RELACIÓN 1 - ESTADÍSTICA DESCRIPTIVA

3. $n = 11$ alumnos

a) ¿Mediana?

Med

19	20	21	23	25	28	31	32	33	34	36
1	2	3	4	5	6	7	8	9	10	11

Es impar $\frac{n+1}{2} = 6$

Med = 28

b)

7 ——— 11

x ——— 100

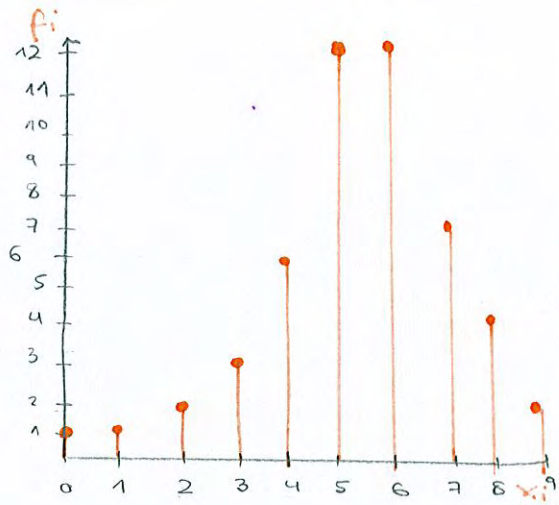
$x = \frac{700}{11} = 63'63 =$ **64%**

4.

x_i	n_i	f_i	N_i	F_i
0	1	1/50	1	1/50
1	1	1/50	2	2/50
2	2	2/50	4	4/50
3	3	3/50	7	7/50
4	6	6/50	13	13/50
5	12	12/50	25	25/50
6	12	12/50	37	37/50
7	7	7/50	44	44/50
8	4	4/50	48	48/50
9	2	2/50	50	50/50

n_i = frecuencia absoluta

f_i = frecuencia relativa



5.

Antonio = 1 tarta

Juan = 0 tarta

x_i	n_i
0	1
1	1

$n = 2$

$\bar{x} = \frac{0+1}{2} = 0'5$ tarta

$x_1^2 = 0$ $x_2^2 = 1$

$s^2 = \frac{\sum n_i x_i^2}{N} - \bar{x}^2 = \frac{1 \cdot 0 + 1 \cdot 1^2}{2} - 0'25 = 0'25$

$s = \sqrt{0'25} =$ **0'5** $= \bar{x}$

⑥

a)

x_i	n_i	f_i	N_i	F_i	$x_i \cdot n_i$
1	2	2/100	2	2/100	2
2	9	9/100	11	11/100	18
3	14	14/100	25	25/100	42
4	20	20/100	45	45/100	80
5	18	18/100	63	63/100	90
6	15	15/100	78	78/100	90
7	9	9/100	87	87/100	63
8	6	6/100	93	93/100	48
9	4	4/100	97	97/100	36
10	2	2/100	99	99/100	20
11	1	1/100	100	100/100	11

$N = 100$

b) • $\bar{X} = \frac{\sum x_i n_i}{N} = 5$

$\bar{x} = 5$

c) • $x_{meo} = \frac{N}{2} = 50 \quad N_i \geq \frac{N}{2}$

$63 \geq 50$

$x_{meo} = 5$

• 1º cuartil $= x_i : N/4$

$x_i : 100/4 = 25$

$x_i : N_i = 25$

$C_1 = 3$

Rango intercuartílico $6 - 3 = 3$

3º cuartil $\quad x_i : N_i = 3N/4 \rightarrow \quad N_i = 3 \cdot 100/4 = 300/4 = 75$

$C_3 = 6$

d) • Moda

x_i : n_i mayor

Moda = 4

e) S^2, S, desviación media, coeficiente de variación pearson

f) Coeficiente de asimetría, de curtosis g) Tipificar variable

Después de la pag 1 de la Relación (Ampliación ejercicio 6)

16/8/11

e) VARIANZA

$$s^2 = \frac{\sum n_i (x_i - \bar{x})^2}{N} = \frac{2(1-5)^2 + 9(2-5)^2 + 14(3-5)^2 + \dots 1\cdot(11-5)^2}{100}$$

$s^2 = 4'44$

Desviación típica $s = \sqrt{s^2} = 2'11$

Desviación media $= \frac{\sum n_i |x_i - \bar{x}|}{N} = \frac{2.4 + 9.3 + 14.2 \dots + 1.6}{100} = 1'66$

Coeficiente de variación de Pearson $= \frac{s}{\bar{x}} = \frac{2'11}{5} = 0'42$ (Medida relativa de la dispersión) $= 0'42\%$ de la media

f) ESTADÍSTICOS DE FORMA

Coeficiente de asimetría $g_1 = \frac{(1-5)^3 \cdot 0'02 + (2-5)^3 \cdot 0'09 + \dots (11-5)^3 \cdot 0'01}{2'11^3} =$

Coeficiente de curtosis $g_2 = \frac{\sum (x_i - \bar{x})^4}{s^4} - 3 = \frac{(1-5)^4 \cdot 0'02 + (2-5)^4 \cdot 0'09 + \dots + (11-5)^4 \cdot 0'01}{2'11^4}$

Es leptocúrtica

g) Tipificar variable

$$z = \frac{x - \mu}{s} = \frac{x - 5}{2'11} =$$

z_i $-1'89$ $-1'42$ $-0'95$ $-0'47$ 0 $0'47$ $0'95$ $1'42$ $1'89$ $2'36$ $2'84$

2

(7.)

x_i	x_i^2	z_i
2	4	$-3/\sqrt{5}$
4	16	$-1/\sqrt{5}$
6	36	$1/\sqrt{5}$
8	64	$3/\sqrt{5}$

$N = 4$

$\bar{x} = \frac{\sum x_i n_i}{N} = \frac{2+4+6+8}{4} = 5$

$s^2 = \frac{\sum n_i x_i^2}{N} - \bar{x}^2 = \frac{4+16+36+64}{4} - 25 = 5$

$s = \sqrt{5}$

a.)

$z = \frac{x-\bar{x}}{s} = \frac{2-5}{\sqrt{5}} \Big/ \frac{4-5}{\sqrt{5}} \Big/ \frac{6-5}{\sqrt{5}} \Big/ \frac{8-5}{\sqrt{5}}$

$\bar{z} = \frac{-3/\sqrt{5} - 1/\sqrt{5} + 1/\sqrt{5} + 3/\sqrt{5}}{} = \frac{0}{\sqrt{5}} = 0$

$s_z^2 = \frac{\sum n_i z_i^2}{N} - \bar{z}^2 = \frac{\left(-3/\sqrt{5}\right)^2 + \left(-1/\sqrt{5}\right)^2 + \left(1/\sqrt{5}\right)^2 + \left(3/\sqrt{5}\right)^2}{4} =$

$= \frac{\frac{9}{5} + \frac{1}{5} + \frac{1}{5} + \frac{9}{5}}{4} = \frac{20/5}{4} = \frac{4}{4} = 1$

(8.) $N = 150$ estudiantes

Estadística: $\bar{x} = 7'8$, $s_x = 0'8$

Cálculo: $\bar{y} = 7'3$, $s_y = 0'76$

a) $s_x > s_y$ $0'8 > 0'76$ Mayor dispersión absoluta en estadística

se comparan desviaciones típicas

c) Tipificamos para compararlo

$z_x = \frac{7'5 - 7'8}{0'8} = -0'375$ $\quad z_y = \frac{7'1 - 7'3}{0'76} = -0'2631$

Sobresalió más en el examen de Cálculo

a) $s_x > s_y$

En estadística

b) $Cv_x = \frac{s_x}{\bar{x}} = \frac{0'8}{7'8} = 0'1025$

$Cv_y = \frac{s_y}{\bar{y}} = \frac{0'76}{7'3} = 0'1041$

Mayor dispersión relativa en Cálculo

9.

Km. 10^3 (y) \ Tipo neumático (x)	A	B	C	D	E
50		1			
51			1		
58			1	1	
59	2				
62				1	
70					1
73	1				
75					1
76		1			1
89			1		
92		1			
100	1				
102	1			1	
111					1
119		1			
123		1			1
128					1
129	1				
130					1
132		1			
133			1		
136				1	
138			1		
141			1		
149	1				

3

$x_i^2 n_i$ =	24200	42250	90000	101 150	90 250	55125	26450
$x_i - \bar{x}$ =	24'769	14'769	4'769	5'231	15'231	25'231	35'231

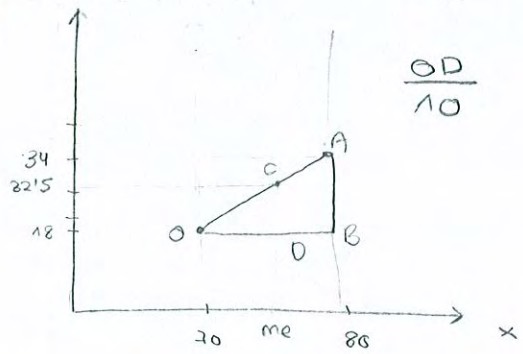
(10)

	x_i	n_i	f_i	N_i	F_i
$50 \leq x < 60$	55	8	8/65	8	8/65
$60 \leq x < 70$	65	10	10/65	18	18/65
$70 \leq x < 80$	75	16	16/65	34	34/65
$80 \leq x < 90$	85	14	14/65	48	48/65
$90 \leq x < 100$	95	10	10/65	58	58/65
$100 \leq x < 110$	105	5	5/65	63	63/65
$110 \leq x < 120$	115	2	2/65	65	65/65

$N = 65$

- $\bar{x} = \frac{\sum x_i n_i}{N} = \frac{5185}{65} = \boxed{79'769}$

- $N_i \geq \frac{N}{2} = 32'5$



$\frac{OD}{10}$

- Moda: $\boxed{70 \leq x < 80}$

$me = 70 + \frac{32'5 - 18}{34 - 18}(80 - 70) =$

$me = 70 + \frac{14'5}{16}(10) = \boxed{79'06}$

- Desviación típica

$S_x^2 = \frac{\sum n_i x_i^2}{N} - (\bar{x})^2 = 6606'54 - 79'769 = 243'45$

$S_x = \sqrt{243'45} = \boxed{15'60}$

- Desviación media

$D_{\bar{x}} = \frac{\sum |x_i - \bar{x}|}{N} = 1'692$

(11)

Horas trabajadas x	2	2	3	3	4	4	5	6	7	7
Errores y	0	1	1	1	3	3	6	7	8	7

$N = 10$

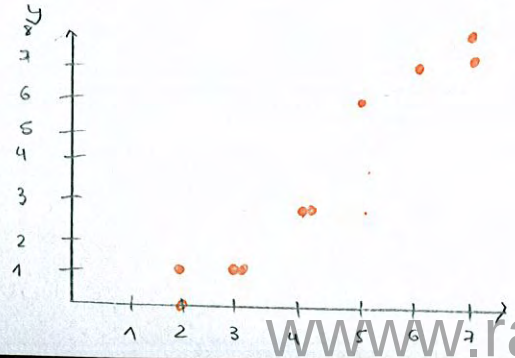
$\bar{x} = 4'3 \quad \bar{y} = 3'7$

$S_x^2 = 3'21 \quad S_x = 1'79164$

$S_y^2 = 8'21 \quad S_y = 2'865$

Covarianza $S_{xy} = \frac{\sum n_i x_i y_i}{N} - \bar{x}\bar{y} = 4'99$

a)



b) coeficiente de correlación lineal

$$r = \frac{S_{xy}}{S_x S_y} = \frac{4'99}{1'79164 \cdot 2'865} = 0'972$$

Existe una fuerte correlación lineal directa

c) Recta de regresión de y sobre x y/x

$$y - \bar{y} = \frac{S_{xy}}{S_x^2}(x - \bar{x}) \qquad y - 3'7 = \frac{4'99}{3'21}(x - 4'3)$$

$$y - 3'7 = 1'5545x - 6'68442$$

$$y = 1'5545x - 2'9844$$

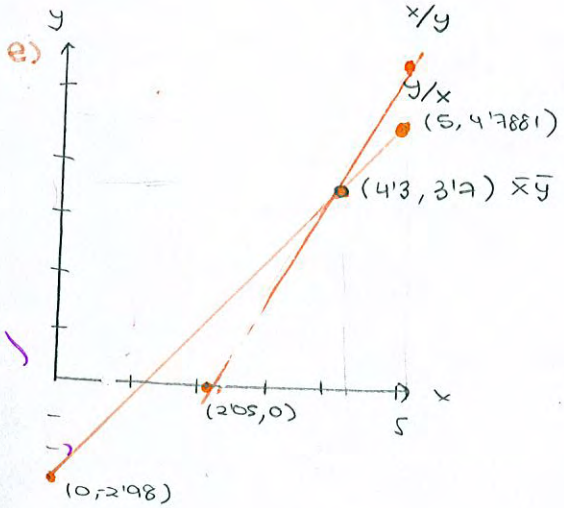
d) Recta de x sobre y x/y

$$x - \bar{x} = \frac{S_{xy}}{S_y^2}(y - \bar{y}) \qquad x - 4'3 = \frac{4'99}{8'21}(y - 3'7)$$

$$x = 0'6078y - 2'249 + 4'3$$

$$x = 0'6078y + 2'051$$

e)



f) $y = 1'5545x - 2'9844$

$y = (1'5545 \cdot 10) - 2'9844 = 12'5606$

Ensaeft

g) $x = 0'6078y + 2'051$

Horas

$x = 0'6078 \cdot 13 + 2'051 = 9'9524$

12.

x	1	20	50	100	200	300	500	1000
y	7	8'5	9	9'4	9'7	9'9	10'2	10'5

N = 8

a) $\bar{x} = 271'375$

$\bar{y} = 9'275$

$$S_x^2 = \frac{\sum n_i x_i^2}{N} - (\bar{x})^2$$

$S_x^2 = 174112'625 - 73644'39 = 100468'23$

$S_x = 316'967$

$$S_y^2 = \frac{49 + 72'25 + 81 + 88'36 + 94'09 + 98'01 + 104'04 + 110'25}{8} - 86'026 =$$

$S_y^2 = 1'099$ $S_y = 1'048$

3

$x_i^2 n_i$ =	24200	42250	90000	101 150	90 250	55125	26450
$x_i - \bar{x}$ =	24'769	14'769	4'769	5'231	15'231	25'231	35'231

(10)

	x_i	n_i	f_i	N_i	F_i
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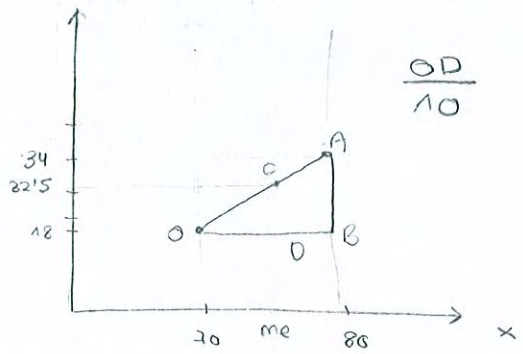
- $N_i \geq \frac{N}{2} = 32'5$



$\frac{OD}{10}$

- Moda: $70 \leq x < 80$

$$me = 70 + \frac{32'5 - 18}{34 - 18}(80 - 70) =$$

$$me = 70 + \frac{14'5}{16}(10) = 79'06$$

- Desviación típica

$$\sigma_x^2 = \frac{\sum n_i x_i^2}{N} - (\bar{x})^2 = 6606'54 - 79'769 = 243'45$$

$$\sigma_x = \sqrt{243'45} = 15'60$$

- Desviación media

$$D_{\bar{x}} = \frac{\sum |x_i - \bar{x}|}{N} = 1'692$$

(11)

Horas trabajadas x	2	2	3	3	4	4	5	6	7	7
Errores y	0	1	1	1	3	3	6	7	8	7

$N = 10$

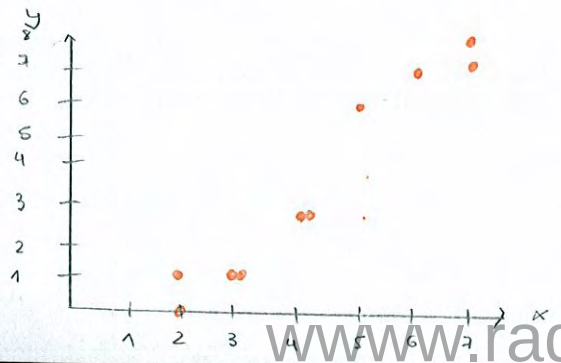
$\bar{x} = 4'3 \quad \bar{y} = 3'7$

$\sigma_x^2 = 3'21 \quad \sigma_x = 1'79164$

$\sigma_y^2 = 8'21 \quad \sigma_y = 2'865$

Covarianza $\sigma_{xy} = \frac{\sum n_i x_i y_i}{N} - \bar{x}\bar{y} = 4'99$

a)



- Regresión logarítmica:

$$y - \bar{y} = \frac{s_{xy}}{s_{x'^2}}(x' - \bar{x}')$$

$$y - 9'275 = \frac{2'157}{4'2102}(x' - 4'4585)$$

md despejado

Decimales

$$y = 0'5123x' - 9'6105 + 9'275$$

$$y = 0'5123x' - 0'3355$$

$$\boxed{y = 0'51\ln x - 7}$$

d) $x = 400$ $\quad y = 0'51 \ln 400 + 0'71 = \boxed{3'76}$

(13.) Coeficiente de correlación de Spearman

$$r_s = 1 - \frac{6 \Sigma d_i^2}{n(n^2-1)}$$

Trabajadores	horas x		errores y		orden x	orden y	d	d^2
1	2	④	0	1	1'5	1	0'5	0'25
2	2	②	1	2	1'5	3	1'5	2'25
3	3	③	1	3	3'5	3	0'5	0'25
4	3	4	1	4	3'5	3	0'5	0'25
5	4	5	3	5	5'5	5'5	0	0
6	4	6	3	6	5'5	5'5	0	0
7	5	7	6	7	7	7	0	0
8	6	8	7	8	8	8'5	0'5	0'25
9	7	9	8	10	9'5	10	0'5	0'25
10	7	10	7	9	9'5	8'5	1	1

Σ 4'5

$$r_s = 1 - \frac{6 \cdot 4'5}{10(10^2-1)} = 1 - \frac{27}{990} = 1 - 0'015 = 0'97272$$

Covarianza

$$S_{xy} = \frac{\Sigma n_i x_i y_i}{N} - \bar{y}\bar{x} = \frac{7 + 170 + 450 + 940 + 1940 + 2970 + 5100 + 10500}{8}$$

$$-2517'003 = 242'622$$

a)

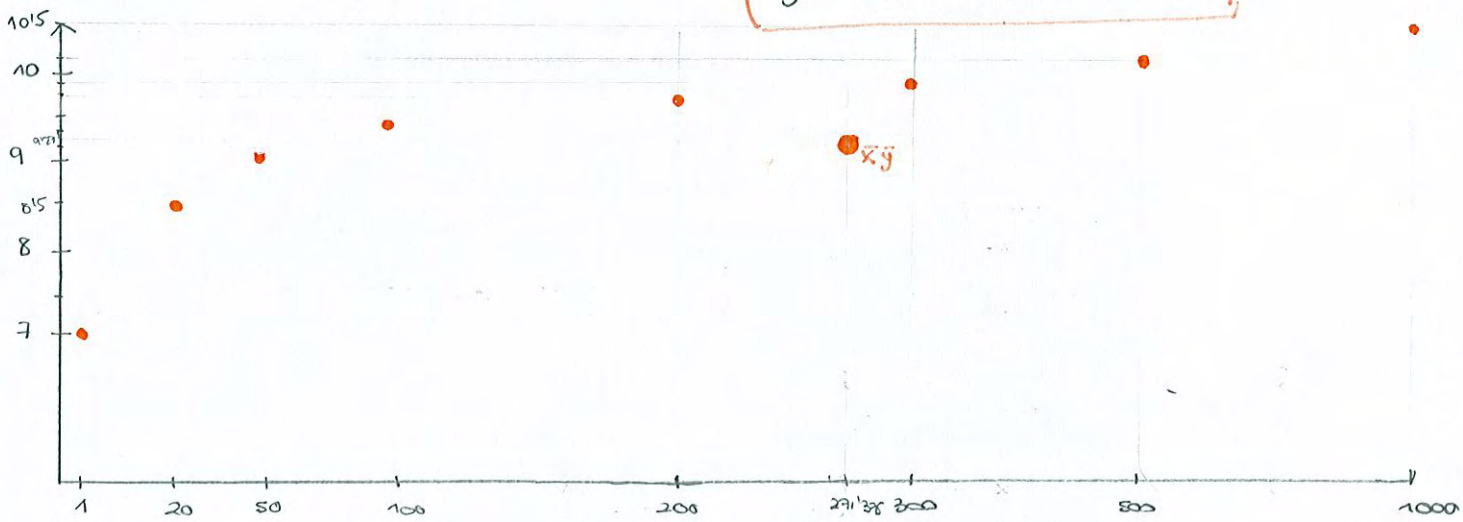
$$r = \frac{S_{xy}}{S_x S_y} = \frac{242'622}{36'967 \cdot 1'048} = \boxed{0'73}$$ Fuerte relación directa

$$y - \bar{y} = \frac{S_{xy}}{S_x^2}(x - \bar{x}) \qquad y - 9'275 = \frac{242'622}{100468'23}(x - 271'375)$$

$$y = 0'0024x - 0'6553 + 9'275$$

$$\boxed{y = 0'0024x + 8'62}$$

Hay q dibujar la recta



c)

$(x')^2$	8'976	15'30	21'21	28'068	32'536	38'69	47'75
$\ln x \to x'$ 0	2'996	3'912	4'605	5'298	5'704	6'22	6'91

$y' = ax' + b$

$\bar{x}' = 4'455$

$y = a \ln x + b$ $\quad y = y'$

$y' = Ax' + B$ $\quad x' = \ln x$

$$S_{x'}^2 = \frac{\Sigma n_i x_i^2}{N} - \bar{x}^2 = 4'21$$

$$S_{x'} = 2'054$$

$$S_{x'y} = \frac{\Sigma n_i x_i' y_i}{N} - \bar{x}'\bar{y} = \frac{0 + 25'466 + 35'208 + 43'287 + 51'3906 + 56'4696 + 63'444 + 72'555}{8}$$

$$43'477 - 41'320 = 2'157$$

14. • Coeficiente x_i^2

	Con Trabajo	Sin Trabajo	n_i
Grad. Ingeniería	30	20	50
Grad. Derecho	60	40	100
Grad. Medicina	40	10	50
n_j	130	70	200

- Frecuencias esperadas: $\frac{50 \cdot 130}{200}$ $\frac{50 \cdot 70}{200}$ $\frac{100 \cdot 130}{200}$

	Con	Sin	n_i
Ingeniería	32'5	17'5	50
Derecho	65	35	100
medicina	32'5	17'5	50
n_j	130	70	200

$$x^2 = \frac{(30-32'5)^2}{32'5} + \frac{(20-17'5)^2}{17'5} + \frac{(60-65)^2}{65} + \frac{(40-35)^2}{35} + \frac{(40-32'5)^2}{32'5} + \frac{(10-17'5)^2}{17'5} =$$

$$x^2 = 0'192 + 0'357 + 0'3846 + 0'71 + 1'73 + 3'214 = 6'59$$

$x^2 = 6'59$ Existe cierta relación entre el tipo de carrera y encontrar trabajo o no

• Coeficiente de contingencia:

$$C = \sqrt{\frac{x^2}{x^2+n}} = \sqrt{\frac{6'59}{6'59+200}} = 0'1786$$

El valor máximo que podría tomar es 0'81 por ello está muy lejos y esto no dice que las variables no son apenas dependientes.

Relación 1: ESTADÍSTICA

3. a) mediana ?

19	20	21	23	25	28	31	32	33	34	36
1	2	3	4	5	6	7	8	9	10	11

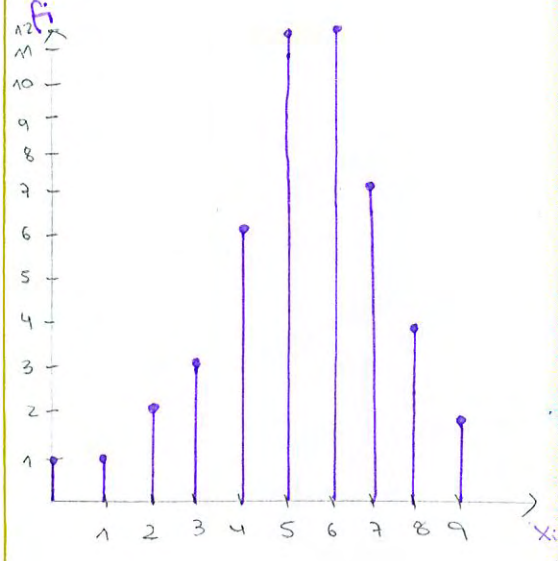
mediana

Es impar $\frac{n+1}{2} = \frac{11+1}{2} = 6$

b) $7 \text{ —— } 11$
$x \text{ —— } 100$ $\quad x = \frac{700}{11} = 63'63$ → 64 %

4.

x_i	n_i	f_i	N_i	F_i
0	1	1/50	1	1/50
1	1	1/50	2	2/50
2	2	2/50	4	4/50
3	3	3/50	7	7/50
4	6	6/50	13	13/50
5	12	12/50	25	25/50
6	12	12/50	37	37/50
7	7	7/50	44	44/50
8	4	4/50	48	48/50
9	2	2/50	50	1



5. Antonio = 1 tarta
Juan = 0 Tarta

$\bar{x} = \frac{0+1}{2} = 1/2$ tarta $\qquad s^2 = \frac{\sum n_i x_i^2}{N} - \bar{x}^2 = \frac{1 \cdot 0^2 + 1 \cdot 1^2}{2} - 1/2^2$

$s^2 = \frac{1}{4} \qquad s = \sqrt{\frac{1}{4}} = \boxed{\frac{1}{2}}$

6.

$$\bar{X} = \frac{\Sigma x_i n_i}{N} = \frac{500}{10} = \boxed{5 = \bar{X}}$$

Me: $x_i : N_i \geq \frac{N}{2}$ $\quad N_i \geq \frac{100}{2}$ $\quad N_i \geq 50$ $\quad N_i = 63$

$\boxed{x_{med} = 5}$

1º cuartil: $x_i : N/4$ $\quad x_i : 100/4 = 25$ $\quad \boxed{C_1 = 3}$

3º cuartil: $3N/4$ $\quad 300/4 = 75$ $\quad x_i : 75 = 6$ $\quad \boxed{C_3 = 6}$

Moda: $\boxed{4}$

7.

x_i 2 4 6 8 $\quad 2+4+6+8 = \frac{20}{4} = 5$

z_i $\frac{-3}{\sqrt{5}}$ $\frac{-1}{\sqrt{5}}$ $\frac{1}{\sqrt{5}}$ $\frac{3}{\sqrt{5}}$

a) $s^2 = \frac{\Sigma x_i^2 n_i}{N} - \bar{x}^2 = \frac{4+16+36+64}{4} - 5^2 =$

Media

$z = \frac{x-\mu}{s} = \frac{x-5}{\sqrt{5}}$; $\bar{z} = \frac{\Sigma z_i n_i}{N} = \frac{\frac{-3}{\sqrt{5}} + \left(\frac{-1}{\sqrt{5}}\right) + \left(\frac{3}{\sqrt{5}}\right) + \left(\frac{1}{\sqrt{5}}\right)}{4} = \boxed{0}$

$s^2 = 5$ $\quad s = \sqrt{5}$

Desviación típica

$$s^2 = \frac{\Sigma z_i^2 n_i}{N} - \bar{z}^2 = \frac{\left(\frac{-3}{\sqrt{5}}\right)^2 + \left(\frac{-1}{\sqrt{5}}\right)^2 + \left(\frac{1}{\sqrt{5}}\right)^2 + \left(\frac{3}{\sqrt{5}}\right)^2}{4} - 0^2 = \frac{1'8 + 0'2 + 0'2 + 1'8}{4} =$$

$\boxed{1}$

b)

8. N = 150 estudiantes

$\bar{x}_E = 7'8$ $\quad s_E = 0'8$

$\bar{x}_C = 7'3$ $\quad s_C = 0'76$

a) Términos absolutos → desviación típica.

$s_E = 0'8$ $\quad s_C = 0'76$ $\quad s_E > s_C \Rightarrow$ Hay mayor dispersión en estadística.

b) Términos relativos – covarianza.

$$CV_E = \frac{S_E}{\bar{X}_E} = \frac{0'8}{7'8} = 0'1025 \qquad CV_C = \frac{S_C}{\bar{X}_C} = \frac{0'76}{7'3} = 0'1041$$

Hay mayor dispersión en Calvo

c) Tipificamos para compararlos

$$z_E = \frac{7'5 - 7'8}{0'8} = -0'375 \qquad z_C = \frac{7'1 - 7'3}{0'76} = -0'263$$

Sobresalió más en Calvo

9. b) media, S, coeficiente de variación

A:

→ Media

$$\bar{X}_A = \frac{(2 \cdot 60) + (0 \cdot 80) + (1 \cdot 100) + (120 \cdot 1) + (140 \cdot 1)}{5} = \boxed{96} \qquad 4+4=8$$

→ D. típica

$$S_A^2 = \frac{\Sigma n_i x_A^2 - \bar{A}^2}{N} = 1024 \qquad S_A = \boxed{32}$$

→ coeficiente de variación

$$\frac{S}{\bar{X}} = \frac{32}{96} = \boxed{0'3}$$

B:

$$\bar{X}_B = \boxed{102'85} \qquad 1+2=3 \qquad S_B^2 = \frac{60^2 + 80^2 + 100^2 \cdot 2 + 120^2 \cdot 2 + 140}{7} - 102'85^2 =$$

$$CV = \boxed{0'24} \qquad S_B^2 = 621'8775 \qquad S = \boxed{24'93}$$

C:

$$\bar{X}_C = \boxed{108'57} \qquad 15 = 6 \qquad S_C^2 = 1355'41 \qquad S_C = \boxed{36'81} \qquad CV_C = \boxed{0'33} \qquad 5$$

D:

$$\bar{X}_D = \boxed{90} \qquad 5+3=8 \qquad S_D^2 = 633'33 \qquad S_D = \boxed{25'16} \qquad CV_D = \boxed{0'27} \qquad 3$$

E:

$$\bar{X}_E = \boxed{100} \qquad 3+2=5 \qquad S_E^2 = 640 \qquad S_E = \boxed{25'29} \qquad CV_E = \boxed{0'25} \qquad 2$$

c) menor duración → (+ / −)

1 2 3 4 5

B E C A D

10.

	x_i	n_i	N_i
55	$50 \leq x < 60$	8	8
65	$60 \leq x < 70$	10	18
75	$70 \leq x < 80$	16	34
85	$80 \leq x < 90$	14	48
95	$90 \leq x < 100$	10	58
105	$100 \leq x < 110$	5	63
115	$110 \leq x < 120$	2	65

$N = 65$

$\bar{x} = 79'76$

$me \rightarrow x_i : N_i \geq \frac{N}{2}$

$65/2 = 32'5$

$Me = 70 + \frac{32'5 - 18}{34 - 18}(80-70) = 79'0625$

Mode $70 \leq x \leq 80$

$S_x^2 = 238'49$

$S_x = 15'44$

$S_{\bar{x}} = \frac{\sum n_i |x_i - \bar{x}|}{N} =$

11.

x	2	2	3	3	4	4	5	6	7	7
y	0	1	1	1	3	3	6	7	8	7

$\bar{x} = 4'3$ $S_x^2 = 3'21$ $S_x = 1'791$

$\bar{y} = 3'7$ $S_y^2 = 8'21$ $S_y = 2'86$

b) $S_{xy} = \frac{\sum n_i x_i y_i}{N} - \bar{x}\bar{y} = 4'99$

$r = \frac{4'99}{4'850} = 0'972$

c) $y - \bar{y} = \frac{S_{xy}}{S_x^2}(x - \bar{x}) \Rightarrow y - 3'7 = \frac{4'99}{3'21}(x - 4'3) =$

$y = 1'554517x - 2'9844$

d) $x - \bar{x} = \frac{S_{xy}}{S_y^2}(y - \bar{y}) \Rightarrow x - 4'3 = \frac{4'99}{8'21}(y - 3'7) =$

$y = 0'6077795y - 2'0511$

f) $y = 1'5545x - 2'9844$

$y = 1'5545 \cdot 10 - 2'9844 =$ **12'5606 errores**

g) $x = 0'6078y + 2'9511$ $\quad x = 0'6078 \cdot 13 + 2'9511 =$ **9'9525 horas**

12.

x	1	20	50	100	200	300	500	1000	$\bar{x} = 271'375$
y	7	8'5	9	9'4	9'7	9'9	10'2	10'5	$\bar{y} = 9'275$

$S_x^2 = 100468'2344$ $\quad S_x = 316'967245$ $\quad S_y = 1'099375$ $\quad S_y = 1'0485$

a)

$S_{xy} = \frac{\sum n_i x_i y_i}{N} - \bar{x}\bar{y} = 242'6218$ $\quad r = \frac{242'6218}{S_x S_y} =$ **0'73**

$y - \bar{y} = \frac{S_{xy}}{S_x^2}(x - \bar{x}) = y - 9'275 = \frac{242'6218}{100468'2344}(x - 271'375)$

$y = 0'0024x + 8'621$

c) modelo de regresión logarítmico

$y' = Ax' + B$
$y = a \ln x + b$

$x' = \ln x$ $\quad A = a$
$y' = y$ $\quad B = b$

x'(lnx)	0	2'996	3'912	4'6051	5'2983	5'7037	6'2146	6'907
$(x')^2$	0	8'976	15'30	21'21	28'072	32'53	38'62	47'7

$\bar{x}' = 4'455$ $\quad S_{x'}^2 = 4'21$ $\quad S_{x'} = 2'054$ $\quad S_{x'y} = 2'157$

$y - \bar{y} = \frac{S_{x'y}}{S_{x'}^2}(x' - \bar{x}') = y - 9'275 = \frac{2'157}{4'21}(x' - 4'455)$

$y = 0'5123x' + 7$

$y = 0'51 \ln x + 7$

d) $y = 0'51 \cdot \ln 400 + 7 =$ **10'069**

13. Spearman horas de trabajo y errores

x	2 (1)	2 (2)	3 (3)	3 (4)	4 (5)	4 (6)	5 (7)	6 (8)	7 (9)	7 (10)
y	0 (1)	1 (2)	1 (3)	1 (4)	3 (5)	3 (6)	6 (7)	7 (8)	8 (10)	7 (9)
d_i	0'5	1'5	0'5	0'5	0	0	0	0'5	0'5	1
d_i^2	0'25	2'25	0'25	0'25	0	0	0	0'25	0'25	1
orden x	1'5	1'5	3'5	3'5	5'5	5'5	7	8	9'5	9'5
orden y	1	3	3	3	5'5	5'5	7	8'5	10	8'5

$$r_s = 1 - \frac{6 \Sigma d_i^2}{n(n^2-1)}$$

$$= 1 - \frac{6 \cdot 4'5}{10(100-1)} = 1 - 0'027$$

$$r_s = 97'272$$

$$\Sigma d_i^2 = 4'5$$

14. 200 graduados = n

χ^2? C. de contingencia

	Con Trabajo	Sin trabajo	n_i
G. Ingeniería	30	20	50
G. Derecho	60	40	100
G. Medicina	40	10	50
n_j	130	70	200

$$\chi^2 = \frac{(30-32'5)^2}{32'5} + \frac{(20-17'5)^2}{17'5} + \ldots + \frac{(60-65)^2}{65} + \frac{(40-35)^2}{35} + \ldots + \frac{(40-32'5)^2}{32'5} + \frac{(10-17'5)^2}{17'5} =$$

Frecuencias esperadas

	Con	Sin	
Ingeniería	$\frac{50 \cdot 130}{200} = 32'5$	17'5	50
Derecho	65	35	100
Medicina	32'5	17'5	50

$$\chi^2 = 0'1923 + 0'357 + 0'385 + 0'714 + 1'173 + 3'214 = 6'61$$

$$\chi^2 = 6'61$$

$$C = \sqrt{\frac{6'61}{6'61 + 200}} = 0'1789$$

$$\text{max valor} = \sqrt{(3-1)/2} = \sqrt{1} = 1$$

No son apenas dependientes.