

MAT-205:00010

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1. Female Population of Thailand: 36,772,621

Source: <https://statisticstimes.com/demographics/country/thailand-demographics.php>

We can calculate the number of women with breast cancer in Thailand using proportions.

Calculation: Number of women with breast cancer in Thailand using proportions.

$$\frac{38}{100000} = \frac{x}{36772621}$$

Which can then be re-arranged as:

$$x = 36772621 \times \frac{38}{100000}$$

Thus, the number of women with breast cancer in Thailand is approximately **13,974** people.

2. Hypergeometric Distribution

- (a) Between 21 and 40 cases ($P(20 < X \leq 40)$) is **0.66 or 66%**
- (b) More than 60 cases of breast cancer is **0.0004 or 0.04%**
- (c) Less than or equal to 30 cases of breast cancer is **0.11 or 11%**
- (d) Exactly 35 cases of breast cancer: **0.06 or 6%**

3. The reason why we can use binomial approximation to the hypergeometric distribution is due to the fact that there is a large population of items with a small proportion of successes and that the proportion of successes in the sample will be similar to the population.

Binomial Approximation

- (a) Between 21 and 40 cases ($P(20 < X \leq 40)$) is **0.66 or 66%**
- (b) More than 60 cases of breast cancer is **0.0004 or 0.04%**
- (c) Less than or equal to 30 cases of breast cancer is **0.11 or 11%**
- (d) Exactly 35 cases of breast cancer: **0.06 or 6%**

4. The reason for why we can use the Poisson approximation to the binomial distribution is because of a similar reason as the 3rd question as the probability of success is small and the number of trials is large, thus, the number of successes is rare and follows a Poisson-like distribution.

Poisson approximation

- (a) Between 21 and 40 cases ($P(20 < X \leq 40)$) is **0.66 or 66%**
- (b) More than 60 cases of breast cancer is **0.0004 or 0.04%**
- (c) Less than or equal to 30 cases of breast cancer is **0.11 or 11%**
- (d) Exactly 35 cases of breast cancer: **0.06 or 6%**

5. Definitions:

A: Blue team wins and kills the dragon

B: Blue team wins, kills the dragon and kills the herald

X: The first match of A observation

Y: The first match of B observation

Probabilities of X:

(a) Before 7th game: **0.795 or around 80%**

(b) On the 7th game: **0.048 or around 4.8%**

(c) After 7th game: **0.158 or around 16%**

Probabilities of Y:

(a) Before 7th game: **0.278 or 28%**

(b) On 7th game: **0.038 or 3.8%**

(c) After 7th game: **0.684 or 6.8%**