The results below are generated from an R script.

```r
#
site <-
"http://www1.appstate.edu/~arnholta/classes/STT3820/Data/CSV/Ch25_Women's_Skating_1500.csv"
ws <- read.csv(file = url(site))
head(ws)

   Skating.Pair Start.number Name country        Lane time
1         1          37  OLTEAN Daniela Romania-ROM I    129.2
2         2          32    NEMOTO Nami Japan-JPN O    122.3
3         2           76   ZHANG Xiaolei China-CHN I    125.8
4         3           1  ABRAMOVA Yekaterina Russia-RUS I    121.6
5         3           23     LAMB Maria United States-USA I    122.1
6         4           44 REMPEL Shannon Canada-CAN I    122.2

wsclean <- ws[-1, ] # Need to remove the first row of the data frame
head(wsclean)

   Skating.Pair Start.number Name country        Lane time
2         2          32    NEMOTO Nami Japan-JPN O    122.3
3         2           76   ZHANG Xiaolei China-CHN I    125.8
4         3           1  ABRAMOVA Yekaterina Russia-RUS I    121.6
5         3           23     LAMB Maria United States-USA I    122.1
6         4           44 REMPEL Shannon Canada-CAN I    122.2
7         4           34  NOH Seon Yeong Korea-KOR I    123.3

str(wsclean)
'data.frame': 34 obs. of 6 variables:
$ Skating.Pair: int 2 2 3 3 4 4 5 5 6 6 ...  
$ Start.number: int 32 76 1 23 44 34 57 25 47 29 ...  
$ Name: Factor w/ 35 levels "ABRAMOVA Yekaterina ",...  
$ country: Factor w/ 13 levels "AustriaAUT ",...  
$ Lane: Factor w/ 2 levels "I ","O ": 2 1 1 2 1 2 2 1 1 2 ...  
$ time: num 122 126 122 122 122 122 122 122 122 122 ...  

# Note how the levels of the Lane factor are stored!!!
inner <- wsclean$time[wsclean$Lane == "I "]
outer <- wsclean$time[wsclean$Lane == "O "]
DIFF <- inner - outer

# Graphs now (Base)
qqnorm(DIFF, col = "red")
qqline(DIFF, col = "blue")
```

*This report is automatically generated with the R package knitr (version 0.2).*
Normal Q–Q Plot

Theoretical Quantiles

Sample Quantiles

# hist(DIFF, col = "blue")

Histogram of DIFF

# plot(density(DIFF))  # Basic
```r
plot(density(DIFF), col = "red", lwd = 2, main = "")  # Dressed up

# Mechanics
nd <- sum(!is.na(DIFF))
```
```r
dbar <- mean(DIFF)
sd <- sd(DIFF)
tobs <- (dbar - 0)/(sd/sqrt(nd))
pvalue <- (1 - pt(tobs, nd - 1)) * 2
c(dbar, sd, nd, tobs, pvalue)

[1] 0.4988 2.3335 17.0000 0.8814 0.3912

# Easier way
t.test(time ~ Lane, data = wsclean, paired = TRUE)

Paired t-test
data: time by Lane
t = 0.8814, df = 16, p-value = 0.3912
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.7009  1.6986
sample estimates:
mean of the differences
  0.4988

# OR
t.test(inner, outer, paired = TRUE)

Paired t-test
data: inner and outer
t = 0.8814, df = 16, p-value = 0.3912
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.7009  1.6986
sample estimates:
mean of the differences
  0.4988

# Other graphics (lattice)
library(lattice)
```


```r
densityplot(-(time[Lane == "I"] - time[Lane == "O"]), data = wsclean, xlab = "Difference in Time for Paired Skaters")

qqmath(-DIFF)
```
qqmath(-(time[Lane == "I"] - time[Lane == "O"]), data = wsclean,
        ylab = "Difference in Time for Paired Skaters")

histogram(~DIFF)
```r
# ggplot
library(ggplot2)

ggplot(data = wsclean, aes(x = (time[Lane == "I"] - time[Lane == "O"])) + geom_histogram(binwidth = 2)
```
\texttt{ggplot(data = wsclean, aes(sample = (time[Lane == "I"] - time[Lane == "O"]))) + stat_qq()}

ggplot(data = wsclean, aes(x = (time[Lane == "I"] - time[Lane == "O"]))) + geom_density()
The R session information (including the OS info, R version and all packages used):

```r
sessionInfo()

R version 2.14.1 (2011-12-22)
Platform: x86_64-pc-mingw32/x64 (64-bit)

locales:
[1] C

attached base packages:
[1] splines grid tools stats graphics grDevices utils datasets methods base

other attached packages:
[1] car_2.0-11 survival_2.36-10 nnet_7.3-1 PASWR_1.1 e1071_1.6
[6] class_7.3-3 MASS_7.3-16 knitr_0.2 ggplot2_0.8.9 proto_0.3-9.2
[11] reshape_0.8.4 plyr_1.6 lattice_0.20-0 tikzDevice_0.6.2 cacheSweave_0.6
[16] formatR_0.3-4 optparse_0.9.4 getopt_1.17 highlight_0.3.1 parser_0.0-14
[21] Rcpp_0.9.8 int64_1.1.2 codetools_0.2-8 stashR_0.3-4 filehash_2.2

loaded via a namespace (and not attached):
[1] digest_0.5.1 evaluate_0.4.1 pgfSweave_1.2.1 stringr_0.6

Sys.time()

[1] "2012-02-14 15:49:05 EST"
```