**T-Shirt Trove**

Congratulations! While cleaning out your attic, you discovered a box of 100 vintage T-shirts of a formerly famous character/celebrity who is suddenly popular again. You’d like to sell these T-shirts in a flash online sale, but you’re not sure what price to set to make the most revenue. If you set the price too high, you will earn more per shirt, but may sell too few to make a good profit. On the other hand, if you set the price too low, you will sell more shirts, but may earn too little per shirt. Any leftover T-shirts will be of no worth after the flash sale, given the fickle nature of the vintage T-shirt market.

1)You call your friend who has experience selling vintage T-shirts in online flash sales. He provides you with the following table that shows the quantity of shirts he has sold under various prices:

|  |  |
| --- | --- |
| **Price** | **Quantity** |
| $20 | 80 |
| $40 | 60 |
| $60 | 40 |
| $80 | 20 |

Based on this information, answer the following questions:

* What is your objective in normal language?
* What is (are) your decision variable(s) in normal language?
* How do your decision variable(s) relate mathematically to your objective?
* If you had to pick one of the prices from the table, which one would maximize your objective?

2) Your friend refers you to a pricing specialist who has done significant research in the vintage T-shirt / online flash sale market. She tells you with certainty that the number of T-shirts you will sell is given by the following formula:

Quantity Sold = (100 – T-shirt Price).

Based on this new information, answer the following question:

* What price should you set to maximize your revenue?

3) Your pricing specialist has also done substantial research on how online advertising affects T-shirt sales, and offers to run a banner campaign for you. She tells you that if you choose to spend advertising dollars, the number of T-shirts you will sell is given by the following formula:

Quantity Sold = (100 – T-shirt Price + Square Root of Advertising Dollars)

Your pricing/advertising specialist also informs you that if you choose to advertise with her, you must set your shirt price to a minimum of $50 in order for her to maintain her image as **the** upscale pricing/advertising specialist for vintage T-shirt online flash sales. You also know that you can spend a maximum of $1000 dollars on advertising. Based on this new information, answer the following questions:

* What is your objective in normal language?
* What is (are) your decision variable(s) in normal language?
* What is (are) your constraints in normal language?
* How do your decision variable(s) relate mathematically to your objective?
* Which price should you set?
* How many dollars should you spend on advertising?