The following data is from the pennies you weighed earlier in the semester. The data in the table gives the weight in grams and the date for 70 pennies. You can find this data on the class Minitab Worksheet **'Pennies–Fall2002.'**

Year	2002	2001	1982	1991	1999	2000	1993	1986	1988	2001
Weight	2.51	2.5	3.11	2.49	2.49	2.51	2.5	2.51	2.49	2.48
Year	1990	1977	1997	2001	1997	1968	1965	1994	1986	1984
Weight	2.48	3.08	2.47	2.49	2.48	3.09	3.08	2.55	2.54	2.59
Year	1978	2001	1975	1999	2001	1986	1998	2001	1982	1994
Weight	3.07	2.5	3.06	2.5	2.52	2.56	2.48	2.52	3.07	2.5
Year	2001	1977	1964	1974	1975	1969	1978	2002	1994	1989
Weight	2.49	3.06	3.07	3.11	3.1	3.14	3.09	2.49	2.51	2.52
Year	1971	1961	1993	2000	2001	2001	1996	1993	1990	2001
Weight	3.12	3.14	2.48	2.5	2.49	2.49	2.49	2.49	2.5	2.49
Year	1983	1972	2002	1971	2002	2002	1975	1979	1989	2002
Weight	2.53	3.11	2.51	3.06	2.5	2.52	3.04	3.05	2.52	2.48
Year	1991	2002	1996	2002	1982	1996	1995	2002	1997	2002
Weight	2.49	2.49	2.49	2.48	3.1	2.46	2.5	2.46	2.51	2.51

1. Draw a stem & leaf plot of the weights, using the hundredths digit as the leaf and a stem interval of length 0.05 (5 hundredths). Note: you can do this on Minitab and copy it to this sheet, but make sure you specify the interval increment correctly.
2. Based on your stem and leaf plot describe the most important feature observe about your dataset**.**
3. Draw a **bar type** time-series plot (not a line type) of the frequency of the pennies in our sample. List each year individually not groups of years.
4. Carefully draw a **sideways** box-plot of the weights of pennies. Label your axis.
5. Using year as your independent variable, use Minitab to draw a plot of weight versus year. Attach your plot to this sheet.
6. Recall that the stem-and-leaf diagram found previously for this data showed an important feature. From your Minitab plot you should now be able to observe the cause of this feature. In the space below, give an explanation of the cause.

Stem-and-Leaf Display: Weight

Stem-and-leaf of Weight N = 70
Leaf Unit = 0.010

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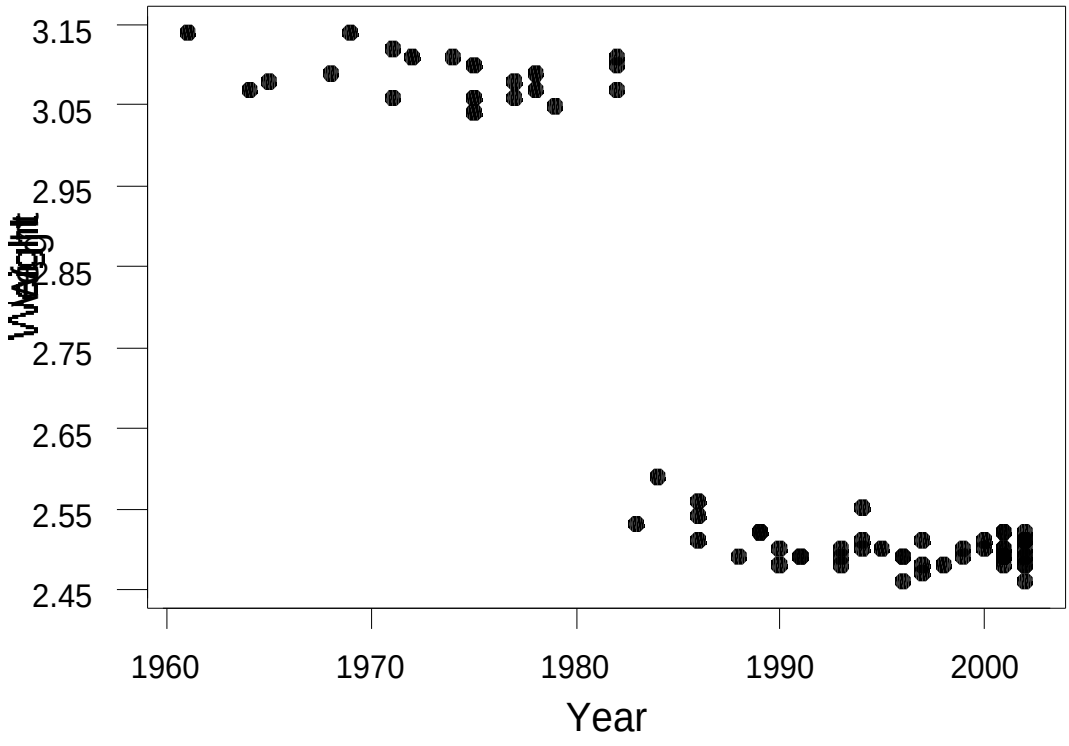
  24   24 667888888899999999999999
 (23)  25 00000000011111112222234
  23   25 569
  20   26
  20   26
  20   27
  20   27
  20   28
  20   28
  20   29
  20   29
  20   30 4
  19   30 56667778899
```



In February 2000, The New York Times published data on Nokia sales. For the years 1991 through 1997, the sales in billions of dollars are shown in the table below.

Sales	3.8	3.6	4.0	6.2	8.2	8.2	9.7
Year	91	92	93	94	95	96	97

I. Answer the following questions.

1. What is the correlation coefficient between Sales and Year?

2. What is the equation **(use three significant figures in rounding your coefficients)** of the linear regression line for the sales, using year as the predictor? **Use the data in the form listed. (If you round off this equation incorrectly or if you get the explanatory and response variables wrong, many of your answers may be judged incorrect.)**

3. Interpret the slope of your regression equation in the context of this problem.

4. What Variable did you use for your explanatory variable?

5. Did you understand the meaning of three significant digits? (If not, ask for help!)

6. What is the value of R^2 for the above regression equation?

7. What percent of the variation is explained by the above regression equation?

8. Based on the **rounded-off** regression equation, what were Nokia's sales **in billions of dollars** for 1995?

9. Based on the **rounded-off** regression equation, what were Nokia's sales **in billions of dollars** for 1980?

10. Based on the **rounded-off** regression equation, what will Nokia's sales be **in billions of dollars** for 2000? **(Note: what value should you use for the year 2000 to make sure that it numerically follows 99?)**

11. The actual Nokia sales for 2000 were 27.0 billions of dollars. Find the difference between this actual value and your predicted value above.

12. Based on the difference in the actual and predicted Nokia sales found above, explain what this tells you about the use of a linear model here.

13. Based on the **rounded-off** regression equation, in what year did Nokia sales first reach 1 billion dollars?

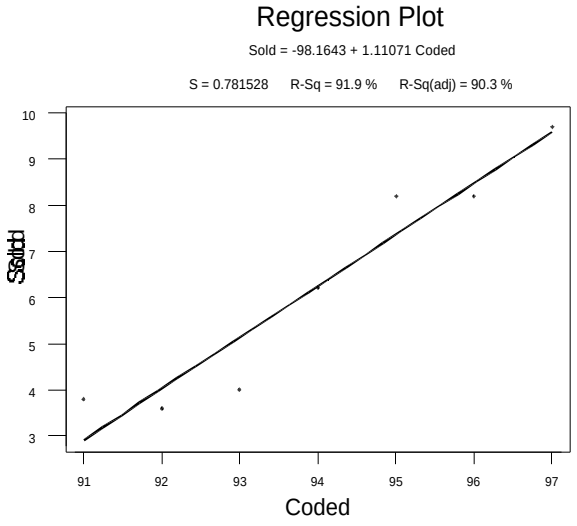
14. What is the mean sales in billions of dollars for the years listed? **Round to three significant figures.**

15. Based on the **rounded**-off regression equation, **rounded-off mean**, calculate the year in which Nokia sales first reached the mean sales.

16. What is the median sales in billions of dollars for the years listed? **Round to three significant figures.**

17. Based on the **rounded**-off regression equation, **rounded-off median**, calculate the year in which Nokia sales first reached the median sales.

18. From a **statistical point of view**, explain why the predicted Nokia sales you calculated for 1980 could be misleading. **Print your answer neatly below.**



II. According to The New York Times Nokia sales for the years 1998 through 2001 were respectively in billions of dollars 15.4, 20.0, 27.0 and 28.0. Add these sales to your data set and on the grid below draw a scatter plot of this revised data set. **(Note: using the convention given, 98 for 1998, 99 for 1999, etc., what values should you use for the years 2000 and 2001 to ensure that the numbers used are greater in sequence than 98 & 99?)**

1. Based on your scatter plot and the expected behavior of these two variables, tell what type of regression equation, linear, quadratic, cubic, or exponential, should be used to best fit this data?
2. **Note: if Model is Incorrect your remaining answers will be judged incorrect.**
3. Use Minitab, or your Calculator to find the regression equation of your curve. **Round all of your coefficients to three significant figures.**
4. What is the value of R^2 for the above regression equation? **(Note: if you rounded off incorrectly, your remaining answers may be judged incorrect.)**
5. Based on the **rounded-off** regression equation, what are the expected Nokia sales in billions of dollars for 2000?
6. Find the difference between this actual Nokia sales for 2000 and your predicted value above.
7. Based on the **rounded-off** regression equation, in what year did Nokia sales first reach 25 billion dollars?