Exercise 1

Rules that ‘must’ be satisfied:

1. Linear relationship between each pair of items
2. item must have 5 or more categories OR frequency distributions must be similar
3. N must be equal or greater to 100
4. N must be equal or greater than 5 times the number of items
5. Correlations between most of items > 0.3
6. Bartlett’s sphericity test must be significant ($p<0.05$)
7. KMO index must be greater than 0.6

I.
1. Linear relationship
2. 5 categories
3. 400 > 100
4. 400 > 5x30
5. Most correlations > 0.3
6. p-value Bartlett < 0.05
7. KMO > 0.6

Thus factor analysis is possible

II.
1. Linear relationship
2. 5 categories
3. 600 > 100
4. 600 > 5x5
5. 2 correlations > 0.3 → too few
6. p-value Bartlett < 0.05
7. KMO < 0.6 → too small

Thus factor analysis cannot be done

III. 1. Linear relationship with 2 categories is not possible

2. 2 categories → too few. Frequency distributions also differ.

3. 500 > 100

4. 500 > 5x10

5. Most correlations > 0.3

6. p-value Bartlett < 0.05

7. KMO > 0.6

Thus factor analysis cannot be done

IV. 1. Linear relationship

2. 5 categories

3. 105 > 100

4. 105 > 5x20 (4 scales with 20 items each)

5. Most correlations > 0.3

6. p-value Bartlett < 0.05

7. KMO > 0.6

Thus factor analysis is possible

V. 1. Linear relationship

2. 3, 4 of 5 categories, frequency distributions similar.

3. 105 > 100

4. 105 > 5x18

5. most correlations > 0.3

6. p-value Bartlett < 0.05

7. KMO > 0.6

Thus factor analysis is possible

Exercise 2.

Exercise 3.

Statement I is correct. In factor analysis factors are latent variables, and in the PCA components are manifest variables.

Statement II is correct. The goal is to reproduce the correlations between variables as good as possible and to explain as much variance as possible.

→ a

Exercise 11.

With the simple structure each item loads only on 1 factor.

Situation I: all items load equally high on both factors.

Situation II: item 2 doesn’t load on any factor.

Situation II: each item loads on only 1 factor so this solution meets criteria of simple structure.

Situation IV: all items load equally high (in absolute values) on both factors.

→ c

Exercise 14.

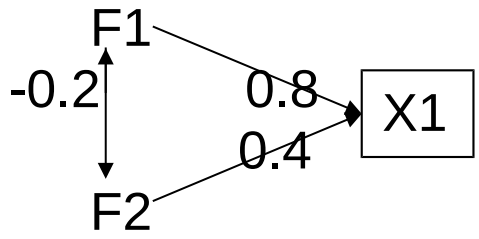
Statement I is correct. Factors can only be interpreted after rotation.

Statement II is false. This is true with varimax rotation, but not with oblimin. With oblimin rotation correlations are presented in the structure matrix and the component loads in the pattern matrix.

→ b

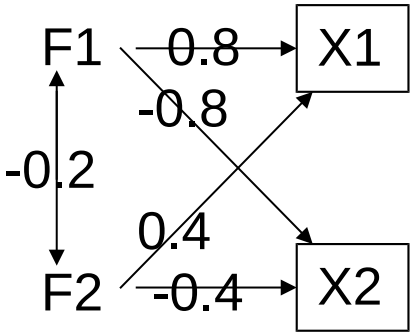
Exercise 16.

Statement I is correct:
This is oblique rotation. Following paths are present here:



0.8 + -0.2 x 0.4 = 0.8 – 0.08 = 0.72

Statement II is correct: Following paths are present here:



0.8 x -0.8 = -0.64
0.4 x -0.4 = -0.16
0.8 x -0.2 x -0.4 = 0.064
0.4 x -0.2 x -0.8 = 0.064

-0.64 – 0.16 + 0.064 + 0.064 = -0.672 > -0.8

→ a

Exercise 6.

Statement I is false. In factor analysis factors are latent variables, and in the PCA components are manifest variables.

Statement II is false. Factors in PFA explain only common variance. Factors in PCA explain both common and unique variance.

→ d

Exercise 10.

When you look at the scree plot there can be 3 (or maybe 4) selected factors. Look also at the Kaiser's criterion and will see 3 factors that you can select. There are 3 clear eigenvalues> 1.

→ b

Exercise 13.

All statements are correct. One component is the best summary of all variables / items. A component is a linear combination which explains most variance in the items and that best reproduces correlations between the items / variables.

→ d

Exercise 14.

Statement I is false: rotation does not change reproduced correlations.

Statement II is correct: the total variance of all items explained by 1 factor states changes, BUT

the total variance of all items explained by all factors do not change.

→ c

Exercise 5.

Statement I is correct: as factor loadings change, correlations change too.

Statement II is correct: the variance of 1 item by 1 factor states change, the total variance of all items explained by all factors do not change.

→ a

Exercise 6.

Statement I is false: PCA can also be oblique.

Statement II is also false: Only in PCA component are explaining both common and unique variance. In PFA factors are explaining only common variance between variables.

→ d