Applied Statistics MATH 661 Assignment #8

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1 Task 1 IPC Excercise 5.57

1.1 IPC 5.57 What is wrong in each case?

1.1.1 a) If you toss a fair coin four times and a head appears each time, then the next toss is more likely to be a tail than a head.

This is wrong because it assumes the previous outcomes somehow influence the following outcomes. In reality, these are independent trials and any number of sequential heads does not affect the probability of any particular subsequent outcome.

1.1.2 b) If you toss a fair coin four times and observe the following pattern HTHT, then the next toss ir more likely to be a head than a tail.

Again, these are independent trials and therefore any outcome does not affect following outcomes.

1.1.3 c) Pcaret is a parameter for the binomial distribution.

Pcaret is a porportion parameter. The binomial distribution pdf does not take proportions as input. The p in the binomial pdf is for probability of a success.

1.1.4 d) The binomial distribution can be used to model the number of pedestrian/cyclist near-crash events on campus.

The ***number*** of pedestrian/cyclist near crashes on a campus is modeled by a count distribution. For this example, a Poisson distribution should be used.

Task 2 IPC Excercise 5.58

1.2 IPC 5.58 Explain what is wrong in each scenario.

1.2.1 a) In the binomial setting X is a proportion.

In the binomial setting x is the number of successes in a predetermined number of Bernoulli trials.

1.2.2 b) The Variance for a Binomial count is $ $\sqrt{p(1-p)/n}$$

The variance for a Binomial distribution is $ np(1-p) $

1.2.3 c)The normal approximation to the Binomial Distribution is always accurate when n is greater thatn 1000.

There is no specific number that determines when it is appropriate to approximate Binomial distribution with Normal distribution. All parameters should be considered.

1.3 IPC 5.60 Should you use the Binomial Distribution?

1.3.1 a) X is the mean daily excercise time of the sample.

No, by definition, Binomial distribution handles a count of successes in a set of Bernoulli trials.

1.3.2 b) A manufacturer of shoes picks out 20 shoes to inspect. X is the number of pairs of shoes with a defect.

No, N=20, X=10. After each trial, the probability of a success or fialure does not remain constant. Therefore, the Binomial distribution does not apply.

1.3.3 c) A SRS asks college student whether they eat at least 5 servins of fruit per day.

No. There are different probabilities of success. The probbility that a student in this sample responds 'yes' is a random variable.

1.3.4 d) X is the number of days during the school year that you miss class.

No. I never miss class.

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2 Task 4

2.1 IPC 5.82 Poisson

[1]:
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def poisson(mu, x):
    from math import exp
    from math import factorial
    p = exp(-mu)*mu**(x)/factorial(x)
    return p
```

[2]:
```
# What is the probability that for lambda = 15, 4

p = poisson(15/25,4)
print(p)
```

```
0.002963582834907743
```

3 Task 5

3.1 IPC 6.52 What is wrong in each case?

3.1.1 a) A researcher tests the following null hypothesis: $ H_O: x} = 23 $

This is wrong because a null hypothesis never includes = sign

3.1.2 b) A random sample of size 30 is taken from a population that is assumed to have a standarad deviation of 5. The sample stndard deviation is 5/30.

The sample standard deviation is
$ s = $(\sigma) / (\sqrt{n})$$
that is
$ s = $(5)/(\sqrt{30})$$

3.1.3 c) A studey with $barx = 45$ reports statistical significance for $H_a : \mu > 50$.

This study is statistically significant for a sample mean other than the one reported.

3.1.4 d) A researcher tests $ H_0: $\mu = 350$andconcludesthatthepopulationmeanisequalto$350.

A null hypothesis does not include = sign by definition.

4 Task 6

4.1 IPC 6.57 Translating research quesitons into hypotheses

4.1.1 a) U.S Census bureau

$ H_o: bar{x} = 42,800, H_a: bar{x} > 42,800 $

4.1.2 b) Registration Technicians

$ H_o: x} = 0.4, H_a: x} \neq 0.4$

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