

# PRÁCTICA TEMA 7. SOLUCIONES.

## EJERCICIO 1

$$\bar{x} = 25$$

$$s_x = 8$$

$$X = 30$$

$$a) z_x = \frac{X - \bar{x}}{s_x} = \frac{30 - 25}{8} = 0.62$$

$$b) T = 50 + 10z_x = 50 + 10 \cdot 0.62 = 50 + 6.2 = 56.2$$

$$c) D = 50 + 20z_x = 50 + 20 \cdot 0.62 = 50 + 12.4 = 62.4$$

$$d) P = 73.24 \approx 73$$

↳ probabilidad asociada a  $z = 0.62 \rightarrow 0.7324$

$$e) E = 5 + 2 \cdot z_x = 5 + 2 \cdot 0.62 = 5 + 1.24 = 6.24 \approx 6$$

b, c y e:  
puntuación típica en la escala original

$$y = a + b \cdot z_x$$

puntuación típica derivada

desviación típica en la nueva escala

## EJERCICIO 2

$$N = 500$$

$$\bar{x} = 18$$

$$s_x = 6$$

a) Cuando  $p = 0.75 \rightarrow z = 0.67$  (valor buscado en la tabla)

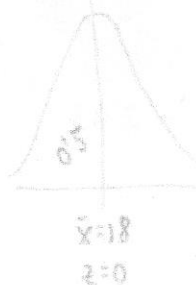
$$z = \frac{X - \bar{x}}{s_x} \rightarrow 0.67 = \frac{X - 18}{6} \rightarrow 4.02 = X - 18$$

$$4.02 + 18 = X$$

$$22.02 = X$$

CURVA NORMAL:

b)



50% quedó por debajo

$$\begin{array}{r} 500 \text{ --- } 100 \\ x \text{ --- } 50 \end{array} \quad x = \frac{500 \cdot 50}{100} = 250$$

250 personas quedaron por debajo de la media

## EJERCICIO 3

$$\bar{x} = 40$$

$$\bar{y} = 70$$

$$x = 30$$

$$y = ?$$

$$Y = X - \bar{x} + \bar{y} = 30 - 40 + 70 = 60$$

### EJERCICIO 4

### DISEÑO DE GRUPOS EQUIVALENTES

FORMA X	FORMA Y	X <sup>2</sup>	Y <sup>2</sup>	X*
40	36	1600	1296	0'72 (40 - 43'33) + 41'17 = 38'77 ≈ 39
39	41	1521	1681	0'72 (39 - 43'33) + 41'17 = 38'05 ≈ 38
44	39	1936	1521	0'72 (44 - 43'33) + 41'17 ≈ 42
50	45	2500	2025	0'72 (50 - 43'33) + 41'17 ≈ 46
46	40	2116	1600	0'72 (46 - 43'33) + 41'17 ≈ 43
41	46	1681	2116	0'72 (41 - 43'33) + 41'17 ≈ 40
Σ	260	247	11354	10239

$$X^* = Y = \left( \frac{S_y}{S_x} \right) (X - \bar{X}) + \bar{Y} = \left( \frac{3'02}{4'17} \right) (X - 43'33) + 41'17 = 0'72 (X - 43'33) + 41'17$$

$$S_y = \sqrt{\frac{\sum Y^2}{N} - \bar{Y}^2} = \sqrt{\frac{10239}{6} - 41'17^2} = 3'02 \rightarrow S_y = 3'02^2 = 9'12$$

$$\bar{Y} = \frac{\sum Y}{N} = \frac{247}{6} = 41'17$$

$$S_x = \sqrt{\frac{\sum X^2}{N} - \bar{X}^2} = \sqrt{\frac{11354}{6} - 43'33^2} = 4'17$$

$$\bar{X} = \frac{\sum X}{N} = \frac{260}{6} = 43'33$$

$$S_e = \sqrt{\frac{2S_y^2}{N_1 + N_2} (z_x^2 + 2)} = \sqrt{\frac{2 \cdot 9'12}{6 + 6} (1'6^2 + 2)} = 2'63$$

$$z_x = \frac{X - \bar{X}}{S_x} = \frac{50 - 43'33}{4'17} = \frac{6'67}{4'17} = 1'6$$

### EJERCICIO 5

### DISEÑO DE UN SOLO GRUPO

$$X^* = Y = \left( \frac{S_{y_1} + S_{y_2}}{S_{y_1} + S_{y_2}} \right) \left( X - \frac{\bar{X}_1 + \bar{X}_2}{2} \right) + \frac{\bar{Y}_1 + \bar{Y}_2}{2} = \left( \frac{2'58 + 2'48}{1'6 + 1'75} \right) \left( X - \frac{12'6 + 14}{2} \right) + \frac{13 + 13'47}{2}$$

$$X^* = 1'51 (X - 13'3) + 13'23$$

$$S_{y_1} = \sqrt{\frac{\sum Y_1^2}{N} - \bar{Y}_1^2} = \sqrt{\frac{2635}{15} - 13^2} = \sqrt{6'65} = 2'58$$

$$\bar{y}_1 = \frac{\sum Y_1}{N} = \frac{195}{15} = 13$$

$$S_{y_2} = \sqrt{\frac{\sum Y_2^2}{N} - \bar{y}_2^2} = \sqrt{\frac{2810}{15} - 13'47^2} = \sqrt{6'16} = 2'48$$

$$\bar{y}_2 = \frac{\sum Y_2}{N} = \frac{202}{15} = 13'47$$

$$S_{x_1} = \sqrt{\frac{\sum X_1^2}{N} - \bar{x}_1^2} = \sqrt{\frac{2420}{15} - 12'6^2} = \sqrt{2'57} = 1'6$$

$$\bar{x}_1 = \frac{\sum X_1}{N} = \frac{189}{15} = 12'6$$

$$S_{x_2} = \sqrt{\frac{\sum X_2^2}{N} - \bar{x}_2^2} = \sqrt{\frac{2986}{15} - 14^2} = \sqrt{3'06} = 1'75$$

$$\bar{x}_2 = \frac{\sum X_2}{N} = \frac{210}{15} = 14$$

### EJERCICIO 6

#### DISEÑO DE ANCLAJE

$$X^* = Y = \left( \frac{\sqrt{S_y^2 + b_{y22}^2 (S_z^2 - S_{z_2}^2)}}{\sqrt{S_x^2 + b_{x21}^2 (S_z^2 - S_{z_1}^2)}} \right) \left[ X - [\bar{x} + b_{x21} (\bar{z} - \bar{z}_1)] + [\bar{y} + b_{y22} (\bar{z} - \bar{z}_2)] \right]$$

Z <sub>1</sub>	X	Z <sub>2</sub>	Y	Y <sup>2</sup>	YZ <sub>2</sub>	X <sup>2</sup>	Z <sub>1</sub> <sup>2</sup>	Z <sub>2</sub> <sup>2</sup>	X <sup>2</sup>	XZ <sub>1</sub>	X*
14	32	10	20	400	200	1024	100	196	1024	448	0'48(32-23'4)+24 ≈ 28
12	25	10	25	625	250	625	100	144	625	300	0'48(25-23'4)+24 ≈ 25
9	26	8	20	400	160	676	64	81	676	234	0'48(26-23'4)+24 ≈ 25
11	19	13	30	900	390	361	169	121	361	209	0'48(19-23'4)+24 ≈ 22
10	15	15	25	625	375	225	225	100	225	150	0'48(15-23'4)+24 ≈ 20
Σ	56	117	56	2950	1375	2911	658	642	2911	1341	

$$X^* = Y^* = \left( \frac{\sqrt{14 + 1'03^2 (4'56 - 6'16)}}{\sqrt{3'46 + 3'42^2 (4'56 - 2'96)}} \right) \left[ X - [23'4 + 3'42 (11'2 - 11'2)] + [24 + 1'03 (11'2 - 11'2)] \right] =$$

$$\frac{3'67}{73} = \frac{\sqrt{13'46}}{\sqrt{53'32}} \left[ X - [23'4 + 3'42 (11'2 - 11'2)] + [24 + 1'03 (11'2 - 11'2)] \right] =$$

$$= 0'48 (X - 23'4) + 24$$

$$S_y^2 = \frac{\sum Y^2}{N} - \bar{y}^2 = \frac{2950}{5} - 24^2 = 590 - 576 = 14 \rightarrow S_y = \sqrt{14} = 3'74$$

$$\bar{Y} = \frac{\sum Y}{N} = \frac{120}{5} = 24$$

$$b_{Y22} = r_{Y22} \frac{S_Y}{S_{Z_2}} = 0.67 \frac{3.74}{2.48} = 1.03$$

$$r_{Y22} = \frac{n \sum Y Z_2 - \sum Y \sum Z_2}{\sqrt{[n \sum Y^2 - (\sum Y)^2] [n \sum Z_2^2 - (\sum Z_2)^2]}} = \frac{5 \cdot 1375 - 120 \cdot 56}{\sqrt{[5 \cdot 2950 - 120^2] [5 \cdot 658 - 56^2]}} = \frac{6875 - 6720}{\sqrt{350 \cdot 154}} = \frac{155}{232.16} = 0.67$$

$$S_{Z_2} = \sqrt{\frac{\sum Z_2^2}{N} - \bar{Z}_2^2} = \sqrt{\frac{658}{5} - 11.2^2} = \sqrt{131.6 - 125.44} = \sqrt{6.16} = 2.48 \rightarrow S_{Z_2}^2 = 2.48^2 = 6.16$$

$$\bar{Z}_2 = \frac{\sum Z_2}{N} = \frac{56}{5} = 11.2$$

$$S_{Z_2}^2 = \frac{\sum Z_2^2}{N} - \bar{Z}_2^2 = \frac{1300}{10} - 11.2^2 = 130 - 125.44 = 4.56$$

(10) 5 PERSONAS DEL GRUPO A + 5 PERSONAS DEL GRUPO B

$$\bar{Z} = \frac{\sum Z}{N} = \frac{112}{10} = 11.2$$

$$\sum Z_1 + \sum Z_2 = 56 + 56 = 112$$

$$S_X^2 = \frac{\sum X^2}{N} - \bar{X}^2 = \frac{2911}{5} - 23.4^2 = 34.6 \rightarrow S_X = \sqrt{34.6} = 5.88$$

$$\bar{X} = \frac{\sum X}{N} = \frac{117}{5} = 23.4$$

$$r_{X21} = \frac{n \sum X Z_1 - \sum X \sum Z_1}{\sqrt{[n \sum X^2 - (\sum X)^2] [n \sum Z_1^2 - (\sum Z_1)^2]}} = \frac{5 \cdot 1341 - 117 \cdot 56}{\sqrt{[5 \cdot 2911 - 117^2] [5 \cdot 642 - 56^2]}} = \frac{6705 - 6552}{\sqrt{866.74 \cdot 253.15}} = \frac{153}{253.15} = 0.6$$

$$b_{X21} = r_{X21} \frac{S_X}{S_{Z_1}} = 0.6 \cdot \frac{5.88}{1.72} = 3.42$$

$$S_{Z_1} = \sqrt{\frac{\sum Z_1^2}{N} - \bar{Z}_1^2} = \sqrt{\frac{642}{5} - 11.2^2} = \sqrt{2.96} = 1.72 \rightarrow S_{Z_1}^2 = 1.72^2 = 2.96$$

$$\bar{Z}_1 = \frac{\sum Z_1}{N} = \frac{56}{5} = 11.2$$