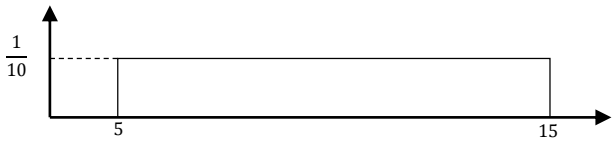
Part 3.1: Finding the Probability

The first thing we need to know how to do is find the probability from a uniform distribution. To do this we find the area of the relevant part of the rectangle. Let's have a look at an example.

Example
The time taken for a component to wear out has a uniform distribution with a minimum of 5 days and a maximum of 15 days.

a. What is the probability that it wears out in less than 7 days?
b. What is the probability that it lasts longer than 10 days?
c. What is the probability that it wears out between 5 and 8 days?

Answer
The first thing that we must do is draw the probability function, as this makes life much easier. Shading in the area that you are trying to find is also helpful.



a. The probability that it is less than 7 days is the probability that it is between 5 days and 7 days. Now we know that the area of a rectangle, and thus the probability, is base × height, so it is $2 \times \frac{1}{10} = 0.2$.
b. The probability that it takes more than 10 days to fail is the probability it is between 10 and 15 days, this means the area, and therefore the probability, is $5 \times \frac{1}{10} = 0.5$.
c. The difference between these two days is 3, so the probability is $3 \times \frac{1}{10} = 0.3$.

Exercise 3.1

1. The time taken to tie a knot has a uniform distribution. The minimum time is 4 seconds and the maximum time is 8 seconds. What is the probability that it:
    a. Takes less than 5 seconds to tie?
    b. More than 6 seconds to tie?
    c. Between 4.5 and 6.4 seconds to tie?
    d. Longer than 10 seconds to tie?
2. The amount of grain that spills from a bag has a uniform distribution with a minimum of 2 g and a maximum of 12 g. What is the probability that:
    a. More than 10 g spill out?
    b. Less than 2 g spill out?
    c. Between 3 and 5 grams spill out?
    d. Less than 2.5 g spill out?
3. The length of pieces of wood have a uniform distribution with a minimum of 3 m and a maximum of 3.2 m. What is the probability the wood is:
    a. More than 3.18 m long?
    b. Less than 3.04 m long?
    c. Between 3.02 m and 3.05 m long?
    d. Between 3.21 m and 3.3 m long?
4. A farmer knows that the heaviest his cows get is 790 kg and the lightest is 660 kg. What is the probability the cow weighs:
    a. More than 750 kg?
    b. Between 700 kg and 750 kg?
    c. More than 300 kg?
    d. Less than 200 kg?
5. The amount spend on my phone bill a month has a minimum of $80.00 and a maximum of $93.00. Find the probability the phone bill is:
    a. Between $80.50 and $90.50?
    b. Less than $82.50?
    c. Between $92.00 and $94.00?
6. The maximum length of a pen is 12.52 cm and the minimum length is 12.41 cm. Using a normal distribution find the probability the pen is:
    a. More than 12.49 cm?
    b. Less than 12.43 cm?
    c. Between 12.42 and 12.45 cm?
    d. More than 12.6 cm?

7. The maximum distance a rugby player can normally kick a ball is 49 m and the minimum is 10 m. What is the probability the kick is:
    a. More than 10 m?
    b. Less than 40 m?
    c. Between 30 m and 40 m?
    d. More than 36 m?

8. The minimum time I spend each day reading is 10 minutes and the maximum is 3 hours. What is the probability that I spend:
    a. Between 2 and 2.5 hours reading?
    b. More than 1 hour reading?
    c. Less than 40 minutes reading?