poisson.

$$p(x) = \frac{e^{-\lambda} \cdot \lambda^x}{x!} \quad x = 0, 1, 2, \ldots$$

Q 4. What if in each page there are 1000 w
we still have average 6 typos per page.
What's the prob for no typo in the page?

$x = 0$.

Binomial distrition

prob of each word to contain a typo.

$$p = \frac{6}{1000} = 0.006.$$

X: the number of typo.

$X \sim B(n=1000, p=0.006)$.

pmf:

Q: $X_1 \sim Po(\lambda_1)$
$X_2 \sim Po(\lambda_2)$ independent X_1, X_2.

What is the dist of sum, $X_1 + X_2$?

$X_1 + X_2 \sim Po(\lambda = \lambda_1 + \lambda_2)$ $\boxed{\checkmark}$

Q. Say 1000 X's. $X \sim Po(\lambda)$.

$\sum_i X_i = ?$

$\frac{\sum_i X_i}{n} = ?$

① Po ✓

② normal $\rightarrow$ CLT ✓

mean $= \sum_i \mu_i$ $= \sum \lambda$

Var $= \sum \sigma_i^2$ $= \sum \lambda = n\lambda$

Ex. H A. birth rate $\sim Po(2.3)$ per hour.
H B. birth rate $\sim Po(1.6)$ per hour.

Q What's the prob that in total 7 births from A and B.

Scanned by CamScanner

Multinomial dist.

Q. types of blood

type	A	B	AB	O
prob.	.042	.10	.004	.044

pick randomly 10 $= n$ Americans,
what's the probability of

6 O $\quad X_1 = 6$. $\quad X_1 + X_2 + X_3 + X_4 = 10$

2 A $\quad X_2 = 2$.

1 B $\quad X_3 = 1$

1 AB ? $\quad X_4 = 1$

Notes: ① each trial will have more than 2 possible outcomes, only one of ~~the~~ the outcomes will happen

② for each outcome, we have prob

$p_1 \; p_2 \; \cdots \; p_K$

$$\sum_{i=1}^{K} p_i = 1.$$

pmf: $E(X) = n \cdot p$. $Var = np(1-p)$.

Binomial

$pmf = \binom{n}{k} p^k (1-p)^{n-k}$

multinomial

$pmf = \left(\frac{n!}{X_1! \cdot X_2! \cdots X_k!}\right) p_1^{X_1} \cdot p_2^{X_2} \cdots p_k^{X_k}$

$X = (X_1, X_2, \cdots X_k)$.

$X_1 \quad X_2, \quad \cdots \quad X_k$

$\sum_{i=1}^{k} X_i = n$.

Q $E(X)$. $Var(X)$.

$E(X_1) = n \cdot P_1$ $Var = nP_1(1-P_1)$

$\vdots$

$E(X_2) = n \cdot P_2$. $Var = n \cdot P_2(1-P_2)$

$\vdots$

$E(X_k) = n \cdot P_k$. $\cdots$