

Sample	BR	B
1	6.2	5.1
2	6.3	5.2
3	5.9	4.7
4	5.5	6.0
5	5.6	4.4
6	6.0	4.9
7	6.2	5.3

$$\textcircled{1} \text{ Mean}_1 = \frac{6.2+6.3+5.9+5.5+5.6+6.0+6.2}{7} = 5.96$$

$$\textcircled{2} \text{ Mean}_2 = \frac{5.1+5.2+4.7+6.0+4.4+4.9+5.3}{7} = 5.09$$

$$\textcircled{3} \Sigma X^2 = 6.2^2 + 6.3^2 + 5.9^2 + 5.5^2 + 5.6^2 + 6.0^2 + 6.2^2 = 248.99$$

$$\textcircled{4} \Sigma X^2 = 5.1^2 + 5.2^2 + 4.7^2 + 6.0^2 + 4.4^2 + 4.9^2 + 5.3^2 = 182.60$$

$$\Sigma X = 6.2+6.3+5.9+5.5+5.6+6.0+6.2 = 41.7$$

$$\Sigma X = 5.1+5.2+4.7+6.0+4.4+4.9+5.3 = 35.6$$

$$\textcircled{5} S^2 = \frac{(\Sigma X^2) - \frac{(\Sigma X)^2}{n}}{n-1} = \frac{248.99 - \frac{(41.7)^2}{7}}{7-1} = 0.31$$

$$SD = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}} = \sqrt{\frac{182.6 - \frac{35.6^2}{7}}{7-1}} = 0.51$$

$$t = \frac{|\bar{X}_1 - \bar{X}_2|}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{(n_1+n_2-2)} \times \left(\frac{n_1+n_2}{n_1 n_2}\right)}} = \frac{5.96 - 5.09}{\sqrt{\frac{(7-1) \times 0.31^2 + (7-1) \times 0.51^2}{(7+7-2)} \times \left(\frac{7+7}{7 \times 7}\right)}} = 3.856$$

$$df = (n_1 + n_2 - 2) = 12 \quad P = 2.179 (95\%) \quad P = 3.055 (99\%)$$

$$t = 3.856 > 2.179 \quad t = 3.856 > 3.055$$

∴ reject Null hypothesis

	before	after	difference	rank	signed rank
1	900	1456	556	10	10
2	945	1325	380	5.5	5.5
3	859	1266	407	8	8
4	879	999	120	3	3
5	620	1003	383	7	7
6	965	960	-5	1	-1
7	~~403~~ 963	1025	62	2	2
8	~~856~~ 403	826	423	9	9
9	~~77~~ 856	1236	380	5.5	5.5
10	753	1009	256	4	4

$$T_+ = 10 + 5.5 + 8 + 3 + 7 + 2 + 9 + 5.5 + 4 = 54$$

$$T_- = 1$$

check: $T_- = \frac{10(10+1)}{2} - T_+ = 1$ ✓ compared with table

$$T_+ = \frac{10(10+1)}{2} - T_- = 54$$

$$df = 10 - 0 = 10 \text{ (no zero difference)}$$

table value ($p = 0.05$) = 8

$$\therefore T_- = 1 < 8 \quad \text{reject Null hypothesis}$$

	A	B	C	D	Total
observed:	41	19	24	16	100
expect:	25	25	25	25	100
O-E	16	-6	-1	-9	

$$\chi^2 = \sum \frac{(O-E)^2}{E} = \frac{16^2}{25} + \frac{36}{25} + \frac{1}{25} + \frac{81}{25}$$

$$= 14.96$$

$$df = 3$$

$$14.96 > 7.815 (P=0.05)$$

$$14.96 > 11.345 (P=0.01)$$

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Vistors	Rank	Cocals	Rank	Difference	d^2
1	~~1~~ 8	4	5	3	9
7	~~7~~ 7	3	6	-4	16
2	~~2~~ 7	6	3	4	16
3	~~3~~ 6	7	2	4	16
5	~~5~~ 4	1	8	-4	16
4	~~4~~ 5	8	1	4	16
6	~~6~~ 3	5	4	-1	1
8	~~8~~ 1	2	7	-6	36

$$n=8$$

$$\sum d^2 = 126$$

$$df=6$$

$$r_s = 1 - \frac{6 \sum d^2}{n^3 - n} = 1 - \frac{6 \times 126}{8^3 - 8} = -0.5$$

Table 0.886 ($p=0.05$) 1.00 ($p=0.01$)

$$-0.5 < 0.886$$

	x	x ²	y	y ²	xy
1	1	1	2	4	~~2~~ 2
2	2	4	4	16	~~8~~ 8
3	4	16	4	16	~~16~~ 16
4	8	64	6	36	48
5	10	100	7	49	70
6	13	169	8	64	104
7	12	144	7	49	84

$$\bar{x} = 7.14 \quad \sum x^2 = 498 \quad \bar{y} = 5.43 \quad \sum y^2 = 234 \quad \sum xy = 332$$

$$b = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} = \frac{332 - \frac{38 \times 50}{7}}{498 - \frac{(30)^2}{7}} = \frac{332 - 271.43}{498 - 128.57} = \frac{60.57}{369.43} = 0.164$$

$$a = \bar{y} - b\bar{x} = 5.43 - 0.164 \times 7.14 = 4.83$$

$$\therefore y = 4.83 + 0.164x$$

$$x = 5 \text{ 吋} \quad y = 4.83 + 0.164 \times 5 = 5.65$$