1. RAM (the kind of model we are using), is implemented with Symmetric (S), Asymmetric (A), means (M) and a filter (F) matrix

2. Build our old friend m1: the model of mpg from `?umxRAM`

3. Type: `m1@matrices$S`

   - What is this for?
   - What do you see (~5 things to note)?

   - Which cells (paths) in `S` are free for our model?

4. Type: `m1@matrices$A`
   - What do you see?
   - Which cells (paths) in `A` are free for our model?

5. Look up the help for `?mxConstraint`
6. Run the example model: What is it doing?
7. We haven't covered it yet, but look up `?mxAlgebra`
   - Why might you need an algebra in a model?

8. Look up the help for `?mxCheckIdentification`
9. Run the example model
   - What was the effect of setting the latent variable's variance (model2n)?
   - What happens if you run the model
10. Use path tracing rules
    - What is the effect of a two-path connection .5 and .3?
    - Draw a model a bit like the one for reading on the poster on the wall, but simpler :-)
    - put estimated values on it.
    - Use the path tracing rules to show the total influence of a latent variable in your model on a particular manifest
    - https://en.wikipedia.org/wiki/Path_analysis_(statistics)#Path_tracing_rules
11. Run the example in `?umxMI` (umx's modification indices function)
    - The output shows paths that would appear to lead to a better fit.
    - In this case, none are very important, but try adding one of them to a copy of this model, and compare the fit

- *note*: This is COMPLETELY POST HOC
12. Read the warnings in ?mxMI
    - Explain to your lab mates why modification indices risk unreplicable models
    - Can you think of a situtation where they might be of value?
    - How would you test a modified model?
13. Note: MI is a very limited, automated method which looks at evidence for paths given the model. It can't invent new (potentially MUCH better) models and suggest those. That is what AI tries to do.

Extra credit

1. Run the 1-factor model (first model in examples in ?umx)
2. What does m1$F show you?
    - Hint "F" stands for filter

3. Build a twin model to practice for next week
    - ?umxACE

Refs

1. [David Kenny page](http://davidakenny.net/cm/fit.htm)
    - http://davidakenny.net/cm/fit.htm
2. [umx home page](http://tbates.github.io)
    - http://tbates.github.io
3. [OpenMx home page](http://openmx.ssri.psu.edu)
    - http://openmx.ssri.psu.edu