EX 1

a) $r_{bis} = \dfrac{\bar{X}_c - \bar{X}}{S_x} \sqrt{\dfrac{p}{q}} = \dfrac{3.33 - 3.1}{1.04} \sqrt{\dfrac{0.6}{0.4}} = \dfrac{0.23}{1.04} \sqrt{1.5} = 0,22 \cdot 1,22 = 0.27$

| | 1 | 2 | 3 | 4 | 5 | 6 | X | X-i | $(X-i)^2$ |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | 1 | 1 | 0 | 0 | 0 | 3 | 2 | 4 |
| B | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 4 |
| C | 1 | 0 | 1 | 0 | 1 | 1 | 4 | 3 | 9 |
| D | 1 | 1 | 0 | 0 | 1 | 1 | 4 | 4 | 16 |
| E | 1 | 0 | 0 | 1 | 1 | 0 | 3 | 3 | 9 |
| F | 1 | 1 | 1 | 1 | 1 | 0 | 5 | 4 | 16 |
| G | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 5 | 25 |
| H | 1 | 1 | 1 | 1 | 0 | 1 | 5 | 4 | 16 |
| I | 1 | 1 | 1 | 0 | 0 | 0 | 3 | 2 | 4 |
| J | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 4 |
| N=10 | | | | | | | | 31 | 107 |

$\bar{X}_c = \dfrac{2+3+4+5+4+2}{6} = \dfrac{20}{6} = 3.33$

$X_T = \dfrac{31}{10} = 3.1$

$S_x = \sqrt{\dfrac{\Sigma x^2}{N} - \bar{X}^2} = \sqrt{\dfrac{107}{10} - 3.1^2} = \sqrt{10.7 - 9.61} = \sqrt{1.09} = 1.04$

b) $0.2 < \overset{D}{0.27} < 0.29$ — The item discriminates slightly

EXERCISE 2

a) Item 1

b) $X = R - \frac{w}{k-1} = 3 - \frac{2}{4-1} = 3 - \frac{2}{3} = 3 - 0'67 = 2.33$

c) $\frac{1}{k} = \frac{1}{4} = 0.25$

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EJERCICIO 3

$S^2_p = 6$ GUTTMAN-FLANAGAN:

$S^2_i = 4$

$S^2_x = 16$

$$r_{xx'} = 2\left(1 - \frac{S^2_p + S^2_i}{S^2_x}\right) = 2\left(1 - \frac{6+4}{16}\right) = 2\left(1 - \frac{10}{16}\right) =$$

$S_2 = 3 \rightarrow S_2^2 = 3^2 = 9$

$$= 2\,(1 - 0{,}625) = 2 \cdot 0'375 = 0{,}75$$

$R_{xx'} = \frac{S^2_v}{S^2_x} = 0'81$

$EI = 10$

$$r_{22} = 1 - \frac{S_1^2}{S_2^2}(1 - r_{11}) = 1 - \frac{16}{9}(1 - 0'75) = 1 - 1{,}78 \cdot 0{,}25 =$$

$$= 1 - 0'445 = 0.56$$

Tenemos que pasar de $r_{xx'} = 0{,}56$ a $R_{xx'} = 0'81$. La fiabilidad puede aumentar aumentando el nº de ítems o aumentando la variabilidad de la muestra. Dado que la variabilidad está ya determinada ($S_2 = 3$), sólo queda la posibilidad de aumentar el nº de ítems.

$$n = \frac{R_{xx'}\,(1 - r_{xx'})}{r_{xx'}\,(1 - R_{xx'})} = \frac{0'81\,(1 - 0'56)}{0'56\,(1 - 0'81)} = \frac{0{,}81 \cdot 0'44}{0'56 \cdot 0'19} = \frac{0'36}{0'11} = 3'27$$

$$n = \frac{EF}{EI} \rightarrow 3'27 = \frac{EF}{10} \rightarrow 32'7 = EF$$

$$33 \simeq EF$$

Añadidos: $EF - EI = 33 - 10 = 23$ Habría que añadir 23 ítems.

## EJERCICIO 4

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 1 | 21 | 22 | 36 | 26 | 23 | 26 | 35 | 38 | 34 | 24 | 28 | 31 | 27 | 28 | 25 |
| TEST 2 | 23 | 25 | 23 | 29 | 35 | 30 | 38 | 38 | 24 | 34 | 29 | 28 | 27 | 28 | 32 |
| CASILLA | d | d | b | d | c | c | a | a | b | c | d | b | d | d | c |

TEST 2

| TEST 1 | ≥30 | <30 | |
|---|---|---|---|
| ≥30 | 2 a | 3 b | 5 g |
| <30 | 4 c | 6 d | 10 h |
| | 6 e | 9 f | 15 |

$$k = \frac{Fc - Fa}{N - Fa} = \frac{8-8}{15-8} = \frac{0}{7} = 0$$

$$Fc = a + d = 2 + 6 = 8$$

$$Fa = \frac{e \cdot g}{N} + \frac{f \cdot h}{N} = \frac{6 \cdot 5}{15} + \frac{9 \cdot 10}{15} = \frac{30}{15} + \frac{90}{15} = 2 + 6 = 8$$

EJERCICIO 5

| X | Y | XY | $X^2$ | $Y^2$ |
|---|---|---|---|---|
| 2 | 1 | 2 | 4 | 1 |
| 4 | 2 | 8 | 16 | 4 |
| 6 | 4 | 24 | 36 | 16 |
| 8 | 4 | 32 | 64 | 16 |
| 10 | 8 | 80 | 100 | 64 |
| 30 | 19 | 146 | 220 | 101 |

$$Lim: Y' \pm E_{max} = 6.2 \pm 1.65 < \begin{matrix} 7.85 \\ 4.55 \end{matrix}$$

$$Y' = a + bX \longrightarrow Y' = -1 + 0'8X \quad \text{Si } x = 9,\ \hat{Y} = -1 + 0'8 \cdot 9 = -1 + 7.2 = 6.2$$

$$a = \bar{Y} - b\bar{X} = 3'8 - 0'8 \cdot 6 = 3'8 - 4'8 = -1$$

$$\bar{Y} = \frac{\Sigma Y}{N} = \frac{19}{5} = 3,8$$

$$b = r_{xy} \frac{S_y}{S_x} = 0'94 \cdot \frac{2,4}{2,83} = 0.8$$

$$r_{xy} = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}} = \frac{5 \cdot 146 - 30 \cdot 19}{\sqrt{[5 \cdot 220 - 30^2][5 \cdot 101 - 19^2]}}$$

$$= \frac{730 - 570}{\sqrt{[1100 - 900][505 - 361]}} = \frac{160}{\sqrt{200 \cdot 144}} = \frac{160}{\sqrt{28800}} = \frac{160}{169.71} = 0.94$$

$$S_y = \sqrt{\frac{\Sigma Y^2}{N} - \bar{Y}^2} = \sqrt{\frac{101}{5} - 3'8^2} = \sqrt{20,2 - 14,44} = \sqrt{5.76} = 2.4$$

$$S_x = \sqrt{\frac{\Sigma X^2}{N} - \bar{X}^2} = \sqrt{\frac{220}{5} - 6^2} = \sqrt{44 - 36} = \sqrt{8} = 2.83$$

$$\bar{X} = \frac{\Sigma X}{N} = \frac{30}{5} = 6$$

$$E_{max} = Z_c \cdot S_{y \cdot x} = 1'96 \cdot 0'84 = 1,65$$

$$S_{y \cdot x} = S_y \sqrt{1 - r_{xy}^2} = 2.4\sqrt{1 - 0'94^2} = 2.4\sqrt{1 - 0'88} = 2,4\sqrt{0,12} = 2,4 \cdot 0,35 = 0.84$$