

# 10-1

Analizza e descrivi il seguente set di dati:

<b>A</b>	2	1	1	2	1	1
<b>B</b>	4	1	2	4	2	4
<b>C</b>	5	3	2	3	2	4

riportando tutti i passaggi intermedi

	I	II	III	IV	V	VI	sx	sx <sup>2</sup>	Media	dev.st.
<b>A</b>	2	1	1	2	1	1	8	12	1,333333	0,516398
<b>B</b>	4	1	2	4	2	4	17	57	2,833333	1,32916
<b>C</b>	5	3	2	3	2	4	19	67	3,166667	1,169045
<b>sx</b>							44			
<b>sx<sup>2</sup></b>								136		

TC = $\frac{(sx)^2}{n}$	$\frac{(sx)^2}{n}$	n	$\frac{(sx)^2}{n}$
	1936	18	107,5556

SS TOT $[s(x^2) - TC] =$	136	-107,556	28,44444
--------------------------	-----	----------	----------

SS TRATT. $\frac{(SXA)^2/nA + (SXB)^2/nB + \dots + (SXG)^2/nG -}{6}$	714	-107,556	11,44444
--	-----	----------	----------

SORGENTI	SS	DF	MS	F
TRATTAMENTI	11,44444	2	5,722222	5,04902
ERRORE	17	15	1,133333	1
TOTALE	28,44444	17	1,673203	

# Tavola $F_{(0,05)}$

g.l.	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	25	30	40
1	161,4	199,5	215,7	224,6	230,2	234	236,8	238,9	240,5	241,9	243,9	245,4	246,5	247,3	248	249,3	250,1	251,1
2	18,51	19	19,16	19,25	19,3	19,33	19,35	19,37	19,39	19,4	19,41	19,42	19,43	19,44	19,45	19,46	19,46	19,47
3	10,13	9,852	9,277	9,117	9,013	8,941	8,887	8,845	8,812	8,785	8,745	8,715	8,692	8,675	8,66	8,634	8,617	8,594
4	7,709	6,944	6,591	6,388	6,256	6,163	6,094	6,041	5,999	5,964	5,912	5,873	5,844	5,821	5,803	5,769	5,746	5,717
5	6,608	5,786	5,409	5,192	5,05	4,95	4,876	4,818	4,772	4,735	4,678	4,636	4,604	4,579	4,558	4,521	4,496	4,464
6	5,987	5,143	4,757	4,534	4,387	4,284	4,207	4,147	4,099	4,06	4	3,956	3,922	3,896	3,874	3,835	3,808	3,774
7	5,591	4,737	4,347	4,12	3,972	3,866	3,787	3,726	3,677	3,637	3,575	3,529	3,494	3,467	3,445	3,404	3,376	3,34
8	5,318	4,459	4,066	3,838	3,688	3,581	3,5	3,438	3,388	3,347	3,284	3,237	3,202	3,173	3,15	3,108	3,079	3,043
9	5,117	4,256	3,863	3,633	3,482	3,374	3,293	3,23	3,179	3,137	3,073	3,025	2,989	2,96	2,936	2,893	2,864	2,826
10	4,965	4,103	3,708	3,478	3,326	3,217	3,135	3,072	3,02	2,978	2,913	2,865	2,828	2,798	2,774	2,73	2,7	2,661
11	4,844	3,982	3,587	3,357	3,204	3,095	3,012	2,948	2,896	2,854	2,788	2,739	2,701	2,671	2,646	2,601	2,57	2,531
12	4,747	3,885	3,49	3,259	3,106	2,996	2,913	2,849	2,796	2,753	2,687	2,637	2,599	2,568	2,544	2,498	2,466	2,426
14	4,6	3,739	3,344	3,112	2,958	2,848	2,764	2,699	2,646	2,602	2,534	2,484	2,445	2,413	2,388	2,341	2,308	2,266
15	4,543	3,682	3,287	3,056	2,901	2,79	2,707	2,641	2,588	2,544	2,475	2,424	2,385	2,353	2,328	2,28	2,247	2,204
16	4,494	3,634	3,239	3,007	2,852	2,741	2,657	2,591	2,538	2,494	2,425	2,373	2,333	2,302	2,276	2,227	2,194	2,151
18	4,414	3,555	3,16	2,928	2,773	2,661	2,577	2,51	2,456	2,412	2,342	2,29	2,25	2,217	2,191	2,141	2,107	2,063
20	4,351	3,493	3,098	2,866	2,711	2,599	2,514	2,447	2,393	2,348	2,278	2,225	2,184	2,151	2,124	2,074	2,039	1,994
25	4,242	3,385	2,991	2,759	2,603	2,49	2,405	2,337	2,282	2,236	2,165	2,111	2,069	2,035	2,007	1,955	1,919	1,872
30	4,171	3,316	2,922	2,69	2,534	2,421	2,334	2,266	2,211	2,165	2,092	2,037	1,995	1,96	1,932	1,878	1,841	1,792
40	4,085	3,232	2,839	2,606	2,449	2,336	2,249	2,18	2,124	2,077	2,003	1,948	1,904	1,868	1,839	1,783	1,744	1,693
50	4,034	3,183	2,79	2,557	2,4	2,286	2,199	2,13	2,073	2,026	1,952	1,895	1,85	1,814	1,784	1,727	1,687	1,634
100	3,936	3,087	2,696	2,463	2,305	2,191	2,103	2,032	1,975	1,927	1,85	1,792	1,746	1,708	1,676	1,616	1,573	1,515
150	3,904	3,056	2,665	2,432	2,274	2,16	2,071	2,001	1,943	1,894	1,817	1,758	1,711	1,673	1,641	1,58	1,535	1,475
200	3,888	3,041	2,65	2,417	2,259	2,144	2,056	1,985	1,927	1,878	1,801	1,742	1,694	1,656	1,623	1,561	1,516	1,455

Tavola realizzata con la funzione invF di excel

3

SORGENTI	SS	DF	MS	F
TRATTAMENTI	11,44444	2	5,722222	5,05
ERRORE	17	15	1,133333	1
TOTALE	28,44444	17	1,673203	

$p < 0,05$

$$MDS = t * \sqrt{MS_{errore} * \frac{n_A + n_B}{n_A * n_B}} = t * \sqrt{1,13 * 0,3} =$$

$$= t * \sqrt{0,37} = t * 0,6146$$

$$\frac{6+6}{6*6} = \frac{12}{36} = 0,3$$

consulto la dabella di 

per  $gl = n_A + n_B - 2 = 10$

4

probabilità % di un valore più elevato di t trascurando il segno

due code	0,5	0,4	0,3	0,2	0,1	0,05	0,02	0,01	0,002	0,001
una coda	0,25	0,2	0,15	0,1	0,05	0,025	0,01	0,005	0,001	0,0005
g.l.										
1	1,000	1,376	1,963	3,078	6,314	12,710	31,820	63,660	318,310	636,620
2	0,816	1,061	1,386	1,886	2,920	4,303	6,965	9,925	22,327	31,599
3	0,765	0,978	1,250	1,638	2,353	3,182	4,541	5,841	10,215	12,924
4	0,741	0,941	1,190	1,533	2,132	2,776	3,747	4,604	7,173	8,610
5	0,727	0,920	1,156	1,476	2,015	2,571	3,365	4,032	5,893	6,869
6	0,718	0,906	1,134	1,440	1,943	2,447	3,143	3,707	5,208	5,959
7	0,711	0,896	1,119	1,415	1,895	2,365	2,998	3,499	4,785	5,408
8	0,706	0,889	1,108	1,397	1,860	2,306	2,896	3,355	4,501	5,041
9	0,703	0,883	1,100	1,383	1,833	2,262	2,821	3,250	4,297	4,781
10	0,700	0,879	1,093	1,372	1,812	2,228	2,764	3,169	4,144	4,587
11	0,697	0,876	1,088	1,363	1,796	2,201	2,718	3,106	4,025	4,437
12	0,695	0,873	1,083	1,356	1,782	2,179	2,681	3,055	3,930	4,318
13	0,694	0,870	1,079	1,350	1,771	2,160	2,650	3,012	3,852	4,221
14	0,692	0,868	1,076	1,345	1,761	2,145	2,624	2,977	3,787	4,140
15	0,691	0,866	1,074	1,341	1,753	2,131	2,602	2,947	3,733	4,073
16	0,690	0,865	1,071	1,337	1,746	2,120	2,583	2,921	3,686	4,015
17	0,689	0,863	1,069	1,333	1,740	2,110	2,567	2,898	3,646	3,965
18	0,688	0,862	1,067	1,330	1,734	2,101	2,552	2,878	3,610	3,922
19	0,688	0,861	1,066	1,328	1,729	2,093	2,539	2,861	3,579	3,883
20	0,687	0,860	1,064	1,325	1,725	2,086	2,528	2,845	3,552	3,850
21	0,686	0,859	1,063	1,323	1,721	2,080	2,518	2,831	3,527	3,819
22	0,686	0,858	1,061	1,321	1,717	2,074	2,508	2,819	3,505	3,792
23	0,685	0,858	1,060	1,319	1,714	2,069	2,500	2,807	3,485	3,768
24	0,685	0,857	1,059	1,318	1,711	2,064	2,492	2,797	3,467	3,745
25	0,684	0,856	1,058	1,316	1,708	2,060	2,485	2,787	3,450	3,725
26	0,684	0,856	1,058	1,315	1,706	2,056	2,479	2,779	3,435	3,707
27	0,684	0,855	1,057	1,314	1,703	2,052	2,473	2,771	3,421	3,690
28	0,683	0,855	1,056	1,313	1,701	2,048	2,467	2,763	3,408	3,674
29	0,683	0,854	1,055	1,311	1,699	2,045	2,462	2,756	3,396	3,659
30	0,683	0,854	1,055	1,310	1,697	2,042	2,457	2,750	3,385	3,646
40	0,681	0,851	1,050	1,303	1,684	2,021	2,423	2,704	3,307	3,551
60	0,679	0,848	1,045	1,296	1,671	2,000	2,390	2,660	3,232	3,460
80	0,678	0,846	1,043	1,292	1,664	1,990	2,374	2,639	3,195	3,416
100	0,677	0,845	1,042	1,290	1,660	1,984	2,364	2,626	3,174	3,390
1.000	0,675	0,842	1,037	1,282	1,646	1,962	2,330	2,581	3,098	3,300
infinito	0,674	0,842	1,036	1,282	1,645	1,960	2,326	2,576	3,090	3,291

Tavola realizzata con la funzione invt di excel

da tabella di **t** (0,01) 2,228 **MDS =** 1,37

Sempre uguale perché n uguale per tutte le tesi

Si mettono in ordine crescente le medie:

**Media**

**A** 1,33

**B** 2,83

**C** 3,17

$1,33 \text{ vs. } 3,17 = 1,84$   
 $1,33 \text{ vs. } 2,83 = 1,50$      $2,83 \text{ vs. } 3,17 = 0,34$

1,33

a

2,83

b

3,17

b

a    b    b

	Media	dev.st.	err.st.
A	1,333333	0,516398	0,210819
B	2,833333	1,32916	0,542627
C	3,166667	1,169045	0,477261

## Presento i risultati con l'arrotondamento finale

TESI	A	B	C
n	6	6	6
media	1,3 a	2,8 b	3,2 b
dev.st.	0,52	1,33	1,17

Nota: medie con lettere differenti indicano differenze significative per  $p < 0,05$ ; test di student.

*note: means bearing different letters differ per  $p < 0.05$ .*

Confronto fra le medie tramite test di Student.

*Post hoc test: Student t test.*

# 9-1

**Analizza e descrivi il seguente set di dati randomizzati:**

A	B
1	4
2	5
4	1
2	6
1	5
2	4

**utilizza l'analisi della varianza**

**riporta tutti i passaggi intermedi**

	A	B		
	1	4		
	2	5		
	4	1		
	2	6		
	1	5		
	2	4		
n	6	6	12	
somma	12	25	37	
sx <sup>2</sup>	30	119	149	
media	2	4,166667	3,083333	
TC = (sx) <sup>2</sup> /n			114,0833	
d.s.	1,095445	1,722401		
e.s.	0,447214	0,703167		

  

	A	B		
n	6	6		
media	2,00 a	4,17 b		
d.s.	1,095	1,722		

nota: lettere diverse fra le medie indicano differenze significative per p<0,05

  

TRATT. (SXA) <sup>2</sup> /nA+(SXB) <sup>2</sup> /nB-TC =	14,08333	1	14,08333	6,76	F
ERRORE (V.TOT-TRATT)	20,83333	10	2,083333		
V. TOT [s(x <sup>2</sup> ) - TC] =	34,91667	11			

da tabella di: **F**<sub>(0,05)</sub> 4,965      **F**<sub>(0,01)</sub> 10,04

### Tavola **F** (0,05)

g.l.	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	25	30	40
1	161,4	199,5	215,7	224,6	230,2	234	236,8	238,9	240,5	241,9	243,9	245,4	246,5	247,3	248	249,3	250,1	251,1
2	18,51	19	19,16	19,25	19,3	19,33	19,35	19,37	19,39	19,4	19,41	19,42	19,43	19,44	19,45	19,46	19,46	19,47
3	10,13	9,552	9,277	9,117	9,013	8,941	8,887	8,845	8,812	8,785	8,745	8,715	8,692	8,675	8,66	8,634	8,617	8,594
4	7,709	6,944	6,591	6,388	6,256	6,163	6,094	6,041	5,999	5,964	5,912	5,873	5,844	5,821	5,803	5,769	5,746	5,717
5	6,608	5,786	5,409	5,192	5,05	4,95	4,876	4,818	4,772	4,735	4,678	4,636	4,604	4,579	4,558	4,521	4,496	4,464
6	5,987	5,143	4,757	4,534	4,387	4,284	4,207	4,147	4,099	4,06	4	3,956	3,922	3,896	3,874	3,835	3,808	3,774
7	5,591	4,737	4,347	4,12	3,972	3,866	3,787	3,726	3,677	3,637	3,575	3,529	3,494	3,467	3,445	3,404	3,376	3,34
8	5,318	4,459	4,066	3,838	3,688	3,581	3,5	3,438	3,388	3,347	3,284	3,237	3,202	3,173	3,15	3,108	3,079	3,043
9	5,117	4,256	3,863	3,633	3,482	3,374	3,293	3,23	3,179	3,137	3,073	3,025	2,989	2,96	2,936	2,893	2,864	2,826
10	4,965	4,103	3,708	3,478	3,326	3,217	3,135	3,072	3,02	2,978	2,913	2,865	2,828	2,798	2,774	2,73	2,7	2,661
12	4,747	3,885	3,49	3,259	3,106	2,996	2,913	2,849	2,796	2,753	2,687	2,637	2,599	2,568	2,544	2,498	2,466	2,426
14	4,6	3,739	3,344	3,112	2,958	2,848	2,764	2,699	2,646	2,602	2,534	2,484	2,445	2,413	2,388	2,341	2,308	2,266
16	4,494	3,634	3,239	3,007	2,852	2,741	2,657	2,591	2,538	2,494	2,425	2,373	2,333	2,302	2,276	2,227	2,194	2,151
18	4,414	3,555	3,16	2,928	2,773	2,661	2,577	2,51	2,456	2,412	2,342	2,29	2,25	2,217	2,191	2,141	2,107	2,063
20	4,351	3,493	3,098	2,866	2,711	2,599	2,514	2,447	2,393	2,348	2,278	2,225	2,184	2,151	2,124	2,074	2,039	1,994
25	4,242	3,385	2,991	2,759	2,603	2,49	2,405	2,337	2,282	2,236	2,165	2,111	2,069	2,035	2,007	1,955	1,919	1,872
30	4,171	3,316	2,922	2,69	2,534	2,421	2,334	2,266	2,211	2,165	2,092	2,037	1,995	1,96	1,932	1,878	1,841	1,792
40	4,085	3,232	2,839	2,606	2,449	2,336	2,249	2,18	2,124	2,077	2,003	1,948	1,904	1,868	1,839	1,783	1,744	1,693
50	4,034	3,183	2,79	2,557	2,4	2,286	2,199	2,13	2,073	2,026	1,952	1,895	1,85	1,814	1,784	1,727	1,687	1,634
100	3,936	3,087	2,696	2,463	2,305	2,191	2,103	2,032	1,975	1,927	1,85	1,792	1,746	1,708	1,676	1,616	1,573	1,515
150	3,904	3,056	2,665	2,432	2,274	2,16	2,071	2,001	1,943	1,894	1,817	1,758	1,711	1,673	1,641	1,58	1,535	1,475
200	3,888	3,041	2,65	2,417	2,259	2,144	2,056	1,985	1,927	1,878	1,801	1,742	1,694	1,656	1,623	1,561	1,516	1,455
400	3,865	3,018	2,627	2,394	2,237	2,121	2,032	1,962	1,903	1,854	1,776	1,717	1,669	1,63	1,597	1,534	1,488	1,425

Tavola realizzata con la funzione invF di excel

## Tavola $F_{(10,30)}$

g.l.	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	25	30
1	4052	4999	5404	5624	5764	5859	5928	5981	6022	6056	6107	6143	6170	6191	6209	6240	6260
2	98,5	99	99,16	99,25	99,3	99,33	99,36	99,38	99,39	99,4	99,42	99,43	99,44	99,44	99,45	99,46	99,47
3	34,12	30,82	29,46	28,71	28,24	27,91	27,67	27,49	27,34	27,23	27,05	26,92	26,83	26,75	26,69	26,58	26,5
4	21,2	18	16,69	15,98	15,52	15,21	14,98	14,8	14,66	14,55	14,37	14,25	14,15	14,08	14,02	13,91	13,84
5	16,26	13,27	12,06	11,39	10,97	10,67	10,46	10,29	10,16	10,05	9,888	9,77	9,68	9,609	9,553	9,449	9,379
6	13,75	10,92	9,78	9,148	8,746	8,466	8,26	8,102	7,976	7,874	7,718	7,605	7,519	7,451	7,396	7,296	7,229
7	12,25	9,547	8,451	7,847	7,46	7,191	6,993	6,84	6,719	6,62	6,469	6,359	6,275	6,209	6,155	6,058	5,992
8	11,26	8,649	7,591	7,006	6,632	6,371	6,178	6,029	5,911	5,814	5,667	5,559	5,477	5,412	5,359	5,263	5,198
9	10,56	8,022	6,992	6,422	6,057	5,802	5,613	5,467	5,351	5,257	5,111	5,005	4,924	4,86	4,808	4,713	4,649
10	10,04	7,559	6,552	5,994	5,636	5,386	5,2	5,057	4,942	4,849	4,706	4,601	4,52	4,457	4,405	4,311	4,247
12	9,33	6,927	5,953	5,412	5,064	4,821	4,64	4,499	4,388	4,296	4,155	4,052	3,972	3,91	3,858	3,765	3,701
14	8,862	6,515	5,564	5,035	4,695	4,456	4,278	4,14	4,03	3,939	3,8	3,698	3,619	3,556	3,505	3,412	3,348
16	8,531	6,226	5,292	4,773	4,437	4,202	4,026	3,89	3,78	3,691	3,553	3,451	3,372	3,31	3,259	3,165	3,101
18	8,285	6,013	5,092	4,579	4,248	4,015	3,841	3,705	3,597	3,508	3,371	3,269	3,19	3,128	3,077	2,983	2,919
20	8,096	5,849	4,938	4,431	4,103	3,871	3,699	3,564	3,457	3,368	3,231	3,13	3,051	2,989	2,938	2,843	2,778
25	7,77	5,568	4,675	4,177	3,855	3,627	3,457	3,324	3,217	3,129	2,993	2,892	2,813	2,751	2,699	2,604	2,538
30	7,562	5,39	4,51	4,018	3,699	3,473	3,305	3,173	3,067	2,979	2,843	2,742	2,663	2,6	2,549	2,453	2,386
40	7,314	5,178	4,313	3,828	3,514	3,291	3,124	2,993	2,888	2,801	2,665	2,563	2,484	2,421	2,369	2,271	2,203
50	7,171	5,057	4,199	3,72	3,408	3,186	3,02	2,89	2,785	2,698	2,563	2,461	2,382	2,318	2,265	2,167	2,098
100	6,895	4,824	3,984	3,513	3,206	2,988	2,823	2,694	2,59	2,503	2,368	2,265	2,185	2,12	2,067	1,965	1,893
150	6,807	4,749	3,915	3,447	3,142	2,924	2,761	2,632	2,528	2,441	2,305	2,203	2,122	2,057	2,003	1,9	1,827
200	6,763	4,713	3,881	3,414	3,11	2,893	2,73	2,601	2,497	2,411	2,275	2,172	2,091	2,026	1,971	1,868	1,794
400	6,699	4,659	3,831	3,366	3,063	2,847	2,684	2,556	2,452	2,365	2,229	2,126	2,045	1,979	1,925	1,82	1,745

11

Tavola realizzata con la funzione invF di excel

# 8-1

**Analizza e descrivi il seguente set di dati appaiati:**

prima	-	dopo
40		40
47		50
40		47
50		50
38		40
38		47
42		47

**riporta tutti i passaggi intermedi**

12

	prima	-	dopo	dopo- prima
	40		40	0
	47		50	3
	40		47	7
	50		50	0
	38		40	2
	38		47	9
	42		47	5
n =	7		7	7
media =	42,1 a		45,9 b	3,7
SS=	128,86		106,86	71,43
VAR =	21,48		17,81	11,90
d.s. =	4,63		4,22	3,45
es =	1,751578		1,59506	1,304101
d (A-B)=				3,714286
n <sub>A</sub> + n <sub>B</sub> =	14			
n <sub>A</sub> * n <sub>B</sub> =	49			
n <sub>A</sub> + n <sub>B</sub> - 2 =	12	= g.l. =		6
	3,428571			
ds <sup>2</sup> <sub>d</sub> =	5,612245			
ds <sub>d</sub> =	2,369018			
t calcolato =	1,567859			2,848157
t <sub>0,05</sub> =	2,179			1,943
t <sub>0,01</sub> =	3,055			3,143

Nota: medie con lettere diverse differiscono statisticamente per p<0,05\*

**o meglio**

	prima	-	dopo	dopo- prima
n =	7		7	7
media =	42,1		45,9	3,7 *
d.s. =	4,63		4,22	3,45

\* valore statisticamente significativo per p<0,05

t =  $\frac{\text{differenza medie}}{\text{errore standard campione}}$   $sm = d.s./\sqrt{n}$

probabilità % di un valore più elevato di t trascurando il segno.										
due code	0,5	0,4	0,3	0,2	0,1	0,05	0,02	0,01	0,002	0,001
una coda	0,25	0,2	0,15	0,1	0,05	0,025	0,01	0,005	0,001	0,0005
g.l.										
1	1,000	1,376	1,963	3,078	6,314	12,710	31,820	63,660	318,310	636,620
2	0,816	1,061	1,386	1,886	2,920	4,303	6,965	9,925	22,327	31,599
3	0,765	0,978	1,250	1,638	2,353	3,182	4,541	5,841	10,215	12,924
4	0,741	0,941	1,190	1,533	2,132	2,776	3,747	4,604	7,173	8,610
5	0,727	0,920	1,156	1,476	2,015	2,571	3,365	4,032	5,893	6,869
6	0,718	0,906	1,134	1,440	1,943	2,447	3,143	3,707	5,208	5,959
7	0,711	0,896	1,119	1,415	1,895	2,365	2,998	3,499	4,785	5,408
8	0,706	0,889	1,108	1,397	1,860	2,306	2,896	3,355	4,501	5,041
9	0,703	0,883	1,100	1,383	1,833	2,262	2,821	3,250	4,297	4,781
10	0,700	0,879	1,093	1,372	1,812	2,228	2,764	3,169	4,144	4,587
11	0,697	0,876	1,088	1,363	1,796	2,201	2,718	3,106	4,025	4,437
12	0,695	0,873	1,083	1,356	1,782	2,179	2,681	3,055	3,930	4,318
13	0,694	0,870	1,079	1,350	1,771	2,160	2,650	3,012	3,852	4,221
14	0,692	0,868	1,076	1,345	1,761	2,145	2,624	2,977	3,787	4,140
15	0,691	0,866	1,074	1,341	1,753	2,131	2,602	2,947	3,733	4,073
16	0,690	0,865	1,071	1,337	1,746	2,120	2,583	2,921	3,686	4,015
17	0,689	0,863	1,069	1,333	1,740	2,110	2,567	2,898	3,646	3,965
18	0,688	0,862	1,067	1,330	1,734	2,101	2,552	2,878	3,610	3,922
19	0,688	0,861	1,066	1,328	1,729	2,093	2,539	2,861	3,579	3,883
20	0,687	0,860	1,064	1,325	1,725	2,086	2,528	2,845	3,552	3,850
21	0,686	0,859	1,063	1,323	1,721	2,080	2,518	2,831	3,527	3,819
22	0,686	0,858	1,061	1,321	1,717	2,074	2,508	2,819	3,505	3,792
23	0,685	0,858	1,060	1,319	1,714	2,069	2,500	2,807	3,485	3,768
24	0,685	0,857	1,059	1,318	1,711	2,064	2,492	2,797	3,467	3,745
25	0,684	0,856	1,058	1,316	1,708	2,060	2,485	2,787	3,450	3,725
26	0,684	0,856	1,058	1,315	1,706	2,056	2,479	2,779	3,435	3,707
27	0,684	0,855	1,057	1,314	1,703	2,052	2,473	2,771	3,421	3,690
28	0,683	0,855	1,056	1,313	1,701	2,048	2,467	2,763	3,408	3,674
29	0,683	0,854	1,055	1,311	1,699	2,045	2,462	2,756	3,396	3,659
30	0,683	0,854	1,055	1,310	1,697	2,042	2,457	2,750	3,385	3,646
40	0,681	0,851	1,050	1,303	1,684	2,021	2,423	2,704	3,307	3,551
60	0,679	0,848	1,045	1,296	1,671	2,000	2,390	2,660	3,232	3,460
80	0,678	0,846	1,043	1,292	1,664	1,990	2,374	2,639	3,195	3,416
100	0,677	0,845	1,042	1,290	1,660	1,984	2,364	2,626	3,174	3,390
1.000	0,675	0,842	1,037	1,282	1,646	1,962	2,330	2,581	3,098	3,300
infinito	0,674	0,842	1,036	1,282	1,645	1,960	2,326	2,576	3,090	3,291

# 7-1

Analizza e descrivi il seguente set di dati randomizzati:

A	B
1	4
2	5
4	1
2	6
1	5
2	4

utilizza il test di t  
riporta tutti i passaggi intermedi

15

media =	2	4,166667
SS=	6,00	14,83
VAR =	1,20	2,97
d.s. =	1,095445	1,722401
es =	0,447214	0,703167
d (A-B)=	2,166667	
$n_A + n_B =$	12	
$n_A * n_B =$	36	
$n_A + n_B - 2 =$	<b>10 = g.l.</b>	
	3,333333	
$ds^2_d =$	0,694444	
$ds_d =$	0,833333	
t calcolato =	2,6	2,6
$t_{0,05} =$	2,228	
$t_{0,01} =$	3,169	
P =	0,026491	
$MDS_{0,05} =$	1,856667	
$MDS_{0,01} =$	2,640833	

	A		B	
n	6		6	
media	2,00	a	4,17	b
d.s.	1,095		1,722	

nota: lettere diverse fra le medie indicano differenze significative per  $p < 0,05$

da tabella di: **t**

**(0,05)**

**(0,01)**

16



probabilità % di un valore più elevato di t trascurando il segno.										
due code	0,5	0,4	0,3	0,2	0,1	0,05	0,02	0,01	0,002	0,001
una coda	0,25	0,2	0,15	0,1	0,05	0,025	0,01	0,005	0,001	0,0005
<b>g.l.</b>										
1	1,000	1,376	1,963	3,078	6,314	12,710	31,820	63,660	318,310	636,620
2	0,816	1,061	1,386	1,886	2,920	4,303	6,965	9,925	22,327	31,599
3	0,765	0,978	1,250	1,638	2,353	3,182	4,541	5,841	10,215	12,924
4	0,741	0,941	1,190	1,533	2,132	2,776	3,747	4,604	7,173	8,610
5	0,727	0,920	1,156	1,476	2,015	2,571	3,365	4,032	5,893	6,869
6	0,718	0,906	1,134	1,440	1,943	2,447	3,143	3,707	5,208	5,959
7	0,711	0,896	1,119	1,415	1,895	2,365	2,998	3,499	4,785	5,408
8	0,706	0,889	1,108	1,397	1,860	2,306	2,896	3,355	4,501	5,041
9	0,703	0,883	1,100	1,383	1,833	2,262	2,821	3,250	4,297	4,781
10	0,700	0,879	1,093	1,372	1,812	2,228	2,764	3,169	4,144	4,587
11	0,697	0,876	1,088	1,363	1,796	2,201	2,718	3,106	4,025	4,437
12	0,695	0,873	1,083	1,356	1,782	2,179	2,681	3,055	3,930	4,318
13	0,694	0,870	1,079	1,350	1,771	2,160	2,650	3,012	3,852	4,221
14	0,692	0,868	1,076	1,345	1,761	2,145	2,624	2,977	3,787	4,140
15	0,691	0,866	1,074	1,341	1,753	2,131	2,602	2,947	3,733	4,073
16	0,690	0,865	1,071	1,337	1,746	2,120	2,583	2,921	3,686	4,015
17	0,689	0,863	1,069	1,333	1,740	2,110	2,567	2,898	3,646	3,965
18	0,688	0,862	1,067	1,330	1,734	2,101	2,552	2,878	3,610	3,922
19	0,688	0,861	1,066	1,328	1,729	2,093	2,539	2,861	3,579	3,883
20	0,687	0,860	1,064	1,325	1,725	2,086	2,528	2,845	3,552	3,850
21	0,686	0,859	1,063	1,323	1,721	2,080	2,518	2,831	3,527	3,819
22	0,686	0,858	1,061	1,321	1,717	2,074	2,508	2,819	3,505	3,792
23	0,685	0,858	1,060	1,319	1,714	2,069	2,500	2,807	3,485	3,768
24	0,685	0,857	1,059	1,318	1,711	2,064	2,492	2,797	3,467	3,745
25	0,684	0,856	1,058	1,316	1,708	2,060	2,485	2,787	3,450	3,725
26	0,684	0,856	1,058	1,315	1,706	2,056	2,479	2,779	3,435	3,707
27	0,684	0,855	1,057	1,314	1,703	2,052	2,473	2,771	3,421	3,690
28	0,683	0,855	1,056	1,313	1,701	2,048	2,467	2,763	3,408	3,674
29	0,683	0,854	1,055	1,311	1,699	2,045	2,462	2,756	3,396	3,659
30	0,683	0,854	1,055	1,310	1,697	2,042	2,457	2,750	3,385	3,646
40	0,681	0,851	1,050	1,303	1,684	2,021	2,423	2,704	3,307	3,551
60	0,679	0,848	1,045	1,296	1,671	2,000	2,390	2,660	3,232	3,460
80	0,678	0,846	1,043	1,292	1,664	1,990	2,374	2,639	3,195	3,416
100	0,677	0,845	1,042	1,290	1,660	1,984	2,364	2,626	3,174	3,390
1.000	0,675	0,842	1,037	1,282	1,646	1,962	2,330	2,581	3,098	3,300
infinito	0,674	0,842	1,036	1,282	1,645	1,960	2,326	2,576	3,090	3,291

**6-1**

**Calcola l'intervallo fiduciale della media dei seguenti dati**

lunghezza remiganti
12
12
19
22
12
22
10
10
19
14

**riporta tutti i passaggi intermedi**

lunghezza remigan	
	12
	12
	19
	22
	12
	22
	10
	10
	19
	14
<b>n</b>	<b>10</b>
<b>media</b>	<b>15,2</b>
<b>d.s.</b>	<b>4,80</b>
e.s. (sm)	1,517893277
t=	2,262
t*sm =	3,433474592
<b>limiti</b>	<b>18,6</b>
<b>fiduciali</b>	<b>11,8</b>

Limiti fiduciali della  
lunghezza delle remiganti  
per  $p < 0,05 = 11,8 < \mu > 18,6$

**ricordarsi sempre di  
arrotondare le medie al  
decimo dell'errore standard!**

19

**5-1**

Se accoppio un Labrador nero particolare (eterozigote) con uno biondo la probabilità di avere cuccioli neri e biondi è uguale, cioè =  $p=q=0,5$

**Se ottengo 8 cuccioli neri  
con che probabilità posso rigettare l'ipotesi**

**$p = q = 0,5?$**

**che probabilità avevo di  
avere 4 cuccioli biondi  
e 4 neri?**

**riporta tutti i passaggi intermedi**

Combinazione		$p^s * q^r$	$n!/(s!*r!)$	P
nero	biondo	$0,5^8 * 0,5^0$	$8!/(8!*0!)$	
8	0	0,0039063	1	0,003906

**La probabilità di avere 8 cuccioli neri è del 4 per mille. Posso quindi ipotizzare che p e q non fossero pari a 0,5.**

Combinazione		$p^s * q^r$	$n!/(s!*r!)$	P
nero	biondo	$0,5^4 * 0,5^4$	$8!/(4!*4!)$	
4	4	0,0039063	70	0,273438

**La probabilità di avere 4 cuccioli neri e 4 cuccioli biondi è del 27,34%.**