

R Programlamaya Giriş — Listeler: Çözümler

R Programlama ve İstatistik Akademisi

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1. Liste Temelleri

Çözüm 1.1 — Basit liste oluşturma

```
ogr <- list(  
  ad      = "Deniz",  
  yas     = 24,  
  notlar  = c(78, 82, 91),  
  mezun   = TRUE  
)  
ogr
```

```
$ad  
[1] "Deniz"
```

```
$yas  
[1] 24
```

```
$notlar  
[1] 78 82 91
```

```
$mezun  
[1] TRUE
```

Çözüm 1.2 — Yapıyı inceleme

```
class(ogr)
```

```
[1] "list"
```

```
length(ogr)
```

```
[1] 4
```

```
str(ogr)
```

```
List of 4
 $ ad      : chr "Deniz"
 $ yas     : num 24
 $ notlar: num [1:3] 78 82 91
 $ mezun   : logi TRUE
```

```
names(ogr)
```

```
[1] "ad"      "yas"      "notlar" "mezun"
```

2. Erişim Yöntemleri: [], [[]], \$

Çözüm 2.1 — Alt liste vs doğrudan eleman

```
ogr["ad"]      # alt liste (list)
```

```
$ad
[1] "Deniz"
```

```
str(ogr["ad"])
```

```
List of 1
 $ ad: chr "Deniz"
```

```
ogr[["ad"]]    # doğrudan eleman (char)
```

```
[1] "Deniz"
```

```
str(ogr[["ad"]])
```

```
chr "Deniz"
```

```
ogr$yas          # isimle erişim
```

```
[1] 24
```

Çözüm 2.2 — Hata yakalama

```
if (!is.null(ogr$kan_grubu)) {  
  print(ogr$kan_grubu)  
} else {  
  message("kan_grubu bilgisi bulunamadı (NULL).")  
}
```

3. Güncelleme, Ekleme, Silme

Çözüm 3.1 — Güncelleme

```
ogr$yas <- 25  
ogr$universite <- "Hacettepe"  
str(ogr)
```

List of 5

```
$ ad      : chr "Deniz"  
$ yas     : num 25  
$ notlar  : num [1:3] 78 82 91  
$ mezun   : logi TRUE  
$ universite: chr "Hacettepe"
```

Çözüm 3.2 — Silme

```
ogr$mezun <- NULL  
str(ogr)   # mezun alanı artık yok
```

List of 4

```
$ ad      : chr "Deniz"  
$ yas     : num 25  
$ notlar  : num [1:3] 78 82 91  
$ universite: chr "Hacettepe"
```

4. İç İçe Listeler

Çözüm 4.1 — Sınıf listesi

```
sinif <- list(  
  ogr1 = ogr,  
  ogr2 = list(ad = "Mert",   yas = 22, notlar = c(70, 82), adres = list(il = "İzmir", ilce =  
  ogr3 = list(ad = "Zeynep", yas = 21, notlar = c(90, 95, 93))  
)  
str(sinif)
```

```
List of 3  
 $ ogr1:List of 4  
  ..$ ad      : chr "Deniz"  
  ..$ yas      : num 25  
  ..$ notlar   : num [1:3] 78 82 91  
  ..$ universite: chr "Hacettepe"  
 $ ogr2:List of 4  
  ..$ ad      : chr "Mert"  
  ..$ yas      : num 22  
  ..$ notlar   : num [1:2] 70 82  
  ..$ adres :List of 2  
  .. ..$ il   : chr "İzmir"  
  .. ..$ ilce : chr "Karşıyaka"  
 $ ogr3:List of 3  
  ..$ ad      : chr "Zeynep"  
  ..$ yas      : num 21  
  ..$ notlar   : num [1:3] 90 95 93
```

```
mean(sinif$ogr3$notlar)
```

```
[1] 92.66667
```

Çözüm 4.2 — Derin erişim

```
sinif$ogr2$adres$ilce
```

```
[1] "Karşıyaka"
```

```
sinif[["ogr2"]][["adres"]][["ilce"]]
```

```
[1] "Karşıyaka"
```

5. Liste-Fonksiyon Etkileşimi

Çözüm 5.1 — lapply() ve sapply()

```
sayilar <- list(a = 1:5, b = 6:10, c = c(10, 20, 30, 40))
```

```
lapply(sayilar, mean) # liste
```

```
$a  
[1] 3
```

```
$b  
[1] 8
```

```
$c  
[1] 25
```

```
sapply(sayilar, mean) # vektör
```

```
a b c  
3 8 25
```

Çözüm 5.2 — NA'lı değerlerle çalışma

```
set.seed(42)  
sayilar2 <- list(  
  x = c(1, 2, 3, NA),  
  y = c(10, 12, NA, 14),  
  z = rnorm(5)  
)  
  
lapply(sayilar2, sd, na.rm = TRUE)
```

```
$x  
[1] 1
```

```
$y  
[1] 2
```

```
$z  
[1] 0.6929061
```

```
sapply(sayilar2, sd, na.rm = TRUE)
```

```
      x      y      z  
1.0000000 2.0000000 0.6929061
```

Çözüm 5.3 — Çoklu özet

```
lapply(sayilar2, function(v) list(mean = mean(v, na.rm = TRUE),  
                                   sd    = sd(v, na.rm = TRUE)))
```

```
$x  
$x$mean  
[1] 2
```

```
$x$sd  
[1] 1
```

```
$y  
$y$mean  
[1] 12
```

```
$y$sd  
[1] 2
```

```
$z  
$z$mean  
[1] 0.4413039
```

```
$z$sd  
[1] 0.6929061
```

Çözüm 5.4 — Matrisleştirme

```
sapply(sayilar2, range, na.rm = TRUE)
```

```
      x  y      z  
[1,] 1 10 -0.5646982  
[2,] 3 14  1.3709584
```

6. Model Çıktıları Liste Olarak: lm()

Çözüm 6.1 — lm() nesnesinin yapısı

```
veri <- data.frame(x = 1:5, y = c(2, 4, 6, 8, 10))  
model <- lm(y ~ x, data = veri)
```

```
class(model)
```

```
[1] "lm"
```

```
str(model)
```

List of 12

```
$ coefficients : Named num [1:2] -1.59e-15 2.00  
..- attr(*, "names")= chr [1:2] "(Intercept)" "x"  
$ residuals    : Named num [1:5] 4.37e-16 -8.28e-16 3.03e-16 1.30e-16 -4.22e-17  
..- attr(*, "names")= chr [1:5] "1" "2" "3" "4" ...  
$ effects      : Named num [1:5] -1.34e+01 6.32 0.00 -4.44e-16 -8.88e-16  
..- attr(*, "names")= chr [1:5] "(Intercept)" "x" "" "" ...  
$ rank         : int 2  
$ fitted.values: Named num [1:5] 2 4 6 8 10  
..- attr(*, "names")= chr [1:5] "1" "2" "3" "4" ...  
$ assign       : int [1:2] 0 1  
$ qr           :List of 5  
..$ qr        : num [1:5, 1:2] -2.236 0.447 0.447 0.447 0.447 ...  
.. ..- attr(*, "dimnames")=List of 2  
.. .. ..$ : chr [1:5] "1" "2" "3" "4" ...  
.. .. ..$ : chr [1:2] "(Intercept)" "x"  
.. ..- attr(*, "assign")= int [1:2] 0 1  
..$ qraux: num [1:2] 1.45 1.12  
..$ pivot: int [1:2] 1 2
```

```

..$ tol : num 1e-07
..$ rank : int 2
..- attr(*, "class")= chr "qr"
$ df.residual : int 3
$ xlevels : Named list()
$ call : language lm(formula = y ~ x, data = veri)
$ terms :Classes 'terms', 'formula' language y ~ x
.. ..- attr(*, "variables")= language list(y, x)
.. ..- attr(*, "factors")= int [1:2, 1] 0 1
.. ..- attr(*, "dimnames")=List of 2
.. ..$ : chr [1:2] "y" "x"
.. ..$ : chr "x"
.. ..- attr(*, "term.labels")= chr "x"
.. ..- attr(*, "order")= int 1
.. ..- attr(*, "intercept")= int 1
.. ..- attr(*, "response")= int 1
.. ..- attr(*, ".Environment")=<environment: R_GlobalEnv>
.. ..- attr(*, "predvars")= language list(y, x)
.. ..- attr(*, "dataClasses")= Named chr [1:2] "numeric" "numeric"
.. ..- attr(*, "names")= chr [1:2] "y" "x"
$ model :'data.frame': 5 obs. of 2 variables:
..$ y: num [1:5] 2 4 6 8 10
..$ x: int [1:5] 1 2 3 4 5
..- attr(*, "terms")=Classes 'terms', 'formula' language y ~ x
.. ..- attr(*, "variables")= language list(y, x)
.. ..- attr(*, "factors")= int [1:2, 1] 0 1
.. ..- attr(*, "dimnames")=List of 2
.. ..$ : chr [1:2] "y" "x"
.. ..$ : chr "x"
.. ..- attr(*, "term.labels")= chr "x"
.. ..- attr(*, "order")= int 1
.. ..- attr(*, "intercept")= int 1
.. ..- attr(*, "response")= int 1
.. ..- attr(*, ".Environment")=<environment: R_GlobalEnv>
.. ..- attr(*, "predvars")= language list(y, x)
.. ..- attr(*, "dataClasses")= Named chr [1:2] "numeric" "numeric"
.. ..- attr(*, "names")= chr [1:2] "y" "x"
- attr(*, "class")= chr "lm"

```

```
model$coefficients
```

```
(Intercept)          x
```



```
-1.588822e-15 2.000000e+00
```

```
model$residuals
```

```
      1      2      3      4      5  
4.367205e-16 -8.275904e-16 3.027995e-16 1.302899e-16 -4.221962e-17
```

```
model$fitted.values
```

```
 1  2  3  4  5  
2  4  6  8 10
```

```
ozet <- summary(model)  
class(ozet)
```

```
[1] "summary.lm"
```

```
ozet$r.squared
```

```
[1] 1
```

```
ozet$coefficients
```

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-1.588822e-15	6.012996e-16	-2.642313e+00	7.750218e-02
x	2.000000e+00	1.812987e-16	1.103152e+16	1.642724e-48

Çözüm 6.2 — Tahmin

```
predict(model, newdata = data.frame(x = c(6, 7)))
```

```
 1  2  
12 14
```

7. Ek Uygulama: İsimleri Düzenlemek

Çözüm 7.1 — names() ile yeniden adlandırma

```
# Tüm ogr'lerde 'ad' -> 'isim' olacak şekilde dönüştürme
for (i in seq_along(sinif)) {
  nm <- names(sinif[[i]])
  if ("ad" %in% nm) {
    names(sinif[[i]])[nm == "ad"] <- "isim"
  }
}
str(sinif)
```

```
List of 3
 $ ogr1:List of 4
  ..$ isim      : chr "Deniz"
  ..$ yas       : num 25
  ..$ notlar     : num [1:3] 78 82 91
  ..$ universite: chr "Hacettepe"
 $ ogr2:List of 4
  ..$ isim      : chr "Mert"
  ..$ yas       : num 22
  ..$ notlar     : num [1:2] 70 82
  ..$ adres     :List of 2
  .. ..$ il      : chr "İzmir"
  .. ..$ ilce    : chr "Karşıyaka"
 $ ogr3:List of 3
  ..$ isim      : chr "Zeynep"
  ..$ yas       : num 21
  ..$ notlar     : num [1:3] 90 95 93
```

Çözüm 7.2 — unlist() riskleri

```
alt <- sinif$ogr1[c("isim", "yas")]
alt
```

```
$isim
[1] "Deniz"
```

```
$yas
[1] 25
```

```
unlist(alt) # türlerin karaktere zorlanabileceğine dikkat!
```

```
    isim    yas
"Deniz"    "25"
```

```
# Not: Heterojen yapılar 'unlist' ile anlam kaybına uğrayabilir.
```