T6. VARIABLES ALEATORIAS

- Discreta: Binomial, Poisson
- Continua: Uniforme, Normal

* VARIABLES ALEATORIAS DISCRETAS

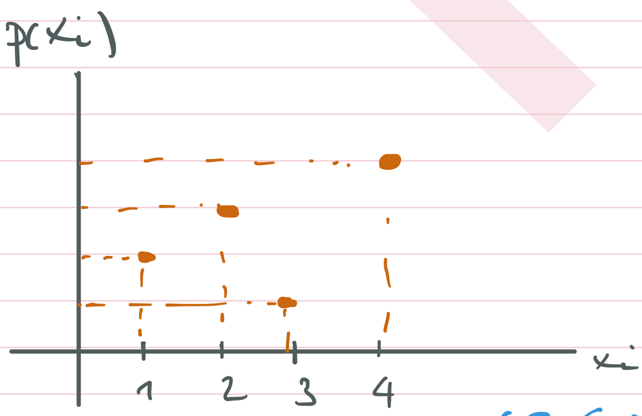
$p(x) \longrightarrow$ Función probabilidad o cuantía

$F(x) \longrightarrow$ Función Distribución

x_i	1	2	3	4
$p(x_i)$	0'2	0'3	0'1	0'4
$F(x_i)$	0'2	0'5	0'6	1

$$\boxed{\begin{array}{c} 0 \leq p(x_i) \leq 1 \\ \sum p(x_i) = 1 \end{array}}$$

- $p(x=2) = 0'3$
- $p(x \leq 2) = p(x=1) + p(x=2) = F(2) = 0'5$
- $p(x < 2) = p(x=1) = F(1) = 0'2$
- $p(2 < x \leq 4) = p(x=3) + p(x=4) = F(4) - F(2) = 0'5$
- $p(2 \leq x \leq 4) = p(x=2) + p(x=3) + p(x=4) = F(4) - F(1) = 0'8$



- **ESPERANZA**: $E(x) = \sum x_i \cdot p(x_i)$
- **VARIANZA**: $Var(x) = E(x^2) - (E(x))^2$

$$E(x^2) = \sum x_i^2 \cdot p(x_i)$$

x_i	1	2	3	4
$p(x_i)$	0'2	0'3	0'1	0'4
$F(x_i)$	0'2	0'5	0'6	1

$$E(x) = 1 \cdot 0'2 + 2 \cdot 0'3 + 3 \cdot 0'1 + 4 \cdot 0'4 = 2'7$$

$$Var(x) = 1^2 \cdot 0'2 + 2^2 \cdot 0'3 + 3^2 \cdot 0'1 + 4^2 \cdot 0'4 - 2'7^2 =$$
$$= 8'7 - 2'7^2 = 1'41$$

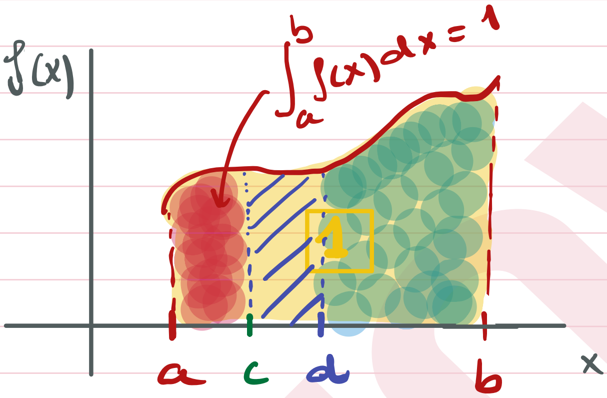
NOVA

* VARIABLES ALEATORIAS CONTINUAS

$f(x) \longrightarrow$ Función densidad

$p(x) \longrightarrow$ Función probabilidad o cuantía

$F(x) \longrightarrow$ Función Distribución



$$\int_{-\infty}^{\infty} f(x)\,dx = 1$$

$$f(x) \geq 0 \ \forall x$$

$p(x)$ solo está definida en un intervalo, no está definida en un punto

$p(x=c) = 0$

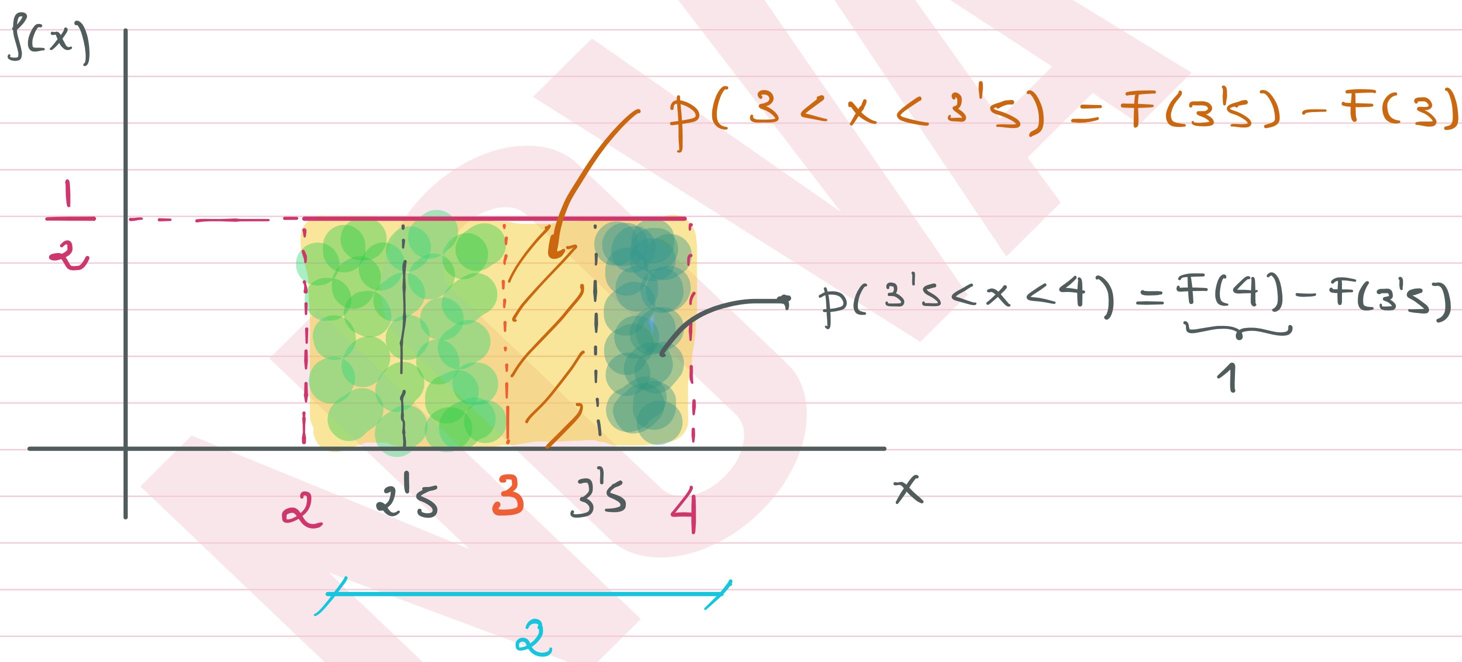
- $p(c \leq x \leq d) = p(c < x < d) = \int_c^d f(x)\,dx = F(d) - F(c)$

- $p(x < c) = \int_a^c f(x)\,dx = F(c)$

- $p(x > d) = \int_d^b f(x)\,dx = F(b) - F(d) = 1 - F(d)$

- **ESPERANZA** : $E(x) = \int_{-\infty}^{\infty} x \cdot f(x)\,dx$
- **VARIANZA** : $Var(x) = E(x^2) - (E(x))^2$

$$E(x^2) = \int_{-\infty}^{\infty} x^2 \cdot f(x)\,dx$$



- $p(x \leq 2'5) = 0'25$
- $p(x < 3) = p(x \leq 3) = F(3) = 0'5 = \int_{2}^{3} \frac{1}{2}\,dx =$

$$= \frac{1}{2}x\Big]_2^3 = \frac{3-2}{2} = \frac{1}{2}$$

- $p(x > 3'5) = \int_{3'5}^{4} \frac{1}{2}\,x\,d = \frac{1}{2}x\Big]_{3'5}^{4} = \frac{4-3'5}{2} = 0'25$