```
> model
    Path            Parameter StartValue
1   f1 <-> f1       <fixed>   1
2   f2 <-> f2       <fixed>   1
3   f1 <-> f2       phi12
4   f1 -> test1     111
5   f1 -> test2     121
6   f1 -> test3     131
7   f2 -> test4     141
8   f2 -> test5     151
9   f2 -> test6     161
10  test1 <-> test1 psi1
11  test2 <-> test2 psi2
12  test3 <-> test3 psi3
13  test4 <-> test4 psi4
14  test5 <-> test5 psi5
15  test6 <-> test6 psi6

Wald Test
Parameter Estimates
       Estimate    Std Error z value    Pr(>|z|)
phi12  0.5174477 0.1428618 3.6220168 2.923151e-04 f2 <--> f1
111    5.8405799 0.9961878 5.8629306 4.547684e-09 test1 <--- f1
121    5.8181612 0.9537258 6.1004546 1.057672e-09 test2 <--- f1
131    4.6619297 0.7813908 5.9661950 2.428500e-09 test3 <--- f1
142    5.2803944 0.6998085 7.5454845 4.506090e-14 test4 <--- f2
152    4.2002964 0.6219754 6.7531552 1.446640e-11 test5 <--- f2
162    3.7596012 0.6341158 5.9288877 3.049937e-09 test6 <--- f2
psi1  11.5237142 4.2639676 2.7025802 6.880359e-03 test1 <--> test1
psi2   9.1449650 3.8321808 2.3863605 1.701606e-02 test2 <--> test2
psi3   6.6817381 2.5977026 2.5721720 1.010627e-02 test3 <--> test3
psi4   0.7857837 1.2943966 0.6070656 5.438073e-01 test4 <--> test4
psi5   2.8806946 1.0939493 2.6332981 8.456010e-03 test5 <--> test5
psi6   5.1557270 1.4685341 3.5107983 4.467633e-04 test6 <--> test6

Model Chisquare =  9.805231   Df =  8 Pr(>Chisq) = 0.2789632
 RMSEA index =  0.08531798      < 0.06
 Bentler CFI =  0.9886952       > 0.90
 SRMR        =  0.05713602      < 0.10
 AIC         =  35.80523
 BIC         =  -17.92066

> model.r
    Path            Parameter StartValue
1   f1 <-> f1       <fixed>   1
2   f2 <-> f2       <fixed>   1
3   f1 <-> f2       <fixed>   0
4   f1 -> test1     111
5   f1 -> test2     121
6   f1 -> test3     131
7   f2 -> test4     142
8   f2 -> test5     152
```

```
9  f2 -> test6      162
10 test1 <-> test1 psi1
11 test2 <-> test2 psi2
12 test3 <-> test3 psi3
13 test4 <-> test4 psi4
14 test5 <-> test5 psi5
15 test6 <-> test6 psi6

Parameter Estimates
      Estimate  Std Error  z value   Pr(>|z|)
111   5.959319 1.0220812 5.830573 5.523740e-09 test1 <--- f1
121   5.790517 0.9948650 5.820404 5.870540e-09 test2 <--- f1
131   4.847564 0.7929993 6.112948 9.780727e-10 test3 <--- f1
142   5.272619 0.7287468 7.235186 4.648908e-13 test4 <--- f2
152   4.273652 0.6296759 6.787066 1.144368e-11 test5 <--- f2
162   3.843758 0.6507932 5.906267 3.499472e-09 test6 <--- f2
psi1 11.314482 4.3903401 2.577131 9.962416e-03 test1 <--> test1
psi2 10.786054 4.1629691 2.590952 9.571077e-03 test2 <--> test2
psi3  5.615109 2.6085506 2.152578 3.135186e-02 test3 <--> test3
psi4  1.532830 1.4165339 1.082099 2.792086e-01 test4 <--> test4
psi5  2.434826 1.0925535 2.228565 2.584288e-02 test5 <--> test5
psi6  5.053484 1.4916429 3.387864 7.043909e-04 test6 <--> test6

Model Chisquare =  17.35811    Df =  9 Pr(>Chisq) = 0.04339455
 RMSEA index =  0.1759431       < 0.06
 Bentler CFI =  0.946358        > 0.90
 SRMR        =  0.2664906       < 0.10
 AIC         =  41.35811
 BIC         =  -13.54777

> anova(sem1,sem2)
LR Test for Difference Between Models

      Model Df Model Chisq Df LR Chisq Pr(>Chisq)
sem1         8       9.6871
sem2         9      17.3581  1   7.6711   0.005611 **

> Cluster Analysis

groups

 x1  x2  x3  x4  x5  x6

  13  10   2   1   5   1
```
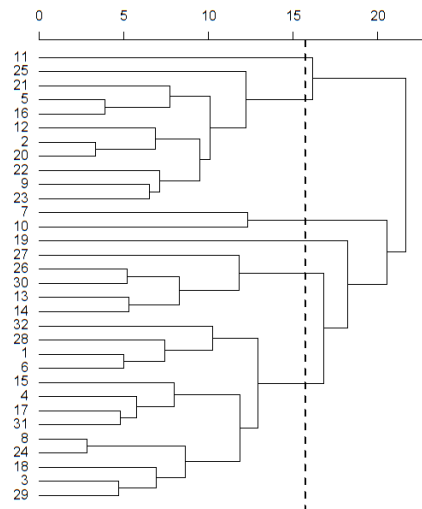
0   5   10   15   20

11
25
21
5
16
12
2
20
22
9
23
7
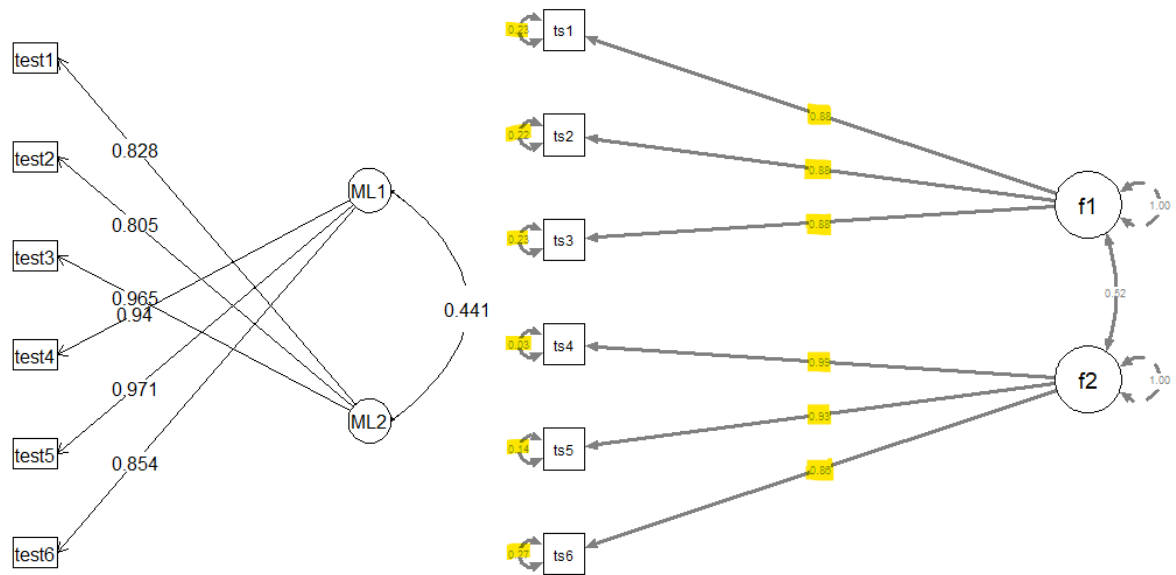10
19
27
26
30
13
14
32
28
1
6
15
4
17
31
8
24
18
3
29

➢ 6.1:
- (a):
  - The RMSEA has p-value of 0.085 which is greater than 0.06 which indicates we have a bad fit. The CFI has a p-value of 0.99 which is greater than 0.90 which indicates we have a good fit. The SRMR has a p-value of 0.057 which is less than 0.10 which indicates we have a good fit.
- (b):
  - $H_0 : \Psi_4 = 0$, $H_1 : \Psi_4 \neq 0$ at $\alpha = 0.05$
  - Since $z = 0.607$ with a p-value $= 0.543$, fail to reject H_0 at the 0.05 level. There is not evidence against the claim that the population error variances for the variable test4 and math ability is 0.
- (c):
  - Likelihood Ratio Test:
    - $H_0 : \Psi_4 = 0$, $H_1 : \Psi_4 \neq 0$ at $\alpha = 0.05$
    - Since $x^2_0(1) = 7.67$ with a p-value $= 0.0056$, reject H_0 at the 0.05 level. Thus, there is evidence against the claim that the population error for the variable test4 and math ability is 0.
  - Information Criteria:
    - The full model is the preferable model to the reduced model according to the AIC and BIC.
      - AIC($AIC_{reduced} = 41.35811 > AIC_{full} = 35.80523$)
      - BIC($BIC_{reduced} = -13.54777 > BIC_{Full} = -17.92066$)

➢ H.6.2:
- (a)

- (b):
  -