$

2) Compute $_{10}C_4 \cdot (.7)^4 \cdot (.3)^6$, Round to 3-dec. places or S.N.

$\boxed{\wedge}$ $\boxed{\div}$ $\boxed{\rightarrow}$

$= \boxed{.037}$

3) Given binomial Prob. dist with $n=12$ and $P=.8$, $x \rightarrow$ # of successes

a) $P(x=10) = \text{binompdf}(12, .8, 10) = \boxed{.283}$

b) $P(x \leq 10) = \text{binomcdf}(12, .8, 10) = \boxed{.725}$

Oct 29-10:37 AM

I flipped a fair coin 400 times.

Success is to land tails.

1) $n = 400$ 2) $p = .5$ 3) $q = .5$

4) $\mu = np = 200$ 5) $\sigma^2 = npq = 100$ 6) $\sigma = \sqrt{\sigma^2} = \sqrt{100} = 10$

7) Usual Range "95% Range" $\mu \pm 2\sigma = 200 \pm 2(10) = 200 \pm 20 \Rightarrow \boxed{180 \text{ to } 220}$

8) P(fewer than 210 tails)

$P(x < 210) = P(x \le 209)$

$= \text{binomcdf}(400, .5, 209)$

$= \boxed{.829}$

10) P(more than 185 tails)

$P(x > 185) = P(x \ge 186) = 1 - P(x \le 185)$

we don't want this — 185 | 186 — we want this

1: Total Prob.

$= 1 - \text{binomcdf}(400, .5, 185)$

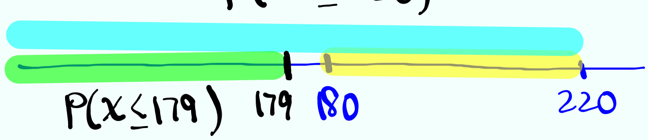
$= \boxed{.927}$

Oct 29-10:44 AM

11) P(# of tails is $\underbrace{\text{between 180 and 220}}$, inclusive)

$P(180 \le x \le 220) = P(x \le 220) - P(x \le 179)$

$P(x \le 220)$



$= \text{binomcdf}(400, .5, 220) - \text{binomcdf}(400, .5, 179)$

$= \boxed{.960} \approx 96\%$

Usual Range $\rightarrow$ 95% $\rightarrow$ $\boxed{180 - 220}$

Oct 29-10:55 AM

Given: Binomial Prob. dist with $n=30$, $p=\frac{1}{3}$

1) $q=1-p=\boxed{\frac{2}{3}}$ 2) $\mu=np=\boxed{10}$ 3) $\sigma^2=npq=\boxed{\frac{20}{3}}$

4) $\sigma=\sqrt{\sigma^2}=\sqrt{\frac{20}{3}}$

$\boxed{2nd}$ $\boxed{x^2}$ $20 \boxed{\div} 3$ $\boxed{Enter}$ $\approx \boxed{2.582}$

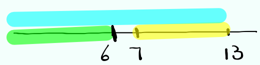
Round to whole #

$\boxed{\sigma=3}$

68% Range $\mu \pm \sigma = 10 \pm 3 \Rightarrow \boxed{7 \text{ to } 13}$

5) $P(7 \le x \le 13) = P(x \le 13) - P(x \le 6)$

Reduce by 1



$= \text{binomcdf}(30, 1/3, 13) - \text{binomcdf}(30, 1/3, 6)$

$= \boxed{.826}$

$P(7 \le x \le 13) = .826$
$\approx 83\%$

68% Range $\rightarrow \boxed{7 \text{ to } 13}$

SG 16 ✓

Oct 29-11:01 AM

Working with Continuous Random Variable (SG 17-20)

1) Uniform Prob. dist.
2) Standard Normal Prob. dist.

} SG 17

3) Normal Prob. dist.
4) Applications

} SG 18

5) Central limit theorem
6) More applications

} SG 19 & 20

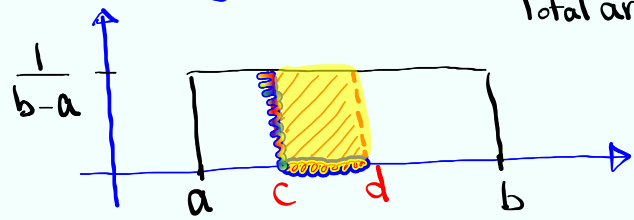
Oct 29-11:14 AM

Uniform Prob. dist. : (SG17)

Let x be a continuous random variable for all values from a to b with uniform Prob. dist.

Graph is rectangular as shown below.

Total area = 1

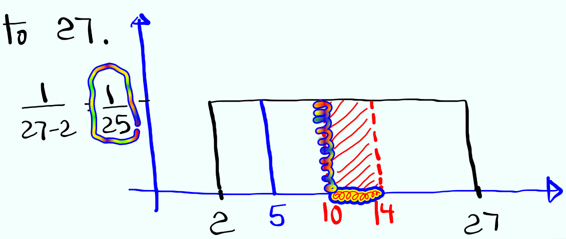


$P(x=c) = \boxed{0}$

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

Oct 29-11:18 AM

Consider a uniform Prob. dist. for all values from 2 to 27.



$P(x=5) = \boxed{0}$

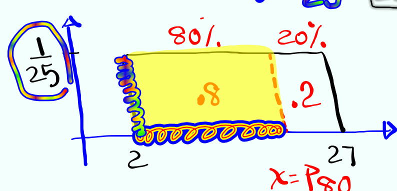
Line

$P(10 < x < 14) = (14-10) \cdot \frac{1}{25} = \boxed{\frac{4}{25}}$

Find $x = P_{80}$

80% below

20% above



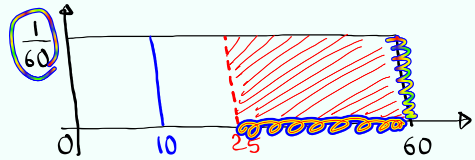
$(x-2) \cdot \frac{1}{25} = .8$

$x - 2 = 25(.8)$

$x = 2 + 25(.8) = \boxed{22}$

Oct 29-11:23 AM

Wait time at the Local DMV has a Uniform Prob. dist. from 0 minute to 60 minutes.



P(wait time is $\underbrace{\text{exactly}}$ 10 minutes)

$P(x = 10) = \boxed{0}$
Line

P(wait time $\underbrace{\text{exceeds}}$ 25 minutes)

$P(x > 25) = (60 - 25) \cdot \frac{1}{60} = \frac{35}{60} = \boxed{\frac{7}{12}}$

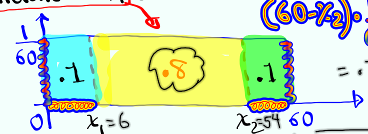
find two times, round to whole minute, that separate the $\boxed{\text{middle 80\%}}$ from the rest.

$1 - .8 = .2$

$.2 \div 2 = .1$

$(x_1 - 0) \cdot \frac{1}{60} = .1$

$x_1 - 0 = 60(.1)$ $\boxed{x_1 = 6}$



$(60 - x_2) \cdot \frac{1}{60} = .1$

$60 - x_2 = 60(.1)$ $\boxed{x_2 = 54}$

Oct 29-11:31 AM

Standard Normal Prob. Dist.:

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

2) Data dist is symmetric, has a bell-shape graph with total area = 1.

3) Mean = Mode = Median

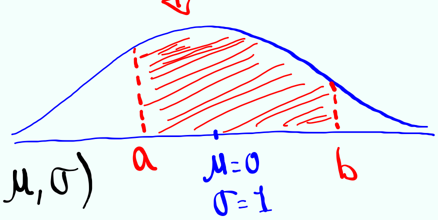
4) $\mu = 0$, $\sigma = 1$

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

How to find it:

$\boxed{\text{2nd}}$ $\boxed{\text{VARS}}$

normalcdf(L, U, μ, σ)



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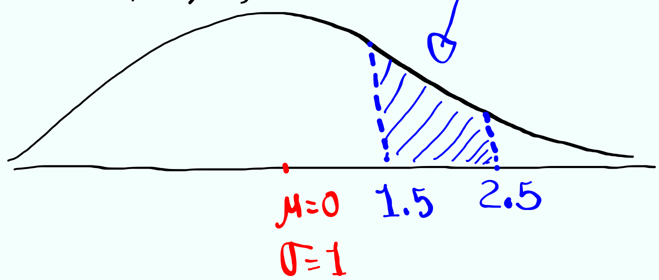
find $P(1.5 < Z < 2.5)$

$= \text{normalcdf}(1.5, 2.5, 0, 1)$

$= \boxed{.061}$

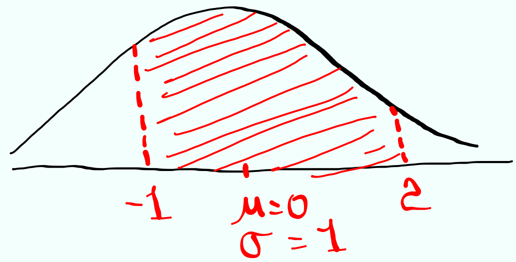


find $P(-1 < Z < 2)$

$= \text{normalcdf}(-1, 2, 0, 1)$

(−)

$= \boxed{.819}$

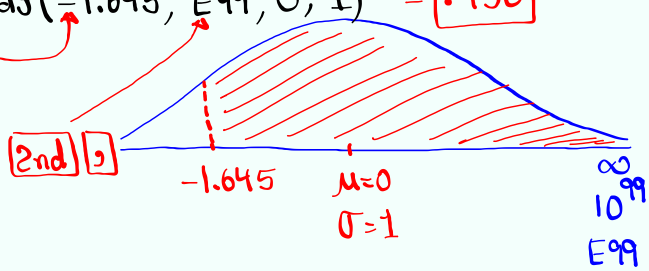


Oct 29-11:50 AM

find $P(Z > -1.645)$

$= \text{normalcdf}(-1.645, E99, 0, 1) = \boxed{.950}$

(−)

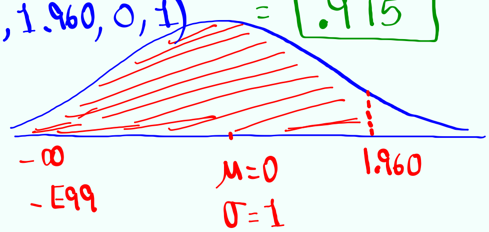


find $P(Z < 1.960)$

$= \text{normalcdf}(-E99, 1.960, 0, 1) = \boxed{.975}$

(−)

2nd ,



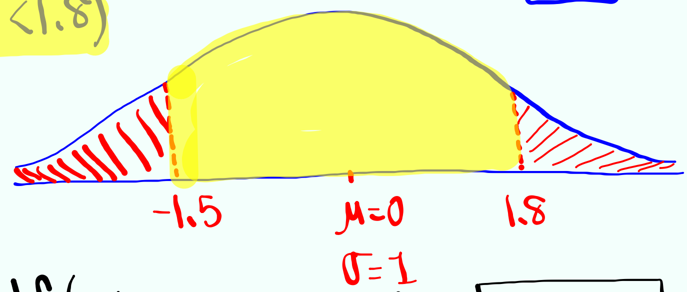
Oct 29-11:58 AM

Find $P(Z<-1.5 \text{ OR } Z>1.8)$ → was AND

$\boxed{0}$

$= 1 - P(-1.5<Z<1.8)$

↑
Total Area



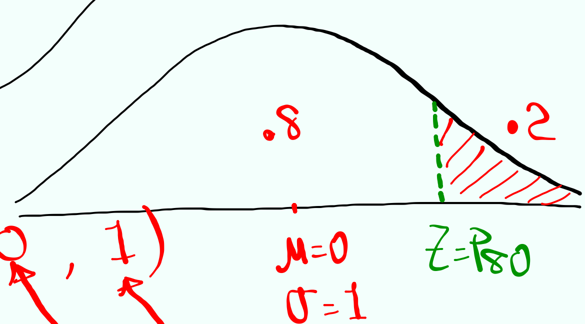
$= 1 - \text{normalcdf}(-1.5, 1.8, 0, 1) = \boxed{.103}$

Oct 29-12:07 PM

Doing Reverse:

2nd | VARS

Find $Z = P_{80}$



$Z = \text{invNorm}(.8, 0, 1)$

Left area, μ, σ

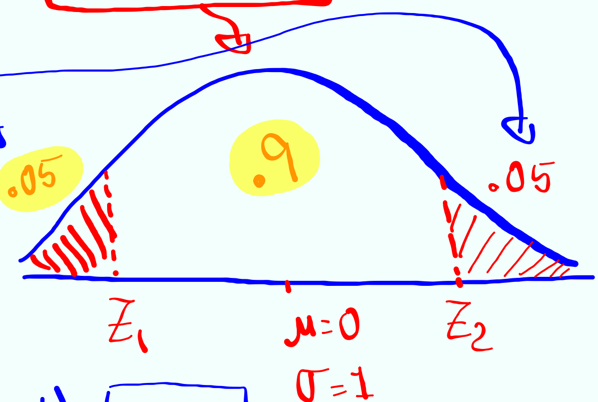
$= \boxed{.842}$

Oct 29-12:11 PM

Find two z-Values, Round to 3-dec. Places that separate the middle 90% from the rest.

$1 - .9 = .1$

$.1 \div 2 = .05$



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

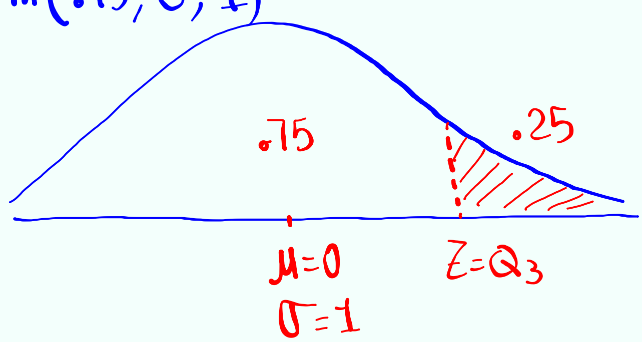
$z_2 = \text{invNorm}(.95, 0, 1) = \boxed{1.645}$

Oct 29-12:15 PM

Find $z = Q_3$.

$z = Q_3 = \text{invNorm}(.75, 0, 1)$

$= \boxed{.674}$



SG 17✓

Oct 29-12:21 PM

3 Females, 5 Males, Select 2 people.

F F — 2 females

F M, M F — 1 Female

M M — 0 Females

$P(2 \text{ Females}) = \frac{3}{8} \cdot \frac{2}{7} = \boxed{\frac{3}{28}}$

$P(1 \text{ Female}) = 2 \cdot \frac{3}{8} \cdot \frac{5}{7} = \boxed{\frac{15}{28}}$

$P(0 \text{ Females}) = \frac{5}{8} \cdot \frac{4}{7} = \boxed{\frac{5}{14}}$

3 $\boxed{\div}$ 28 $\boxed{+}$
15 $\boxed{\div}$ 28 $\boxed{+}$
5 $\boxed{\div}$ 14 $\boxed{\text{enter}}$
1

# F	P(# F)
2	3/28
1	15/28
0	5/14

F → L1
P(# F) → L2
Use $\boxed{\text{1-Var Stats}}$ with L1 & L2

$\mu = \bar{x} = .75$

$\sigma = \sigma_x = .634$

$\sigma^2 = .4017857143$
$= \boxed{\frac{45}{112}}$

$\boxed{\text{VARS}}$
$\boxed{\text{5: Statistics}}$
$\boxed{4\text{: } \sigma_x}$
$\boxed{x^2}$ $\boxed{\text{Enter}}$

Oct 29-12:24 PM