2. On average, 1 bus stops at a certain point every 15 minutes. What's the probability that no buses will turn up in a single 15 minute interval?

If X is the number of buses that stop in a 15 minute interval, then $X \sim Po(1)$

$E(X) = \lambda$
$= 1$

$Var(X) = \lambda$
$= 1$

For a general probability, $P(X = r) = \frac{e^{-\lambda} \lambda^r}{r!}$

$P(X = 0) = \frac{e^{-1} \times 1^0}{0!}$
$= \frac{e^{-1} \times 1}{1}$
$= 0.368$

3. 20% of cereal packets contain a free toy. What's the probability you'll need to open fewer than 4 cereal packets before finding your first toy?

If X is the number of cereal packets that need to be opened in order to find your first toy, then $X \sim Geo(0.2)$

$E(X) = 1/p$
$= 1/0.2$
$= 5$

$Var(X) = q/p^2$
$= 0.8/0.2^2$
$= 0.8/0.04$
$= 20$

For a general probability, $P(X \leq r) = 1 - q^r$

$P(X \leq 3) = 1 - q^r$
$= 1 - 0.8^3$
$= 1 - 0.512$
$= 0.488$