Answer on Question #55537 – Math – Statistics and Probability

a. BranCrunch is a new breakfast cereal. Boxes of BranCrunch are labeled ‘ 675 grams’ but there is some variation. The actual mean weight is 675 grams with a standard deviation of 21 grams.

i. Dan’s Discount Store sells BranCrunch in mega-packs of 8 boxes. Assuming the weights of boxes of BranCrunch are normally distributed, find the probability that the average weight of a mega-pack of BranCrunch is higher than 665 grams.

Solution

$$P(\bar{X} > 665) = P\left(Z > \frac{665 - \mu}{\frac{\sigma}{\sqrt{n}}}\right) = P\left(Z > \frac{665 - 675}{\frac{21}{\sqrt{8}}}\right) = P(Z > -1.35) = 1 - P(Z < -1.35)$$

From z-table

$$P(Z < -1.35) = 0.0885.$$

Thus,

$$P(\bar{X} > 665) = 1 - 0.0885 = 0.9115$$

ii. Louie’s Convenience Store receives a shipment of 30 boxes of BranCrunch. Louie’s will complain to the manufacturers if the total weight of this shipment is lower than 20 kg. Find the probability that Louie’s Convenience Store will complain about the shipment and explain why the information about the weights of BranCrunch following a normal distribution is not necessary to answer this part of the question.

Solution

Sample size is $n = 30$.

$$P(X_1 + \cdots + X_{30} < 20000) = P\left(Z < \frac{\frac{20000}{n} - \mu}{\frac{\sigma}{\sqrt{n}}}\right) = P\left(Z < \frac{\frac{20000}{30} - 675}{\frac{21}{\sqrt{30}}}\right) = P(Z < -2.17)$$

From z-table

$$P(Z < -2.17) = 0.0150.$$

We don’t need a normality for this distribution because according to the Central Limit theorem we can use normal approximation to the distribution of average weight with sample size 30.