```
# exam 1  - narrative -  occurrence 1
> lmerdf1naoc1item3 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                 + `Item14` +  `Item17` +  `Item25`  + `Item26`  +
`Item29`
+                 + (1 + `Stu1ent I1`|`Item3`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item3)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item3)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item3    (Intercept)  1.215e+00 1.102e+00
          `Stu1ent I1` 8.233e-20 2.869e-10 1.00
 Residual              1.215e+00 1.102e+00
Number of obs: 159, groups:  Item3, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     1.5731   0.680
Item5...61    1.5035     0.2117   7.104
Item5...6D    1.0616     1.1399   0.931
Item11...7    1.4647     0.2206   6.640
Item14        1.3361     0.2158   6.193
Item17        0.9623     0.2063   4.664
Item25        1.6449     0.2457   6.695
Item26        1.0508     0.2415   4.352
Item29        0.8366     0.2419   3.458

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.696
Item5...61 -0.042 -0.053
Item5...6D -0.020  0.003  0.076
Item11...7 -0.010  0.003  0.016   0.053
Item14     -0.039 -0.015 -0.161   0.026  -0.359
Item17     -0.039 -0.018  0.047   0.056  -0.138 -0.049
Item25     -0.003 -0.007  0.011   0.070  -0.039 -0.043 -0.177
Item26      0.000 -0.002 -0.165  -0.212  -0.202  0.058 -0.085 -0.319
Item29      0.006 -0.003 -0.054   0.032  -0.084 -0.133 -0.136 -0.298 -0.182
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item5 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                           + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                           + (1 + `Stu1ent I1`|`Item5...6`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item5)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item5...6)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups    Name         Variance  Std.Dev.  Corr
 Item5...6 (Intercept)  1.215e+00 1.102e+00
           `Stu1ent I1` 3.761e-19 6.133e-10 1.00
 Residual               1.215e+00 1.102e+00
Number of obs: 159, groups:  Item5...6, 3

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     0.2086   5.127
Item5...61    1.5035     1.5735   0.956
Item5...6D    1.0616     1.9314   0.550
Item11...7    1.4647     0.2206   6.640
Item14        1.3361     0.2158   6.193
Item17        0.9623     0.2063   4.664
Item25        1.6449     0.2457   6.695
Item26        1.0508     0.2415   4.352
Item29        0.8366     0.2419   3.458

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.019
Item5...61 -0.699 -0.053
Item5...6D -0.577  0.013  0.406
Item11...7 -0.010  0.020  0.002   0.031
Item14     -0.039 -0.112 -0.022   0.015  -0.359
Item17     -0.039 -0.135  0.006   0.033  -0.138 -0.049
Item25     -0.003 -0.052  0.002   0.041  -0.039 -0.043 -0.177
Item26      0.000 -0.014 -0.022  -0.125  -0.202  0.058 -0.085 -0.319
Item29      0.006 -0.026 -0.007   0.019  -0.084 -0.133 -0.136 -0.298 -0.182
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item11 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                           + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                           + (1 + `Stu1ent I1`|`Item11...7`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item11)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item11...7)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups     Name         Variance  Std.Dev.  Corr
 Item11...7 (Intercept)  1.215e+00 1.102e+00
            `Stu1ent I1` 6.312e-20 2.512e-10 -1.00
 Residual                1.215e+00 1.102e+00
Number of obs: 159, groups:  Item11...7, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     0.2086   5.127
Item5...61    1.5035     0.2117   7.104
Item5...6D    1.0616     1.1399   0.931
Item11...7    1.4647     1.5747   0.930
Item14        1.3361     0.2158   6.193
Item17        0.9623     0.2063   4.664
Item25        1.6449     0.2457   6.695
Item26        1.0508     0.2415   4.352
Item29        0.8366     0.2419   3.458

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.019
Item5...61 -0.042 -0.397
Item5...6D -0.020  0.021  0.076
Item11...7 -0.694  0.003  0.002   0.007
Item14     -0.039 -0.112 -0.161   0.026  -0.050
Item17     -0.039 -0.135  0.047   0.056  -0.019 -0.049
Item25     -0.003 -0.052  0.011   0.070  -0.005 -0.043 -0.177
Item26      0.000 -0.014 -0.165  -0.212  -0.028  0.058 -0.085 -0.319
Item29      0.006 -0.026 -0.054   0.032  -0.012 -0.133 -0.136 -0.298 -0.182
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item14 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                           + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                           + (1 + `Stu1ent I1`|`Item14`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item14)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item14)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item14   (Intercept)  1.215e+00 1.102e+00
          `Stu1ent I1` 8.732e-20 2.955e-10 1.00
 Residual              1.215e+00 1.102e+00
Number of obs: 159, groups:  Item14, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     0.2086   5.127
Item5...61    1.5035     0.2117   7.104
Item5...6D    1.0616     1.1399   0.931
Item11...7    1.4647     0.2206   6.640
Item14        1.3361     1.5740   0.849
Item17        0.9623     0.2063   4.664
Item25        1.6449     0.2457   6.695
Item26        1.0508     0.2415   4.352
Item29        0.8366     0.2419   3.458

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.019
Item5...61 -0.042 -0.397
Item5...6D -0.020  0.021  0.076
Item11...7 -0.010  0.020  0.016   0.053
Item14     -0.699 -0.015 -0.022   0.004  -0.049
Item17     -0.039 -0.135  0.047   0.056  -0.138 -0.007
Item25     -0.003 -0.052  0.011   0.070  -0.039 -0.006 -0.177
Item26      0.000 -0.014 -0.165  -0.212  -0.202  0.008 -0.085 -0.319
Item29      0.006 -0.026 -0.054   0.032  -0.084 -0.018 -0.136 -0.298 -0.182
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item17 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                          + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                          + (1 + `Stu1ent I1`|`Item17`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item17)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item17)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item17   (Intercept)  1.215e+00 1.102e+00
          `Stu1ent I1` 9.539e-20 3.089e-10 -1.00
 Residual              1.215e+00 1.102e+00
Number of obs: 159, groups:  Item17, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     0.2086   5.127
Item5...61    1.5035     0.2117   7.104
Item5...6D    1.0616     1.1399   0.931
Item11...7    1.4647     0.2206   6.640
Item14        1.3361     0.2158   6.193
Item17        0.9623     1.5728   0.612
Item25        1.6449     0.2457   6.695
Item26        1.0508     0.2415   4.352
Item29        0.8366     0.2419   3.458

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.019
Item5...61 -0.042 -0.397
Item5...6D -0.020  0.021  0.076
Item11...7 -0.010  0.020  0.016   0.053
Item14     -0.039 -0.112 -0.161   0.026  -0.359
Item17     -0.699 -0.018  0.006   0.007  -0.018 -0.006
Item25     -0.003 -0.052  0.011   0.070  -0.039 -0.043 -0.023
Item26      0.000 -0.014 -0.165  -0.212  -0.202  0.058 -0.011 -0.319
Item29      0.006 -0.026 -0.054   0.032  -0.084 -0.133 -0.018 -0.298 -0.182
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item25 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                           + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                           + (1 + `Stu1ent I1`|`Item25`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item25)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item25)
   Data: df1

REML criterion at convergence: 483.6

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9749 -0.6977  0.0755  0.3755  7.6654

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item25   (Intercept)  9.243e-01 0.9614049
          `Stu1ent I1` 3.845e-07 0.0006201 -0.99
 Residual              1.208e+00 1.0991553
Number of obs: 159, groups:  Item25, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8733     0.2054   4.251
Item3         1.0900     0.2093   5.208
Item5...61    1.5036     0.2112   7.120
Item5...6D    1.1403     1.1406   1.000
Item11...7    1.4556     0.2220   6.556
Item14        1.3305     0.2152   6.183
Item17        0.9788     0.2069   4.730
Item25        1.6528     0.3045   5.427
Item26        1.0634     0.2412   4.409
Item29        0.8218     0.2420   3.395

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.107
Item5...61 -0.226 -0.396
Item5...6D -0.114  0.031  0.074
Item11...7 -0.054  0.009  0.021   0.043
Item14     -0.211 -0.114 -0.161   0.024  -0.354
Item17     -0.216 -0.121  0.044   0.065  -0.149 -0.051
Item25     -0.275 -0.039  0.009   0.058  -0.033 -0.035 -0.139
Item26     -0.006 -0.010 -0.164  -0.208  -0.198  0.056 -0.082 -0.255
Item29      0.039 -0.035 -0.051   0.025  -0.074 -0.131 -0.143 -0.241 -0.183
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item26 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                           + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                           + (1 + `Stu1ent I1`|`Item26`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item26)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item26)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item26   (Intercept)  1.215e+00 1.102e+00
          `Stu1ent I1` 5.233e-22 2.288e-11 1.00
 Residual              1.215e+00 1.102e+00
Number of obs: 159, groups:  Item26, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     0.2086   5.127
Item5...61    1.5035     0.2117   7.104
Item5...6D    1.0616     1.1399   0.931
Item11...7    1.4647     0.2206   6.640
Item14        1.3361     0.2158   6.193
Item17        0.9623     0.2063   4.664
Item25        1.6449     0.2457   6.695
Item26        1.0508     1.5777   0.666
Item29        0.8366     0.2419   3.458

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.019
Item5...61 -0.042 -0.397
Item5...6D -0.020  0.021  0.076
Item11...7 -0.010  0.020  0.016   0.053
Item14     -0.039 -0.112 -0.161   0.026  -0.359
Item17     -0.039 -0.135  0.047   0.056  -0.138 -0.049
Item25     -0.003 -0.052  0.011   0.070  -0.039 -0.043 -0.177
Item26     -0.692 -0.002 -0.025  -0.032  -0.031  0.009 -0.013 -0.049
Item29      0.006 -0.026 -0.054   0.032  -0.084 -0.133 -0.136 -0.298 -0.028
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc1item29 <- lmer(`SUM...13` ~ `Item3` + `Item5...6` +
`Item11...7`
+                           + `Item14` +  `Item17` +  `Item25`  + `Item26`
+ `Item29`
+                           + (1 + `Stu1ent I1`|`Item29`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc1item29)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item3 + Item5...6 + Item11...7 + Item14 + Item17 +
    Item25 + Item26 + Item29 + (1 + `Stu1ent I1` | Item29)
   Data: df1

REML criterion at convergence: 483.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-1.9801 -0.6970  0.0732  0.4164  7.6803

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item29   (Intercept)  1.215e+00 1.102e+00
          `Stu1ent I1` 2.446e-20 1.564e-10 1.00
 Residual              1.215e+00 1.102e+00
Number of obs: 159, groups:  Item29, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.8876     1.1141   0.797
Item3         1.0694     0.2086   5.127
Item5...61    1.5035     0.2117   7.104
Item5...6D    1.0616     1.1399   0.931
Item11...7    1.4647     0.2206   6.640
Item14        1.3361     0.2158   6.193
Item17        0.9623     0.2063   4.664
Item25        1.6449     0.2457   6.695
Item26        1.0508     0.2415   4.352
Item29        0.8366     1.5778   0.530

Correlation of Fixed Effects:
           (Intr) Item3  I5...61 I5...6D I11... Item14 Item17 Item25 Item26
Item3      -0.019
Item5...61 -0.042 -0.397
Item5...6D -0.020  0.021  0.076
Item11...7 -0.010  0.020  0.016   0.053
Item14     -0.039 -0.112 -0.161   0.026  -0.359
Item17     -0.039 -0.135  0.047   0.056  -0.138 -0.049
Item25     -0.003 -0.052  0.011   0.070  -0.039 -0.043 -0.177
Item26      0.000 -0.014 -0.165  -0.212  -0.202  0.058 -0.085 -0.319
Item29     -0.690 -0.004 -0.008   0.005  -0.013 -0.020 -0.021 -0.046 -0.028
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
# exam 1  - narrative -  occurrence 2
> lmerdf1naoc2item1 <- lmer(`SUM...13` ~ `Item1` + `Item9...3` +
`Item33...4`
+                       + (1 + `Stu1ent I1`|`Item1`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc2item1)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item1 + Item9...3 + Item33...4 + (1 + `Stu1ent I1` |
Item1)
   Data: df1

REML criterion at convergence: 688.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5277 -0.6265 -0.1548  0.7727  3.6171

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item1    (Intercept)  5.693e+00 2.386e+00
          `Stu1ent I1` 3.235e-18 1.799e-09 1.00
 Residual              4.498e+00 2.121e+00
Number of obs: 159, groups:  Item1, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.1021     2.4071   0.458
Item1         2.0324     3.3925   0.599
Item9...3     3.0005     0.3790   7.917
Item33...4    2.2262     0.3695   6.025

Correlation of Fixed Effects:
           (Intr) Item1  I9...3
Item1      -0.702
Item9...3  -0.059 -0.016
Item33...4 -0.041 -0.017 -0.333
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc2item9 <- lmer(`SUM...13` ~ `Item1` + `Item9...3` +
`Item33...4`
+                       + (1 + `Stu1ent I1`|`Item9...3`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc2item9)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item1 + Item9...3 + Item33...4 + (1 + `Stu1ent I1` |
Item9...3)
   Data: df1

REML criterion at convergence: 688.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5277 -0.6265 -0.1548  0.7727  3.6171

Random effects:
 Groups    Name         Variance  Std.Dev.  Corr
 Item9...3 (Intercept)  4.498e+00 2.121e+00
           `Stu1ent I1` 6.393e-19 7.996e-10 1.00
 Residual               4.498e+00 2.121e+00
Number of obs: 159, groups:  Item9...3, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.1021     2.1446   0.514
Item1         2.0324     0.3502   5.803
Item9...3     3.0005     3.0233   0.992
Item33...4    2.2262     0.3695   6.025

Correlation of Fixed Effects:
           (Intr) Item1  I9...3
Item1      -0.049
Item9...3  -0.702 -0.019
Item33...4 -0.046 -0.166 -0.042
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1naoc2item33 <- lmer(`SUM...13` ~ `Item1` + `Item9...3` +
`Item33...4`
+                      + (1 + `Stu1ent I1`|`Item33...4` ), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc2item33)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item1 + Item9...3 + Item33...4 + (1 + `Stu1ent I1` |
Item33...4)
   Data: df1

REML criterion at convergence: 688.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5277 -0.6265 -0.1548  0.7727  3.6171

Random effects:
 Groups     Name         Variance  Std.Dev.  Corr
 Item33...4 (Intercept)  4.498e+00 2.121e+00
            `Stu1ent I1` 1.170e-18 1.081e-09 1.00
 Residual                4.498e+00 2.121e+00
Number of obs: 159, groups:  Item33...4, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.1021     2.1446   0.514
Item1         2.0324     0.3502   5.803
Item9...3     3.0005     0.3790   7.917
Item33...4    2.2262     3.0221   0.737

Correlation of Fixed Effects:
           (Intr) Item1  I9...3
Item1      -0.049
Item9...3  -0.066 -0.155
Item33...4 -0.700 -0.020 -0.041
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
# exam 1  - expository -  occurrence 1
> # exam 1  - expository -  occurrence 1
> lmerdf1exoc1item6 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` + `Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item6...19`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item6)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item6...19)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups     Name              Variance  Std.Dev.  Corr
 Item6...19 (Intercept)       6.797e-01 8.244e-01
            `Student ID...15` 1.683e-19 4.103e-10 -1.00
 Residual                     6.797e-01 8.244e-01
Number of obs: 159, groups:  Item6...19, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     1.1777   0.865
Item10        1.5133     0.1758   8.610
Item12        1.3843     0.1678   8.251
Item15...22   1.4322     0.1577   9.079
Item18        1.1839     0.1809   6.543
Item24        1.0719     0.1719   6.235
Item30        1.2355     0.1563   7.905
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.695
Item10      -0.005 -0.042
Item12      -0.005 -0.013 -0.215
Item15...22 -0.028  0.002 -0.131 -0.246
Item18       0.008 -0.036 -0.136 -0.023 -0.085
Item24      -0.038 -0.002 -0.067 -0.259 -0.058 -0.143
Item30      -0.058 -0.008  0.063 -0.074 -0.099  0.037 -0.278
Item32      -0.003  0.012 -0.174  0.008 -0.143 -0.257 -0.132 -0.175
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item10 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item10`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item10)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item10)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item10   (Intercept)       6.797e-01 8.244e-01
          `Student ID...15` 7.190e-21 8.479e-11 1.00
 Residual                   6.797e-01 8.244e-01
Number of obs: 159, groups:  Item10, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     0.1661   6.133
Item10        1.5133     1.1791   1.283
Item12        1.3843     0.1678   8.251
Item15...22   1.4322     0.1577   9.079
Item18        1.1839     0.1809   6.543
Item24        1.0719     0.1719   6.235
Item30        1.2355     0.1563   7.905
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.016
Item10      -0.692 -0.044
Item12      -0.005 -0.089 -0.032
Item15...22 -0.028  0.012 -0.020 -0.246
Item18       0.008 -0.257 -0.020 -0.023 -0.085
Item24      -0.038 -0.011 -0.010 -0.259 -0.058 -0.143
Item30      -0.058 -0.056  0.009 -0.074 -0.099  0.037 -0.278
Item32      -0.003  0.085 -0.026  0.008 -0.143 -0.257 -0.132 -0.175
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item12 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item12`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item12)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item12)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item12   (Intercept)       6.797e-01 8.244e-01
          `Student ID...15` 5.044e-21 7.102e-11 -1.00
 Residual                   6.797e-01 8.244e-01
Number of obs: 159, groups:  Item12, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     0.1661   6.133
Item10        1.5133     0.1758   8.610
Item12        1.3843     1.1779   1.175
Item15...22   1.4322     0.1577   9.079
Item18        1.1839     0.1809   6.543
Item24        1.0719     0.1719   6.235
Item30        1.2355     0.1563   7.905
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.016
Item10      -0.005 -0.294
Item12      -0.693 -0.013 -0.031
Item15...22 -0.028  0.012 -0.131 -0.035
Item18       0.008 -0.257 -0.136 -0.003 -0.085
Item24      -0.038 -0.011 -0.067 -0.037 -0.058 -0.143
Item30      -0.058 -0.056  0.063 -0.011 -0.099  0.037 -0.278
Item32      -0.003  0.085 -0.174  0.001 -0.143 -0.257 -0.132 -0.175
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item15 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item15...22`), data
= df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item15)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item15...22)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups      Name              Variance  Std.Dev.  Corr
 Item15...22 (Intercept)       6.797e-01 8.244e-01
             `Student ID...15` 2.481e-20 1.575e-10 -1.00
 Residual                      6.797e-01 8.244e-01
Number of obs: 159, groups:  Item15...22, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     0.1661   6.133
Item10        1.5133     0.1758   8.610
Item12        1.3843     0.1678   8.251
Item15...22   1.4322     1.1766   1.217
Item18        1.1839     0.1809   6.543
Item24        1.0719     0.1719   6.235
Item30        1.2355     0.1563   7.905
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.016
Item10      -0.005 -0.294
Item12      -0.005 -0.089 -0.215
Item15...22 -0.697  0.002 -0.018 -0.033
Item18       0.008 -0.257 -0.136 -0.023 -0.011
Item24      -0.038 -0.011 -0.067 -0.259 -0.008 -0.143
Item30      -0.058 -0.056  0.063 -0.074 -0.013  0.037 -0.278
Item32      -0.003  0.085 -0.174  0.008 -0.019 -0.257 -0.132 -0.175
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item18 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                            + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                            + (1 + `Student ID...15`|`Item18`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item18)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item18)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item18   (Intercept)       6.797e-01 8.244e-01
          `Student ID...15` 4.389e-19 6.625e-10 1.00
 Residual                   6.797e-01 8.244e-01
Number of obs: 159, groups:  Item18, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     0.1661   6.133
Item10        1.5133     0.1758   8.610
Item12        1.3843     0.1678   8.251
Item15...22   1.4322     0.1577   9.079
Item18        1.1839     1.1799   1.003
Item24        1.0719     0.1719   6.235
Item30        1.2355     0.1563   7.905
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.016
Item10      -0.005 -0.294
Item12      -0.005 -0.089 -0.215
Item15...22 -0.028  0.012 -0.131 -0.246
Item18      -0.690 -0.039 -0.021 -0.004 -0.013
Item24      -0.038 -0.011 -0.067 -0.259 -0.058 -0.022
Item30      -0.058 -0.056  0.063 -0.074 -0.099  0.006 -0.278
Item32      -0.003  0.085 -0.174  0.008 -0.143 -0.039 -0.132 -0.175
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item24 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item24`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item24)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item24)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item24   (Intercept)       6.797e-01 8.244e-01
          `Student ID...15` 1.193e-20 1.092e-10 1.00
 Residual                   6.797e-01 8.244e-01
Number of obs: 159, groups:  Item24, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     0.1661   6.133
Item10        1.5133     0.1758   8.610
Item12        1.3843     0.1678   8.251
Item15...22   1.4322     0.1577   9.079
Item18        1.1839     0.1809   6.543
Item24        1.0719     1.1785   0.910
Item30        1.2355     0.1563   7.905
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.016
Item10      -0.005 -0.294
Item12      -0.005 -0.089 -0.215
Item15...22 -0.028  0.012 -0.131 -0.246
Item18       0.008 -0.257 -0.136 -0.023 -0.085
Item24      -0.697 -0.002 -0.010 -0.038 -0.009 -0.021
Item30      -0.058 -0.056  0.063 -0.074 -0.099  0.037 -0.041
Item32      -0.003  0.085 -0.174  0.008 -0.143 -0.257 -0.019 -0.175
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item30 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item30`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc1item30)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item30)
   Data: df1

REML criterion at convergence: 399.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.1292 -0.6721  0.1624  0.5409  2.5939

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item30   (Intercept)       6.797e-01 8.244e-01
          `Student ID...15` 8.917e-20 2.986e-10 1.00
 Residual                   6.797e-01 8.244e-01
Number of obs: 159, groups:  Item30, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.5541     0.8337   0.665
Item6...19    1.0187     0.1661   6.133
Item10        1.5133     0.1758   8.610
Item12        1.3843     0.1678   8.251
Item15...22   1.4322     0.1577   9.079
Item18        1.1839     0.1809   6.543
Item24        1.0719     0.1719   6.235
Item30        1.2355     1.1764   1.050
Item32        1.3885     0.1644   8.447

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.016
Item10      -0.005 -0.294
Item12      -0.005 -0.089 -0.215
Item15...22 -0.028  0.012 -0.131 -0.246
Item18       0.008 -0.257 -0.136 -0.023 -0.085
Item24      -0.038 -0.011 -0.067 -0.259 -0.058 -0.143
Item30      -0.701 -0.007  0.008 -0.010 -0.013  0.005 -0.037
Item32      -0.003  0.085 -0.174  0.008 -0.143 -0.257 -0.132 -0.023
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc1item32 <- lmer(`SUM...27` ~ `Item6...19` + `Item10` +
`Item12`
+                           + `Item15...22` +  `Item18` +  `Item24`  +
`Item30`  + `Item32`
+                           + (1 + `Student ID...15`|`Item32`), data =
df1)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  unable to evaluate scaled gradient
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
> summary(lmerdf1exoc1item32)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item6...19 + Item10 + Item12 + Item15...22 + Item18 +
    Item24 + Item30 + Item32 + (1 + `Student ID...15` | Item32)
   Data: df1

REML criterion at convergence: 398.7

Scaled residuals:
     Min       1Q   Median       3Q      Max
-3.14842 -0.68428  0.07796  0.62079  2.57381

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item32   (Intercept)       6.661e-01 0.8161595
          `Student ID...15` 7.676e-07 0.0008761 0.32
 Residual                   6.674e-01 0.8169693
Number of obs: 159, groups:  Item32, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.1678     1.2091   0.139
Item6...19    1.0032     0.1663   6.031
Item10        1.5294     0.1750   8.740
Item12        1.3843     0.1682   8.230
Item15...22   1.4124     0.1568   9.008
Item18        1.1794     0.1794   6.575
Item24        1.0572     0.1733   6.101
Item30        1.2286     0.1550   7.929
Item32        3.4931     1.7898   1.952

Correlation of Fixed Effects:
            (Intr) I6...1 Item10 Item12 I15... Item18 Item24 Item30
Item6...19  -0.098
Item10       0.044 -0.304
Item12      -0.116 -0.066 -0.223
Item15...22  0.003  0.015 -0.133 -0.244
Item18      -0.009 -0.250 -0.138 -0.019 -0.084
Item24       0.114 -0.031 -0.055 -0.278 -0.051 -0.143
Item30      -0.020 -0.056  0.062 -0.076 -0.096  0.037 -0.269
Item32      -0.664  0.013 -0.004  0.053 -0.071 -0.026 -0.108 -0.042
optimizer (nloptwrap) convergence code: 0 (OK)
unable to evaluate scaled gradient
Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
```

```
# exam 1  - expository -  occurrence 2
> lmerdf1exoc2item7 <- lmer(`SUM...27` ~ `Item7` + `Item16` + `Item31...18`
+                           + (1 + `Student ID...15`|`Item7`), data = df1)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  unable to evaluate scaled gradient
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
> summary(lmerdf1exoc2item7)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item7 + Item16 + Item31...18 + (1 + `Student ID...15` |
Item7)
   Data: df1

REML criterion at convergence: 657

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.50230 -0.67782 -0.04638  0.73626  2.79022

Random effects:
 Groups   Name              Variance  Std.Dev. Corr
 Item7    (Intercept)       3.645e+00 1.909154
          `Student ID...15` 2.834e-06 0.001683 0.36
 Residual                   3.636e+00 1.906849
Number of obs: 159, groups:  Item7, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6044     2.7152   0.223
Item7         6.9253     4.0748   1.700
Item16        2.4038     0.3393   7.084
Item31...18   2.1993     0.3476   6.326

Correlation of Fixed Effects:
            (Intr) Item7  Item16
Item7       -0.659
Item16      -0.051 -0.017
Item31...18 -0.033 -0.060 -0.264
optimizer (nloptwrap) convergence code: 0 (OK)
unable to evaluate scaled gradient
Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
```

```
> lmerdf1exoc2item16 <- lmer(`SUM...27` ~ `Item7` + `Item16` +
`Item31...18`
+                           + (1 + `Student ID...15`|`Item16`), data = df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc2item16)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item7 + Item16 + Item31...18 + (1 + `Student ID...15` |
Item16)
   Data: df1

REML criterion at convergence: 657.3

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5923 -0.6808  0.0085  0.7169  2.7554

Random effects:
 Groups   Name              Variance  Std.Dev.  Corr
 Item16   (Intercept)       2.824e+00 1.6805101
          `Student ID...15` 8.142e-08 0.0002853 1.00
 Residual                   3.677e+00 1.9174405
Number of obs: 159, groups:  Item16, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.1735     2.1065   0.557
Item7         3.0466     0.3546   8.593
Item16        3.0509     2.9648   1.029
Item31...18   2.2196     0.3493   6.355

Correlation of Fixed Effects:
            (Intr) Item7  Item16
Item7       -0.018
Item16      -0.704 -0.036
Item31...18 -0.045 -0.309 -0.049
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf1exoc2item31 <- lmer(`SUM...27` ~ `Item7` + `Item16` +
`Item31...18`
+                           + (1 + `Student ID...15`|`Item31...18`), data =
df1)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1exoc2item31)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...27 ~ Item7 + Item16 + Item31...18 + (1 + `Student ID...15` |
Item31...18)
   Data: df1

REML criterion at convergence: 657.3

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.59602 -0.68036  0.01107  0.72087  2.75887

Random effects:
 Groups      Name              Variance  Std.Dev.  Corr
 Item31...18 (Intercept)       3.678e+00 1.918e+00
             `Student ID...15` 5.364e-19 7.324e-10 -1.00
 Residual                      3.678e+00 1.918e+00
Number of obs: 159, groups:  Item31...18, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.3048     1.9372   0.674
Item7         3.0486     0.3545   8.600
Item16        2.4041     0.3413   7.044
Item31...18   2.2212     2.7346   0.812

Correlation of Fixed Effects:
            (Intr) Item7  Item16
Item7       -0.008
Item16      -0.064 -0.219
Item31...18 -0.702 -0.040 -0.034
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> # exam 2  - narrative -  occurrence 1
> lmerdf2naoc1item4 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                           + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                           + (1 + `Stu1ent I1`|`Item4`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item4)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item4)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item4    (Intercept)  5.258e-01 7.251e-01
          `Stu1ent I1` 3.377e-19 5.811e-10 1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item4, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.7324   0.841
Item4         1.4145     1.0392   1.361
Item12        1.0919     0.1811   6.028
Item14        1.1549     0.1662   6.950
Item16        1.3674     0.1664   8.216
Item18        0.9573     0.1733   5.524
Item23        1.6135     0.2056   7.847
Item26        1.5559     0.1649   9.433
Item27        1.2168     0.2345   5.188

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.693
Item12 -0.006 -0.035
Item14 -0.043 -0.032 -0.055
Item16 -0.035 -0.005 -0.086 -0.089
Item18 -0.009  0.000 -0.067 -0.330 -0.172
Item23  0.012 -0.018 -0.168 -0.098 -0.162 -0.094
Item26 -0.023 -0.010 -0.099 -0.046 -0.251 -0.198 -0.073
Item27  0.009 -0.014 -0.121 -0.054 -0.079  0.003 -0.239 -0.060
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item12 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                          + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                          + (1 + `Stu1ent I1`|`Item12`), data = df2)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  unable to evaluate scaled gradient
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
   Hessian is numerically singular: parameters are not uniquely determined
> summary(lmerdf2naoc1item4)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item4)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item4    (Intercept)  5.258e-01 7.251e-01
          `Stu1ent I1` 3.377e-19 5.811e-10 1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item4, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.7324   0.841
Item4         1.4145     1.0392   1.361
Item12        1.0919     0.1811   6.028
Item14        1.1549     0.1662   6.950
Item16        1.3674     0.1664   8.216
Item18        0.9573     0.1733   5.524
Item23        1.6135     0.2056   7.847
Item26        1.5559     0.1649   9.433
Item27        1.2168     0.2345   5.188

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.693
Item12 -0.006 -0.035
Item14 -0.043 -0.032 -0.055
Item16 -0.035 -0.005 -0.086 -0.089
Item18 -0.009  0.000 -0.067 -0.330 -0.172
Item23  0.012 -0.018 -0.168 -0.098 -0.162 -0.094
Item26 -0.023 -0.010 -0.099 -0.046 -0.251 -0.198 -0.073
Item27  0.009 -0.014 -0.121 -0.054 -0.079  0.003 -0.239 -0.060
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item14 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                            + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                            + (1 + `Stu1ent I1`|`Item14`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item14)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item14)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item14   (Intercept)  6.916e-01 8.316e-01
          `Stu1ent I1` 2.339e-19 4.836e-10 1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item14, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.8380   0.735
Item4         1.4145     0.1688   8.381
Item12        1.0919     0.1811   6.028
Item14        1.1549     1.1878   0.972
Item16        1.3674     0.1664   8.216
Item18        0.9573     0.1733   5.524
Item23        1.6135     0.2056   7.847
Item26        1.5559     0.1649   9.433
Item27        1.2168     0.2345   5.188

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.013
Item12 -0.005 -0.217
Item14 -0.700 -0.027 -0.008
Item16 -0.030 -0.032 -0.086 -0.012
Item18 -0.008  0.002 -0.067 -0.046 -0.172
Item23  0.010 -0.109 -0.168 -0.014 -0.162 -0.094
Item26 -0.020 -0.064 -0.099 -0.006 -0.251 -0.198 -0.073
Item27  0.008 -0.087 -0.121 -0.008 -0.079  0.003 -0.239 -0.060
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item16 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                            + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                            + (1 + `Stu1ent I1`|`Item16`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item16)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item16)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item16   (Intercept)  6.916e-01 8.316e-01
          `Stu1ent I1` 1.492e-20 1.221e-10 -1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item16, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.8380   0.735
Item4         1.4145     0.1688   8.381
Item12        1.0919     0.1811   6.028
Item14        1.1549     0.1662   6.950
Item16        1.3674     1.1878   1.151
Item18        0.9573     0.1733   5.524
Item23        1.6135     0.2056   7.847
Item26        1.5559     0.1649   9.433
Item27        1.2168     0.2345   5.188

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.013
Item12 -0.005 -0.217
Item14 -0.038 -0.194 -0.055
Item16 -0.699 -0.004 -0.012 -0.012
Item18 -0.008  0.002 -0.067 -0.330 -0.024
Item23  0.010 -0.109 -0.168 -0.098 -0.023 -0.094
Item26 -0.020 -0.064 -0.099 -0.046 -0.035 -0.198 -0.073
Item27  0.008 -0.087 -0.121 -0.054 -0.011  0.003 -0.239 -0.060
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item18 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                            + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                            + (1 + `Stu1ent I1`|`Item18`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item18)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item18)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item18   (Intercept)  6.916e-01 8.316e-01
          `Stu1ent I1` 1.901e-23 4.361e-12 -1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item18, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.8380   0.735
Item4         1.4145     0.1688   8.381
Item12        1.0919     0.1811   6.028
Item14        1.1549     0.1662   6.950
Item16        1.3674     0.1664   8.216
Item18        0.9573     1.1888   0.805
Item23        1.6135     0.2056   7.847
Item26        1.5559     0.1649   9.433
Item27        1.2168     0.2345   5.188

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.013
Item12 -0.005 -0.217
Item14 -0.038 -0.194 -0.055
Item16 -0.030 -0.032 -0.086 -0.089
Item18 -0.695  0.000 -0.010 -0.048 -0.025
Item23  0.010 -0.109 -0.168 -0.098 -0.162 -0.014
Item26 -0.020 -0.064 -0.099 -0.046 -0.251 -0.029 -0.073
Item27  0.008 -0.087 -0.121 -0.054 -0.079  0.000 -0.239 -0.060
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item23 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                            + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                            + (1 + `Stu1ent I1`|`Item23`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item23)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item23)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item23   (Intercept)  8.754e-01 9.356e-01
          `Stu1ent I1` 5.834e-19 7.638e-10 1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item23, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.9413   0.654
Item4         1.4145     0.1688   8.381
Item12        1.0919     0.1811   6.028
Item14        1.1549     0.1662   6.950
Item16        1.3674     0.1664   8.216
Item18        0.9573     0.1733   5.524
Item23        1.6135     1.3390   1.205
Item26        1.5559     0.1649   9.433
Item27        1.2168     0.2345   5.188

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.012
Item12 -0.005 -0.217
Item14 -0.034 -0.194 -0.055
Item16 -0.027 -0.032 -0.086 -0.089
Item18 -0.007  0.002 -0.067 -0.330 -0.172
Item23 -0.693 -0.017 -0.026 -0.015 -0.025 -0.014
Item26 -0.018 -0.064 -0.099 -0.046 -0.251 -0.198 -0.011
Item27  0.007 -0.087 -0.121 -0.054 -0.079  0.003 -0.037 -0.060
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item26 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                            + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                            + (1 + `Stu1ent I1`|`Item26`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item26)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item26)
   Data: df2

REML criterion at convergence: 400.3

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.52029 -0.78486  0.03531  0.48120  2.77147

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item26   (Intercept)  4.636e-02 0.2153106
          `Stu1ent I1` 4.104e-07 0.0006407 -1.00
 Residual              6.833e-01 0.8265971
Number of obs: 159, groups:  Item26, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.2680     0.5227   2.426
Item4         1.4064     0.1689   8.328
Item12        1.0829     0.1802   6.010
Item14        1.1702     0.1662   7.043
Item16        1.3738     0.1658   8.288
Item18        0.9559     0.1727   5.536
Item23        1.6262     0.2054   7.916
Item26        0.6229     0.8198   0.760
Item27        1.2155     0.2352   5.167

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.091
Item12 -0.039 -0.215
Item14  0.032 -0.204 -0.057
Item16 -0.003 -0.039 -0.087 -0.081
Item18 -0.042  0.010 -0.068 -0.334 -0.175
Item23  0.028 -0.099 -0.170 -0.101 -0.164 -0.087
Item26 -0.607 -0.039  0.015 -0.023 -0.045 -0.071 -0.099
Item27 -0.037 -0.070 -0.121 -0.065 -0.086  0.013 -0.223 -0.077
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc1item27 <- lmer(`SUM...13` ~ `Item4` + `Item12` + `Item14`
+                            + `Item16` +  `Item18` +  `Item23`  + `Item26`
+ `Item27`
+                            + (1 + `Stu1ent I1`|`Item27`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc1item27)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item4 + Item12 + Item14 + Item16 + Item18 + Item23 +
    Item26 + Item27 + (1 + `Stu1ent I1` | Item27)
   Data: df2

REML criterion at convergence: 400.9

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5355 -0.7406  0.0143  0.4618  2.8667

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item27   (Intercept)  6.916e-01 8.316e-01
          `Stu1ent I1` 3.478e-18 1.865e-09 -1.00
 Residual              6.916e-01 8.316e-01
Number of obs: 159, groups:  Item27, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6159     0.8380   0.735
Item4         1.4145     0.1688   8.381
Item12        1.0919     0.1811   6.028
Item14        1.1549     0.1662   6.950
Item16        1.3674     0.1664   8.216
Item18        0.9573     0.1733   5.524
Item23        1.6135     0.2056   7.847
Item26        1.5559     0.1649   9.433
Item27        1.2168     1.1993   1.015

Correlation of Fixed Effects:
       (Intr) Item4  Item12 Item14 Item16 Item18 Item23 Item26
Item4  -0.013
Item12 -0.005 -0.217
Item14 -0.038 -0.194 -0.055
Item16 -0.030 -0.032 -0.086 -0.089
Item18 -0.008  0.002 -0.067 -0.330 -0.172
Item23  0.010 -0.109 -0.168 -0.098 -0.162 -0.094
Item26 -0.020 -0.064 -0.099 -0.046 -0.251 -0.198 -0.073
Item27 -0.687 -0.017 -0.024 -0.011 -0.015  0.001 -0.047 -0.012
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> # exam 2  - narrative -  occurrence 2
> lmerdf2naoc2item1 <- lmer(`SUM...13` ~ `Item1` + `Item29` + `Item32`
+                           + (1 + `Stu1ent I1`|`Item1`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf1naoc2item1)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item1 + Item9...3 + Item33...4 + (1 + `Stu1ent I1` |
Item1)
   Data: df1

REML criterion at convergence: 688.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5277 -0.6265 -0.1548  0.7727  3.6171

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item1    (Intercept)  5.693e+00 2.386e+00
          `Stu1ent I1` 3.235e-18 1.799e-09 1.00
 Residual              4.498e+00 2.121e+00
Number of obs: 159, groups:  Item1, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   1.1021     2.4071   0.458
Item1         2.0324     3.3925   0.599
Item9...3     3.0005     0.3790   7.917
Item33...4    2.2262     0.3695   6.025

Correlation of Fixed Effects:
           (Intr) Item1  I9...3
Item1      -0.702
Item9...3  -0.059 -0.016
Item33...4 -0.041 -0.017 -0.333
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc2item29 <- lmer(`SUM...13` ~ `Item1` + `Item29` + `Item32`
+                            + (1 + `Stu1ent I1`|`Item29`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc2item29)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item1 + Item29 + Item32 + (1 + `Stu1ent I1` | Item29)
   Data: df2

REML criterion at convergence: 648.6

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.9074 -0.5708 -0.1416  0.7419  1.9083

Random effects:
 Groups   Name         Variance  Std.Dev. Corr
 Item29   (Intercept)  4.382e+00 2.093265
          `Stu1ent I1` 5.312e-06 0.002305 -1.00
 Residual              3.418e+00 1.848880
Number of obs: 159, groups:  Item29, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)  -0.1837     0.7698  -0.239
Item1         2.3351     0.3199   7.299
Item29        4.7125     1.1416   4.128
Item32        2.4550     0.3223   7.616

Correlation of Fixed Effects:
       (Intr) Item1  Item29
Item1  -0.235
Item29 -0.595 -0.056
Item32 -0.087 -0.212 -0.099
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2naoc2item32 <- lmer(`SUM...13` ~ `Item1` + `Item29` + `Item32`
+                            + (1 + `Stu1ent I1`|`Item32`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2naoc2item32)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...13 ~ Item1 + Item29 + Item32 + (1 + `Stu1ent I1` | Item32)
   Data: df2

REML criterion at convergence: 650.1

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.66274 -0.52930 -0.06809  0.62886  1.85980

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item32   (Intercept)  3.507e+00 1.873e+00
          `Stu1ent I1` 8.878e-19 9.422e-10 -1.00
 Residual              3.507e+00 1.873e+00
Number of obs: 159, groups:  Item32, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.6582     1.8878   0.349
Item1         2.3330     0.3211   7.265
Item29        2.5260     0.3316   7.618
Item32        2.4693     2.6684   0.925

Correlation of Fixed Effects:
       (Intr) Item1  Item29
Item1  -0.054
Item29 -0.030 -0.241
Item32 -0.701 -0.026 -0.034
optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
# exam 2  - expository -  occurrence 1
> summary(lmerdf2exoc1item5)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item11 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item5)
   Data: df2

REML criterion at convergence: 364

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.0958 -0.4750 -0.1054  0.5448  2.8855

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item5    (Intercept)  5.824e-01 7.632e-01
          `Student ID` 2.042e-20 1.429e-10 1.00
 Residual              5.824e-01 7.632e-01
Number of obs: 159, groups:  Item5, 3

Fixed effects:
            Estimate Std. Error t value
(Intercept)  0.25126    0.77025   0.326
Item51       1.54654    1.08947   1.420
Item5C       0.34791    1.21472   0.286
Item6        1.06038    0.16503   6.426
Item91       1.22171    0.16730   7.303
Item9C      -0.25126    0.77025  -0.326
Item111      1.48907    0.14354  10.374
Item11C      0.11873    0.95536   0.124
Item13       1.35884    0.20833   6.523
Item151      1.16018    0.17840   6.503
Item15E     -0.50858    0.79777  -0.638
Item191      0.91563    0.20725   4.418
Item19C     -0.08799    0.80299  -0.110
Item22       1.59584    0.16096   9.914

Correlation matrix not shown by default, as p = 14 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2exoc1item6 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                           + `Item11` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                           + (1 + `Student ID`|`Item6`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2exoc1item6)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item11 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item6)
   Data: df2

REML criterion at convergence: 364

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.0958 -0.4750 -0.1054  0.5448  2.8855

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item6    (Intercept)  5.824e-01 7.632e-01
          `Student ID` 3.919e-20 1.980e-10 1.00
 Residual              5.824e-01 7.632e-01
Number of obs: 159, groups:  Item6, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)  0.25126    0.77025   0.326
Item51       1.54654    0.14850  10.415
Item5C       0.34791    0.55736   0.624
Item6        1.06038    1.09185   0.971
Item91       1.22171    0.16730   7.303
Item9C      -0.25126    0.77025  -0.326
Item111      1.48907    0.14354  10.374
Item11C      0.11873    0.95536   0.124
Item13       1.35884    0.20833   6.523
Item151      1.16018    0.17840   6.503
Item15E     -0.50858    0.79777  -0.638
Item191      0.91563    0.20725   4.418
Item19C     -0.08799    0.80299  -0.110
Item22       1.59584    0.16096   9.914

Correlation matrix not shown by default, as p = 14 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2exoc1item9 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                           + `Item1` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                           + (1 + `Student ID`|`Item9`), data = df2)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge with max|grad| = 0.00502468 (tol = 0.002,
component 1)
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model is nearly unidentifiable: very large eigenvalue
 - Rescale variables?;Model is nearly unidentifiable: large eigenvalue
ratio
 - Rescale variables?
> summary(lmerdf2exoc1item9)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item1 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item9)
   Data: df2

REML criterion at convergence: 441.2

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.1538 -0.4929 -0.1036  0.6115  2.6362

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item9    (Intercept)  9.678e-01 0.9837728
          `Student ID` 3.236e-07 0.0005689 -0.29
 Residual              9.650e-01 0.9823543
Number of obs: 159, groups:  Item9, 3

Fixed effects:
            Estimate Std. Error t value
(Intercept) -0.01458    1.05084  -0.014
Item51       1.59409    0.19295   8.262
Item5C       0.10762    0.59170   0.182
Item6        1.10360    0.21455   5.144
Item91       1.53802    1.51188   1.017
Item9C      -0.42952    1.81892  -0.236
Item1        0.44410    0.18368   2.418
Item13       1.59249    0.26649   5.976
Item151      1.53392    0.22726   6.750
Item15E      0.29788    1.02601   0.290
Item191      1.04448    0.26698   3.912
Item19C      0.04946    1.03367   0.048
Item22       1.63407    0.20789   7.860

Correlation matrix not shown by default, as p = 13 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
Model failed to converge with max|grad| = 0.00502468 (tol = 0.002,
component 1)
Model is nearly unidentifiable: very large eigenvalue
 - Rescale variables?
Model is nearly unidentifiable: large eigenvalue ratio
 - Rescale variables?
```

```
> lmerdf2exoc1item11 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                            + `Item1` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                            + (1 + `Student ID`|`Item11`), data = df2)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge with max|grad| = 0.637328 (tol = 0.002,
component 1)
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model is nearly unidentifiable: very large eigenvalue
 - Rescale variables?;Model is nearly unidentifiable: large eigenvalue
ratio
 - Rescale variables?
> summary(lmerdf2exoc1item11)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item1 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item11)
   Data: df2

REML criterion at convergence: 369.4

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.0974 -0.5370 -0.2137  0.5782  3.0437

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item11   (Intercept)  4.986e-02 0.2232949
          `Student ID` 7.082e-07 0.0008416 -0.98
 Residual              5.669e-01 0.7529058
Number of obs: 159, groups:  Item11, 3

Fixed effects:
            Estimate Std. Error t value
(Intercept)  0.26956    0.45733   0.589
Item51       1.49391    0.14821  10.080
Item5C       0.30325    0.51185   0.592
Item6        0.99994    0.16496   6.062
Item91       1.16576    0.16720   6.972
Item9C      -0.45023    0.76890  -0.586
Item1        0.23690    0.14340   1.652
Item13       1.32018    0.20629   6.400
Item151      1.24104    0.17736   6.997
Item15E     -0.40516    0.78972  -0.513
Item191      0.94691    0.20468   4.626
Item19C     -0.09386    0.79230  -0.118
Item22       1.62632    0.15954  10.194

Correlation matrix not shown by default, as p = 13 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
Model failed to converge with max|grad| = 0.637328 (tol = 0.002, component
1)
Model is nearly unidentifiable: very large eigenvalue
 - Rescale variables?
Model is nearly unidentifiable: large eigenvalue ratio
 - Rescale variables?
```

```
> lmerdf2exoc1item13 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                            + `Item1` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                            + (1 + `Student ID`|`Item13`), data = df2)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  unable to evaluate scaled gradient
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
> summary(lmerdf2exoc1item13)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item1 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item13)
   Data: df2

REML criterion at convergence: 440.6

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.18822 -0.53495 -0.08401  0.59648  2.64266

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item13   (Intercept)  1.220e+00 1.1045578
          `Student ID` 5.742e-07 0.0007577 -0.96
 Residual              9.590e-01 0.9793008
Number of obs: 159, groups:  Item13, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)  0.32587    0.34431   0.946
Item51       1.57481    0.19299   8.160
Item5C       0.10451    0.58986   0.177
Item6        1.10418    0.21395   5.161
Item91       1.25991    0.21675   5.813
Item9C      -0.87620    0.99865  -0.877
Item1        0.46146    0.18362   2.513
Item13       1.66763    0.52054   3.204
Item151      1.55514    0.22765   6.831
Item15E      0.37458    1.02283   0.366
Item191      1.03120    0.26729   3.858
Item19C      0.05392    1.03037   0.052
Item22       1.64076    0.20724   7.917

Correlation matrix not shown by default, as p = 13 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
unable to evaluate scaled gradient
Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
```

```
> lmerdf2exoc1item15 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                            + `Item1` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                            + (1 + `Student ID`|`Item15`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2exoc1item15)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item1 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item15)
   Data: df2

REML criterion at convergence: 441

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.16643 -0.51466 -0.09343  0.60649  2.64193

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item15   (Intercept)  9.622e-01 0.9809199
          `Student ID` 4.329e-07 0.0006579 1.00
 Residual              9.626e-01 0.9811139
Number of obs: 159, groups:  Item15, 3

Fixed effects:
            Estimate Std. Error t value
(Intercept) -1.23606    1.43698  -0.860
Item51       1.58751    0.19267   8.240
Item5C       0.11146    0.59107   0.189
Item6        1.10327    0.21430   5.148
Item91       1.27059    0.21693   5.857
Item9C      -0.86040    1.00034  -0.860
Item1        0.45026    0.18352   2.453
Item13       1.59116    0.26616   5.978
Item151      2.83724    2.23473   1.270
Item15E      1.92770    2.59696   0.742
Item191      1.04390    0.26662   3.915
Item19C      0.06363    1.03239   0.062
Item22       1.63619    0.20763   7.880

Correlation matrix not shown by default, as p = 13 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2exoc1item19 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                            + `Item1` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                            + (1 + `Student ID`|`Item19`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2exoc1item19)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item1 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item19)
   Data: df2

REML criterion at convergence: 441.1

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.16410 -0.49759 -0.09373  0.60502  2.63697

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item19   (Intercept)  9.668e-01 0.9832450
          `Student ID` 3.601e-07 0.0006001 0.99
 Residual              9.645e-01 0.9821061
Number of obs: 159, groups:  Item19, 3

Fixed effects:
            Estimate Std. Error t value
(Intercept)  -0.9798     1.4142  -0.693
Item51        1.5873     0.1930   8.224
Item5C        0.1097     0.5916   0.185
Item6         1.1012     0.2145   5.133
Item91        1.2675     0.2171   5.838
Item9C       -0.8623     1.0014  -0.861
Item1         0.4504     0.1837   2.451
Item13        1.5827     0.2679   5.909
Item151       1.5344     0.2272   6.753
Item15E       0.3389     1.0252   0.331
Item191       1.9425     2.2335   0.870
Item19C       1.4564     2.5857   0.563
Item22        1.6423     0.2078   7.904

Correlation matrix not shown by default, as p = 13 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> lmerdf2exoc1item22 <- lmer(`SUM...28` ~ `Item5` + `Item6` + `Item9`
+                            + `Item1` +  `Item13` +  `Item15`  + `Item19`
+ `Item22`
+                            + (1 + `Student ID`|`Item22`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf2exoc1item22)
Linear mixed model fit by REML ['lmerMod']
Formula: SUM...28 ~ Item5 + Item6 + Item9 + Item1 + Item13 + Item15 +
    Item19 + Item22 + (1 + `Student ID` | Item22)
   Data: df2

REML criterion at convergence: 440

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.26264 -0.56834 -0.08053  0.59682  2.65018

Random effects:
 Groups   Name         Variance  Std.Dev.  Corr
 Item22   (Intercept)  7.038e-01 0.8389249
          `Student ID` 8.675e-07 0.0009314 -1.00
 Residual              9.526e-01 0.9760005
Number of obs: 159, groups:  Item22, 2

Fixed effects:
            Estimate Std. Error t value
(Intercept)  -0.1514     0.3623  -0.418
Item51        1.5799     0.1918   8.238
Item5C        0.1229     0.5882   0.209
Item6         1.0946     0.2133   5.133
Item91        1.2422     0.2167   5.733
Item9C       -0.8805     0.9952  -0.885
Item1         0.4634     0.1830   2.532
Item13        1.5662     0.2657   5.894
Item151       1.5413     0.2267   6.799
Item15E       0.4119     1.0201   0.404
Item191       1.0760     0.2653   4.057
Item19C       0.1035     1.0277   0.101
Item22        2.3073     0.5932   3.890

Correlation matrix not shown by default, as p = 13 > 12.
Use print(x, correlation=TRUE)  or
    vcov(x)        if you need it

optimizer (nloptwrap) convergence code: 0 (OK)
boundary (singular) fit: see help('isSingular')
```

```
> # exam 2  - expository -  occurrence 2
> lmerdf2exoc2item8 <- lmer(`SUM...28` ~ `Item8` + `Item31` + `Item33`
+                           + (1 + `Student ID`|`Item8`), data = df2)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  unable to evaluate scaled gradient
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge: degenerate  Hessian with 2 negative eigenvalues
> summary(lmerdf21exoc2item8)
Error in h(simpleError(msg, call)) :
  error in evaluating the argument 'object' in selecting a method for
function 'summary': object 'lmerdf21exoc2item8' not found
```

```
> lmerdf2exoc2item31 <- lmer(`SUM...28` ~ `Item8` + `Item31` + `Item33`
+                            + (1 + `Student ID`|`Item31`), data = df2)
boundary (singular) fit: see help('isSingular')
> summary(lmerdf21exoc2item31)
Error in h(simpleError(msg, call)) :
  error in evaluating the argument 'object' in selecting a method for
function 'summary': object 'lmerdf21exoc2item31' not found
```

```
> lmerdf2exoc2item33 <- lmer(`SUM...28` ~ `Item8` + `Item31` + `Item33`
+                            + (1 + `Student ID`|`Item33`), data = df2)
Warning messages:
1: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  unable to evaluate scaled gradient
2: In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge: degenerate  Hessian with 1 negative eigenvalues
> summary(lmerdf21exoc2item33)
Error in h(simpleError(msg, call)) :
  error in evaluating the argument 'object' in selecting a method for
function 'summary': object 'lmerdf21exoc2item33' not found
```