1. (Special note: Below there are five questions for you to answer. Naturally there are many mathematical formulas and equations in the problem statements. However, due to some technical issues on Coursera, from time to time for some learners, some formulas and equations cannot be displayed correctly (while some others can). As there is no way for the instructing team to solve this issue, we post all the problem statements in a PDF file here. If unfortunately some formulas and equations are not readable for you, please use the PDF file to prepare your answers and then come back to Coursera to choose/fill in your answers.) 1 / 1 point

You may produce seven products by consuming three materials. The unit sales price and material consumption of each product are listed in Table 1. For each day, the supply of these three materials are limited. The supply limits are listed in Table 2. For each day, you need to determine the production quantity for each product.

Product	**Price**	**Material 1**	**Material 2**	**Material 3**
1	100	0	3	10
2	120	5	10	10
3	135	5	3	9
4	90	4	6	3
5	125	8	2	8
6	110	5	2	10
7	105	3	2	7

Table 1: Product information for Problem 1

Material	**Supply limit**
1	100
2	150
3	200

Table 2: Material information for Problem 1

Formulate a linear integer program that generates a feasible production plan to maximize the total profit (which is also the total revenue, as there is no cost in this problem). Then write a computer program (e.g., using MS Excel solver) to solve this instance and obtain an optimal plan. Do not set the production quantities to be integer; leave them fractional. After you find an optimal solution and its objective value, write down the integer part of the objective value as your solution (i.e., rounding down that value to the closest integer).

3404

Correct

2. Consider a set of data (x_i, y_i), $i = 1, ..., n$, provided in Table 3. If we believe that x_i and y_i has a linear relationship, we may apply *simple linear regression* to fit these data to a linear model. More precisely, we try to find α and β such that the straight line $y = \alpha + \beta x$ minimizes the sum of squared errors for all the data points: 1 / 1 point

$$\min_{\alpha,\beta} \sum_{i=1}^{n} [y_i - (\alpha + \beta x_i)]^2 .$$

x	**y**
38	137
56	201
50	152
52	107
37	150
60	173
67	194
54	166
59	154
43	137
30	38
53	193
59	154
40	175
65	247

Table 3: Data for Problem 2

While almost all statistical software and packages provide tools for one to solve the above linear regression problem, we may also consider it as a nonlinear program and solve it with an optimization solver (e.g., MS Excel solver). For the data provided in the following table, solve the linear regression problem. Write down the optimal β you find by rounding it to the first digit after the decimal point (e.g., 9.011, 1.229, and 3.245 should be rounded to 9.01, 1.23, and 3.25 to be written down).

2.98

Correct