

Name \_\_\_\_\_

## Regression exercise

Day in January, 1987	Ithaca, NY $T_{\min}$	Canandaigua, NY $T_{\min}$
1	19	28
2	25	28
3	22	26
4	-1	19
5	4	16
6	14	24
7	21	26
8	22	24
9	23	24
10	27	29
11	29	29
12	25	27
13	29	31
14	15	26
15	29	38
16	24	23
17	0	13
18	2	14
19	26	28
20	17	19
21	19	19
22	9	17
23	20	22
24	-6	2
25	-13	4
26	-13	5
27	-11	7
28	-4	8
29	-4	14
30	11	14
31	23	23

- 1) From the above table, make a scatterplot of Ithaca's  $T_{\min}$  along the x axis and Canandaigua's  $T_{\min}$  along the y axis. Label both axes. (10 pts)
- 2) From the plot, does a linear relationship exist between both locations'  $T_{\min}$ ? Yes or no \_\_\_\_\_ (5 pts)
- 3) In a spreadsheet, compute  $\sum x$ ,  $\sum y$ ,  $\sum x^2$ ,  $\sum y^2$ , and  $\sum xy$ . (20 pts)
- 4) In a spreadsheet, for the equation  $y=mx+b$ , compute  $m$  and  $b$ . (10 pts)
- 5) In a spreadsheet, what is the correlation  $r$ ? (5 pts)
- 6) In a spreadsheet, what is the variance explained  $r^2$ ? (5 pts)
- 7) Given  $T_{\min}=4^{\circ}\text{F}$  in Ithaca, what is  $T_{\min}$  in Canandaigua using the regression equation? \_\_\_\_\_ (5 pts)

Show the calculation below.

- 8) Suppose a model consistently underpredicts the maximum temperature, and this bias is enhanced for a south wind. A multiple regression equation such as  $y = m_1x_1 + m_2x_2 + b$  can adjust for these biases, where  $x_1$  is the model temperature,  $x_2$  is a modified wind direction variable where  $x_2 = \text{abs}(\text{direction} - 180^\circ)$ , and  $y$  is the observed temperature. Using <http://xuru.org/rt/MLR.asp>, compute  $m_1$ ,  $m_2$ , and  $b$  from the table below. (10 pts)

Model $T_{\max}$ ( $x_1$ )	Modified wind direction ( $x_2$ )	Observed $T_{\max}$ ( $y$ )	Model wind direction
70	90	70.5	270
65	0	66.5	180
60	30	61	150
55	80	55.5	260
45	20	46.3	200
33	90	33.5	90

$$m_1 =$$

$$m_2 =$$

$$b =$$

- 9) If the model predicts a maximum temperature of 63.2°F at this location and a wind direction of 165°, adjust the temperature using the derived multiple regression equation. Show the calculations below. (10 pts).