

Comprehensive Worksheet – Unit 3: Force

Worksheet: Gravity I

It will be necessary that you utilize the data from “Gravity Stats” for you calculations.

- Find the force of attraction between the Moon and the Earth.
- Find the force of attraction between the Sun and the Moon.
- If the Moon was positioned collinearly between the Sun and Earth, what would be the net force on the Moon? (Note: Given distances are from the center of mass, do not worry about a body's radius for this problem.)
- There are two masses initially 1.00 m apart. Mass 1 is 1.50×10^6 kg. Mass 2 is 1.00×10^6 kg. Create a data table and graph for the following situations:
 - Force vs Mass
Mass 2 increases from 1.00×10^6 kg to 2.00×10^6 kg, 3.00×10^6 kg, 4.00×10^6 kg, and 5.00×10^6 kg.
 - Force vs distance
Distance increase from 1 m to 2 m to 3 m to 4 m to 5 m apart.
- Using the Earth's radius and mass, find the acceleration due to gravity of a mass (m) at the Earth's surface. Remember, $F_g = mg$.
- Explain what part of your calculations in question # 5 demonstrates that all objects accelerate towards the earth with the same acceleration.

Gravity Stats

Gravitational Constant	G	$6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2$
Mass of the Earth	M_e	$5.98 \times 10^{24} \text{ kg}$
Mass of the Moon	M_m	$7.35 \times 10^{22} \text{ kg}$
Mass of the Sun	M_s	$1.99 \times 10^{30} \text{ kg}$
Radius of the Earth	R_e	$6.38 \times 10^6 \text{ m}$
Radius of the Moon	R_m	$1.74 \times 10^6 \text{ m}$
Radius of the Sun	R_s	$6.96 \times 10^8 \text{ m}$
Earth to Sun Distance		$1.49 \times 10^{11} \text{ m}$
Earth to Moon Distance		$3.84 \times 10^8 \text{ m}$
Sun to Moon Distance		$1.50 \times 10^{11} \text{ m}$

Worksheet: Problems with Weight...

- A high school student has a mass of 60 kg. What will be the student's:
 - weight on Earth?
 - weight on the moon, where the acceleration due to gravity is 1.62 m/s^2 (~1/6 that of the earth's)?
- An object that weighs 10 Newtons on the earth's surface weighs only 9.98 Newtons on top of a very high mountain. What is the acceleration due to gravity atop this very high mountain?
- An astronaut weighs 750 Newtons on the earth. What is the astronaut's mass?
- A newspaper reporter traveling on board a space ship weighs 82 Newtons in a region where the earth's gravitational force is 1.1 m/s^2 . What is the mass of the newspaper reporter?
- How much does a person weigh on the earth if they weigh 60 Newtons at an altitude where the acceleration due to gravity is 1.2 m/s^2 ?
- Joe has a weight of 850 N on Earth. What is his weight where g is 11.2 m/s^2 ?
- Susan has a weight of 350 N on Planet Z and a weight of 500 N on Earth. What is g on Planet Z?