Part 6.1: Finding the Mean

The first thing that we need to do with these sorts of tables is find the mean. To find the mean you multiply each number by the corresponding probability and then add them all up. Let's look at two examples.

Example 1

The likelihood of winning different prizes in a raffle is shown below.

x	$100	$20	$0
P(X=x)	1/100	3/100	q

Find q and calculate the mean of the prize amount.

Answer

The first thing we need to do is find q. As probabilities always add to one,

$$q = 1 - \frac{1}{100} - \frac{3}{100} = \frac{96}{100}$$

So the mean $= 100 \times \frac{1}{100} + 20 \times \frac{3}{100} + 0 \times \frac{96}{100} = 1.6$

Therefore the mean (or expected value) of the prize from the raffle ticket is likely to be $1.60.

Example 2

The length of time it takes to straighten hair is given in the table below.

x	$0 \le x < 5$	$5 \le x < 10$	$10 \le x < 30$
P(X=x)	0.2	0.5	0.3

Calculate the mean time it takes to straighten hair.

Answer

This question is slightly different as we are not given exact values, but ranges. The values we want to use in this situation is the midpoint of the range, so 2.5, 7.5 and 20 respectively.

Mean $= 2.5 \times 0.2 + 7.5 \times 0.5 + 20 \times 0.3 = 10.25$

Therefore the mean time it takes to straighten hair is 10.25 minutes (or 10 minutes and 15 seconds).

Note: in order for the raffle to be 'fair' the cost of the ticket should be the same as the mean, and if the raffle is to make money the ticket price must be higher than the mean.

Exercise 6.1

1. The prizes in a lottery are shown in the table below.

x	$20	$10	$0
P(X=x)	0.02	0.1	q

   a. Calculate the value of q
   b. What is the mean of the prizes??

2. Biscuits come in 3 packet sizes, small (12), medium (18) and large (30).

x	12	18	30
P(X=x)	0.3	0.5	0.2

   Calculate the mean number of biscuits in a packet based on the table above.

3. Toyota Corollas come in 3 engine sizes, 35% are 1.5 L engines, 50% are 1.8 L engines and the rest are 2.0 L engines.
   a. What percentage of Toyota Corollas have 2.0 L engines?
   b. Calculate the average engine size.

4. Stockings come in three lengths, small (147 – 161 cm), average (162 – 171 cm) and Tall (172 – 183 cm).

x	147 – 161	162 – 171	172 – 183
P(X=x)	0.6	m	0.2

   Calculate the mean length of the stockings.