IB PSYCHOLOGY
(IA Criterion E: Descriptive Statistics)

CALCULATING DESCRIPTIVE STATISTICS WITH MINITAB

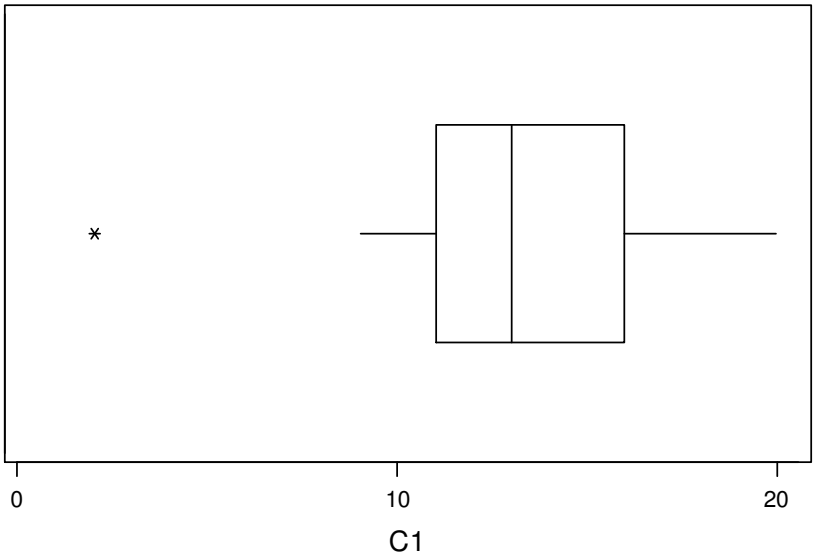
OPEN MINITAB SOFTWARE

start → Programs → Minitab Student 12

TYPE DATA INTO LIST(S); NAME THE LIST(S)

USING A MODIFIED BOX PLOT, CHECK FOR OUTLIERS; REMOVE FROM LIST(S)?

Graph → Boxplot → Options (Transpose X and Y)



CALCULATE DESCRIPTIVE STATISTICS:

a) Stat → Basic Statistics → Display Descriptive Statistics

b) Copy and Paste Results:

Descriptive Statistics

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Test Scores	20	23.650	23.000	23.556	2.907	0.650

Variable	Minimum	Maximum	Q1	Q3
Test Scores	20.000	29.000	21.000	26.000

GRAPHING DESCRIPTIVE STATISTICS:

USING MINITAB SOFTWARE:

a) Graph → Choose Graph (Histogram, Dotplot, Stem-and-Leaf Plot)

b) Copy and paste

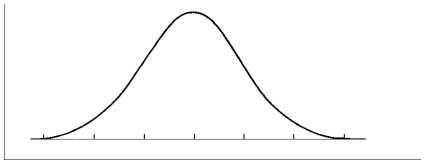
USING EXCEL:

a) Type Data Into A Column →Go to Insert → Chart → Choose Chart Type (Bar Graph, Pie Chart etc) → Save "As New Sheet"

b) Modify scales as needed

c) Copy and paste graph(s); reformat size as needed

CHECKING IF YOUR DATA IS NORMALLY DISTRIBUTED:



MEANS

a) Open Excel → Type Data into List(s)

b) Determine the Skewness Value and Kurtosis Value:

Insert → Function (SKEW or KURT)

c) Calculate the Standard Error (SE) of skewness and kurtosis:

SE of skewness = $\sqrt{\frac{6}{n}}$ where n = your sample size

SE of kurtosis = $\sqrt{\frac{24}{n}}$ where n= your sample size

d) Calculate a normal interval for each:

Interval = (-2SE, 2SE)

If both your skewness/kurtosis values fall within this interval, then it is reasonable to assume that your data for means is normally distributed

PROPORTIONS

a) Determine if $n(p_0)>10$ and $n(1 - p_0)>10$

b) Verify that $N > 10n$

If both conditions are met, then it is reasonable to assume that your data for proportions is normally distributed

APPENDIX

DEFINITIONS

Skewness is a measure of asymmetry. Zero indicates a perfect symmetry; the normal distribution has a skewness of zero. Positive skewness indicates that the "tail" of the distribution is more stretched on the side above the mean. Negative skewness indicates that the tail of the distribution is more stretched on the side below the mean.

Kurtosis characterizes the relative peakedness of flatness of a distribution compared with the normal distribution; the normal distribution has a kurtosis of zero. Positive kurtosis indicates a relatively peaked distribution. Negative kurtosis indicates a relatively flat distribution.

FORMULAS USED BY EXCEL:

$$\text{Skewness} = \frac{n}{(n-1)(n-2)} \sum\left(\frac{x_i - xbar}{s}\right)^3$$

$$\text{Kurtosis} = \left(\frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum\left(\frac{x_i - xbar}{s}\right)^4\right) - \frac{3(n-1)^2}{(n-2)(n-3)}$$

OTHER FORMULAS USED:

$$\text{Skewness} = \frac{\sum (x_i - xbar)^3}{(n-1)s^3}$$

$$\text{Kurtosis} = \frac{\sum (x_i - xbar)^4}{(n-1)s^4} - 3$$

REFERENCES

Jones, Michael N. Assistant Professor at Indiana University, Bloomington.

NIST/SEMATECH e-Handbook of Statistical Methods, http://www.itl.nist.gov/div898/handbook

Pysdek, Thomas (2000). *The Six Sigma Handbook*. McGraw Hill Companies.

Yates, Daniel S., Moore, David S. and Starnes, Daren S. (2003). *The Practice of Statistics*. New York: W. H. Freeman and Company.