IT24100139

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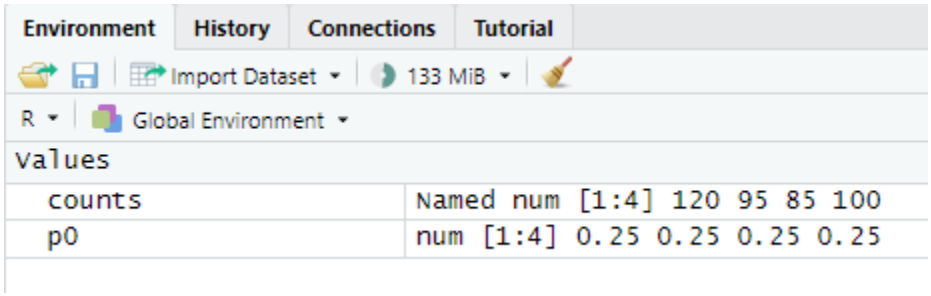
1.)

```
## (i)
## H0: P(A) = P(B) = P(C) = P(D) = 0.25   (choices are equally likely)
## H1: At least one snack type has probability ≠ 0.25 (not all equal)

counts <- c(A = 120, B = 95, C = 85, D = 100)
p0 <- rep(1/4, 4)
```

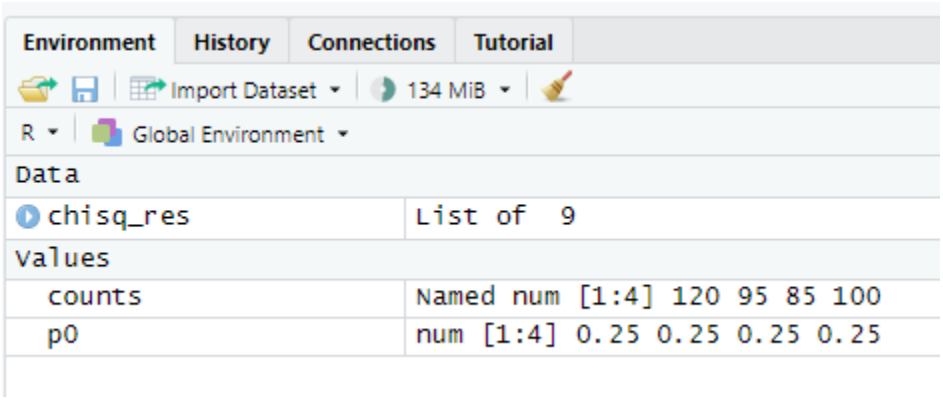
```
> counts <- c(A = 120, B = 95, C = 85, D = 100)
> p0 <- rep(1/4, 4)
>
```



2.)

```
# (ii)
chisq_res <- chisq.test(x = counts, p = p0)

cat("Observed counts:\n"); print(counts)
cat("\nExpected counts (under H0):\n"); print(chisq_res$expected)

cat("\nChi-squared statistic:", unname(chisq_res$statistic),
    "\nDegrees of freedom:", unname(chisq_res$parameter),
    "\nP-value:", chisq_res$p.value, "\n")
```

```
> # (ii)
> chisq_res <- chisq.test(x = counts, p = p0)
>
> cat("Observed counts:\n"); print(counts)
Observed counts:
  A   B   C   D
120  95  85 100
> cat("\nExpected counts (under H0):\n"); print(chisq_res$expected)

Expected counts (under H0):
  A   B   C   D
100 100 100 100
>
> cat("\nChi-squared statistic:", unname(chisq_res$statistic),
+     "\nDegrees of freedom:", unname(chisq_res$parameter),
+     "\nP-value:", chisq_res$p.value, "\n")

Chi-squared statistic: 6.5
Degrees of freedom: 3
P-value: 0.0896625
>
```



3)

```
# (iii)
alpha <- 0.05
if (chisq_res$p.value < alpha) {
  cat("\nDecision: Reject H0 at 5% significance.\n",
      "Conclusion: There IS evidence that snack choices are not equally likely.\n")
} else {
  cat("\nDecision: Fail to reject H0 at 5% significance.\n",
      "Conclusion: There is NOT enough evidence to say snack choices differ from equal likelihood.
}

expected <- sum(counts) * p0
X2_manual <- sum((counts - expected)^2 / expected)
cat("\nManual check of X^2:", X2_manual, "\n")
```

```
> # (iii)
> alpha <- 0.05
> if (chisq_res$p.value < alpha) {
+   cat("\nDecision: Reject H0 at 5% significance.\n",
+       "Conclusion: There IS evidence that snack choices are not equally likely.\n")
+ } else {
+   cat("\nDecision: Fail to reject H0 at 5% significance.\n",
+       "Conclusion: There is NOT enough evidence to say snack choices differ from equal likelihoo
d.\n")
+ }

Decision: Fail to reject H0 at 5% significance.
 Conclusion: There is NOT enough evidence to say snack choices differ from equal likelihood.
>
> expected <- sum(counts) * p0
> X2_manual <- sum((counts - expected)^2 / expected)
> cat("\nManual check of X^2:", X2_manual, "\n")

Manual check of X^2: 6.5
>
```