

6.2 Areas under the SNC

GOALS:

1. Properties of the Stand Normal Curve (SNC)
2. Find areas under the SNC that correspond to specific z-scores.
3. Find z-scores corresponding to areas under the SNC.
4. Use Table for Areas under the SNC
5. Use calculator to find the areas under the SNC
- 6/ Use calculator to find the z score for a given area under the SNC.

Study Ch. 6.2, # 51(47) - 59(55),
63(59), 69(65), 73(69)-77(73), 81(77)

[Link to old Class Notes with problems using the z table.](#)

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6.2 Areas under the SNC

Properties of the SNC:

1. Total Area under SNC = 1
2. x-axis is an asymptote of SNC
3. Symmetrical about $\mu = 0$
4. Almost all area under SNC is within -3 and + 3 z scores (standard deviations)

[Area under the Normal Curve](#)

$$y = \frac{e^{-\frac{(x-\mu)^2}{2\sigma^2}}}{\sqrt{2\pi} \sigma}$$

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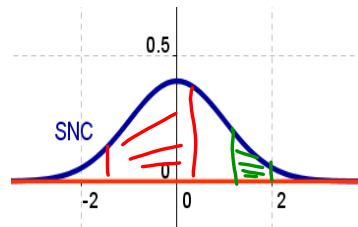
6.2 Areas under the SNC

Standard Normal Curve, to find **AREAS** use:

1. Calculator
2. Tables: see card in book, or appendix, or tables.pdf



6.2 Areas under the SNC



Total Area = 1
 $0 \leq \text{area for interval under SNC} \leq 1$
 $0 \leq p \leq 1$



6.2 Areas under the SNC

Calculator Approach-REQUIRED

Find Area under the Normal Curve

2nd DISTR

normalcdf(left, right, mean, standard deviation)

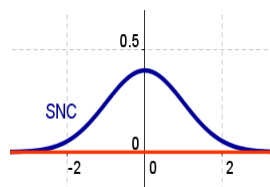
Use this for any normal curve.

If using the Standard Normal Curve (SNC), the mean = 0 and the standard deviation = 1

eg: To find the area between $z = -1$ and $z = 1$ on the SNC, enter:
 $\text{normalcdf}(-1,1,0,1)$ The result is **.6827**

eg: To find the area between $x = 60$ and $x=85$ for a normal distribution with mean=75 and stdev=10, enter:
 $\text{normalcdf}(60,85,75,10)$ The result is **.7745**

To get areas in the left tail of the SNC, use -9 for the left bound.
 To get areas in the right tail of the SNC, use +9 for the right bound.



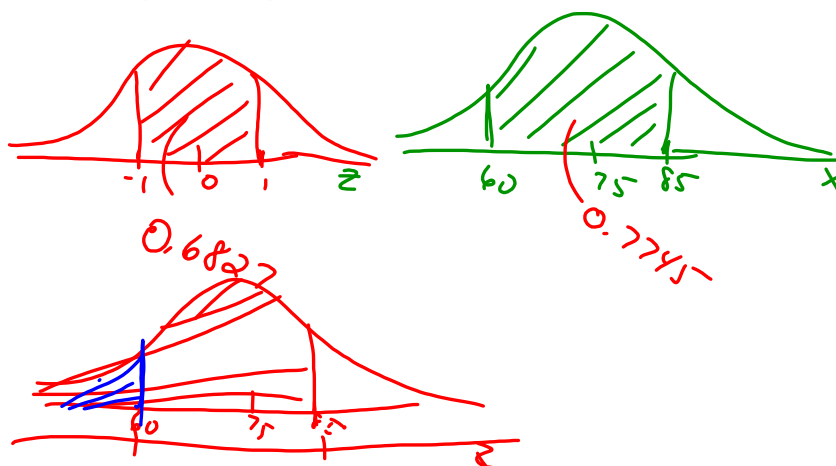
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6.1 Normal Distribution

cholesterol levels have:

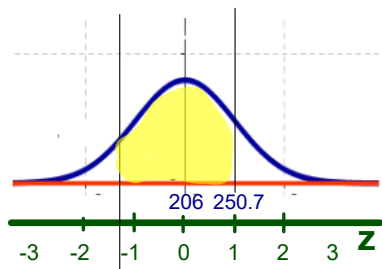
G: $\mu = 206$ mg/dL $\sigma = 44.7$ mg/dL

F: a) Sketch distribution of x. b) z c) Identify and sketch distribution of z.

d) % with cholesterol level between

150 mg/dL and 250 mg/dL = area under SNC betw and

e) % with cholesterol level below 220 mg/dL = area under SNC that lies to _____ of _____



b) $z = \frac{x - \mu}{\sigma}$
 $z = \frac{x - 206}{44.7}$

d) $z = \frac{250 - 206}{44.7} = 0.98$
 $z = \frac{150 - 206}{44.7} = -1.25$

$\text{normalcdf}(150,250,206,44.7) = 0.7324$

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6.1 Normal Distribution

cholesterol levels have:

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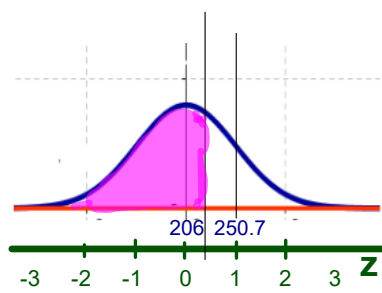
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b) $z = \frac{x - \mu}{\sigma}$
 $z = \frac{x - 206}{44.7}$

d) $z = \frac{250 - 206}{44.7} = 0.98$
 $z = \frac{150 - 206}{44.7} = -1.25$

e) $z = \frac{220 - 206}{44.7} = 0.31$

$\text{normalcdf}(0,220,206,44.7) = 0.6229$

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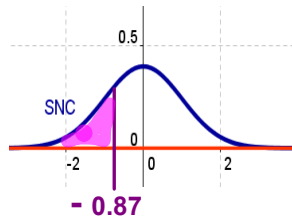
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6.2 Areas under the SNC

G: SNC F: area to left of:

- a) - 0.87 b) 3.56 c) 5.12



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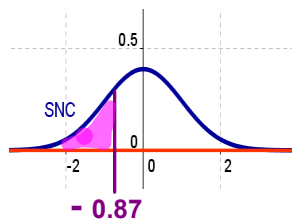
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6.2 Areas under the SNC

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$\text{normalcdf}(\text{left}, \text{right}, \mu, \sigma) = \text{area betw left and right}$

$\text{normalcdf}(-9, -0.87, 0, 1) = 0.19215 = 0.1922$

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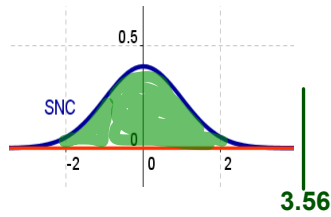
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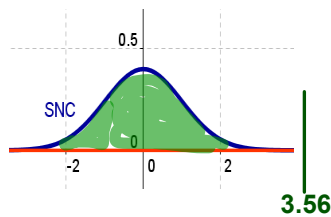
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6.2 Areas under the SNC

G: SNC F: area to left of:

- a) - 0.87 **b) 3.56** c) 5.12



$\text{normalcdf}(\text{left}, \text{right}, \mu, \sigma) = \text{area betw left and right}$

$\text{normalcdf}(-9, 3.56, 0, 1) = 0.999814 = 0.9998$

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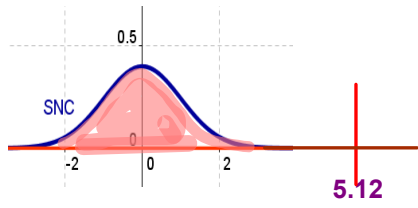
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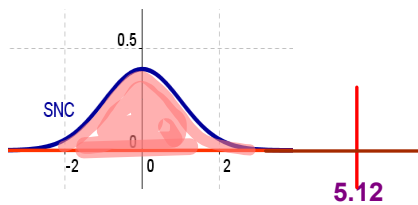
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6.2 Areas under the SNC

G: SNC F: area to left of:

- a) - 0.87 b) 3.56 c) 5.12



normalcdf(left, right, μ , σ) = area betw left and right

normalcdf(-9, 5.12, 0, 1) = 0.9999998 = 1.0000

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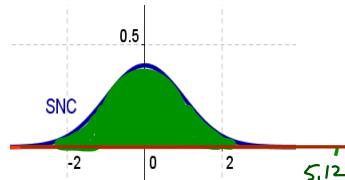
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6.2 Areas under the SNC

To find area using calculator:

1. ALWAYS draw a **sketch** that includes:
normal curve
an x value if appropriate,
a z score, and
the area in question.
2. Use calculator to find the area.



$$\text{normalcdf}(-9, 5.12, 0, 1) = 1.0000$$

area=1.0000
to nearest 4 decimal places

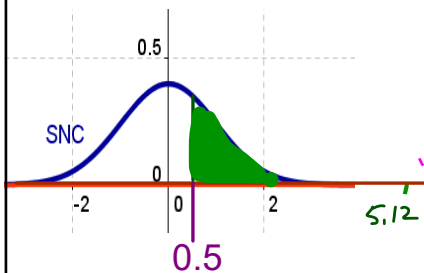
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6.2 Areas under the SNC

G: SNC F: area to **RIGHT** of $z=0.5$



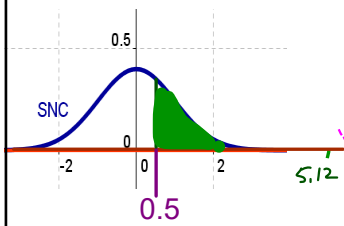
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6.2 Areas under the SNC

G: SNC F: area to **RIGHT** of $z=0.5$



$\text{normalcdf}(\text{left}, \text{right}, \mu, \sigma) = \text{area betw left and right}$

$\text{normalcdf}(0.5, 9, 0, 1) = 0.3085$

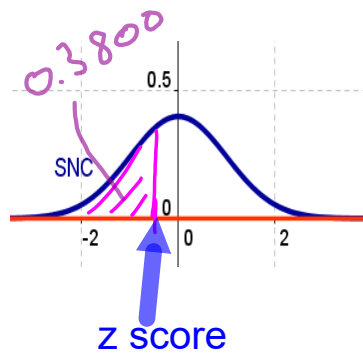
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6.2 Areas under the SNC

G: SNC F: **z score** with area to **left** = 0.3800



Use: 2nd Distr
invNorm

$\text{invNorm}(\text{area to left}, \text{mean}, \text{stdev}) = \text{z score}$

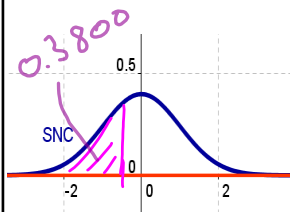
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6.2 Areas under the SNC

G: SNC F: z score with area to left=0.3800



$z = -0.31$

$\text{invNorm}(\text{area to left}, \text{mean}, \text{stdev}) = z \text{ score}$

$\text{invNorm}(0.38, 0, 1) = -0.3054 = -0.31$

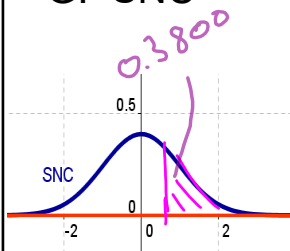
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6.2 Areas under the SNC

G: SNC F: z score with area to right=0.3800



$\text{invNorm}(\text{area to left}, \text{mean}, \text{stdev}) = z \text{ score}$

need area to left +

G: area to right

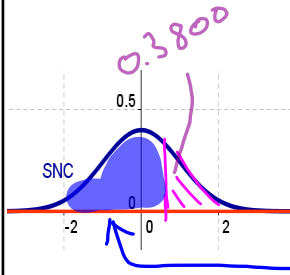
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6.2 Areas under the SNC

G: SNC F: z score with area to right=0.3800



$$\text{Area} = 1 - 0.3800 = 0.6200$$

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

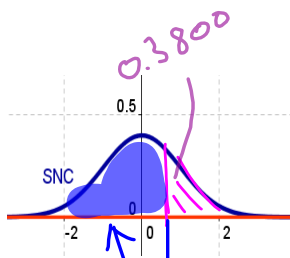
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6.2 Areas under the SNC

G: SNC F: z score with area to right=0.3800



$$\text{Area} = 1 - 0.3800 = 0.6200$$

$$z = 0.31$$

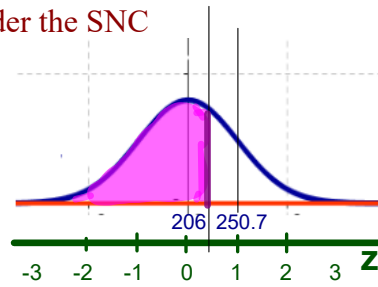
$$\text{invNorm}(0.6200, 0, 1) = 0.3054 = 0.31$$

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6.2 Areas under the SNC



$\text{invNorm}(\text{area to left}, \text{mean}, \text{stdev}) = \text{boundary}$

$\text{invNorm}(\text{area to left}, 0, 1) = z \text{ score}$

$\text{invNorm}(\text{area to left}, \text{mean}, \text{stdev}) = x \text{ value}$

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