Marie McCoy has committed to the local PTA to make some items for a bake sale on Saturday. She has decided to make some combination of chocolate cakes, loaves of white bread, custard pies, and sugar cookies. Thursday evening she went to the store and purchased 20 pounds of flour, 10 pounds of sugar, and 3 dozen eggs, which are the three main ingredients in all the baked goods she is thinking about making. The following table shows how much of each of the main ingredients is required for each baked good:



There are 18.5 cups in a 5 pound bag of flour and 12 cups in a 5 pound bag of sugar. Marie plans to get up and start baking on Friday morning after her kids leave for school and finish before they return after soccer practice (8 hours). She knows that the PTA will sell a chocolate cake for $12, a loaf of bread for $8, a custard pie for $10, and a batch of cookies for $6. Marie wants to decide how many of each type of baked good she should make in order for the PTA to make the most money possible.

a. Formulate a ***linear programming*** model for this problem.

b. Are any of the ingredients left over?

c. If Marie could get more of any ingredient, which should it be? Why?

d. If Marie could get 6 more eggs, 20 more cups of flour, or 30 more minutes of oven time, which should she choose? Why?

e. The solution values for this problem should logically be integers. If the solution values are not integers, discuss how Marie should decide how many of each item to bake. How do total sales for this integer solution compare with those in the original, non-integer solution?