Approximating a Binomial random variable by a Standard Normal random variable - we must scale and shift the Binomial random variable appropriately. $Z \approx \dfrac{X - np}{\sqrt{npq}}$

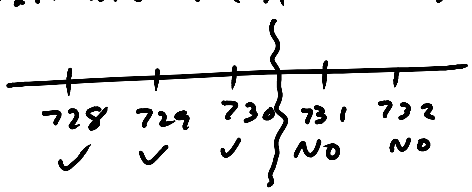
Similarly we can use a Normal approximation to Poisson random variables with large parameter $\lambda$.

In other words, if $X$ is a Poisson random variable with large parameter $\lambda$, then $\dfrac{X-\lambda}{\sqrt{\lambda}}$ is approximately distributed like a standard normal random variable.

(To think about why this is true, write the Poisson $X$ as a sum of $\lambda$ Poisson random variables that are each having parameter 1 and that are independent, if $\lambda$ is an integer.)

E.g. Suppose $X$ is a Poisson random variable with $\lambda = 700$.

Approximate $P(X \leq 730) = P(X \leq 730.5)$




$$= P\left(\frac{X-700}{\sqrt{700}} \leq \frac{730.5-700}{\sqrt{700}}\right)$$

$$\approx P(Z \leq 1.15) = 0.8749$$

By the way, the exact value is

$$P(X \leq 730) = \sum_{j=0}^{730} \frac{e^{-700}\, 700^{j}}{j!} = 0.8750977\ldots..$$

The approximation is pretty good!