Universidad Central del Ecuador
Facultad de Filosofía, Letras y Ciencias de la Educación
Pedagogía de las Ciencias Experimentales Informática

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Curso: 3CE14-002
Fecha: 18/12/2025

Estadística.

Datos:

5	7	8	8	10	11	13	13	14	14	15	17	18	19	19	21	21
24	25	26	27	27	28	30	31	31	32	33	33	34	34	34	35	36
37	37	40	40	41	42	43	43	45	45	47	47	48	48	48	49	50
50	52	52	54	54	55	56	57	65	66	68	68	68	70	70	70	72
72	73	77	78	79	79	79	81	82	82	82	82	83	84	85	86	86
88	89	89	92	92	93	95	96	96	97	98	99	100	100			

Datos no agrupados

Media Aritmética $n = 100$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\bar{x} = \frac{5310}{100}$$

$$\bar{x} = 53,1$$

Mediana

$$M_e = \frac{49 + 50}{2}$$

$$M_e = \frac{99}{2}$$

$$M_e = 49,5$$

Moda

$$M_o = 82$$

Varianza

$$\sigma^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}$$

$$\sigma^2 = \frac{\sum x_i^2}{n} - \bar{x}^2$$

$$\sum x_i^2 = 359034$$

$$\frac{\sum x_i^2}{n} = \frac{359034}{100} = 3590,34$$

$$\bar{x}^2 = (53,1)^2 = 2819,61$$

$$\sigma^2 = 3590,34 - 2819,61$$

$$= 770,73$$

Desviación

$$\sigma = \sqrt{\sigma^2}$$

$$\sigma = \sqrt{770,73}$$

$$\sigma = 27,764$$

Dar $\frac{K}{4}(n+1)$

Cuartiles

Posición:

Q_1 =

$p = \frac{1(100+1)}{4} = \frac{101}{4}$

$= 25,75$

Q_2

$p = \frac{2(100+1)}{4} = \frac{202}{4}$

$= 50,5$

Q_3

$p = \frac{3(100+1)}{4} = \frac{303}{4}$

$75,75$

Calculo

$Q_1 = \frac{x_{25} + x_{26}}{2}$

$Q_1 = \frac{31+31}{2}$

$Q_1 = 31$

$Q_2 = \frac{x_{50} + x_{51}}{2}$

$Q_2 = \frac{49+50}{2}$

$Q_2 = 49,5$

$Q_3 \frac{x_{75}, x_{76}}{2}$

$Q_3 \frac{79,79}{2}$

$Q_3 = 79$

Quintiles

$K_m = \frac{m \cdot (n+1)}{5}$

Posición:

$K_1 = (m=1)$: $\frac{1 \cdot 101}{5} = 20,2$

$K_2 (m=2)$ $\frac{2 \cdot 101}{5} = 40,4$

$K_3 (m=3)$ $\frac{3 \cdot 101}{5} = 60,6$

$K_4 (m=4)$ $\frac{4 \cdot 101}{5} = 80,8$

Calculo

$K_1 = 26 + 0,2(27-26)$

$= 26 + 0,2$

$K_1 = 26,2$

$K_2 = 42 + 0,4(43-42)$

$= 42 + 0,4$

$K_2 = 42,4$

$K_3 = 65 + 0,6(66-65)$

$= 65 + 0,6$

$K_3 = 65,6$

$K_4 = 82 + 0,8(82-82)$

$= 82 + 0$

$K_4 = 82$

Deciles:

$D_m = \frac{m \cdot (n+1)}{10}$

Posición:

$D_1 (m=1)$: $\frac{1 \cdot 101}{10} = 10,1$

$D_2 (m=2)$ $\frac{2 \cdot 101}{10} = 20,2$

$D_3 (m=3)$ $\frac{3 \cdot 101}{10} = 30,3$

$D_4 (m=4)$ $\frac{4 \cdot 101}{10} = 40,4$

Varianza

$$\sigma^2 = \frac{\sum f_i (x_i - \bar{x})^2}{n}$$

$$\frac{\sum f_i x_i^2}{n} = \frac{368793}{100} = 3687,83$$

$$x^2 = (64,20)^2 = 2937,64$$

$$\sigma^2 = 3687,83 - 2937,64$$

$$\sigma^2 = 750,19$$

Desviación

$$\sigma = \sqrt{\sigma^2}$$

$$\sigma = \sqrt{750,19}$$

$$= 27,389$$

$$\approx 27,39$$

Cuantiles

$$Q_k = L_i + \left(\frac{\frac{kn}{4} - F_{i-1}}{f_i}\right) \cdot c$$

Q_1 ($k=1$)

$$\frac{1 \cdot n}{4} = \frac{100}{4} = 25$$

$F_i \geq 25$ = Clase 2 ($F = 26$)

$L_i = 19$
$F_{i-1} = 12$
$f_i = 14$
$c = 14$

$$Q_1 = 19 + \left(\frac{26 - 12}{14}\right) \cdot 14$$

$$= 19 + \left(\frac{13}{14}\right) \cdot 14$$

$$= 19 + 13$$

$$= 32$$

Q_2 (K_2) Mediana

$Q_2 \approx 63,63$

Q_3 (K_3)

$$\frac{3 \cdot n}{4} = \frac{300}{4} = 75$$

$F_i \geq 75$ = Clase 6 (F 86).

$L_i = 75$
$F_{i-1} = 70$
$f_i = 16$
$c = 14$

$$Q_3 = 75 + \left(\frac{75 - 70}{16}\right) \cdot 14$$

$$Q_3 = 75 + \left(\frac{5}{16}\right) \cdot 14$$

$$Q_3 = 75 + \left(\frac{5}{16}\right) \cdot 14$$

$$Q_3 = 75 + \frac{70}{16}$$

$$Q_3 = 75 + 4,375$$

$$Q_3 = 79,375$$

$$Q_3 \approx 79,38$$

Cuartiles

K_1 (n=1)

$\frac{2 \cdot n}{5} = \frac{100}{5} = 20$

$F_i \geq 20$ = Clase 2

$L_i = 19$
$F_{i-1} = 12$
$f_i = 14$

$K_1 = 19 + \left(\frac{20-12}{14}\right) \cdot 14$

$K_1 = 19 + \left(\frac{8}{14}\right) \cdot 14$

$K_1 = 19 + 8 = 27$

K_2 (n=2)

$P = 40$
Clase 3

$L_i = 33$
$F_{i-1} = 26$
$f_i = 17$

$K_2 = 33 + \left(\frac{40-26}{17}\right) \cdot 14$

$K_2 = 44,83$

K_3 (n=3)

$P = 60$
Clase 5
$L_i = 61$

$F_{i-1} = 58$

$f_i = 10$

$K_3 = 61 + \left(\frac{60-58}{12}\right) \cdot 14$

$K_3 = 63,33$

K_4
80
Clase 6

$L_i = 75$
$F_{i-1} = 70$
$f_i = 16$

$K_4 = 75 + \left(\frac{80-70}{16}\right) \cdot 14$

$K_4 = 83,75$

D_5 ($n=5$) D_6 ($n=6$) D_7 ($n=7$) D_8 ($n=8$)

$\frac{5 \cdot 101}{10} = 50,5$ $\frac{6 \cdot 101}{10} = 60,6$ $\frac{7 \cdot 101}{10} = 70,7$ $\frac{8 \cdot 101}{10} = 80,8$

D_9 ($n=9$)

$\frac{9 \cdot 101}{10} = 90,9$

Calculos

$D_1 = 10 + 0,1(15-14)$ $D_2 = 26 + 0,2(27-26)$ $D_3 = 34 + 0,3(34-34)$

$= 14 + 0,1$ $= 26,2$ $= 34$

$= 14,1$

$D_4 = 42 + 0,4(43-42)$ $D_5 = \frac{49+50}{2}$ $D_6 = 65 + 0,6(66-65)$

$42,4$ $= 49,5$ $= 65,6$

$D_7 = 72 + 0,7(73-72)$ $D_8 = 82 + 0,8(82-82)$ $D_9 = 92 + 0,9(92-92)$

$= 72,7$ $= 82$ $= 92$

Percentiles

$P_1 = \frac{P(101)}{100} = 1,01p$

P	Valor	P	Valor	P	Valor	P	Valor	P	Valor	P	Valor
1	5,01	18	24,18	35	37	52	50	69	72	86	86
2	7,01	19	25,19	36	37	53	52	70	72,70	87	87,74
3	7,03	20	26,20	37	40	54	62	71	75,84	88	88,88
4	8,00	21	27,	38	40	55	64	72	71,72	89	89
5	8,05	22	27	39	41,39	56	64	73	78,73	90	92
6	10,06	23	28,46	40	42,40	57	65,57	74	79	91	92
7	11,07	24	30,24	41	43	58	66,58	75	79	92	92,92
8	13,08	25	31	42	43	59	67,72	76	79	93	96,96
9	13,09	26	31	43	46	60	66,60	77	81,77	94	96,94
10	14,10	27	32,27	44	46	61	66,00	78	82	95	96
11	16,22	28	33	45	47	62	66	79	82	96	96
12	17,12	29	33	46	47	63	68	80	82	97	97,97
13	18,13	30	34	47	48	64	68	81	82	98	98,98
14	19	31	34	48	48	65	68	82	81,82	99	100
15	19	32	34	49	48,49	66	70	83	83,83		
16	21	33	35,33	50	49,50	67	70	84	84,84		
17	21	34	36,34	51	50	68	70	85	85,85		

Datos Agrupados

Rango $x_{max} - x_{min}$ $= 100 - 5 = 95$

$k = 1 + 3{,}322 \log_{10}(100) \approx 7{,}64$

Ancho $\frac{95}{7} \approx 13{,}57 \triangleq 14$

n	x_{min}-x_{max}	x_i	f_i	F_i	$f_i \cdot x_i$	x_i^2	$f_i x_i^2$
1	5 - 18	11,5	12	12	138	132,25	1587
2	19 - 32	25,5	14	26	357	650,25	9103,5
3	33 - 46	39,5	17	43	671,5	1560,25	26524,25
4	47 - 60	53,5	15	58	802,5	2862,25	42933,75
5	61 - 74	67,5	12	70	810	4556,25	54675
6	75 - 88	81,5	16	86	1304	6642,25	106276
7	89 - 102	95,5	14	100	1337	9120,25	127683,5
			100		5420		368783

Media Aritmética

$\bar{x} = \frac{5420}{100}$

$\bar{x} = 54{,}20$

$\bar{x} = \frac{\Sigma f_i x_i}{n}$

Mediana

$Me = L_i + \left(\frac{\frac{n}{2} - F_{i-1}}{f_i}\right) \cdot C$

$Me = 47 + \left(\frac{50 - 43}{15}\right) \cdot 14$

$47 + \left(\frac{7}{15}\right) \cdot 14$

$47 + \left(\frac{98}{15}\right)$

$47 + 6{,}5333$

$= 53{,}5333$

$\simeq 53{,}53$

$n = 100 \quad \frac{n}{2} = 50$

$F \geq 50 = 4\,(47, 60)$

$L_i = 47$

$F_{i-1} = 43$

$f_i = 15$

$C = 14$

Moda

$Mo = L_m + \left(\frac{d_1}{d_1 + d_2}\right) \cdot C$

$= 33 + \left(\frac{3}{3+2}\right) \cdot 14$

$= 33 + \left(\frac{3}{5}\right) \cdot 14$

$= 33 + \frac{42}{5}$

$= 33 + 8{,}4$

$= 41{,}4$

$L_m = 33$

$f_i = 17$

$f_{i-1} = 14$

$f_{i+1} = 15$

$d_1 = 17 - 14 = 3$

$d_2 = 17 - 15 = 2$

$C = 14$

$f = 17$

Deciles

$$Dm = Li + \left(\frac{\frac{n \cdot c}{10} - Fi-1}{fi}\right) \cdot c$$

D_1 (n=1)
P = 10
Clase 1
$Li = 5, Fi-1 = 0, fi = 12$

$$D_1 = 5 + \left(\frac{10-0}{12}\right) \cdot 14$$

$$D_1 = 16,67$$

D_2 (n=2)
P = 20

D_2 (n=2)
Posicion 20
Clase 2
$Li = 19, Fi-1 = 12, fi = 14$

$$D_2 = 19 + \left(\frac{20-12}{14}\right) \cdot 14$$

$$D_2 = 19 + 8 = 27$$

D_3 (n=3)
P = 30
Clase 3
$Li = 23, Fi-1 = 26, fi = 17$

$$D_3 = 23 + \left(\frac{30-26}{17}\right) 14$$

$$D_3 = 36,29$$

D_4 (n=4)
P = 40 Clase 3
$Li = 33, Fi-1 = 26, fi = 17$

$$D_4 = 33 + \left(\frac{40-26}{17}\right) 14$$

$$D_4 = 44,53$$

D_5 (n=5)
P = 50
Clase 4
$Li = 47, Fi-1 = 43, fi = 15$

$$D_5 = 47 + \left(\frac{50-43}{15}\right) 14$$

$$D_5 = 53,53$$

D_6 (n=6)
P = 60
Clase 5
$Li = 61, Fi-1 = 58, fi = 12$

$$D_6 = 61 + \left(\frac{60-58}{12}\right) \cdot 14$$

$$D_6 = 63,33$$

D_7 (n=7)
P = 70
Clase 6
$Li = 61, Fi-1 = 58, fi = 12$

$$D_7 = 61 + \left(\frac{70-58}{12}\right) 14$$

$$D_7 = 75$$

D_8 (n=8)
P = 80
Clase 6

$$D_8 = 75 + \left(\frac{80-70}{16}\right) 14$$

$$D_8 = 83,75$$

D_9 (n=9)
P = 90
Clase 7

$$D_9 = 89 + \left(\frac{90-86}{14}\right) \cdot 14$$

$$D_9 = 93$$

Percentiles

$$P_p = L_i + \left(\frac{p - F_{i-1}}{A}\right) \cdot C$$

P	P-p	P	P-p	P	P-p
1	6,17	34	37,65	67	71,00
2	7,33	35	38,47	68	72,38
3	8,50	36	39,29	69	73,25
4	9,67	37	40,12	70	74,13
5	10,83	38	40,94	71	75,88
6	12,00	39	41,76	72	76,75
7	13,17	40	42,59	73	77,63
8	14,33	41	43,41	74	78,50
9	15,50	42	44,24	75	79,38
10	16,67	43	45,06	76	80,25
11	17,83	44	47,93	77	81,13
12	19,00	45	48,87	78	82,00
13	20,00	46	49,80	79	82,88
14	21,00	47	50,73	80	83,75
15	22,00	48	51,67	81	84,63
16	23,00	49	52,60	82	85,50
17	24,00	50	53,53	83	86,38
18	25,00	51	54,47	84	87,25
19	26,00	52	55,40	85	88,13
20	27,00	53	56,33	86	89,00
21	28,00	54	57,27	87	90,00
22	29,00	55	58,20	88	91,00
23	30,00	56	59,13	89	92,00
24	31,00	57	60,07	90	93,00
25	32,00	58	61,00	91	94,00
26	33,00	59	62,17	92	95,00
27	23,82	60	63,33	93	96,00
28	34,65	61	64,60	94	97,00
29	35,47	62	65,67	95	98,00
30	36,29	63	66,83	96	99,00
31	37,12	64	68,00	97	100.
32	37,94	65	69,17	98	101
33	38,76	66	70,33	99	102