

Averaging and Probability Distributions

Example data set:

x_i —
 6
 3
 4
 6
 6
 3
 7
 8
 6
 49

$$\text{average} = \bar{x} = \frac{\sum x_i}{n} = \frac{49}{9} = 5.44$$

Using a weighted average: weight each result by the number of occurrences, n_i .

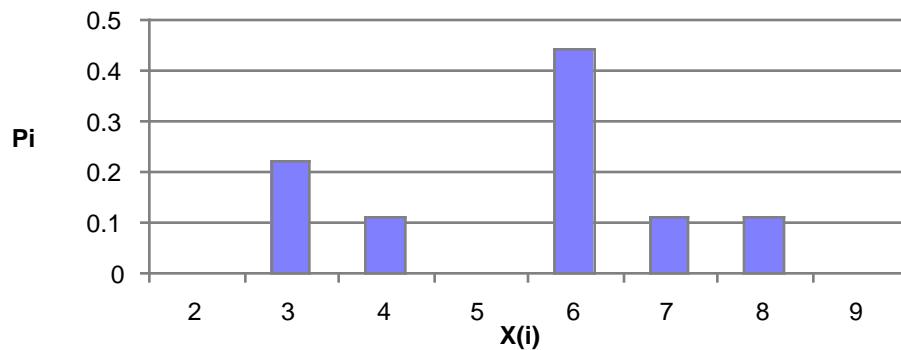
$$\text{average} = \bar{x} = \frac{\sum n_i x_i}{\sum n_i} = \frac{2(3)+1(4)+0(5)+4(6)+1(7)+1(8)}{2+1+0+4+1+1} = \frac{49}{9}$$

with the sum over all possible values of x .

Using a probability distribution $P(x_i)$:

Weight each result by the probability of its occurrence.

x_i	$P(x_i)$
2	0/9
3	2/9
4	1/9
5	0/9
6	4/9
7	1/9
8	1/9
9	0/9
$\sum P(x_i) = 1$	
$P(x_i) = P_i$	



$$\bar{x} = \frac{\sum P_i x_i}{\sum P_i} = \frac{\frac{0}{9}(2) + \frac{2}{9}(3) + \frac{1}{9}(4) + \frac{0}{9}(5) + \frac{4}{9}(6) + \frac{1}{9}(7) + \frac{1}{9}(8) + \frac{0}{9}(9)}{\frac{0}{9} + \frac{2}{9} + \frac{1}{9} + \frac{0}{9} + \frac{4}{9} + \frac{1}{9} + \frac{1}{9} + \frac{0}{9}} = \frac{5.44}{1}$$