TMB exercises

Please work through the exercises that match your skill level. Everyone should have an invitation to a new [TMBforum](https://github.com/orgs/NOAA-FIMS/teams/tmbforum) under FIMS-NOAA/teams. Please use the forum to post questions or start discussions related to the exercises.

1. Beginners:
   1. Read through the [Welcome to the TMB WIki](https://github.com/kaskr/adcomp/wiki).
   2. If needed, install TMB following [download and install](https://github.com/kaskr/adcomp/wiki/Download) instructions
      1. If on Windows, be sure to also install [Rtools](https://cran.r-project.org/bin/windows/Rtools/rtools40.html) and follow the instructions for putting Rtools on the path
      2. Run the example suite to be sure TMB and Rtools are set up correctly
   3. If using RStudio, run TMB:::setupRstudio() for a useful debugging console
   4. See [Code–snippets](https://github.com/kaskr/adcomp/wiki/Code--snippets) and [FAQ](https://github.com/kaskr/adcomp/wiki/FAQ) for useful tips and tricks
   5. **Work through the** [**TMB Tutorial**](https://github.com/kaskr/adcomp/wiki/Tutorial)
   6. For background, see the [TMB book](http://kaskr.github.io/adcomp/_book/Introduction.html)
   7. Watch [TMB Multivariate normal tutorial](https://www.youtube.com/watch?v=M8dR3mvZ5vc&t=177s)
2. Intermediate users:
3. Assignment: Write a randomwalk model
   * 1. Model details:

Use parameters:

* + 1. Simulate data using an R script
    2. Optimize TMB model
  1. Add TMB functionalities to the model
     1. [SIMULATE](https://kaskr.github.io/adcomp/_book/Simulation.html)
     2. [DATA\_INDICATOR\_VECTOR](https://kaskr.github.io/adcomp/_book/Validation.html)
        1. Call TMB::oneStepPredict() from R to validate model
  2. Review the [SEPARABLE](https://kaskr.github.io/adcomp/_book/Densities.html#separable-construction-of-covariance-precision-matrices) function and its implementation in the [ar1xar1](https://github.com/kaskr/adcomp/blob/master/TMB/inst/examples/ar1xar1.cpp) TMB example

1. Advanced users:
   1. Review modular examples found [here](https://andrea-havron-noaa.github.io/FIMS-software/docs/logisticGrowth.html), [here](https://andrea-havron-noaa.github.io/FIMS-software/docs/ar1xar1.html), and [here](https://github.com/NOAA-FIMS/ModularTMBExample)