1. What is our independent variable? What is our dependent variable?

Independent variable is the test condition (congruent and incongruent). Dependent variable is the time for these conditions.

2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

H0: $\mu_1 = \mu_2$

Ha: $\mu_1 \neq \mu_2$

- Null hypothesis is that the congruent condition and incongruent condition population mean times are not different, which will be computed based on the sample data. Alternative hypothesis is that the congruent condition and incongruent condition population mean times are different.
- I will perform two-tail dependent t-test (alpha=0.05) to answer if null hypothesis can be rejected.
- Dependent t-test will be used because the 'related groups' are present in both groups.
- Two-tail test is appropriate because I am testing whether the times are different for the two conditions and not just one direction test of if the difference is greater than or less than.
- T-test is appropriate because we do not know the population's mean and population's standard deviations. Also, there are than 30 sample points. Hence, we use t-test over the z-test.

3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

	Congruent	Incongruent	Diff
Mean	14.1	22.0	8.0
Std Dev	3.6	4.8	4.9
Min	8.6	15.7	2.0
1st quartile	11.9	18.7	3.6
Median	14.4	21.0	7.7
3rd quartile	16.2	24.1	10.3
Max	22.3	35.3	21.9
IQR	4.3	5.3	6.6

4. Provide one or two visualizations that show the distribution of the sample data. Write one or two sentences noting what you observe about the plot or plots.
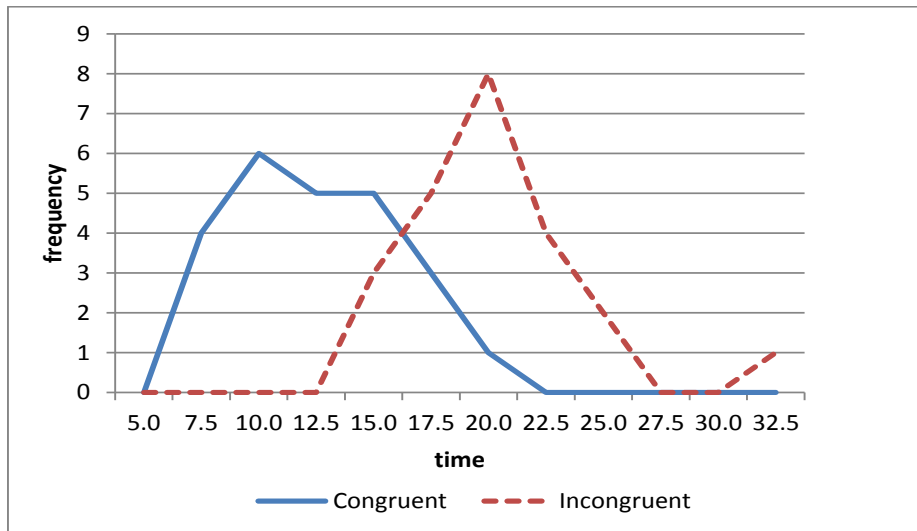
This chart shows the histogram for the time of the two conditions. I used the line chart instead of the regular bar-chart for histogram, because it made it easier to put them into same chart for a comparison. The distribution for the incongruent conditions appears to be on the higher times than that of the congruent condition.   The bulks of the times for congruent condition are in between 7.5 and 20.0 while the bulks for the incongruent condition are in between 17.5 and 25. The peak for congruent condition is in 19.0-12.5 bucket with 6, and incongruent condition is 20.0-22.5 bucket with 8.
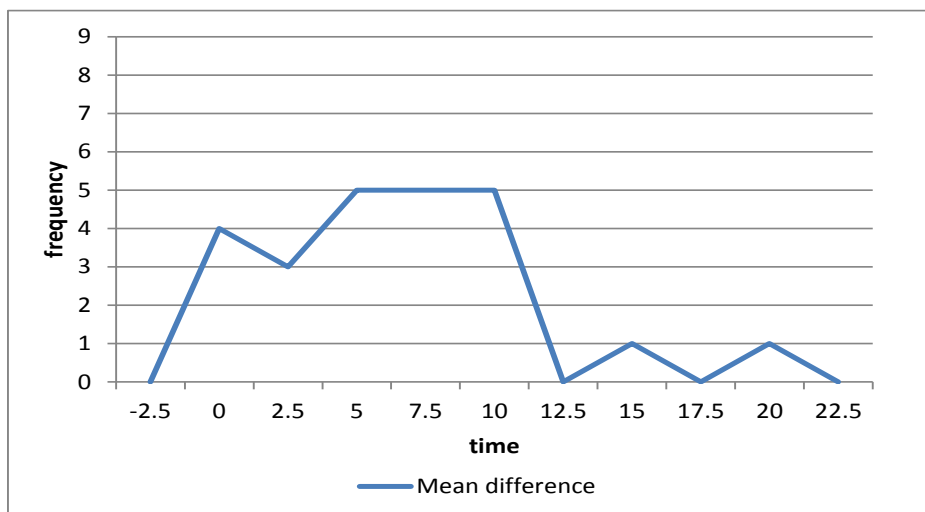
I also looked at the distribution of the mean difference of the two conditions (Incongruent minus congruent). It does have some normal distribution look to it. All the mean difference had positive values.

5. Now, perform the statistical test and report your results. What is your confidence level and your critical statistic value? Do you reject the null hypothesis or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?

mean of the diff	7.96		alpha	0.05
std dev of the diff	4.86		df	23
std error	0.99		t-crit	2.069
t-value	8.02			

- The difference of the mean is 7.96, and the 95% confidence interval is from 5.91 to 10.02.
- The t-value of 8.02 is greater than t-critical value of 2.069, so the mean differences are statistically significant and we reject the null hypothesis.
- This matched my expectations, which was based on the histogram chart above.