Udacity Intro To Statistics Problem Set 6

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Contents

1 Probability Tables

Both tables are valid because the probabilities add to 1:
(i)

outcomes	1	2	3	4	5
probability	1/5	1/5	1/5	1/5	1/5

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{5}{5} = 1 \tag{1}$$

(ii)

outcomes	1	2	3	4	5
probability	1/2	1/5	1/10	1/10	1/10

$$\frac{5}{10} + \frac{2}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{10}{10} = 1 \tag{2}$$

2 Sample Space

A sample space has exactly two outcomes. The first has probability p and the second has probability $3p$. What is the value of p?
The sum of the probabilities of the outcomes must equal 1, so:

$$p + 3p = 1 \tag{3}$$

$$\implies 4p = 1 \tag{4}$$

$$\implies p = \frac{1}{4} \tag{5}$$

3 Union of Probabilities

Given:

$$P(A) = 0.4, P(B) = 0.5, P(A \cap B) = 0.3 \tag{6}$$

Since the probabilities have an intersection that is not empty we use the inclusion-exclusion principle to calculate $p(A \cup B)$:

$$P(A \cup B) = (P(A) + P(B)) - P(A \cup B) = (0.4+0.5) - 0.3 = 0.9 - 0.3 = 0.6 \tag{7}$$

4 Size of an Event

Our experiment consists of tossing a coin 3 times. Take the sample space to be all sequences of 3 heads or tails.

$$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\} \tag{8}$$

For each of the following give the size of the event.
(i) The event 'there are more heads than tails'.

$$\Omega = \{HHH, HHT, HTH, THH\} \tag{9}$$

$$\implies |\Omega| = 4 \tag{10}$$

(ii) The event 'the first heads occurs after the first tails.'

$$\Omega = \{THH, THT, TTH\} \tag{11}$$

$$\implies |\Omega| = 3 \tag{12}$$