Question 3

a.

Given, Probability of one engine failing = 1%

Engines operate **independently**; therefore probability of engine (1) failing is **equal** to probability of engine (2) failing.

Therefore, probability of both engines failing:

$$P(Failure) = 1\% * 1\% = 0.01\%$$

b.

Let a sequence be represented as $[a_0, a_1, ..., a_{29}]$; where a_i represents the birthday of the i^{th} person in the room.

Total number of sequences (s) = 365^{30}

Number of sequences where all birthdays are unique = ${}^{365}P_{30}$.

Therefore number of sequences where at least two people have the same birthday:

n = $365^{30} - {}^{365}P_{30}$

Probability P = $\frac{n}{s}$

$$P = \frac{365^{30} - {}^{365}P_{30}}{365^{30}}$$