

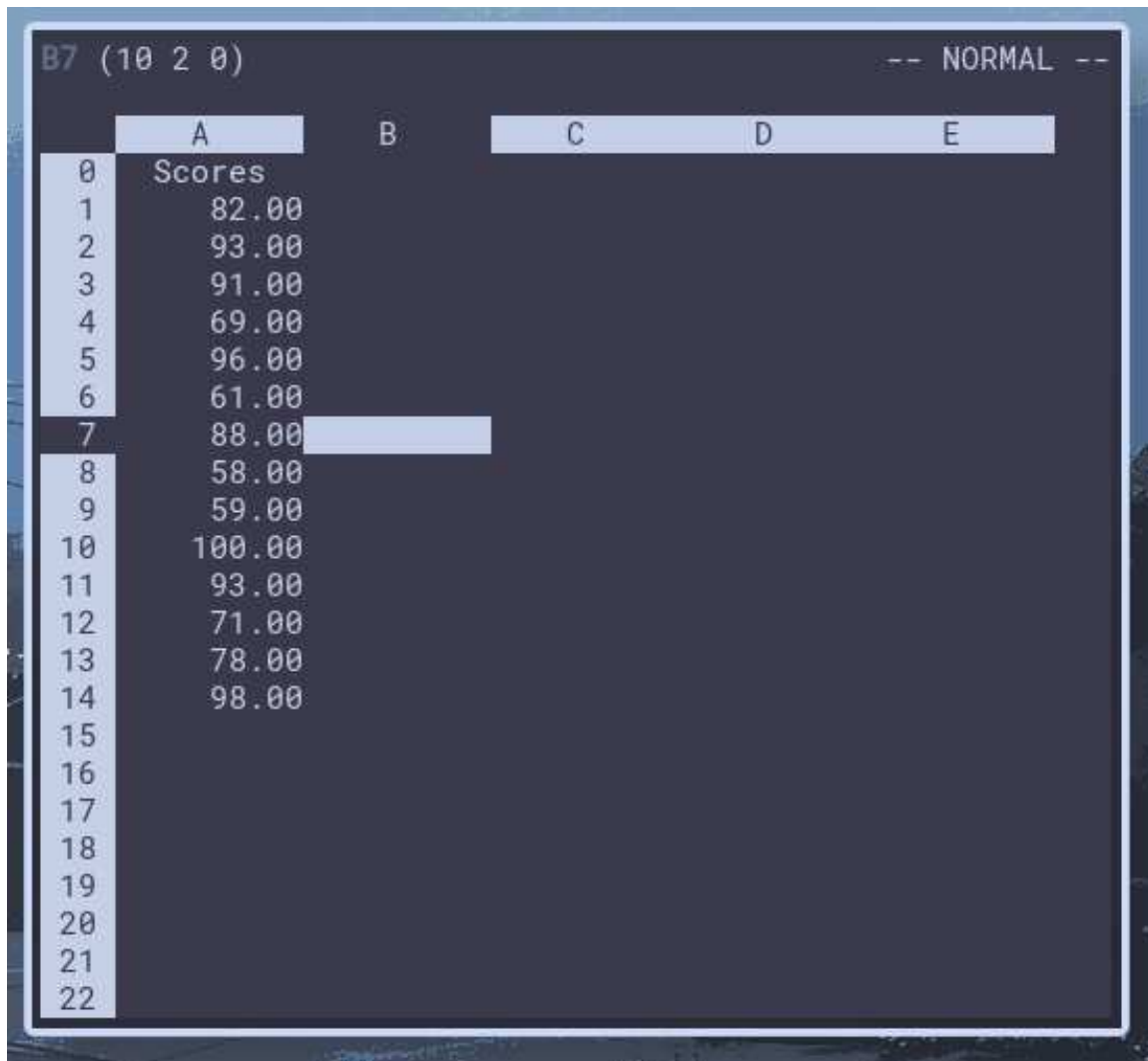
Angeles City Science High School
Research 10

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Section: 10-Hawking

Descriptive analysis

Data spreadsheet:



The image shows a screenshot of a spreadsheet application. The title bar at the top indicates the active window is 'B7 (10 2 0)' and the current view is '-- NORMAL --'. The spreadsheet has a grid with columns labeled A through E and rows numbered 0 through 22. Column A is titled 'Scores' and contains a list of numerical values. Column B is currently selected, highlighted in light blue. The data in column A is as follows:

	A	B	C	D	E
0	Scores				
1	82.00				
2	93.00				
3	91.00				
4	69.00				
5	96.00				
6	61.00				
7	88.00				
8	58.00				
9	59.00				
10	100.00				
11	93.00				
12	71.00				
13	78.00				
14	98.00				
15					
16					
17					
18					
19					
20					
21					
22					

Code:

```
7 # Descriptive Statistics
8
9 # This library is required for kurtosis and skewness function.
10 library(moments)
11 scores <- c(82, 93, 91, 69, 96, 61, 88, 58, 59, 100, 93, 71, 78, 98)
12
13 mean(scores)
14 print(sd(scores)/sqrt(length((scores))))
15 median(scores)
16 scores[which.max(unique(scores))]
17 sd(scores)
18 var(scores)
19 kurtosis(scores)
20 skewness(scores)
21 range(scores)[2]-range(scores)[1]
22 min(scores)
23 max(scores)
24 sum(scores)
25 length(scores)
```

NORMAL descriptive.r

utf-8 < > r

42%

8:1

Result:

```
~/docs/school/res/Q3W7-stats ✓  
Rscript descriptive.r  
[1] 81.21429  
[1] 4.045318  
[1] 85  
[1] 100  
[1] 15.13619  
[1] 229.1044  
[1] 1.634671  
[1] -0.3576747  
[1] 42  
[1] 58  
[1] 100  
[1] 1137  
[1] 14  
~/docs/school/res/Q3W7-stats ✓
```

One-way ANOVA

Data spreadsheet:

	A	B	C	D	E
0	Economics	Medicine	History		
1	42.00	69.00	35.00		
2	53.00	54.00	40.00		
3	49.00	58.00	53.00		
4	53.00	64.00	42.00		
5	43.00	64.00	50.00		
6	44.00	55.00	39.00		
7	45.00	56.00	55.00		
8	52.00	0.00	39.00		
9	54.00	0.00	40.00		
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

Code:

```
9 # One-way ANOVA
8
7 # Importing data from spreadsheet
6 data <- read.csv("one-way.csv")
5
4 attach(data)
3
2 data Economics <- as.numeric(data Economics)
1 data Medicine <- as.numeric(data Medicine)
18 data History <- as.numeric(data History)
1
2 stack <- stack(data)
3
4 # Cleans up and remove 0 in the stack
5 stack <- stack[ -c(17:18), ]
6
7 # Perform anova on the stacked dataframe
8 results <- aov(values ~ ind, stack)
9 summary(results)
```

NORMAL one-way.r

utf-8 < ↕ < r

52%

10:1

Result:

```
~/docs/school/res/Q3W7-stats ✓  
Rscript one-way.r  
      Df Sum Sq Mean Sq F value    Pr(>F)      
ind      2   1086    542.9     15.2 7.16e-05 ***  
Residuals 22    786     35.7            
---  
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```


```
~/docs/school/res/Q3W7-stats ✓  
|
```

Two-way ANOVA


Data spreadsheet:

A0 (10 2 0) "Class"				-- NORMAL --	
0	A	B	C	D	E
	Class	Group	Age		
1	A	6.00	4-8		
2	A	5.00	4-8		
3	A	5.00	4-8		
4	A	2.00	4-8		
5	A	4.00	4-8		
6	A	4.00	8-13		
7	A	5.00	8-13		
8	A	6.00	8-13		
9	A	9.00	8-13		
10	A	8.00	8-13		
11	A	7.00	13-17		
12	A	6.00	13-17		
13	A	10.00	13-17		
14	A	8.00	13-17		
15	A	9.00	13-17		
16	B	1.00	4-8		
17	B	3.00	4-8		
18	B	2.00	4-8		
19	B	1.00	4-8		
20	B	2.00	4-8		
21	B	4.00	8-13		
22	B	5.00	8-13		
23	B	6.00	8-13		
24	B	7.00	8-13		
25	B	3.00	8-13		
26	B	6.00	13-17		
27	B	8.00	13-17		
28	B	4.00	13-17		
29	B	7.00	13-17		
30	B	5.00	13-17		
31					
32					

Code:

```
7 #Statistical tool: two-way anova
6
5 data <- read.csv("two-way.csv")
4
3 # Renaming columns
2 attach(data)
1
8  Convert two columns to factors in two-way anova
1 # Class and Age as the factors to the group
2 data Class <- as.factor(data Class)
3 data Age <- as.factor(data Age)
4
5 # Perform two way anova with Class and age
6 # as factors
7 anova(aov(Group~Class*Age, data = data))
```

NORMAL two-way.r

utf-8 < Δ <  r

53%

8:1

Result:

```
~/docs/school/res/Q3W7-stats ✓
Rscript two-way.r
Analysis of Variance Table

Response: Group
      Df Sum Sq Mean Sq F value    Pr(>F)
Class   1  30.000   30.000  12.1622  0.001901 **
Age     2  78.867   39.433  15.9865 3.862e-05 ***
Class:Age 2   1.800    0.900   0.3649  0.698076
Residuals 24  59.200    2.467

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

~/docs/school/res/Q3W7-stats ✓
```

Fill in the blanks: The F is larger than the F-crit, thus, the null hypothesis is rejected. This implies that music and age have a significance on the results of the students.