# AI1110 - Probability and Random Variables
# Assignment 8

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# Papoulis Chapter 4

## Q 4-30

The probability that a driver will have an accident in 1 month equals 0.02. Find the probability that in 100 months he will have three accidents.

# Solution I

Let the event of accident be represented by a random variable X, where X=0 represents that the driver will not have an accident and X=1 represents that the driver will have an accident.
Given,

$$\Pr(X = 0) = 0.98 \tag{1}$$
$$\Pr(X = 1) = 0.02 \tag{2}$$

This distribution can be represented using a matrix as follows

$$H = \begin{pmatrix} 0.98 \\ 0.02 \end{pmatrix} \tag{3}$$

Let the number of accidents in 100 months be represented by $Y \in \{0, 1, 2, 3, ...100\}$.

# Solution II

The matrix

$$P = \begin{pmatrix} \Pr(Y=0) \\ \Pr(Y=1) \\ \Pr(Y=2) \\ \dots \\ \Pr(Y=100) \end{pmatrix} \tag{4}$$

can be obtained by the following convolution

$$P = Y \oplus Y \oplus Y \oplus ..Y(100 times) \tag{5}$$

Using python for the above calculation, we get

$$\Pr(Y=3) = 0.18227 \tag{6}$$