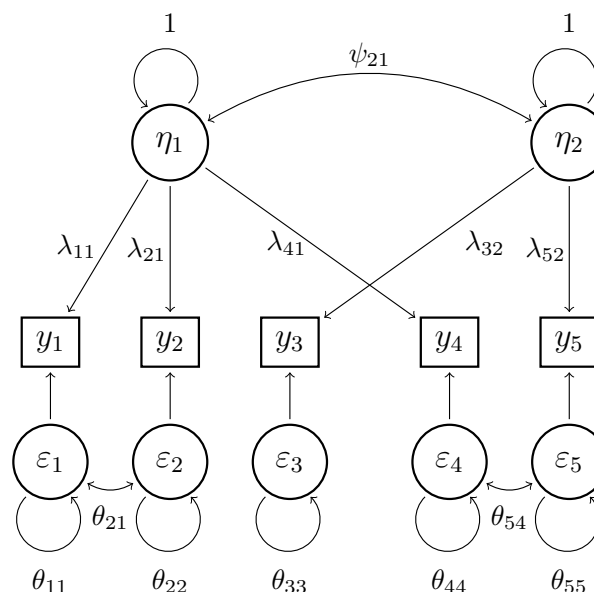


Instructions: please complete each problem below and submit your completed exam in Canvas using one of two file formats: either (1) write your solutions on paper and scan to a PDF, or (2) embed photos of your solutions in a Word/OpenOffice document. On either method, please show (or describe) as much work as possible. Report your final answers rounded to 2 decimal places.

1. A researcher found a two-factor model to account for the correlations among scores on five scale items. The factor loadings are as follows:

	Factor Loadings	
	1	2
Item 1	.591	.642
Item 2	.441	.321
Item 3	.023	.783
Item 4	.871	.225
Item 5	.234	.893

- (a) Based on the factor loadings, what is the estimated correlation between the scores on Items 1 and 3?
 - (b) Based on the factor loadings, what is the estimated correlation between the scores on Items 2 and 5?
 - (c) Compute the common and unique variance for each item.
 - (d) One of the items has a relatively high unique variance. Which item is it, and what does this mean about that item compared to the rest of the items in the scale?
2. Consider the following path model:



3. For the following three problems, you'll need to download the `exam3data.csv` file from Canvas and open it in JASP.
- (a) Compute a correlation matrix for the 8 items and report the correlations between the following two pairs of items: Items 4 and 6, and Items 2 and 7.
 - (b) Perform an exploratory factor analysis using the initial JASP defaults (Number of factors = parallel analysis, Rotation = Oblique/promax, highlighted loadings > 0.4). How many factors do you end up with? Which items load on which factors?
 - (c) Compute the common variance and unique variance for Item 1. Explain what these numbers mean.
 - (d) Compute the model estimated correlations between Items 4 and 6 and Items 2 and 7. How do these estimated correlations compare with the actual correlations you obtained in (a) above?
 - (e) What is the correlation between the factors?
4. This problem is a continuation of Problem 3 above:
- (a) Draw a path model based on the factor structure you extracted in Problem 3. You should have 2 factors and no cross-loadings.
 - (b) Perform a confirmatory factor analysis for this model in JASP. Write down your estimates for (1) the factor loadings, (2) the factor covariances, and (3) the residual variances.
 - (c) Report and interpret two measures of model fit to assess how well your model explains the observed data: (1) the χ^2 test, and (2) the RMSEA.
5. This problem is a continuation of Problem 4 above:
- (a) Using the SEM module in JASP, enter the model you confirmed in Problem 4. Compute modification indices and list the top 5 modifications (along with their MI values) that could be performed.
 - (b) Choose ONE modification and build a new model (Model 2) incorporating that modification. Draw a path model for Model 2, and write down the BIC values for both models (Model 1 and Model 2)?
 - (c) Does Model 2 fit better than Model 1? If so, by how much? Compute and interpret a Bayes factor to express this relative model fit.