In [48]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
import math
```

In [49]:
```python
data = pd.read_csv("L2_data_group3.txt",delimiter="\t")
```

In [50]:
```python
data.describe()
```

Out[50]:

	Before	After
count	50.000000	50.000000
mean	198.082600	253.613200
std	26.693944	44.167379
min	132.040000	163.320000
25%	177.687500	227.572500
50%	196.485000	247.600000
75%	222.032500	267.550000
max	250.970000	443.140000

In [51]:
```python
data.head()
```

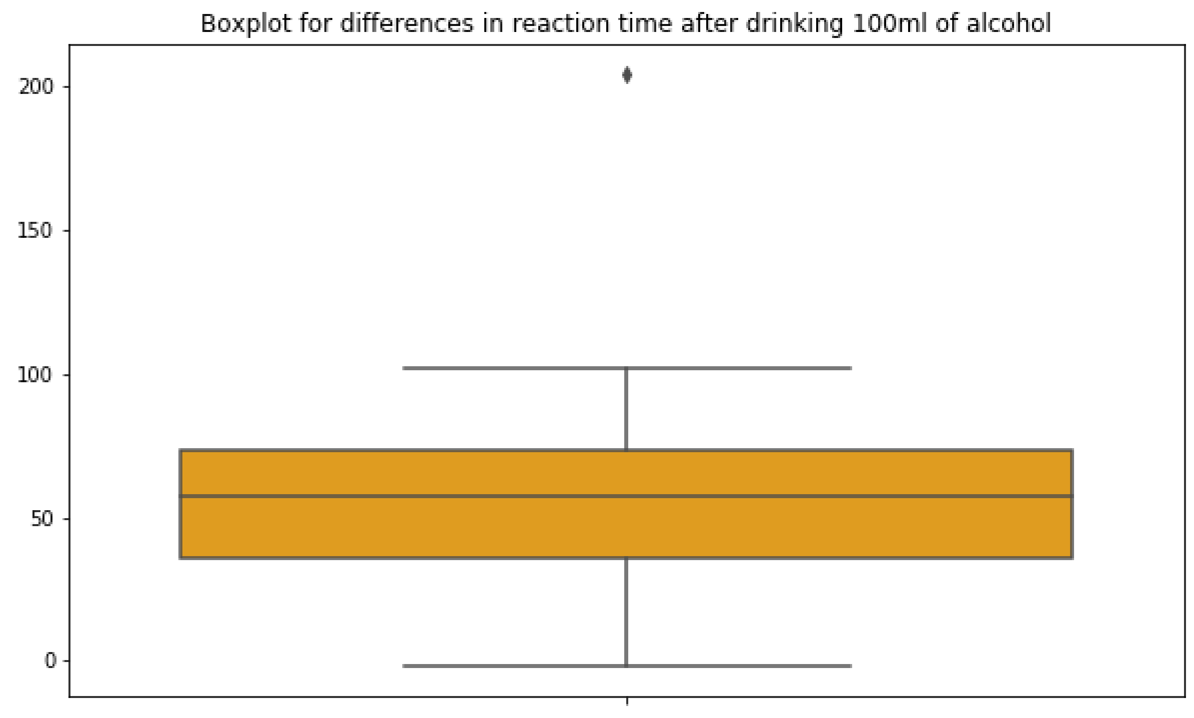
Out[51]:

	Before	After
0	171.14	242.95
1	191.22	216.94
2	207.76	265.78
3	165.44	163.32
4	205.87	213.53

Simple plot to visualize outliers

In [52]:
```python
data['differences'] = data["After"]-data['Before']
```

In [54]:
```python
plt.figure(figsize=(10,6))
sns.boxplot(y=differences,color='orange')
plt.title("Boxplot for differences in reaction time after drinking 100ml of alcohol")
plt.show()
```



Based on this boxplot we can see that outlied sample has got difference in reaction time in around ~200 ms. Now we can perform Tukey test to detect this and maybe other outlied samples.

Tukey test

In [55]:
```python
def tukey_outliers(df, column):
  Q1 = np.percentile(df[column], 25)
  Q3 = np.percentile(df[column], 75)
  IQR = Q3 - Q1
  outlier_step = 1.5 * IQR
  outliers_index = df[(df[column] < Q1 - outlier_step) | (df[column] > Q3 + outlier_step)].i
ndex
```

In [36]:
```python
outliers_index = tukey_outliers(data, 'differences')
```

In [56]:
```python
len(outliers_index)
```

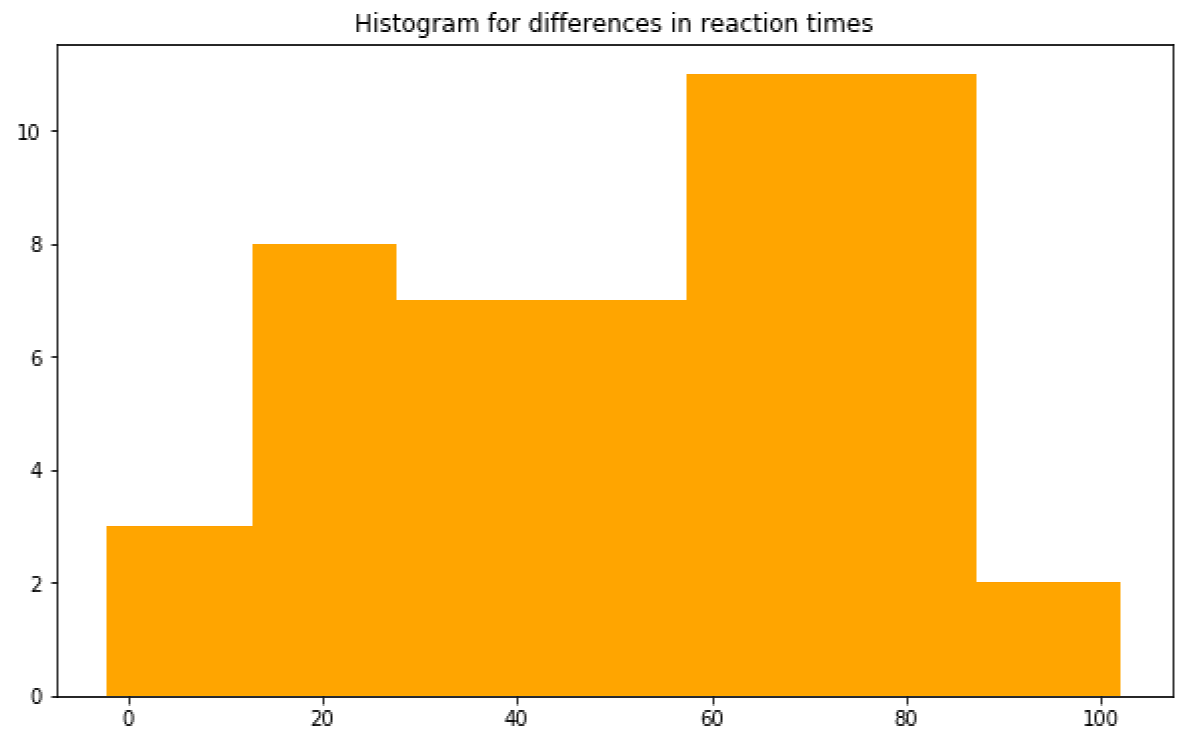
Out[56]: 1

Tukey test found only one outlier in considered dataset. Now we can drop this outlied sample.

In [58]:
```python
data.drop(outliers_index, inplace=True)
```

Histogram

In [59]:
```python
plt.figure(figsize=(10,6))
x = len(data["differences"])
binsizes = math.sqrt(x)
plt.hist(data["differences"], bins = int(binsizes),color='orange')
plt.title('Histogram for differences in reaction times')
plt.show()
```



The data is not normally distributed.

Hypothesis and paired sampled t-test

- H0: There is no difference in reaction time before and after drinking 100ml of alcohol in population of 50 drivers.
- H0: u1 == u2
- Ha: There is a difference in reaction time before and after drinking 100ml of alcohol in population of 50 drivers.
- Ha: u1 != u2

In [46]:
```python
ttest,pval = stats.ttest_rel(data['Before'], data['After'])
print(pval)
if pval<0.05:
    print("The p value is lower than p < 0,05, so we can reject the null hypothesis.")
else:
    print("The p value is not lower than p < 0,05, so we can not reject the null hypothesi
```

```
1.94533467005807e-19
The p value is lower than p < 0,05, so we can reject the null hypothesis.
```

Conclusion

Based on p value obtained in paired sampled t-test, we can assume that there is a difference in reaction times after consuming 100ml of alcohol for the population under study.