



3.2 Calculations

Procedure:

- After all the columns have been filled out with the appropriate information (what you can fill in without calculating), copy the data and the headings and paste them into a new worksheet called "Processing"
- In **Calculated Height** input the equation:
 - =ROUND((Distance*TAN(RADIANS(Angle)))+elev(m),1), where **elev** is your height above sea level
 - This will give you the height of the bird calculated from your angle and estimated distance (Fig.1)

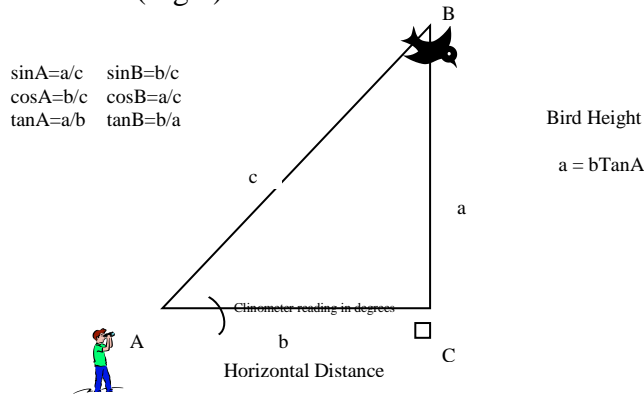


Figure 1. Field Observation Trigonometry

- If the angle is negative, which will occur when the bird is below the height of your location, the equation will need to be changed manually to:
 - =ROUND((Elev (m)-(Distance*TAN(RADIANS(Angle*-1))))),1)
 - You can find the negative values by going into the Data tab in excel and clicking the Funnel shaped filter icon (Fig.2)

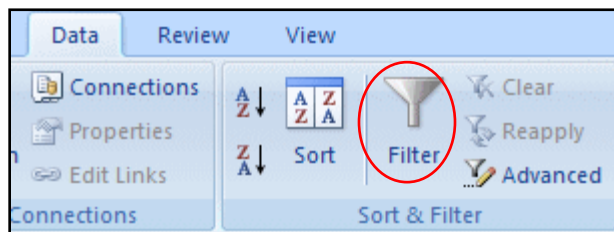


Figure 2. Microsoft Excel Filter icon

- This will show drop down menus on all the column headings
- Click on the one for **Angle** and select "Number Filters" and then "Less Than..." and type in 0 (Fig. 3)

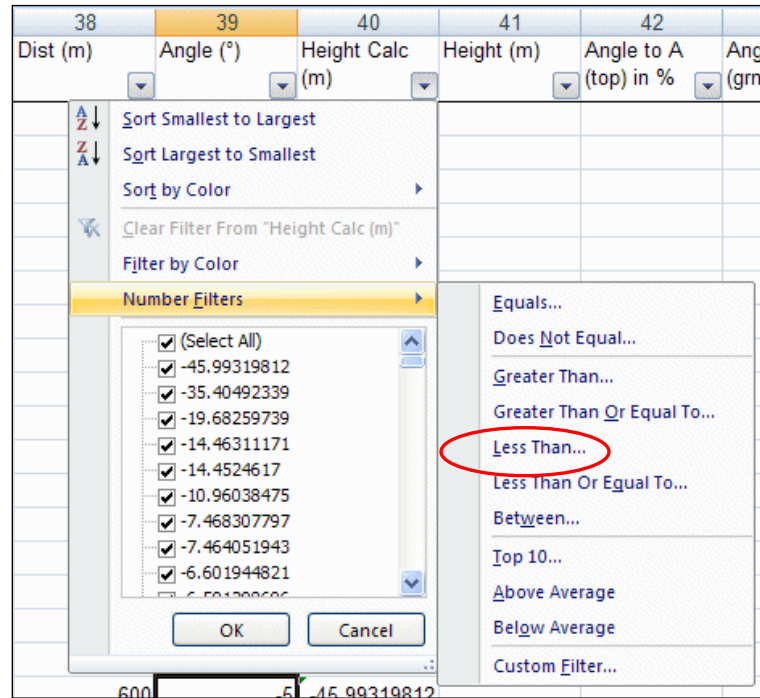


Figure 3. Excel Sort and Filter functions

3. **If you are calculating height in meters above ground:**
 - d. Add a new Column reading “Height above ground (m)”
 - e. Go back to your spatial map of the area that was divided into pie slices reading how high each section was above or below sea level
 - f. Using bearing and distance observations, locate the pie slice in which the bird was flying over
 - g. In Excel, in “Height above ground (m)” enter the equation:
 - iii. **=(Calculated Height of Bird (m)) - (Pie Section Height above sea level (m))**
 - h. Replace the **Height (m)** with **Height (m) above ground** in all equations
4. **Delta X** and **Delta Y** refer to the UTM Northings and Eastings of each point in the flight path the bird *from the observer’s location*
 - a. GIS uses these to place the bird on the map
 - b. These values are calculated using the following equations:
 - iv. $X = \text{ROUND}((\text{UTME} + \text{Distance} * \text{SIN}(\text{RADIANS}(\text{Bearing}))), 1)$
 - v. $Y = \text{ROUND}((\text{UTMN} + \text{Distance} * \text{COS}(\text{RADIANS}(\text{Bearing}))), 1)$
5. Finally, rename all the headings so that they are eight characters or less using only letters (eg: For Target bearing use something like “TRGTBRNG” not “targ_brng”)
6. Copy the GIS headers into a new worksheet
7. Copy your observations and paste just the values into the new worksheet with the GIS headers (Copy>Paste Special>Paste Values)
8. Copy the entire worksheet into a new document and save it in .csv format in the correct directory to be imported into GIS.