multivariate_hw6

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Q5.1

```
pf(50/11, 2, 2, lower.tail = FALSE) # F(2, 2) 계산
```

```
## [1] 0.1803279
```

```
qf(0.05, 2, 2, lower.tail = FALSE)
```

```
## [1] 19
```

#Q5.3

```
invS <- matrix(c(203.018, -163.391, -163.091, 200.228), nrow = 2)
muX <- matrix(c(0.014, 0.003), nrow = 2)
Tsquared_Q3 <- 42 * t(muX) %*% invS %*% muX
Tsquared_Q3
```

```
##          [,1]
## [1,] 1.171016
```

```
pf(Tsquared_Q3*20/41, 2, 40, lower.tail = FALSE) < 0.05 # F(2, 40) 계산. not reject H0.
```

```
##       [,1]
## [1,] FALSE
```

```
critical_value <- qf(0.05, 2, 40, lower.tail = FALSE)*(41/20) #기각역의 critical value.
```

#Q5.4

우선 문제풀이에 쓰일 자료를 입력한다.

```r
mu <- c(95.52, 164.38, 55.69, 93.39, 17.98, 31.13)
va <- c(3266.46, 721.91, 179.28, 474.98, 9.95, 21.26)
s14 <- 1175.50
s56 <- 13.88
```

(a)

```r
crit_a <- qchisq(0.05, 6, lower.tail = FALSE)

for (i in 1:6) {
  print(c(mu[i] - sqrt(va[i]*crit_a/61), mu[i] + sqrt(va[i]*crit_a/61)))
}
```

```
## [1]  69.55347 121.48653
## [1] 152.1728 176.5872
## [1] 49.60667 61.77333
## [1]  83.48823 103.29177
## [1] 16.54687 19.41313
## [1] 29.03513 33.22487
```

(b)

```r
matrix_s14 <- matrix(c(va[1], s14, s14, va[4]), nrow = 2)
eigen_result <- eigen(matrix_s14, symmetric = TRUE)

c(mu[1] - sqrt(crit_a*eigen_result$values[1]/61),
  mu[1] + sqrt(crit_a*eigen_result$values[1]/61))
```

```
## [1]  67.90068 123.13932
```

```r
c(mu[4] - sqrt(crit_a*eigen_result$values[2]/61),
  mu[4] + sqrt(crit_a*eigen_result$values[2]/61))
```

```
## [1] 90.31119 96.46881
```

(c)

```r
crit_b <- qt(1/240, 60, lower.tail = FALSE)

for (i in 1:6) {
  print(c(mu[i] - crit_b*sqrt(va[i]/61), mu[i] + crit_b*sqrt(va[i]/61)))
}
```

```
## [1]  75.55331 115.48669
## [1] 154.9934 173.7666
## [1] 51.01229 60.36771
## [1]  85.77614 101.00386
## [1] 16.87801 19.08199
## [1] 29.51917 32.74083
```

(d)

```r
c(mu[1] - crit_b*sqrt(va[1]/61), mu[1] + crit_b*sqrt(va[1]/61))
```

```
## [1]  75.55331 115.48669
```

```r
c(mu[4] - crit_b*sqrt(va[4]/61), mu[4] + crit_b*sqrt(va[4]/61))
```

```
## [1]  85.77614 101.00386
```

(e)

```r
crit_c <- qt(1/280, 60, lower.tail = FALSE)

c(mu[6] - mu[5] - crit_c*sqrt((va[5]-2*s56+va[6])/61),
  mu[6] - mu[5] + crit_c*sqrt((va[5]-2*s56+va[6])/61))
```

```
## [1] 12.48757 13.81243
```

Q5.5

우선, 문제에 제시된 정보를 R 코드로 입력한다. q+1 = k = 3개 범주로부터 다항분포에 따라 다음과 같이 분포가 생성되었다.

$$X \sim Multi(n = 200,\ p = (p_1, p_2, p_3))$$

이제 Result의 결과를 이에 적용한다.

```r
p1h <- 117/200
p2h <- 62/200
p3h <- 21/200

ph <- c(p1h, p2h, p3h)
sh <- matrix(c(p1h^2, -p1h*p2h, -p1h*p3h, -p1h*p2h, p2h^2, -p1h*p3h, -p1h*p3h, p2h*p3h, p3h^2),
↪   nrow = 3)

crit <- qchisq(0.05, 2, lower.tail = FALSE)
```

따라서 p_1, p_2, p_3 각각의 simultaneous 95% CI는 다음과 같이 주어진다.

```r
c(p1h - sqrt(crit*sh[1]/200), p1h + sqrt(crit*sh[1]/200))
```

```
## [1] 0.4837471 0.6862529
```

```r
c(p2h - sqrt(crit*sh[5]/200), p2h + sqrt(crit*sh[5]/200))
```

```
## [1] 0.2563446 0.3636554
```

```r
c(p3h - sqrt(crit*sh[9]/200), p3h + sqrt(crit*sh[9]/200))
```

```
## [1] 0.08682641 0.12317359
```