ESS 524
Introduction to Heat and Mass Flow Modeling in Earth Sciences

## Matlab Refresher Problems

## 1. Rock ages

An Earth Science grad student, working with a Professor from Oz, collected 5 rocks that had been dropped by a retreating glacier. Using cosmogenic exposure-age dating, she plans to determine a retreat history of the glacier.
She finds that the average exposure age of all 5 rocks is 30.8 kyr .
Rock 1 has been exposed longer than rock 2, by $1 / 10$ of the exposure age rock 4 .
Rock 2 has been exposed longer than rock 3 , by $1 / 4$ of the exposure age of rock 3 .
The average exposure age of rocks 1 and 4 is 18.5 kyr .
The exposure age of rock 2 is only $1 / 6$ that of rock 5 .

- Derive 5 linear equations relating the 5 exposure ages, using the information above.
- Explain in prose how your the equations are related to your known information.
- Write a Matlab script that sets up a matrix equation using your 5 equations, and then solves the system of equations to find the exposure ages of the 5 rocks.
- Thoroughly document every line of your Matlab code, explaining what all the variables and coefficients are, and explaining what every calculation is doing.

BONUS CHALLENGE (no points though).

- Can you suggest an explanation about rock 5?


## 2. Plotting stuff

- Without using "for loops", generate a $10 \times 15$ matrix ( 10 rows and 15 columns) called $\mathbf{M}$. The entry in row $i$ and column $j$ is the square root of $i \times j$.
- Treating the matrix as a map, and the entries as elevations at those points on the map make a contour plot of the contents of matrix $\mathbf{M}$, and add a colorbar so that a viewer can figure out the heights of your contour lines.
- Thoroughly document every line of your Matlab code, explaining what all the variables are, and explaining what every calculation is doing.

