6.3 Normally Distributed Variables

GOALS:

1. Understand that area under a normal curve represents **probabilities** and percentages.
2. Find probabilities (percentages) associated with a normally distributed variable.
3. Find probabilities (percentages) associated with a z-score.
4. Find a z-score associated with percentages or probabilities of normally distributed variables.
5. Find an x value associated with percentages or probabilities of normally distributed variables.

Study 6.3, #87(83)-93(89),97(93)

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6.3 Normally Distributed Variables

2. Find probabilities (percentages) associated with a normally distributed variable using SNC.

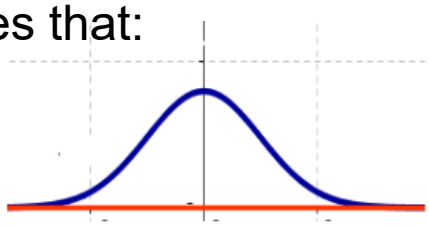
Problem type:

G: n.d. mean 68, standev 10

F: Percentage of all possible values that:

a) lie between 73 and 80

b) at least 75 c) at most 90



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6.3 Normally Distributed Variables

2. Find probabilities (percentages) associated with a normally distributed variable using SNC.

To find probabilities for normal distributions:

1. Calculator approach
2. Table approach (convert to the Standard Normal Curve using z-scores)

To find probabilities,

* Sketch the curve, showing μ and σ.
* Mark off the x value(s), and shade the appropriate area.
* 2nd /DISTR normalcdf(left,right,mean,stdev) to find area
* Probability = area $(0 \le p \le 1)$
* percentage = 100(area)%=100p %

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6.3 Normally Distributed Variables

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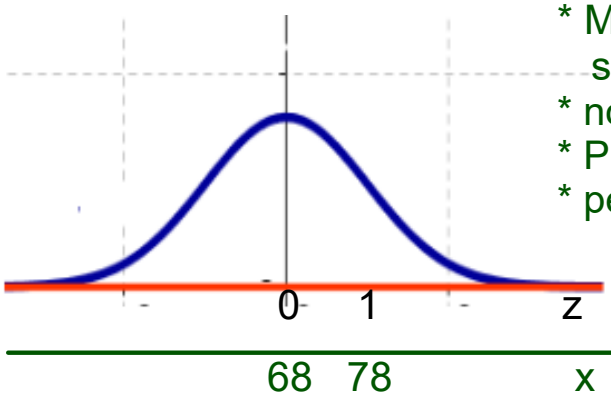

normalcdf(__,__,__,__) = 0._____

P(73≤x≤80) = 0._____

∴ Percent betw 73 and 80 = __.__%

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6.3 Normally Distributed Variables

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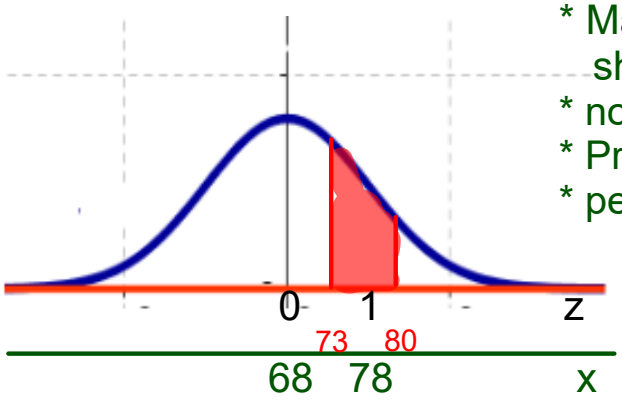

normalcdf(73,80,68,10) = 0.1935

$P(73 \le x \le 80) = 0.1935$

∴ Percent betw 73 and 80 = 19.35%

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6.3 Normally Distributed Variables

2. Find probabilities (percentages) associated with a normally distributed variable using SNC.

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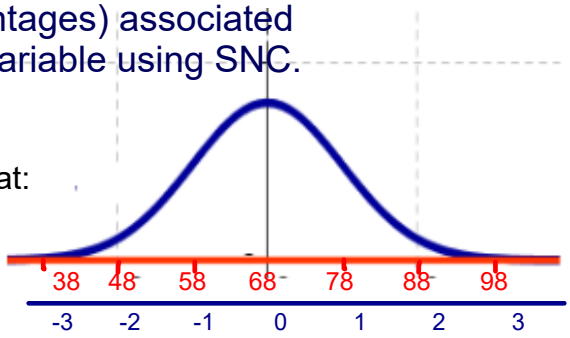

normalcdf(___,____,___,___) = 0._____

$P(x \ge 75) = 0.$_____

∴ ___.___%

pick a number well past 4 or 5 standard deviations = 5(10)=50
(need to get into tail)

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6.3 Normally Distributed Variables

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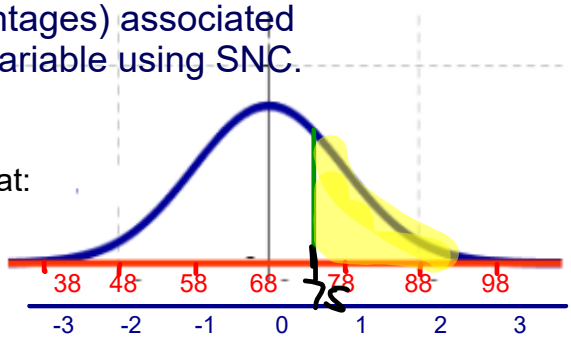

normalcdf(75,**120**,68,10) = 0.2420

$P(x \geq 75) = 0.2420$

$\therefore$ **24.20%**

pick a number well past 4 or 5 standard deviations = 5(10)=50
(need to get into tail)

normalcdf(75,**200**,68,10) = 0.2420
normalcdf(75,**999**,68,10) = 0.2420
BUT, normalcdf(75,**100**,68,10) = 0.24**13**
so to get all x>75, a right bound of 100 is not large enough, because 100 has z=3.2. Need a larger z.

6.3 Normally Distributed Variables

2. Find probabilities (percentages) associated with a normally distributed variable using SNC.

G: n.d. mean 68, standev 10
F: Percentage of all possible values that:
a) lie between 73 and 80
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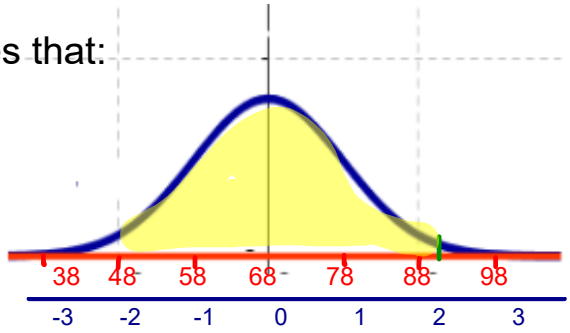


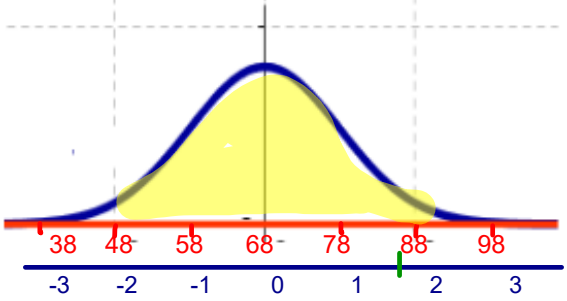
6.3 Normally Distributed Variables

G: n.d. mean 68, standev 10

F: Percentage of all possible values that:

a) lie between 73 and 80

b) at least 75 c) at most 90 ≤ 90



normalcdf(0,90,68,10) = 0.9861

$P(x \leq 90) = 0.9861$

$\therefore$ 98.61%

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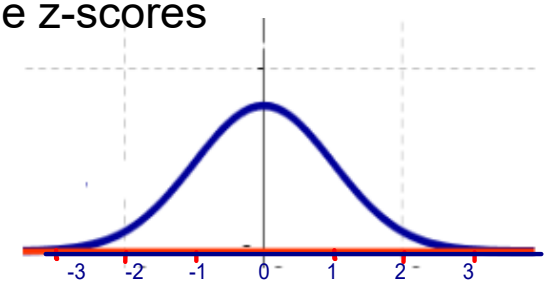
6.3 Normally Distributed Variables

3. Find probabilities (percentages) associated with a z-score using SNC.

0 ≤ area under SNC to left of z-score ≤ 1

F: Percentage of all possible z-scores to left of -0.87



-0.87

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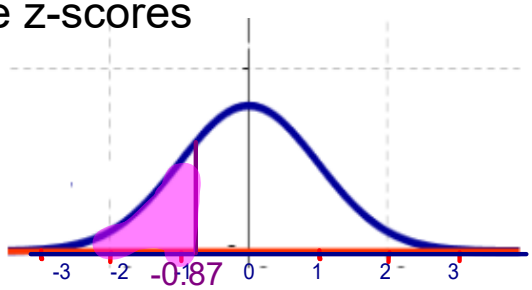
6.3 Normally Distributed Variables

3. Find probabilities (percentages) associated with a z-score using SNC.

$0 \leq$ area under SNC to left of z-score ≤ 1

F: Percentage of all possible z-scores to left of -0.87



2nd VARS(DISTR)

normalcdf(left,right,μ,σ)=

normalcdf(-9,-0.87,0,1)=0.1922

$P(z \leq -0.87) = 0.1922$

$\therefore$ 19.22% of all z-scores are < -0.87

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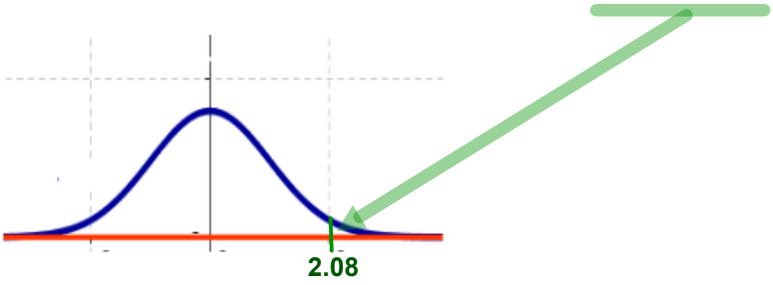
6.3 Normally Distributed Variables

3. Find probabilities (percentages) associated with a z-score using SNC.

F: Percentage of all possible z-scores to right of z=2.08



2nd VARS(DISTR)

normalcdf(left,right,μ,σ)=

normalcdf(2.08,9,0,1)=0.0188

$P(z \geq 2.08) = 0.0188$

$\therefore$ 1.88% of all z-scores are ≥ 2.08

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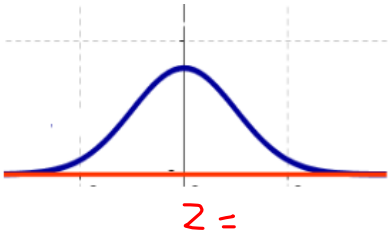
6.3 Normally Distributed Variables

4. Find a z-score associated with percentages or probabilities of normally distributed variables.

Find: z-score that represents the 80th percentile.

2nd DISTR invNorm(area, μ, σ)



invNorm(0.___,__,__)=0._____

∴ z =_____ represents the 80th percentile

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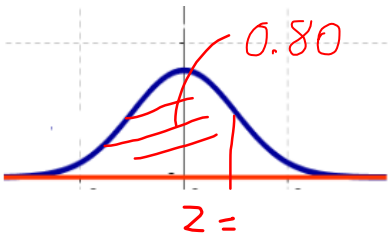
6.3 Normally Distributed Variables

4. Find a z-score associated with percentages or probabilities of normally distributed variables.

Find: z-score that represents the 80th percentile.

2nd DISTR invNorm(area, μ, σ)



invNorm(0.80,0,1)=0.8416

∴ z = 0.84 represents the 80th percentile

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6.3 Normally Distributed Variables

5. Find an x value associated with percentages or probabilities of normally distributed variables.

G: test scores, mean 75, stdev 10.
F: test score at 80th percentile.

2nd DISTR invNorm(area, μ, σ)

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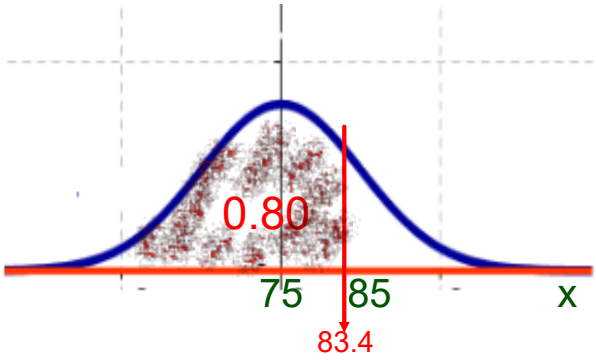
6.3 Normally Distributed Variables

5. Find an x value associated with percentages or probabilities of normally distributed variables.

G: test scores, mean 75, stdev 10.
F: test score at 80th percentile.



2nd DISTR invNorm(area, μ, σ)

invNorm(0.8, 75, 10) = 83.42
test score for 80th percentile =83

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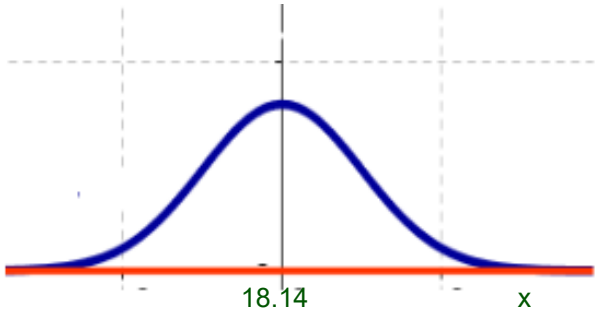
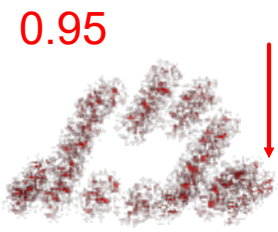
6.3 Normally Distributed Variables

5. Find an x value associated with percentages or probabilities of normally distributed variables.

G: tarantula carapice length is n.d., with
μ = 18.14 mm, σ = 1.76 mm.

F: How large a carapice is at the 95th percentile?





Use calculator

2nd DISTR invNorm(area, μ, σ)

19.9

6.3 Normally Distributed Variables

5. Find an x value associated with percentages or probabilities of normally distributed variables.

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μ = 18.14 mm, σ = 1.76 mm.

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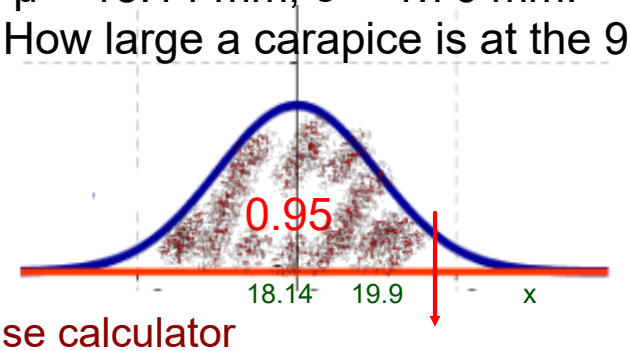

Use calculator

2nd DISTR invNorm(area, μ, σ)

invNorm(0.95, 18.14, 1.76) = 21.03

carapice size at 95th percentile is 21.03mm

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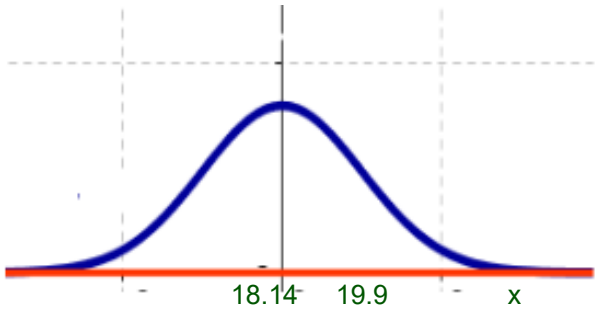
6.3 Normally Distributed Variables

5. Find an x value associated with percentages or probabilities of normally distributed variables.

G: Tarantula carapice length is n.d., with μ = 18.14 mm, σ = 1.76 mm.

F: The carapice size of the upper 1%



0.99

0.01

2nd DISTR/ invNorm(**left area**, μ, σ)

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6.3 Normally Distributed Variables

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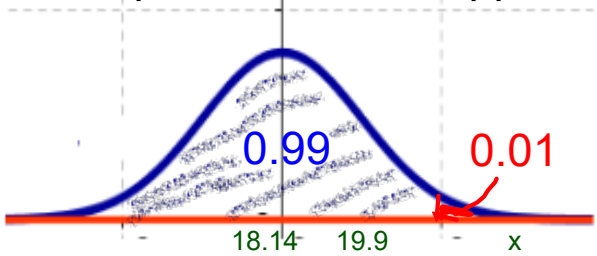

2nd DISTR/ invNorm(**left area**, μ, σ)

invNorm(**0.99**, 18.14, 1.76) = 22.23

The upper 1% in carapice size for tarantuas begins at 22.23mm (x ≥ 22.23)

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