The U-Drive Rent-A-Truck company plans to spend $7 million on 200 new vehicles. Each commercial van will cost $35,000, each small truck $30,000, and each large truck $50,000. Past experience shows that they need twice as many vans as small trucks. How many of each vehicle can they buy?

Start by defining the variables:

V: number of commercial vans to buy

S: number of small trucks to buy

L: number of large trucks to buy

Now let's look at the key information and the corresponding equation:

buy 200 new vehicles $\rightarrow$ $V + S + L = 200$

spend 7 million $\rightarrow$ $35000V + 30000S + 50000L = 7000000$

need twice as many vans as small trucks $\rightarrow$ $V = 2S$

So the system we need to solve is

$$V + S + L = 200$$
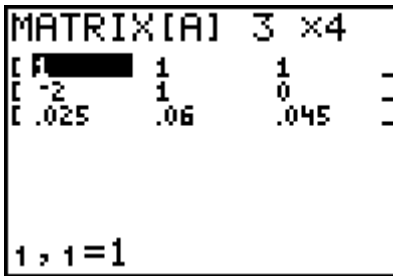$$35000V + 30000S + 50000L = 7000000$$
$$V = 2S$$
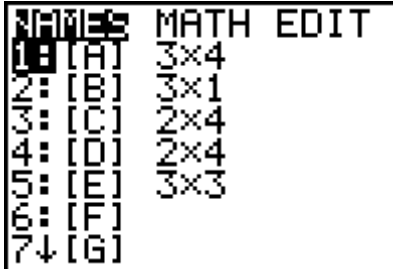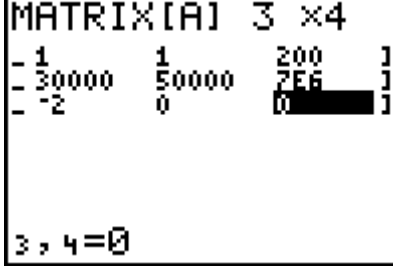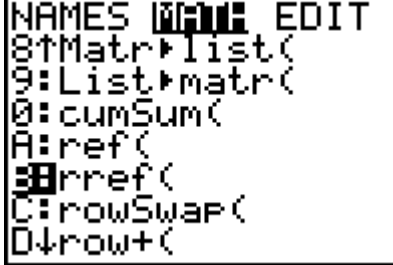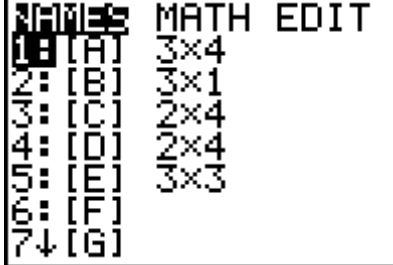
Rewriting in the proper form, we get

$$V + S + L = 200$$
$$35000V + 30000S + 50000L = 7000000$$
$$V - 2S = 0$$

The augmented matrix for this system is

$$\begin{bmatrix} 1 & 1 & 1 & 200 \\ 35000 & 30000 & 50000 & 7000000 \\ 1 & -2 & 0 & 0 \end{bmatrix}$$

To put this in row echelon form, follow the steps below.

1. Start by pressing 2nd x⁻¹ to open the matrix menu. From this menu you can access the NAMES of different matrices, do MATH with matrices and EDIT matrices. 2. Use ▶ to move to EDIT.	NAMES MATH EDIT 1:[A] 3×4 2:[B] 3×1 3:[C] 2×4 4:[D] 2×4 5:[E] 3×3 6:[F] 7↓[G]
3. Press 1 or highlight 1: [A] and press ENTER. 4. Change the matrix to being a 3 by 4 matrix. To do this, simply type that size in place of the existing size. 5. Use your cursor control buttons to move to the different entries in the matrix. Change them to the augmented matrix we found earlier.	MATRIX[A] 3 ×4 [1 1 1 _ [-2 1 0 _ [.025 .06 .045 _ 1,1=1
6. You can press ENTER to move you through the matrix or use the cursor control. Once you have entered the matrix, press 2nd MODE to quit the matrix editor and to return to the home screen. You may need to press CLEAR to clean up the home screen.	MATRIX[A] 3 ×4 1 1 200] 30000 50000 2E6] -2 0 0] 3,4=0
7. Press 2nd x⁻¹ to access the MATRIX menu. 8. Use ▶ to go to MATH. 9. Use ▼ to select B: rref(. Press ENTER. This puts rref(on the home screen.	NAMES MATH EDIT 8↑Matr▶list(9:List▶matr(0:cumSum(A:ref(B:rref(C:rowSwap(D↓row+(
10. To enter the name of the matrix you wish to use in the parentheses, press 2nd x⁻¹ to access the MATRIX menu. 11. Press 1 or highlight 1:[A] and press ENTER. This will paste the name of the matrix, [A], into the rref (command on the home screen. If you enter the name of the matrix any other way, you will get an ERR: DATA TYPE message.	NAMES MATH EDIT 1:[A] 3×4 2:[B] 3×1 3:[C] 2×4 4:[D] 2×4 5:[E] 3×3 6:[F] 7↓[G]

12. Press ENTER to calculate the reduced row echelon form of the augmented matrix. This means V is equal to 120, S is equal to 60 and L is equal to 20 since the first column corresponds to V, the second column corresponds to S and the third column corresponds to L. So 120 vans, 60 small trucks and 30 large trucks are needed.

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rref([A])
   [[1 0 0 120]
    [0 1 0 60 ]
    [0 0 1 20 ]]
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