

Test from Statistics - data and random variable

1. Write formula for computing the average

a) using plain data

b) using different values and relative frequencies.

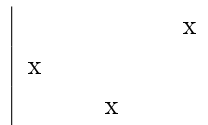
Result _____

$$\frac{1}{n} \sum_{i=1}^n x_i, \quad \sum_X X f_x$$

2. Draw scatter-graph from data

$$x = [1, 3, 5] \quad \text{and} \quad y = [2, 1, 3]$$

Result _____



3. For data

X_i	1	2	5
n_i	27	31	42

where X_i are different values and n_i are frequencies, determine the average.

Result _____

$$\bar{x} = \frac{299}{103} \doteq 2.9$$

4. Explain difference between classical and statistical definition of probability.

Result _____

Classical \rightarrow generator, statistical \rightarrow data

5. Write definitions of a) distribution function, b) density function, c) probability function.

Result _____

$$F(x) = P(X \leq x), \quad f(x) = \frac{dF}{dx}, \quad f(x) = P(X = x)$$

6. For random variable X with density function

$$f(x) = 2 \exp(-2x), \quad x \in (0, \infty)$$

determine: a) distribution function, b) $P(X \leq 0.5)$, c) $P(X > 2)$.

Result _____

$$1 - \exp(-2x), 1 - \exp(-1) = 0.632, \exp(-4) = 0.018$$

7. For joint probability function $f(x, y)$ given by the table

$x \backslash y$	1	2
1	0.1	0.3
2	0.2	0.4

determine a) marginals $f(x)$ and $f(y)$, b) expectations $E[X]$ and $E[Y]$

Result _____

$$f(x) = [0.4, 0.6]', f(y) = [0.3, 0.7]$$

$$1 \cdot 0.4 + 2 \cdot 0.6 = 1.6, 1 \cdot 0.3 + 2 \cdot 0.7 = 1.7$$

8. Write formula for expectation of discrete and continuous random variable.

Result _____

$$\sum_X X f_x, \int_{-\infty}^{\infty} x f(x) dx$$

9. For the function $g(x) = \exp(-5x)$ on the interval $x \in (0, \infty)$ determine the constant k so that the function $k \cdot g(x)$ is a density function.

Result _____

$$k = 5$$

10. Determine the constant p so that the following table

x	1	2	3
$f(x)$	0.2	p	0.5

defines a probability function.

Result _____

$$p = 0.3$$