

Answer the following questions:**Question 1:**Use the revised simplex method to solve the following problem:

15 Max $Z = 2x_1 + x_2$

$$x_1 = 0.29 \quad x_2 = 1.29 \quad Z = 1.86$$

Subject to: $3x_1 + 4x_2 \leq 6$; $6x_1 + x_2 \leq 3$; $x_1, x_2 \geq 0$

Question 2:Use the dual simplex method to solve the following problem:

15 Min $Z = 12x_1 + 5x_2$

$$x_1 = 0 \quad x_2 = 16 \quad Z = 200$$

Subject to: $4x_1 + 2x_2 \geq 80$; $2x_1 + 3x_2 \geq 90$; $x_1, x_2 \geq 0$

Question 3:Try to apply the decomposition technique to solve the following LP problem:

15 Min $Z = 2x_1 - 5x_2 + x_3 - x_4$

$$x_1 = 0 \quad x_2 = 1.5 \quad x_3 = 0 \quad x_4 = 8$$

$$Z = -15.5$$

Subject to: $x_1 + 3x_2 - x_3 - 2x_4 \leq 10$; $x_1 + 2x_2 \leq 3$; $x_1 - x_2 \leq 1$;
 $x_3 - 3x_4 \leq 7$; $2x_3 + x_4 \leq 8$; $x_1, x_2, x_3, x_4 \geq 0$

Question 4:

A student is planning the coming semester. In particular, he is attempting to allocate the weekly number of hours of study to the individual courses he is taking. Each hour of study will increase his mark by a certain quantity (starting at zero).

The following table shows the marginal improvements of the marks given each hour of study (per week) as well as the marks required for passing the course.

	Marketing	Organizational Behavior	Accounting	Operations Research	Finance
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Marginal improvement of mark	5	4.5	5.5	3.5	5.5
Marks required for passing the course	50	55	60	50	50

For example, if our student were to allocate 15 hours (per week) to marketing, then his final mark is expected to be $15(5) = 75$, which means passing the course.

The student's objective is to minimize the total number of hours studied. In addition, the following constraints have been identified:

- A passing grade should be achieved in *each course*.
- Obtain an average grade of at least 64.
- Suppose that the student has the option to flip hamburgers at McDonalds in his spare time. This job pays \$10 per hour. Assuming that the student has a total of 80 hours available for study and flipping, formulate that our student makes at least \$100 per week.
- The number of hours allocated to operations research should be at least 20 percent of the number of hours allocated to the other four subjects combined. Formulate the problem as LP

Question 5:

Given the following LP problem: $\text{Max } Z = 5x_1 + 12x_2 + 4x_3$ Subject to:
 $1x_1 + 2x_2 + x_3 \leq 5$; $2x_1 - x_2 + 3x_3 = 2$; $x_1, x_2, x_3 \geq 0$

With the final optimal table:

Basic	x_0	x_1	x_2	x_3	S_1	R_1	Solution
x_0	1	0	0	$3/5$	$29/5$	$-2/5 + M$	$28\frac{1}{5}$
x_2	0	0	1	$-1/5$	$2/5$	$-1/5$	$8/5$
x_1	0	1	0	$7/5$	$1/5$	$2/5$	$9/5$

How would the current optimal solution be affected if the right-hand side of the constraints is changed from $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$ to $\begin{pmatrix} 7 \\ 2 \end{pmatrix}$ and to $\begin{pmatrix} 3 \\ 10 \end{pmatrix}$

Best Wishes