

# MAT1372, Quiz9, Fall2025

ID: \_\_\_\_\_

Name: \_\_\_\_\_

- This quiz consists of 1 question for a total of 10 points. You have 15 minutes to complete the quiz.
- Show all work and justify your answers.
- Wishing you success.
- Useful formulas:

Hypergeometric:  $P(\text{pick } k \text{ from } r | \text{ pick } n \text{ from } r+b) = P(X = k) = \frac{\binom{r}{k} \binom{b}{n-k}}{\binom{r+b}{n}}$ ;  $\mu = \frac{nr}{r+b}$

Poisson:  $P(\text{observe } k \text{ events}) = \frac{\lambda^k e^{-\lambda}}{k!}; \quad e = 2.718; \quad \mu = \lambda; \quad \sigma = \sqrt{\lambda}$

1. A very skilled court stenographer makes one typographical error (typo) per hour on average.

- What probability distribution is most appropriate for calculating the probability of a given number of typos this stenographer makes in an hour?
- What are the mean and the standard deviation of the number of typos this stenographer makes?
- Would it be considered unusual if this stenographer made 4 typos in a given hour?
- Calculate the probability that this stenographer makes at most 2 typos in a given hour.

Sol

(a) Poisson mean      standard deviation

(b) one typo per hour on average  $\Rightarrow \lambda = 1$ .  $\sigma = \sqrt{\lambda} = \sqrt{1} = 1$

(c) By checking how far away 4 typos are from the mean,  
we are able to know if it is unusual:

$\frac{4-1}{1} = 3$  which means 4 typos are 3  $\sigma$  above the mean  
and it is unusual.

(d)  $P(\text{at most 2 typos})$

$$= P(\text{exactly 0 typo}) + P(\text{exactly 1 typo}) + P(\text{exactly 2 typos})$$

$k=0 \qquad \qquad \qquad k=1 \qquad \qquad \qquad k=2$

$$= \frac{1^0 \cdot e^{-1}}{0!} + \frac{1^1 \cdot e^{-1}}{1!} + \frac{1^2 \cdot e^{-1}}{2!} = e^{-1} \left( \frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} \right)$$

$$= \frac{1}{e} (1 + 1 + \frac{1}{2}) = \frac{1}{e} \cdot \frac{5}{2} = \frac{2.5}{e} = 0.919698\dots$$