

Calculating Gravitational Pull

Name _____

Date _____

The distance between the Earth and the Moon is 384,403 or 3.8×10^5 km. The Earth has a mass of 5.97×10^{24} kg and the moon has a mass of 7.35×10^{22} kg. We are going to compare the gravitational attraction between the two objects at the actual distance, two times the distance, three times the distance, etc.

$$F = G \frac{m_1 m_2}{d^2}$$

G is a constant and is equal to $6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2$

Factor of distance between Earth and Moon	Actual Distance (in km)	Actual Distance in scientific notation (in km)	$F = G \frac{m_1 m_2}{d^2}$ (N)	Force (N) in 10^{24}
2	768,806	0.8×10^6		
3	1,153,209	1.2×10^6		
4				
5				
6				
7				
8				
9				
10				

Graph the distance between Earth and Moon (km) on the x-axis, and the Force (N) on the y-axis.

Application and Analysis Questions

1. Explain the graph in terms of distance and force.
2. Looking at your graph, if the Force = 120×10^{24} N, what is the distance between the Earth and the Moon?
3. Re-write the equation for Gravitational Force to solve for distance (d). Show your work.
4. Use that equation to calculate d for $F=120 \times 10^{24}$ N. SHOW YOUR WORK.
5. How accurate is your graph compared to your calculation? Calculate your % error using the equation below.

$$\frac{\text{Calculated distance} - \text{Graph's distance}}{\text{Calculated distance}} \times 100 = \% \text{ error.}$$

Gravitational Pull Homework

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Write a paragraph or two explaining the relationship between distance and gravitational pull. Be sure to include the following information in your explanation:

- 1- What type of relationship is it?
 - a. Linear
 - b. Inverse power model
 - c. Parabolic
- 2- Describe the rate of change in the graph for the relationship you chose.
- 3- How does this graph compare to the graph of distance vs. light intensity?