Case 5 –Candy Balls

Case material for VBA Programming in Business Economics by Sanne Wøhlk

Please use the Excel file corresponding to this case.

A company is producing a special type of vitamin-injected candy balls. The balls are produced in four colors: red, green, blue, and yellow.

In the production facility the balls are dumped into a large box. The number of balls in a box is given in cell B1 of the file. The existing sub *Generate* generates a box with the specified number of balls and writes information about the balls to sheet 2. For each ball the color and the weight is stated.

The box is automatically transported to the packing facility. In the packing facility, the company is currently exploring two possible ways of packing the balls: An *automatic packing robot* that packs the balls in real time and *manual* packing performed by a team of employees.

The balls should preferably be packed in small bags with 7 (given in B6) balls in each. There must be at least one ball of each of the four colors in each small bag. The total weight of the balls in a small bag must be at least 100 (given in B7). The profit of each small bag is 10 DKK. (given in B5) if the bags are packed by the automatic packing robot. If the balls are packed manually, the salary of the packing team must be subtracted from the profit of 10 per bag. It is estimated that the salary share per small bag is 2 DKK.

The balls that cannot be packed in small bags are packed in large bags and exported. A large bag must contain exactly 20 (given in B12) balls. There are no restriction on the weight and the colors of balls in large bags. The profit of a large bag is 15 DKK (given in B11). The profit of large bags can be assumed to be independent of packing method.

The automatic packing robot.

The automatic packing is performed as follows. The robot has 3 (given in B2) small *bins* and a large *waste basket*. It randomly picks one ball at a time from the box. The order in which the balls are picked is given by the list of the generated balls. After having picked up the ball, the color and weight can be determined. The robot must either place the ball in one of the small bins or in the waste basket. Once the ball is placed the decision cannot be changed. The robot uses the following rules to place the ball.

a) If there is a bin that does not contain a ball of the current color, the ball is placed in such a bin.
b) If all bins already contain a ball of the current color, the ball is placed in a bin that has already at least one ball of each of the four colors.
c) Finally, if neither of the above is possible, the ball is placed in the bin that contains the fewest balls.

As soon as a bin contains 7 (given in B6) balls, it must be emptied. If the balls in the bin fulfill all the requirements of a small bag, they are packed as such. Otherwise, the bin is emptied into the waste basked.

When the box is empty, the content of all bins are moved to the waste basket. The balls in the waste basket are then packed in as many large bags as possible. Subsequently, less than 20 balls will remain in the waste basket.

Manual packing.

The manual packing is performed with the goal of maximizing profit, though respecting the requirements of the bags. When packing manually the weight and color is known for every ball in the box. There are no restrictions on the strategy used (except that you must be able to simulate it through vba code) and many

bags may be packed simultaneously. The goal should be kept in mind. It is up to you which strategy the employee should use.

Please write one of several macros to do the following:

1. Given a box of balls, write one or several macros that pack them in small and large bags as done by the automatic packing robot. The amount of profit originating from small and large bags should be stated along with the total profit.

2. Given a box of balls, write one or several macros that simulated the manual packing. The strategy should be as close as possible to the way you would pack the balls manually. The amount of profit originating from small and large bags should be stated along with the total profit.

3. Write a macro that performs a comparison of the two methods based on the same box of balls. Create a chart that compares the total profit of the two methods along with the profit obtained for each type of bags.

4. Write one or several macros that can be used to compare the automatic and the manual packing. The method should consider packing based on several boxes. The program should give useful information to the user to help him/her choose the best method.