BE the popcorn machine solution

Your job is to play like you're the popcorn machine and say what the probability is of you malfunctioning a particular number of times next week. Remember, the mean number of times you break down in a week is 3.4.

Let's use X to represent the number of times the popcorn machine malfunctions in a week. We have

$X \sim Po(3.4)$

1. What's the probability of the machine not malfunctioning next week?

If there are no malfunctions, then X must be 0.

$$P(X = 0) = \frac{e^{-\lambda} \lambda^r}{r!}$$

$$= \frac{e^{-3.4} \times 3.4^0}{0!}$$

$$= \frac{e^{-3.4} \times 1}{1}$$

$$= 0.033$$

Looks like we can expect the machine to break down only 3.4 times next week, so we'll risk it and skip that new machine. Don't tell the moviegoers.

2. What's the probability of the machine malfunctioning three times next week?

$$P(X = 3) = \frac{e^{-3.4} \times 3.4^3}{3!}$$

$$= \frac{e^{-3.4} \times 39.304}{6}$$

$$= 0.033 \times 6.55$$

$$= 0.216$$

3. What's the expectation and variance of the machine malfunctions?

$$E(X) = \lambda = 3.4 \qquad Var(X) = \lambda = 3.4$$