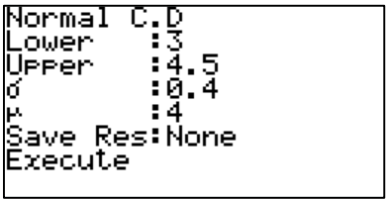
Part 2.3: Between

The next type of questions we will look at are when we are calculating the probability the value is between two values… this is super easy with the graphics calculator… we just put these numbers into the lower and the upper, with the tables we need to work out two probabilities and then add or subtract them.

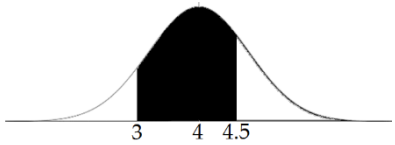
Example
The time taken to brew a coffee is normally distributed with a mean of 4 minutes and a standard deviation of 0.4 minutes. What is the probability it takes between 3 and 4.5 minutes to brew the coffee?

Answer (Graphics Calculator)
You just enter the lower and the upper number in like this:



And you find the answer is 0.888 (3sf).

Answer (Tables)
The first thing we need to do is draw a diagram like this:



As you can see we need to work out the probability between the lower and the median (3 and 4), and between the median and the upper (4 and 4.5).
First up the lower and the median
$Z = \frac{3-4}{0.4} = -2.5$ giving us p = 0.4938
And the median and the upper
$Z = \frac{4.5-4}{0.4} = 1.25$ giving us p = 0.3944
This gives us a total probability of
0.4938 + 0.3944 = 0.888 (3sf)

Exercise 2.3

1. The gestation period for humans is normally distributed with a mean of 40 weeks and a standard deviation of 1.3 weeks. What is the probability that the gestation period is between 38 and 41 weeks?
2. The height of chicken eggs are normally distributed with a mean of 57 mm and a standard deviation of 4 mm. What is the probability that the chicken egg is between 52 mm and 59 mm tall?
3. The fuel efficiency of new cars in 2008 was normally distributed with a mean of 8.9 L/100 km and a standard deviation of 2.1 L/100 km. What is the probability that the fuel efficiency of a new car was between 5 L/100 km and 7 L/100 km?
4. The average stride length of a marathon runner is normally distributed with a mean of 152 cm and a standard deviation of 20.5 cm. What is the probability that the stride length will be between 150 and 160 cm?
5. The time taken to sell a house is normally distributed with a mean of 34 days and a standard deviation of 10 days. What is the probability that it takes between 20 and 30 days to sell a house?
6. The weight of a forward rugby player is normally distributed with a mean of 111 kg and a standard deviation of 8 kg. What is the probability that a forward rugby player weighs between 120 and 130 kg?
7. The time spent by a person in the shower is normally distributed with a mean of 8 minutes and a standard deviation of 3 minutes. What is the probability that someone spends between 4 and 6 minutes in the shower?
8. The length of cats tails are normally distributed with a mean of 30 cm and a standard deviation of 3 cm. what is the probability that a cat's tail is between 28 cm and 32 cm?