

MAT-205:00020

Name: Win (Thanawin Pattanaphol)

Student ID: 01324096

1. The reason behind why we can use normal approximation because N is very large, the binomial becomes similar to a normal curve.

Probability (p): $38 / 100000$

Mean (μ): 37.8

Standard Deviation (σ):

$$\sqrt{100000 \times p \times 1 - p}$$

Normal approximation for X : $X \sim N(38 \text{ (mean)}, 38 \text{ (STD)})$

Probabilities of the following event:

- (a) $P(20 < X \leq 40)$ – More than 20 cases and less or equal to 40 cases: **0.625475 or 63%**
- (b) $P(X > 60)$ – More than 60 cases: **0.000179 or 0.02%**
- (c) $P(X \leq 30)$ – Less than or equal to 30 cases: **0.097141 or 9.7%**
- (d) $P(X = 35)$ – Exactly 35 cases: **0.057498 or 5.7%**

2. Probabilities:

(a) Life Ladder > 5 – Calculated via normal distribution: **0.707072 or 70%**

(a) Life Ladder > 5 – Calculated via empirical probability: **0.702899 or 70%**

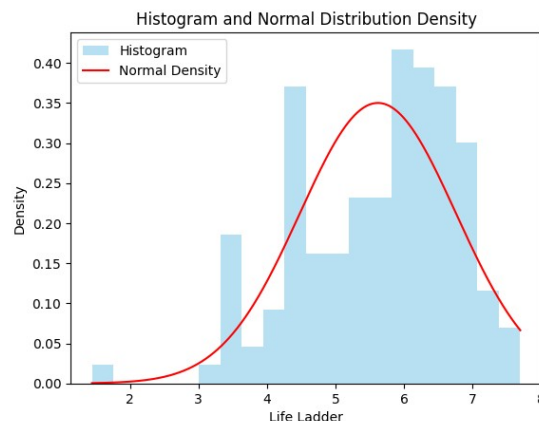
Observation: The normal approximation and the empirical probability values are very similar.

(b) $4 \leq$ Life Ladder ≤ 7 – Calculated via normal distribution: **0.809476 or 81%**

(b) $4 \leq$ Life Ladder ≤ 7 – Calculated via empirical probability: **0.833333 or 83%**

Observation: Both values calculated by both ways have similar values, however, has a bigger difference between the two values than the section (a).

c)



Observation: The normal approximation is not always perfectly smooth, which, is present in various real world datasets.

MAT-205:00020

Name: Win (Thanawin Pattanaphol)

Student ID: 01324096

3. Exponential Distribution

(a) Appropriate exponential distribution for both groups

- Group 1 (stain=1) - $\sigma: 127.08, \lambda: 0.01$

- Group 2 (stain=2) - $\sigma: 83.72, \lambda: 0.01$

(b) Probabilities:

- Group 1 survives more than 10 years: 0.3889 or 39%

- Group 2 survives more than 10 years: 0.2385 or 24%

(c) Probabilities:

- Group 1 dies within 3 years: 0.2467 or 25%

- Group 2 dies within 3 years: 0.3495 or 35%