Q1: Mathematical Question

Question:
We have an education product which is being used in the class. For a class of 30 students, what's the defect frequency target per typical user session (say over a 10-minute period) for the class if we aim for a 90% defect-free rate for the entire class? All students are assumed to use the product the same way in their user session.

Solution:
We are given the following information:

- The number of students in the class, $n = 30$.
- The target defect-free rate for the entire class is $p = 0.9$.

Let q be the defect-free rate for an individual student's user session.

The probability that all 30 students experience defect-free sessions is the product of their individual defect-free probabilities, i.e.,

$$p = q^{30}$$

Substituting $p = 0.9$, we get:

$$0.9 = q^{30}$$

Taking the 30-th root of both sides, we solve for q:

$$q = 0.9^{\frac{1}{30}}$$

Using a calculator, we find:

$$q \approx 0.99655$$

Therefore, the defect-free rate for an individual user session is approximately 0.99655.

The defect frequency per individual user session is:

$$\text{Defect frequency} = 1 - q = 1 - 0.99655 = 0.00345$$

Thus, the defect frequency target per typical user session (10-minute session) is approximately:

$$\boxed{0.345\%}$$