Ryuichi Ogiwara

Project1: Statistics

Q1

Independent variable: each condition (congruent, incongruent)

Dependent variable: the time from each condition

Q2

Tc: sample means of the time from congruent condition

Ti: sample means of the time from incongruent condition

Null hypothesis: $T_i - T_c = 0$

(This means there are no significant difference between the times)

Alternative hypothesis: $T_i - T_c \neq 0$

I will perform **dependent** t-test that would test whether there would be any difference between the times. I expect there would be a significant difference between them, so I set the hypothesis as above. The assumptions are as follows:
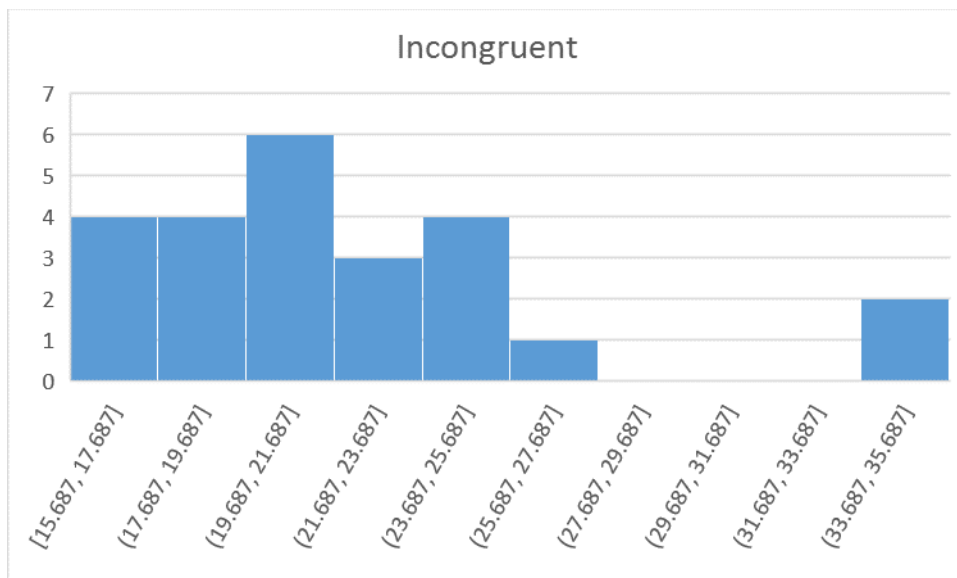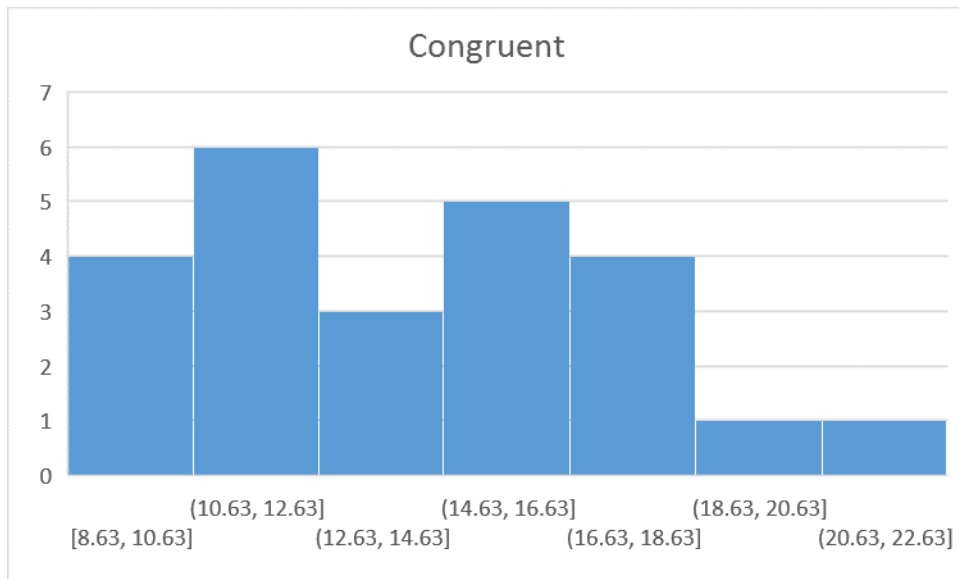
- any conditions except for congruency would be the same
- sample sizes are less than 30
- we don't know the population's standard deviation
- the distributions are Gaussian

Q3

Congruent: Average = 14.05, Sample Standard deviation = 3.56

Incongruent: Average = 22.02, Sample Standard deviation = 4.80

Q4

Congruent

Incongruent

These are histograms for both congruent and incongruent conditions. There are 2 outliers in incongruent conditions. Other than that, I would not say there is any specific pattern on the data. There are too small samples. However, I would expect that the data could follow normal distribution if more data is collected.

Q5

Mean difference = 7.96

Standard deviation of the difference = 4.86

Standard error = 4.86 / sqrt(24) = 0.99

t-statistics = 7.96 / 0.99 = 8.02

t-critical values for a two-tailed test at (α = 0.05) = ±2.069

(degrees of freedom = 23)

Therefore, I reject the null hypothesis, which matches my intuition.

Q6

I think people perceive the color of the character as well as the meaning of the character. So, the participants might be confused when the color did not match its meaning of the character. We might be able to get similar result by conducting the experiment that make participants calculate four arithmetic operations, which operations are different from usual ones. For example, '+' means "deduct", '-' means multiplication and so on.