1ST EXERCISE WAS
SIMPLEX DUAL TYPE.
HAD A LINEAR MODEL
AND YOU WERE ASKED TO WRITE
ITS DUAL AND SOLVE WITH
SIMPLEX DUAL OR SIMPLEX PRIMAL

2. Let us consider the following linear model and the optimal tableau of the relaxed problem (RP)

$\max\ z = x_1 + 2x_2 - x_3$

<u>st</u>

$x_1 + x_2 + 5x_3 \leq 5$

$5x_1 + 3x_2 + x_3 \leq 7$

$x_1, x_2, x_3 \geq 0$, integer

PE	7/3	0	5/3	0	2/3	14/3
a_4	-2/3	0	14/3	1	-1/3	8/3
a_2	5/3	1	1/3	0	1/3	7/3

Using branch & bound algorithm, the first branching has produced Problems P_2 and P_3 whose tableux are the following

	x_1	x_2	x_3	x_4	x_5	x_6	
P_2	0	0	6/5	0	1/5	7/5	21/3
a_4	0	0	24/5	1	-1/5	-2/5	14/5
a_2	0	1	0	0	0	1	2
a_1	1	0	1/5	0	1/5	-3/5	1/5

	x_1	x_2	x_3	x_4	x_5	x_6	
P_3	7/3	0	5/3	0	2/3	0	14/3
a_4	-2/3	0	14/3	1	-1/3	0	8/3
a_2	5/3	1	1/3	0	1/3	0	7/3
a_6	5/3	0	1/3	0	1/3	1	-2/3

2.1. Write the optimal solution of the relaxed problem. Then write the linear models that correspond to problems P_2 and P_3, respectively, and write their optimal solution

2.2 - Represent with the usual tree structure the search that has been done until this point, and identify the upper and lower bounds in each case. Continue applying Branch & bound until optimal solution. Justify the final solution

3-

The Metro water district is a consulting company of environmental projects which is responsible for the management of the transportation of water in a large geographical area. The area is relatively dry so the water must be transported from other areas (R_1, R_2, R_3) and then the company distributes it on its own throughout the area. There are four customer areas (C_1, C_2, C_3, C_4). Water can be transferred from any river to any area except river R_3 which does not communicate with area C_4. Due to the geographical specifity, local transportation costs depend to a large extent on the location of rivers and cities. The transportation cost per thousand cubic meters is given in the following table.

	C_1	C_2	C_3	C_4	Supply
R_1	16	13	22	17	50
R_2	14	13	19	15	60
R_3	19	20	23	-	50
Demand	30	70	40	10	

3.1 - Use Vogel's approximation method for calculating a feasible solution.

3.2 - Considering the solution $x_{12} = 50$, $x_{21} = 40$, $x_{22} = 20$, $x_{31} = 10$, $x_{33} = 40$, $x_{43} = 0$, and $x_{44} = 10$. Check if it is optimal, if not, apply an appropriate algorithm to search for optimal solution.