Arpan

Question 3

$p = \frac{1}{6}$; $q = \frac{5}{6}$; $n = 12000$

$X = \sum X_i$

$X_i = \begin{cases} 1 & p \\ 0 & q \end{cases}$

$Ans = P(1900 < X < 2150)$

$\sigma = npq = 12000 \times \frac{5}{6} \times \frac{1}{6}$

$= \frac{5000}{3}$

$\mu = np = 2000$

We approximate using

$X \sim N\left(2000, \frac{5000}{3}\right)$

Let $Y = N\left(2000, \frac{5000}{3}\right)$

$\Rightarrow P(1900 < X < 2150) = P(1900.5 \leq Y \leq 2149.5)$

$= P\left(\frac{1900.5 - 2000}{\sqrt{\frac{5000}{3}}} \leq \frac{Y - 2000}{\sqrt{\frac{5000}{3}}} \leq \frac{2149.5 - 2000}{\sqrt{\frac{5000}{3}}}\right)$

$= P(-2.448 \leq z \leq 3.661)$

$= \underline{\underline{0.9927}}$

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Question 8

(a) https://stats.stackexchange.com/questions/2092/relationship-between-poisson-and-exponential-distribution

(b) Let an event occur at time t_0

P(event occuring first time at t_1) = p

$\vdots$

P(event occuring first time at $t=k$) $= q^{k-1} p$

If X = r.v. that represents time for next event to occur.

$$P(X=k) = q^{k-1} p.$$

$\Rightarrow X$ is geometrically distributed.

(c) https://math.stackexchange.com/questions/93098/how-to-prove-that-geometric-distributions-converge-to-an-exponential-distributio

(Sorry for SE links, but I prolly wont be better be able to explain than them anyway :|)