

### Constructing a timeplot using software or by hand.

Problem: (From Moore’s Basic Practice of Statistics, 4<sup>th</sup> edition, page 23) Here are data on the average tuition and fees charged by public four-year colleges and universities for the 1976 to 2005 academic years. Because almost any variable measured in dollars increases over time due to inflation (the falling buying power of a dollar), the values are given in “constant dollars,” adjusted to have the same buying power that a dollar had in 2005.

Year	Tuition	Year	Tuition	Year	Tuition	Year	Tuition
1976	\$2,059	1984	\$2,274	1992	\$3,208	2000	\$3,925
1977	\$2,049	1985	\$2,373	1993	\$3,396	2001	\$4,140
1978	\$1,968	1986	\$2,490	1994	\$3,523	2002	\$4,408
1979	\$1,862	1987	\$2,511	1995	\$3,564	2003	\$4,890
1980	\$1,818	1988	\$2,551	1996	\$3,668	2004	\$5,239
1981	\$1,892	1989	\$2,617	1997	\$3,768	2005	\$5,491
1982	\$2,058	1990	\$2,791	1998	\$3,869		
1983	\$2,210	1991	\$2,987	1999	\$3,894		

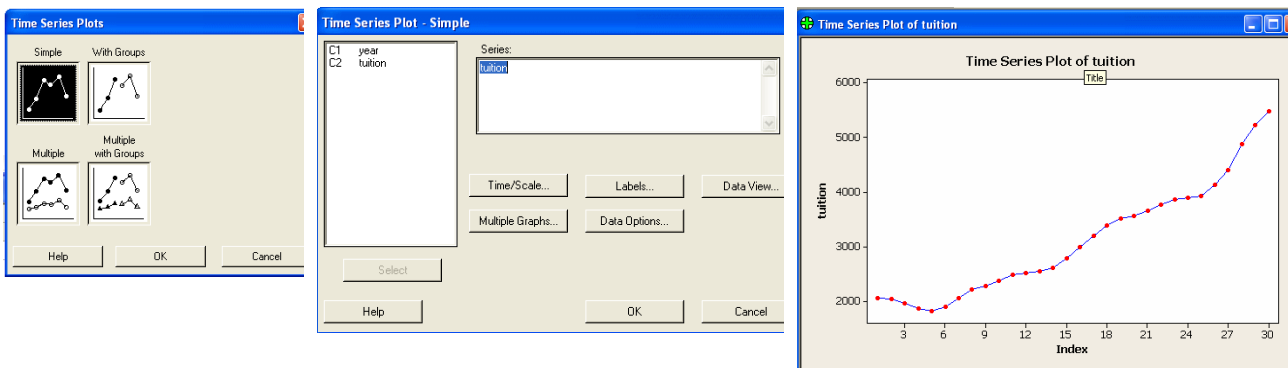
- (a) Make a time plot of average tuition and fees.
- (b) What overall pattern does your plot show?
- (c) Some possible deviations from the overall pattern are outliers, periods of decreasing charges (in 2005 dollars), and periods of particularly rapid increase. Which are present in your plot, and during which years?

**Solution:**

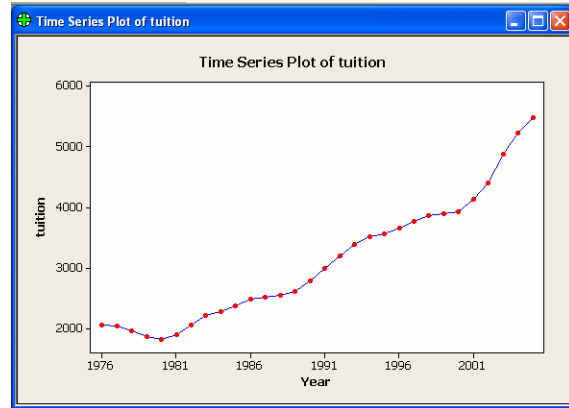
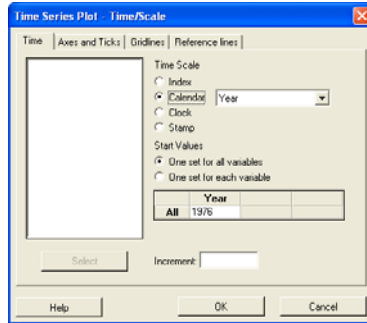
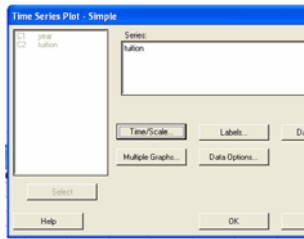
Find the data file for this example on the Data page for our course at <http://www.austincc.edu/mparker/software/data/>. This file is in the folder called “Data for Math 1342 - Introduction and Orientation” and the name of the file is tuition.dat

Notice that a timeplot has the values of the variable up the vertical axis, which is different from any other graph we have studied in this chapter. Time is on the horizontal axis. Usually we make timeplots using software.

MINITAB: Graph > Time Series Plot. You only have to select the variable you want to make the timeplot of. Since the point of a timeplots is to see whether there is a trend over time, by convention, we sometimes use timeplots which don’t have the horizontal axis fully labeled with the year (or month, etc.) but just label it by an “index number” which is 1 for the first year shown, 2 for the second year shown, etc.



Here is one way to label the times in MINITAB 14. Choose the Time/Scale button after you enter the variable to be graphed, and then select what time increment in one box and where to start the labeling in the lower box.



Crunch-It: As of the time of this writing, Crunch-It doesn't specifically have a timeplot option. You can make a timeplot by choosing a scatterplot, and choosing the time as the x-variable and then variable you want to make a timeplot of as the y-variable. Then choose "lines" instead of "points" to connect the points.

STATS **PARTIAL** **DAVID S. MOORE** The Basic Practice of Statistics FIFTH EDITION

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**CrunchIt! 2.0**  
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10	1985	2373
11	1986	2490
12	1987	2511
13	1988	2551
14	1989	2617
15	1990	2791
16	1991	2987
17	1992	3208
18	1993	3396
19	1994	3523
20	1995	3564
21	1996	3668
22	1997	3768
23	1998	3869
24	1999	3894
25	2000	3925
26	2001	4140
27	2002	4408
28	2003	4890

Solution to the exercise.

- See the time plots shown above.
- There is a generally upward trend in tuition over time.
- There are no outliers. Between 1976 and 1980, average tuition declined slightly. Between 2001 and 2005, tuition increased more rapidly than it had been increasing before.