AE Additional Exercises

1. Suppose you were the administrator of a public school system. What kinds of variables would you measure and how would you collect the measurements on the following subjects:
   - **a.** Student learning
   - **b.** School discipline
   - **c.** Teacher preparation
   - **d.** Absenteeism (pupil and teacher)
   - **e.** Cafeteria food quality
2. The head of the Veterans Administration has been receiving complaints from a Vietnam Veterans organization concerning disability checks. The organization claims that checks are continually late. The checks are to arrive no later than the tenth of each month.
   - **a.** What variables would you measure to explore this problem?
   - **b.** How would you collect measurements on these variables?
3. A family member has unexpectedly bequeathed you a sizable sum of money.
   - **a.** What criteria might you wish to evaluate in deciding how to invest the money?
   - **b.** What data might be useful in your considerations?
4. Flying Eagle Airlines advertises that it surpasses all other airlines in flights that arrive on time. A competitor states that it has a better on-time record than any other airline. Can they both be correct? Explain.
5. Two local grocery stores both claim to have the lowest prices in town. Develop a measurement that you believe could be used as a criterion to determine which store actually has the lowest prices.
6. At the end of 2001, the United States had 32.9 million people living in poverty according to the Census Bureau (www.census.gov). This was an increase of 1.3 million from the previous year. Poverty was defined by the Census Bureau as having a cash income less than $14,255 a year. The Census Bureau does not include in their income measurement any part of $167 billion spent on Medicaid, a federal program by which medical care is provided to the poor. The Census Bureau only includes $34.9 billion out of the $205 billion spent annually on public welfare. Forty percent of those classified as impoverished own their own homes. How do you think poverty should be defined?
7. The quality movement has compelled American businesses to address the problem of measuring customer satisfaction. How would you measure customer satisfaction if you owned a car dealership?
8. Identify the following variables as discrete or continuous.
   - **a.** Average test score on a test ranging from 0 to 100
   - **b.** Number of boot errors on a computer
   - **c.** Investment ratios for earnings per share
   - **d.** Energy usage in a production process

9. Determine the level of measurement for each of the following variables.

a. Golf score in relation to par

b. SAT score

c. Rating from 1 to 5 of quality of service in a restaurant

d. Make and model of a vehicle

e. The number of students with a business major

10. According to a Danish researcher, if you drop your average daily activity level by taking elevators instead of stairs, by parking your car in the closest space, or by never walking to run errands, you increase your risk of diabetes, heart disease, and premature death. The researcher studied two groups of healthy men (eight in the first group with an average age of 27 and an average body mass index (BMI) of 22.9, which is well within the normal range; and ten in the second group with an average age of 23.8 years and a BMI of 22.1). In addition to age and BMI, researchers also collected information such as number of steps per day (each group of men was fitted with pedometers), height, weight, and race. With the first group of men, the researchers asked that they reduce their daily activity (steps) by taking cars on short trips and elevators instead of stairs. The insulin levels were also measured for each group and the researchers found that with the reduced activity, insulin levels rose by nearly 60 percent after two weeks of inactivity, thus increasing the risk of diabetes and heart disease. However, the good news is that by increasing activity over a two-week period of time, one can begin to reduce his or her risk of diabetes and heart disease.

Source: U.S. News and World Report

a. List the different variables measured in this study.

b. Which variables are quantitative and which are qualitative?

c. Of the variables that are quantitative, are they discrete or continuous?

d. Give the levels of measurement for these variables.

e. Why is some method of data summary necessary here?

11. Consider the world production of crude oil given in millions of barrels per day.

World Production of Crude Oil

Year	Total World Production (Millions of Barrels per Day)	Year	Total World Production (Millions of Barrels per Day)
1980	63.987	1995	70.274
1981	60.602	1996	71.919
1982	58.098	1997	74.160
1983	57.934	1998	75.656
1984	59.568	1999	74.853
1985	59.172	2000	77.768
1986	61.407	2001	77.686
1987	62.086	2002	76.994
1988	64.380	2003	79.598
1989	65.508	2004	83.105
1990	66.426	2005	84.595
1991	66.399	2006	84.661
1992	66.564	2007	84.543
1993	67.091	2008	85.507
1994	68.590	2009	84.389

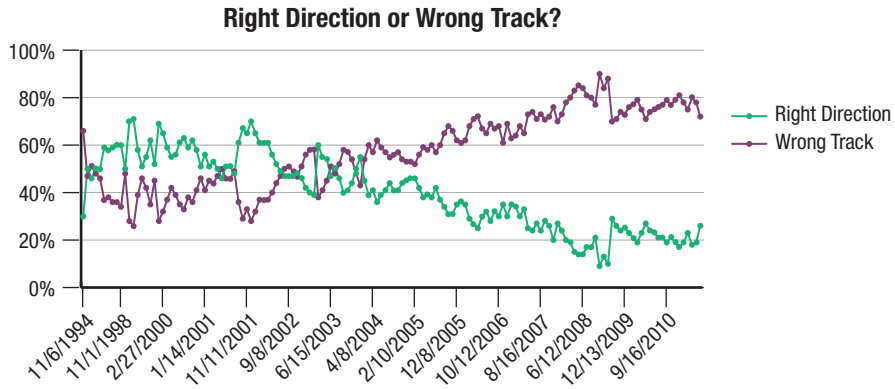
Source: Energy Information Administration

a. What is the level of measurement of the data?

b. Are the data time series or cross-sectional? If the data are time series, plot the data. Does the series appear to be stationary or nonstationary? Explain your answer.

12. Consider the graph of the number of respondents (in percentages) who think things in the U.S. are now on the wrong track versus those that think the economy is going in the right direction. The data were collected using a survey asking the question, *In general, are you satisfied or dissatisfied with the way things are going in the United States at this time?*

Source: Gallup Poll



a. Are the opinions on the outlook of the economy presented in time series or cross-sectional data? Justify your answer.

b. If the data are time series data, does the series appear to be stationary or nonstationary? Explain your answer.

13. Can you think of a process that would yield measurements that did not have any variability? Would studying such a process be very interesting?

14. One of the measurements that population experts use in predicting trends in population growth is the fertility rate. The total fertility rate is sometimes defined as the number of likely births one woman will have in her lifetime. The accompanying table gives the fertility rate from 1934 to 2005. If the data are time series data, plot the data in a line chart. Make observations based on the graph as to whether the series is stationary or nonstationary. If the time series is nonstationary, identify any noticeable trends.

Fertility Rates

Year	Fertility Rate	Year	Fertility Rate	Year	Fertility Rate
1934	2.294	1958	3.693	1982	1.829
1935	2.250	1959	3.705	1983	1.803
1936	2.207	1960	3.654	1984	1.806
1937	2.236	1961	3.629	1985	1.843
1938	2.288	1962	3.474	1986	1.836
1939	2.238	1963	3.333	1987	1.871
1940	2.301	1964	3.208	1988	1.933
1941	2.399	1965	2.928	1989	1.977
1942	2.628	1966	2.736	1990	2.081
1943	2.718	1967	2.573	1991	2.073
1944	2.568	1968	2.477	1992	2.065
1945	2.491	1969	2.465	1993	2.046
1946	2.943	1970	2.480	1994	2.036
1947	3.274	1971	2.267	1995	2.019
1948	3.109	1972	2.010	1996	2.040
1949	3.110	1973	1.879	1997	2.000
1950	3.091	1974	1.835	1998	2.030
1951	3.267	1975	1.774	1999	2.070
1952	3.355	1976	1.738	2000	2.056
1953	3.418	1977	1.790	2001	2.034
1954	3.537	1978	1.760	2002	2.013
1955	3.574	1979	1.808	2003	2.043
1956	3.682	1980	1.840	2004	2.046
1957	3.760	1981	1.815	2005	2.054

Source: U.S. National Center for Health Statistics

15. One of the problems associated with the management of solid waste is the NIMBY (not in my backyard) syndrome. In separate surveys taken in 1988, 1989, and 1990 the National Solid Waste Management Association asked, *Would you object to a new landfill in your community?* The percentage response is given in the table below.

Survey Results

Survey Date	Don't Object	Object	Not Sure
March 1990	36	59	5
February 1989	23	65	12
February 1988	30	62	8

a. What is the level of measurement of the survey data?

b. Are the data time series or cross-sectional?

c. What other information would be useful in evaluating the results of the study?

16. In a recent study of four leading anesthetics, three hundred patients were randomly selected and assigned to be given one of the four products during a surgery. One of the products performed significantly better than the rest. Is this an observational study or a controlled experiment?