

Regression of Distance vs. Acceleration Due to Gravity

Is there gravity in space? How much? How much acceleration due to gravity do artificial satellites experience? What is the true relationship between distance and acceleration due to gravity? If there is gravity in space why do astronauts on the ISS float?

In a group of two (or three), you will need to calculate the acceleration due to gravity for each of the artificial satellites listed in the table below. Use the internet to find the mass and average distance (between apogee and perigee) of each of these satellites is from Earth. Calculate the force of gravity between Earth and each of these randomly selected satellites as well as their acceleration due to gravity around the Earth. Then compute their acceleration due to gravity as a percentage of 'g', the acceleration due to gravity on Earth. Once you have gathered all the data, create a graph to see if there is a relationship between distance and their acceleration due to gravity. Discuss the shape of this graph and if the data seems like it may be linear use technology to find the least squares regression line and residual plot. BTW, pick two satellites of your own to put in the last two rows.

Satellite	Mass (Kg)	Average Distance from Earth (Km)	$F_g(N)$	Accel. due to Gravity (m/s^2)	Percent of 'g'
ISS					
MIR					
Hubble Telescope					
Skylab					
Sputnik					
Salyut 2					
Salyut 5					
Terra					

Again, If the data seems like it may be linear, run a linear regression test. Compute and interpret a 95% confidence interval about the slope.

Next, add Galaxy 15 and the Moon to your list. Graph your data again. Does the data look linear? If not, linearize it. Use technology to find the LSRL and residual plot. If the data seems linear, run a linear regression test and compute and interpret a 95% confidence interval.

Answer the questions posed at the top of the sheet; Is there gravity in space? How much acceleration due to gravity does the ISS experience? If there is gravity in space why do astronauts on the ISS float?

Here is some information that you may need:

Mass of the Earth = 5.974×10^{24} kg

radius of the Earth = 6,371 km

$G = 6.674 \times 10^{-11}$ $N(m^2/kg^2)$

Format this as you would a research paper, start with a cover page. Be sure all tables and graphs are labeled, titled and anchored. All graphs need their axes appropriately labeled with units. Include formulas, define variables, and include one sample calculation. Also include a works cited page.