* First, We can obtain the descriptive statistics from the 500 samples.

|  |  |
| --- | --- |
| **From A1 - A500** | **Descriptive Statistics** |
| Count | 500 |
| Min | 19.81733333 |
| 1st Quartile | 20.25719444 |
| Median | 20.39888889 |
| Mean | 20.39875089 |
| 3rd Quartile | 20.55455556 |
| Max | 20.90888889 |
| Variance | 0.041546188 |
| Standard Deviation | 0.203828821 |

* Then we make a Hypothesis Test according to Mightynuts’s claim

|  |  |
| --- | --- |
| Ho:  | a: 20 |

Test statistic = 

n= sample size= 500

= sample mean=20.39875089

s = sample standard deviation=0.203828821

Test statistic =

(20.39875089 – 20) / (0.203828821/22.3606)=

0.39875089 / 0.00911=

43.7706794731

Set the alpha level =0.05

Based on the T-table(degree of freedom 499), we find that the p value = 1.65

P > 0.05, we fail to reject the null hypothesis

We are 95% confidence that the average net weight of Mightnuts bag is heavier or equal to 20grams.

* *Currently, MightyNut sells about 200,000 25-bags boxes of mix nuts every year.*
  + - Number of bags sold every year = 200,000\*25=5,000,000
* *Currently, MightyNut sells about 200,000 25-bags boxes of mix nuts every year, at the price of ￥87.5/box.*
  + - Revenue = 200000\*25\*￥87.5/box = ￥437,500,000
* *The profit margin is about 30%.*
  + - Profit=Revenue\*30% = 437,500,000\*30% = ￥131,250,000
* *To replace this machine, the company needs to pay ￥800,000.*
* *If the advertising net weight is 19.5g/bag, the selling price of each box would drop to ￥70.*
* *The association issue a new policy that company have to pay penalty fine of ￥50 every time if the package food weight is found to be lighter than the advertising claim.*

Based on the hypothesis test, we are 95% confidence that the net weight is heavier or equal to 20g/bag, there is still 5% chance that the net weight of MightyNuts is lighter than 20grams, we still need to calculate the cost if that 5% occurred.

|  |  |
| --- | --- |
| Option A | Option B |
| 1, Replace the packing machine  2, Keep the advertising net weight to 20g/bag | 1, Keep the packing machine  2, Drop the advertising net weight to 19.5g/bag |
| Cost: +￥800,000  Number of bags sold every year that are underweight = 5,000,000\*5% =250,000bags  Penalty fine paid in a year = 250,000bags \*￥50/bag = ￥12,500,000  Revenue = 200,000box\*￥87.5/box = ￥17,500,000  Cost = +￥800,000 + ￥12,500,000  =13,300,000 | Revenue = 200,000box\*￥70/box = ￥14,000,000 |
| Profit = Revenue – Cost=  ￥17,500,000 – ￥13,300,000=￥4,200,000 | Profit=Revenue-Cost = 14,000,000-0 = ￥14,000,000 |

Summary:

Based on the hypothesis test, we are 95% confident that the net weight of Mightynuts are > or = 20grams per bags. However, we can not even tolerate 5% of error as the penalty fine will be tremendous if we have large amount of sold bags. Therefore, option b is our best strategy.