Problem 1:

The resulting solution is to make 1000 units of High Gloss and 400 units of semi gloss resulting in a profit of $40,000. We also ensure the marketing ratio is met, recipes are followed, and we are restrained to the given supply of ingredients.

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Problem 2:

Using the big M method and disjunctive constraints we make sure either the total number of toys created is less than 400 (when z is 0) or that Zappers make up at least 70% of the total (when z is 1). This mixed with the already given constraints results in 194.6 Space Rays and 454.1 Zappers for a profit of 3287.03

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Table

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Problem 3:

Using the minimal cost network flow model we can map out the best way to fill all orders for minimal cost. We have our supply node going to a raw material node for each period. From there we convert the raw materials into shippable product for the NEXT period because of the given production time. From our shippable inventory nodes we can either rollover inventory into the next period or deliver it. We use a negative cost value on the delivery arcs to represent our sales price and incentivize our model to sell products. Mu=0 values are used to handle excess supply and delivery nodes and Mu=.85 and .92 to represent production inefficiencies and product decay respectively.

Diagram

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The following array shows the amount of flow over each arc. (Next Page)

Table

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