

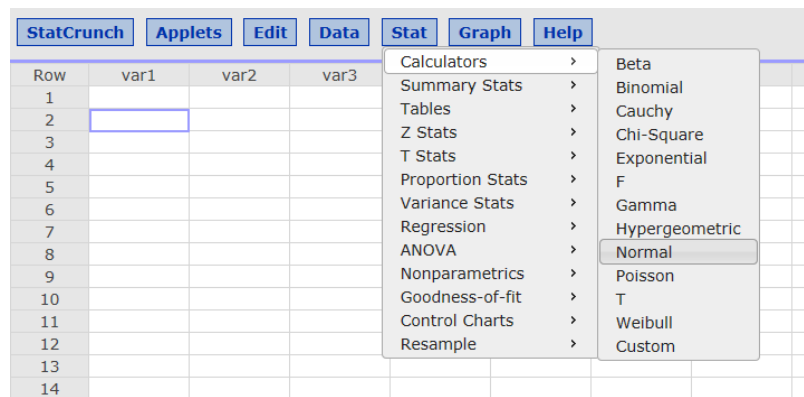
The lesson documents provide information about using the calculator provided with the lessons. The purpose of this supplement is to supply information about another possible technology, namely the StatCrunch computer software product.

**CAUTION:** You should note that the interface for StatCrunch has changed in the past and may well change in the future – accordingly, some of the information given here may prove to be out of date.

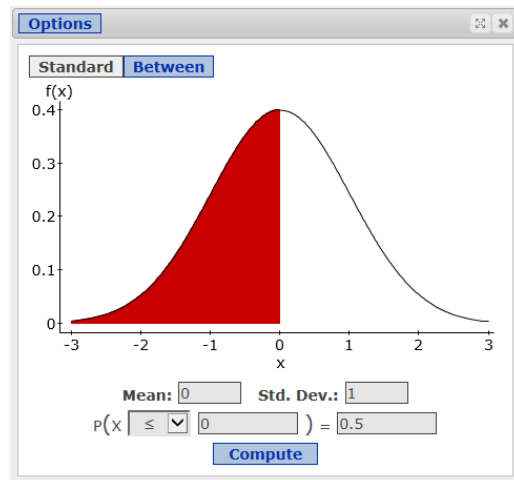
### Starting StatCrunch – see Lesson 2 document

### Lesson 4

The starting point for all our calculations is the **Stat > Calculators > Normal** menu option, as shown in this figure.



This results in the following “Normal calculator” being made available:



We will leave the Mean and Standard Deviation as shown (0 and 1), which allows us to enter  $z$  scores and find areas/probabilities/proportions.

We begin by calculating probabilities based on  $z$  scores, using the problems from the first three examples:

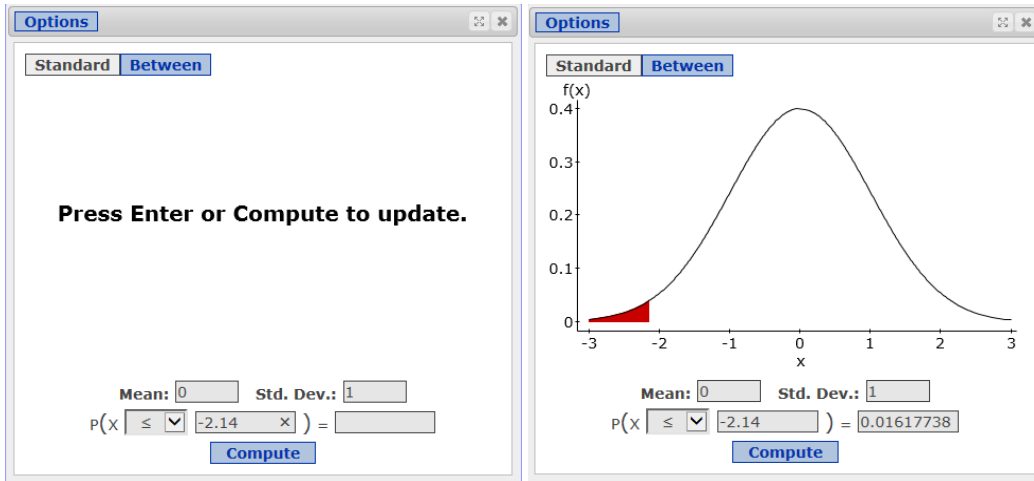
$$P(z \leq -2.14)$$

$$P(z \geq 1.87)$$

$$P(-2.14 \leq z \leq 1.87)$$

**Example 1 using StatCrunch:** Calculate  $P(z \leq -2.14)$

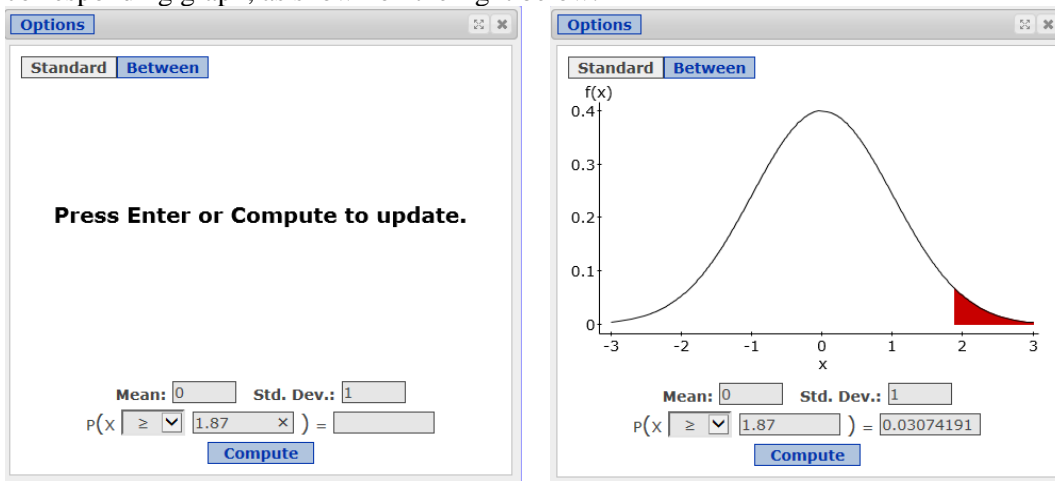
**Solution:** By default, the StatCrunch Normal Calculator is set up to find probabilities less than or equal to a given z score. We simply enter the z score ( $-2.14$ ) as shown in the figure on the left below. When we click the **Compute** button we obtain the result shown on the right below.



Notice that StatCrunch has calculated the probability ( $0.0162 = 1.62\%$ ) and has also created a graph of the corresponding area.

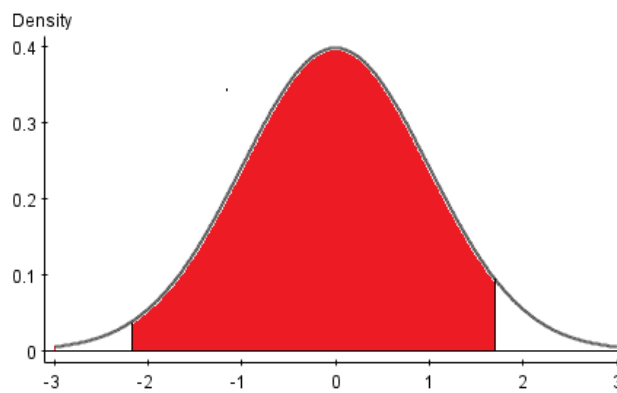
**Example 2 using StatCrunch:** Calculate  $P(z \geq 1.87)$

**Solution:** By default the calculator is ready to calculate areas to the left of a z-score, as indicated by the  $P(X \leq -2.14)$  in our previous example. For this example, we need to use the pull-down menu to change the “ $\leq$ ” option to “ $\geq$ ” instead, then enter the z-score as 1.87, as shown on the left. Once again, clicking on the **Compute** button gives both the answer ( $0.0307 = 3.07\%$ ) and the corresponding graph, as shown on the right below.



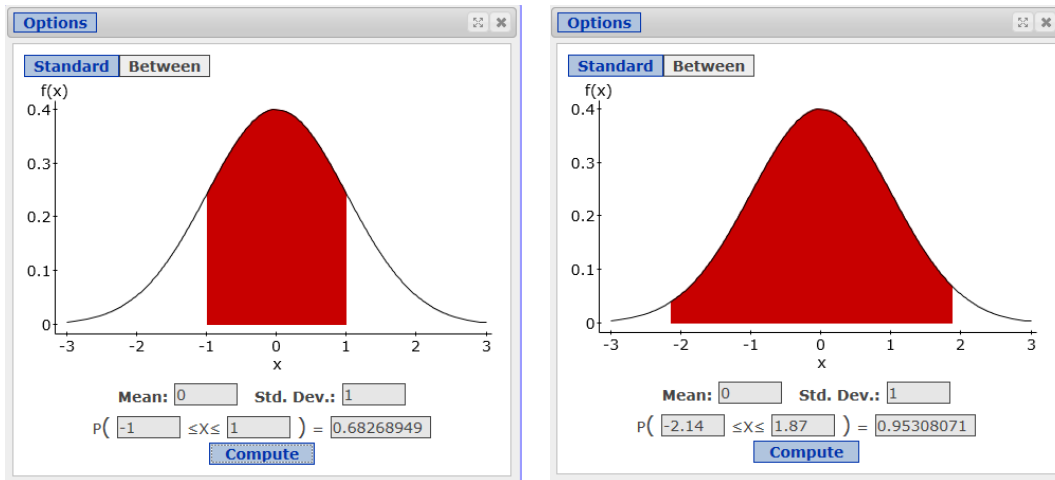
**Example 3 using StatCrunch:** Calculate  $P(-2.14 \leq z \leq 1.87)$

**Solution:** Here is a graph indicating the area we wish to calculate:



The area/probability/proportion we need to calculate begins at  $z = -2.14$  on the left, and ends at  $z = 1.87$  on the right.

For this type of problem, we need to change the calculator from its default **Standard** mode to the **Between** mode, by clicking on the **Between** button at the top. This results in the screen shown on the left below. Simply entering the two  $z$  scores (smaller, then larger) and pressing **Compute** leads to the results shown on the right below.



The probability is .9531 or 95.31%..

**Examples 4-6 using StatCrunch.** For adult female heights (normal with mean 65" and standard deviation 3.5"), calculate:

$$P(\text{height} \leq 60)$$

$$P(\text{height} \geq 71)$$

$$P(62 \leq \text{height} \leq 70)$$

**Solution.** Just as we did when using Table A, the first step in each problem is to calculate the  $z$  score for the heights. We will round the answers to four decimal places rather than two. This converts the

probability about heights to a probability about z scores, which we solve just as we did for examples 1, 2, and 3. Here are the results.

<b>Original</b>	<b>In terms of z</b>	<b>Resulting probability</b>
$P(\text{height} \leq 60)$	$P(z \leq -1.4286)$	$0.0766 = 7.66\%$
$P(\text{height} \geq 71)$	$P(z \geq 1.7143)$	$0.0432 = 4.32\%$
$P(62 \leq \text{height} \leq 70)$	$P(-0.8571 \leq z \leq 1.4286)$	$0.7277 = 72.77\%$

**Note:** There is a shortcut method which your instructor may allow you to use, which bypasses the calculation of the z-score. However, we recommend that you use the method we present here, as the skills you develop will transfer quite nicely when we learn about the “t distribution” later in the course.