

M440B HW 5

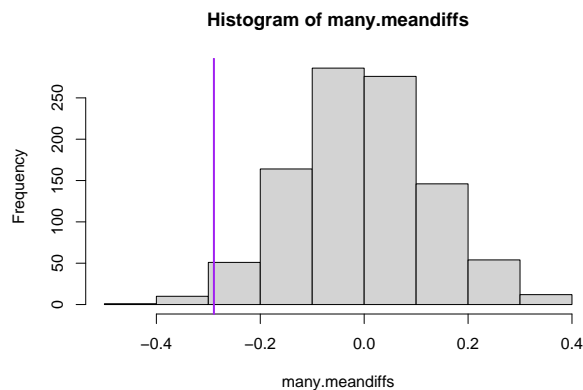
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Permutation t-tests

Problem 1

- A permutation test makes less of an assumption about the data than a t-test. Where a t-test assumes the data is normally distributed, the two sample permutation test only assumes the data comes from independent i.i.d samples.
- There would be a total of $\binom{130}{65}$ total permutations. This value is $\approx 9.5067 \times 10^{37}$.
- Execute and understand the provided code:



d. The figure indicates that there is a difference between the temperatures of females and females.

- Calculate the above p-value. It is below:

```
## [1] 0.012
```

- The strength of the evidence based on the approximate two sided p-value:

```
## [1] 0.026
```

The above p-value is significant at 5% thus there is sufficient evidence to suggest that the mean body temperatures are not equal.

Problem 2

For each gender perform a one-sample permutation t-test of the hypothesis that the mean body temperature is 98.6 degrees.

Response:

The following answers were gathered utilizing the table provided:

Males: the one sided p-value is $\frac{5}{32} \approx 0.156$ and the two sided p-value is $\frac{10}{32} \approx 0.313$. Both p-values are not significant, thus in both cases I would fail to reject the null hypothesis; the null hypothesis being $H_0 : \mu = 98.6$.

The one sided mid p-value for males is $\frac{4.5}{32} \approx 0.141$ while the two sided mid p-value is $\frac{9}{32} \approx 0.281$. Once again both these p-values are not significant, thus I would fail to reject the null hypothesis.

Females: the one sided p-value is $\frac{7}{32} \approx 0.219$ while the two sided p-value is $\frac{14}{32} \approx 0.438$. Both p-values are not significant, thus I would fail to reject the null hypothesis.

The one sided mid p-value is $\frac{6}{32} \approx 0.188$ and the two sided mid p-value is $\frac{12}{32} = 0.375$. Once again the p-values are not significant, thus leading once again to a failure to reject the null hypothesis.

For both sexes, the samples drawn did not provide sufficient evidence to show that the average body temperature is much different from 98.6 degrees.