

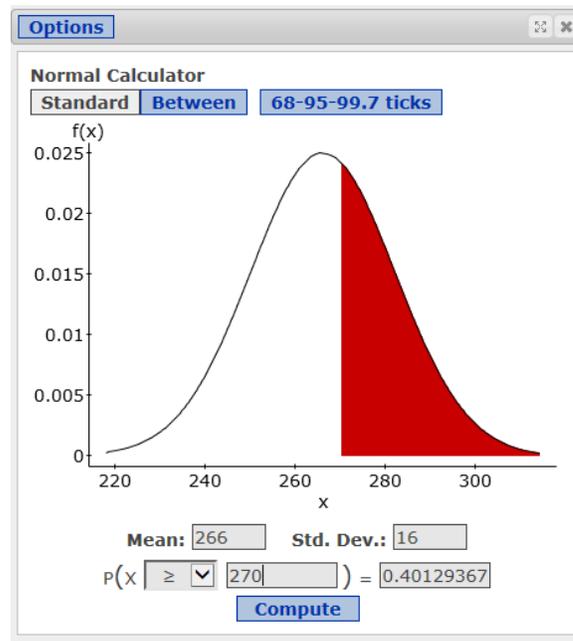
USING THE NORMAL CALCULATOR IN STATCRUNCH

Here's problem #41 from section 7.2.

- 41. Gestation Period** The lengths of human pregnancies are approximately normally distributed, with mean $\mu = 266$ days and standard deviation $\sigma = 16$ days.
- (a) What proportion of pregnancies lasts more than 270 days?
 - (b) What proportion of pregnancies lasts less than 250 days?
 - (c) What proportion of pregnancies lasts between 240 and 280 days?
 - (d) What is the probability that a randomly selected pregnancy lasts more than 280 days?

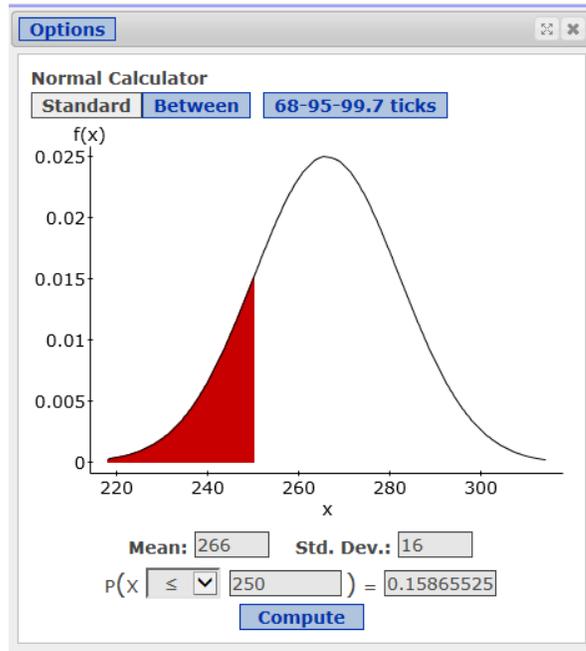
First, note that the random variable, x is the length of a human pregnancy and that x is normally distributed. ("approximately normal", essentially the same thing) The mean is 266 and the standard deviation is 16. Part (a) translates to: $P(x > 270)$. Note that for a continuous variable, (NOT discrete!) $>$ and \geq mean the same thing as do $<$ and \leq .

Open StatCrunch and click "Stats", "Calculators", "Normal". Here's how the normal calculator looks when the information is entered.



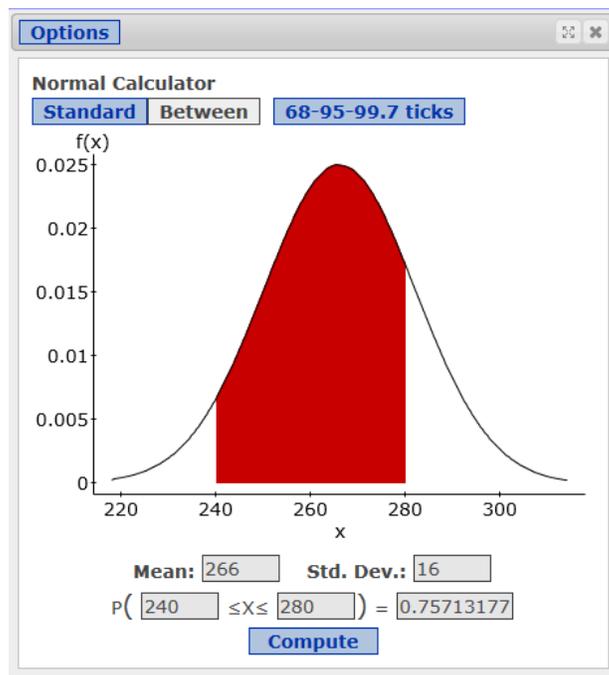
So the probability that a randomly selected pregnancy lasts more than 270 days is 0.4013, or said another way, about 40% of human pregnancies last longer than 270 days.

Part (b) looks like this.



Note how the graph is shaded according to the probability being calculated.

For the first two parts of this problem, you want to use the "Standard" calculator. See that box toward the top of the output, above? For part (c), you want to click the box next to that, "Between". When part (c) is set up, it looks like this, below. The "Between" selection opens up two boxes such that you can calculate probabilities between two values.



You try part (d). The answer is 0.1908.

Now, backwards!

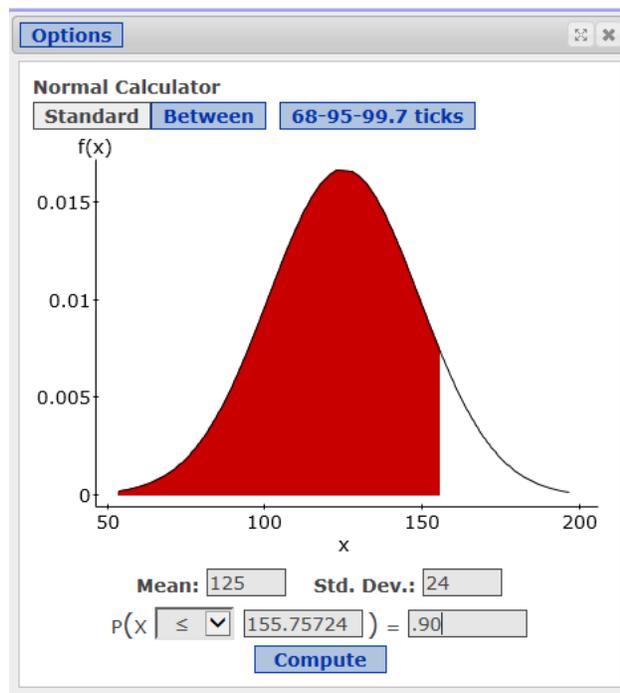
Previously, we were given the cutoff values and asked to find probability. (proportion, percentage, all the same) Note the difference in problem #48, also from 7.2.

48. Reading Rates The reading speed of sixth-grade students is approximately normal, with a mean speed of 125 words per minute and a standard deviation of 24 words per minute.

- (a) What is the reading speed of a sixth-grader whose reading speed is at the 90th percentile?
- (b) A school psychologist wants to determine reading rates for unusual students (both slow and fast). Determine the reading rates of the middle 95% of all sixth-grade students. What are the cutoff points for unusual readers?

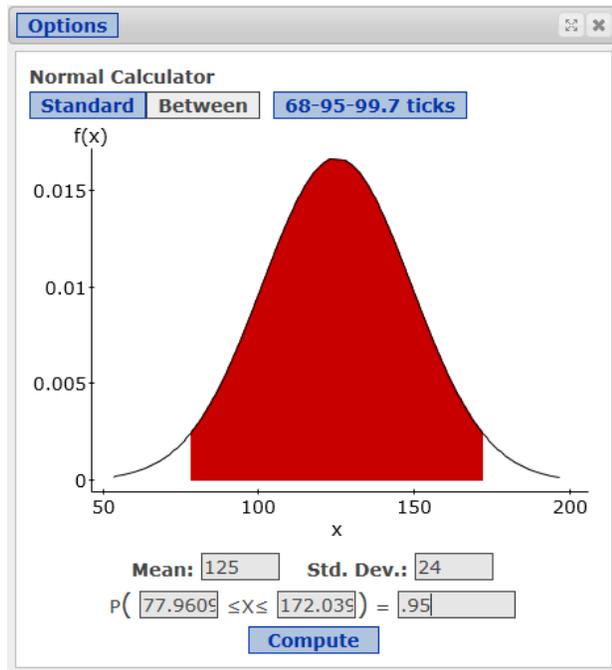
Part (a) is asking for the reading speed, a value of the random variable, NOT a probability! You can do this using the normal calculator backwards. You'll simply fill in the probability box and leave the box for the cutoff value empty.

Again, note that the random variable is the reading speed of a 6th grader and that it's normally distributed. The mean is 125 and standard deviation 24. Recall that a percentile is the percentage of data at or below that specific percentile. The 68th percentile is a value such that 68% of the data is at or below it. The 90th percentile in this problem is a reading speed such that 90% of the reading speeds are at or below it. In the normal calculator, it looks like this.



So 90% of reading speeds are at or below about 156.

In part (b), you can use the “Between” feature again. We want the middle 95%, so when they say “middle”, they mean that the leftover probability/area is split evenly into the two tails. Remember that the total area is always one under a probability curve. The only reason you can use the “Between” feature here is that the tails are symmetric! In StatCrunch, it looks like this.



So the middle 95% of readers read between 78 and 172 words per minute.