Labor Cost Problem

You are to estimate the cost of installing 400,000 bricks that requires complex but repetitive craftsmanship. For the work you expect that your workers' improvement is 10% in productivity from the first segment of brick to the second, for segments of 1,000 bricks.

The average output for a crew of 3 bricklayers and 2 laborers is 180 bricks per hour, based on a building requiring 100,000 bricks.

Use production and cost per crew throughout.
Bricklayer base pay = $31.00, other fringes = $10.00; laborer base pay = $25.00, other fringes = $8.00; workers compensation insurance = 12%, social security = 8%, unemployment compensation = 4%.

Problem 1 – Unit Learning Curve Model:

1) Calculate the labor cost and duration to lay the required bricks with 1, 2, 3, 4, or 5 crews. With an indirect cost of $1,200/day, how many crews yield the least total cost (labor and indirect)?

2) Plot the labor cost and total cost (vertical axis) versus the duration in days for the different alternatives.

Problem 2 – Scheduled Overtime:

1) You are being pressured to work overtime. What are the duration and labor cost plus indirect costs if you schedule 5 crews @ 5 days per week, 10 hours per day? Overtime cost is 100% premium on base pay only. Social security and unemployment will include premium pay, workers compensation will not. Do not consider the learning curve (i.e., crew productivity = 200 bricks per hour).
   a) Use Business Roundtable Report
   b) Use Means Guide overtime data

2) What are the duration and cost if you schedule 5 crews @ 5 days per week, 12 hours per day? Hrs/week?
   a) Use Business Roundtable Report
   b) Use Means Guide overtime data

3) What are the duration and cost of 2-2a and 2-2b if the unit learning curve is considered? Hint : Use hours required obtained from problem 1.1(for 5 crews)

Problem 3 – Learning Curve – Curve Fitting:

1) Using the values of n and T_n in the table, and a two point curve fit for the unit learning curve, calculate s, L_D, $K = t_1$, t_{1000}, and T_{1000}, and plot curves of t_n and T_n for n = 1 to 100.
2) Using the values of n and t_n in the table, and a linear regression curve fit for the unit learning curve, calculate s, L_D, $K = t_1$, t_{1000}, and T_{1000}, and plot curves of t_n and T_n for n = 1 to 100.

N	t_n (hr)	T_n (hr)
2	8.19	17.2
3	7.52	24.7
5	7.68	39.6
9	6.84	66.3
10	6.43	72.7
17	5.93	115.8
19	5.67	127.7
23	5.50	150.0
34	4.91	209.3
36	5.35	219.8
40	5.22	240.9
42	5.26	251.4
45	5.21	267.1
52	5.29	301.9
57	5.06	326.6
67	4.69	374.8
71	4.48	394.1
75	4.48	412.3
83	4.52	448.7
87	4.47	465.9
91	4.29	484.3
96	4.74	507.1
98	4.84	516.4