

# Machine Learning Assignment 30

Maia Dimas

## Problem 30-1A

**A:**

About a 6% chance

$$\begin{aligned}P(T \leq 1) &= \frac{1^2}{16} \\ &= 0.0625\end{aligned}$$

**B:**

You can find the chance of it taking longer than 2 hours, by finding the chance it takes LESS than 2 hours. Its about an 75% chance anyway

$$\begin{aligned}P(T \leq 2) &= \frac{2^2}{16} \\ &= 0.25 \\ P(T > 2) &= 1 - P(T \leq 2) \\ &= 0.75\end{aligned}$$

**C:**

Around a 50% chance

$$\begin{aligned}P(1 \leq T \leq 3) &= P(T \leq 3) - P(T \leq 1) \\ &= 0.5\end{aligned}$$

### Problem 30-1B

Around 18%

$$\begin{aligned}P(T \leq 3 | T \geq 2) &= \frac{P(T \leq 3 \cap T \geq 2)}{P(T \geq 2)} \\ &= \frac{e^{-\frac{2}{3}} - e^{-\frac{3}{3}}}{e^{-\frac{2}{3}}} \\ &= 0.1812692469\end{aligned}$$

### Problem 30-1C

**A:**

$$\begin{aligned}P(\{k\}) &= \sum_{k=1}^{\infty} \frac{c}{3^k} \\ \sum_{k=1}^{\infty} \frac{c}{3^k} &= 1 \\ \frac{c}{1 - \frac{1}{3}} &= 1 \\ \frac{c}{\frac{2}{3}} &= 1 \\ c &= \frac{2}{3}\end{aligned}$$

**B:**

$$\begin{aligned}P(\{2, 4, 6\}) &= \frac{2}{3^2} + \frac{2}{3^4} + \frac{2}{3^6} \\ &= \frac{182}{729} \\ &= 0.2496570645 \quad (\text{Calculator})\end{aligned}$$

C: .

$$\begin{aligned} P(\{3, 4, 5, \dots\}) &= \sum_{k=3}^{\infty} \frac{2}{3^k} \\ &= \frac{2}{27} \\ &= \frac{1}{1 - \frac{1}{3}} \\ &= \frac{1}{9} \\ &= 0.1\dots \end{aligned}$$