BW-HW3

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```
install.packages('MASS')
```

```
##
## The downloaded binary packages are in
##  /var/folders/nl/np7vbbx920z4vn81k8y5gwq00000gn/T//Rtmpzx4kRr/downloaded_packages
```

```
library(MASS)
bw<-data("birthwt")
?birthwt
```

#Problem1

```
library(MASS)
data("birthwt")

mean_weight <- mean(birthwt$lwt)
sd_weight <- sd(birthwt$lwt)
n <- length(birthwt$lwt)

ci <- mean_weight + c(-1, 1) * qt(0.975, df = n-1) * (sd_weight / sqrt(n))
ci
```

```
## [1] 125.4270 134.2027
```

#Problem2

```
smokers <- birthwt$lwt[birthwt$smoke == 1]
non_smokers <- birthwt$lwt[birthwt$smoke == 0]

var_test <- var.test(smokers, non_smokers)
print(var_test)
```

```
##
##  F test to compare two variances
##
## data:  smokers and non_smokers
## F = 1.4126, num df = 73, denom df = 114, p-value = 0.09744
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
```

```
##  0.9388406 2.1671700
## sample estimates:
## ratio of variances
##           1.412636
```

```r
t.test(smokers, non_smokers, var.equal = TRUE, conf.level = 0.90)
```

```
##
##  Two Sample t-test
##
## data:  smokers and non_smokers
## t = -0.60473, df = 187, p-value = 0.5461
## alternative hypothesis: true difference in means is not equal to 0
## 90 percent confidence interval:
##  -10.306448   4.785414
## sample estimates:
## mean of x mean of y
##  128.1351  130.8957
```

#Problem 3

```r
p_hat <- mean(birthwt$ht)
n <- length(birthwt$ht)
error <- qnorm(0.995) * sqrt(p_hat*(1-p_hat)/n)
CI_lower_ht <- p_hat - error
CI_upper_ht <- p_hat + error

cat("99% CI: (", CI_lower_ht, ", ", CI_upper_ht, ")\n")
```

```
## 99% CI: ( 0.01780412 ,  0.10918 )
```

```r
prop.test(sum(birthwt$ht), n, p = 0.20,conf.level = 0.90, alternative = "less")
```

```
##
##  1-sample proportions test with continuity correction
##
## data:  sum(birthwt$ht) out of n, null probability 0.2
## X-squared = 21.167, df = 1, p-value = 2.105e-06
## alternative hypothesis: true p is less than 0.2
## 90 percent confidence interval:
##  0.00000000 0.09324317
## sample estimates:
##          p
## 0.06349206
```

```r
prop_ht <- mean(birthwt$ht)
n_ht <- length(birthwt$ht)

prop.test(sum(birthwt$ht), n_ht, p = 0.20, alternative = "less",conf.level = 0.90)
```

```
##
##  1-sample proportions test with continuity correction
##
## data:  sum(birthwt$ht) out of n_ht, null probability 0.2
## X-squared = 21.167, df = 1, p-value = 2.105e-06
## alternative hypothesis: true p is less than 0.2
## 90 percent confidence interval:
##  0.00000000 0.09324317
## sample estimates:
##          p
## 0.06349206
```

#Problem4

```
prop.test(x = c(sum(birthwt$ui[birthwt$smoke == 0]), sum(birthwt$ui[birthwt$smoke == 1])),
          n = c(sum(birthwt$smoke == 0), sum(birthwt$smoke == 1)), correct = FALSE)
```

```
##
##  2-sample test for equality of proportions without continuity correction
##
## data:  c(sum(birthwt$ui[birthwt$smoke == 0]), sum(birthwt$ui[birthwt$smoke == 1])) out of c(sum(birtl
## X-squared = 0.73025, df = 1, p-value = 0.3928
## alternative hypothesis: two.sided
## 95 percent confidence interval:
##  -0.15157172  0.06108994
## sample estimates:
##    prop 1    prop 2
## 0.1304348 0.1756757
```

```
res<-bartlett.test(bwt ~ factor(race), data = birthwt)
print(res)
```

```
##
##  Bartlett test of homogeneity of variances
##
## data:  bwt by factor(race)
## Bartlett's K-squared = 0.65952, df = 2, p-value = 0.7191
```

```
anova_result <- aov(bwt ~ factor(race), data = birthwt)
summary(anova_result)
```

```
##               Df   Sum Sq Mean Sq F value  Pr(>F)
## factor(race)   2  5015725 2507863   4.913 0.00834 **
## Residuals    186 94953931  510505
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
TukeyHSD(anova_result)
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
```

```
##
## Fit: aov(formula = bwt ~ factor(race), data = birthwt)
##
## $`factor(race)`
##           diff       lwr        upr     p adj
## 2-1 -383.02644 -756.2363  -9.816581 0.0428037
## 3-1 -297.43517 -566.1652 -28.705095 0.0260124
## 3-2   85.59127 -304.4521 475.634630 0.8624372
```