Reduction of magnetics data.

1) This year's data are in the 'mag2025.mat' file. It is a binary file and cannot be cut and pasted. Load the .mat file into matlab. You will find that it loads three variables, x25, y25, m25. The latter is the magnetics data and the former are the x and y coordinates.

2) Have fun with the data by executing

```
figure;
caxis([45500 45800]);
surface(x25,y25,m25);
shading('interp');
axis equal; axis tight;
colorbar; rotate3d
```

and grabbing the figure with the mouse to rotate it.

3) Plot up (y25, m25(:, 29)) to see a South to North profile at around the -23 meter easting. Note that there are two anomalies. The second (northern) is the one we are interested in (the mystery object). The other one is probably a rock (how can you tell?).

4) Use the dipole code posted on the web page to fit the anomaly that occurs around the -23 m mark. Use the magnetic field inclination for San Diego (see assignment 4). You will have to tweak the background intensity to match that of your data. You will also have to adjust the dipole moment and depth of the anomaly-causing object, as well as the zero meter point, to overlay your model on the data. Note that because the object is not a perfect sphere, and the background field to the north is going down, you won't be able to fit both the positive and negative lobes. Concentrate on the positive lobe. (Although you can fit the negative lobe by making the inclination shallower than it really is – this is because the mystery object is not a perfect sphere, and the shape is distorting the field a bit.)

5) How deep is the body creating the anomaly (the magnetometer head is 1.0 m above the beach)? How accurate do you think your estimate is?

6) Reversing the calculation in the assignment, if the body is steel with a susceptibility of 10, how big is it?

7) Write up your work as a report (see the introductory material).

8) If you're looking for extra fun and credit, you could look at data from previous years. Notice how the background field changes, and how the anomaly gets bigger or smaller as the beach sand thickness changes. You should be able to fit previous years data using the same dipole moment as 2024, but at different depths. Here are the profile indexes to pull out the anomaly:

2007	13	2019	13
2008	19	2022	2
2010	14	2024	6
2012	9	2025	29
2013	21		
2015	28		
2016	12		
2017	13		
2018	10		