

## Gravity and the Inverse Square Law

**Gravity** is a great real life application of the [inverse \(indirect\) square law](#), or, "y is inversely proportional to the square of x". The gravity field of a body (comet, planet, star etc) is inversely proportional to the distance from the centre of the body squared. As an equation this is:

$$g \propto \frac{1}{r^2} \quad \Rightarrow \quad g = \frac{k}{r^2}$$

Where:

$g$  = gravity field of a body (acceleration due to gravity in  $\text{ms}^{-2}$ )

$r$  = distance from centre of the body (in m)

### Task 1

For each of the bodies listed below, use the figures for surface gravity and radius to find equations for their gravity fields. (Expect large  $k$  values!):

| Planet                               | Mercury | Venus | Earth | Mars  | Jupiter | Saturn | Uranus | Neptune | Pluto* |
|--------------------------------------|---------|-------|-------|-------|---------|--------|--------|---------|--------|
| Surface Gravity ( $\text{ms}^{-2}$ ) | 3.7     | 8.87  | 9.81  | 3.69  | 24.79   | 3.69   | 8.69   | 11.15   | 0.81   |
| Radius (1000m)                       | 2,439   | 6,051 | 6,378 | 3,396 | 71,492  | 60,268 | 25,550 | 24,764  | 1,151  |

\*Pluto is no longer called a planet but rather a "[dwarf planet](#)". Nevertheless it is still a body with a gravity field that obeys the inverse square law.

You could also try this for the Moon (surface gravity= $1.622\text{ms}^{-2}$ , radius= $1,738,140\text{m}$ ) or the Sun (surface gravity= $274\text{ms}^{-2}$ , radius= $6.955 \times 10^8\text{m}$ ).

### Task 2 - The constant k.

In each of your equations the constant  $k$  actually represents the mass ( $m$ ) of each planet multiplied by the [gravitational constant](#) ( $G$ ), as discovered by [Sir Isaac Newton](#). As an equation this is:

$$k = Gm \quad \text{and hence} \quad g = \frac{Gm}{r^2}$$

The gravitational constant is a very small number measured in Newtons or  $\text{kgms}^{-2}$ :

$$G = 6.674 \times 10^{-11}$$

# Gravity Inverse Square Law Problems Answer Key

**C Cleary**



## **Gravity Inverse Square Law Problems Answer Key:**

## Adopting the Tune of Term: An Mental Symphony within **Gravity Inverse Square Law Problems Answer Key**

In some sort of taken by displays and the ceaseless chatter of instant interaction, the melodic elegance and emotional symphony created by the written word often fade into the back ground, eclipsed by the persistent sound and disruptions that permeate our lives. But, located within the pages of **Gravity Inverse Square Law Problems Answer Key** a marvelous fictional prize full of natural feelings, lies an immersive symphony waiting to be embraced. Constructed by an outstanding composer of language, that interesting masterpiece conducts viewers on an emotional trip, skillfully unraveling the concealed melodies and profound affect resonating within each carefully crafted phrase. Within the depths of this touching examination, we can explore the book is central harmonies, analyze their enthralling publishing type, and surrender ourselves to the profound resonance that echoes in the depths of readers souls.

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## **Table of Contents Gravity Inverse Square Law Problems Answer Key**

1. Understanding the eBook Gravity Inverse Square Law Problems Answer Key
  - The Rise of Digital Reading Gravity Inverse Square Law Problems Answer Key
  - Advantages of eBooks Over Traditional Books
2. Identifying Gravity Inverse Square Law Problems Answer Key
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Gravity Inverse Square Law Problems Answer Key
  - User-Friendly Interface
4. Exploring eBook Recommendations from Gravity Inverse Square Law Problems Answer Key
  - Personalized Recommendations

- Gravity Inverse Square Law Problems Answer Key User Reviews and Ratings
- Gravity Inverse Square Law Problems Answer Key and Bestseller Lists
- 5. Accessing Gravity Inverse Square Law Problems Answer Key Free and Paid eBooks
  - Gravity Inverse Square Law Problems Answer Key Public Domain eBooks
  - Gravity Inverse Square Law Problems Answer Key eBook Subscription Services
  - Gravity Inverse Square Law Problems Answer Key Budget-Friendly Options
- 6. Navigating Gravity Inverse Square Law Problems Answer Key eBook Formats
  - ePub, PDF, MOBI, and More
  - Gravity Inverse Square Law Problems Answer Key Compatibility with Devices
  - Gravity Inverse Square Law Problems Answer Key Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Gravity Inverse Square Law Problems Answer Key
  - Highlighting and Note-Taking Gravity Inverse Square Law Problems Answer Key
  - Interactive Elements Gravity Inverse Square Law Problems Answer Key
- 8. Staying Engaged with Gravity Inverse Square Law Problems Answer Key
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Gravity Inverse Square Law Problems Answer Key
- 9. Balancing eBooks and Physical Books Gravity Inverse Square Law Problems Answer Key
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Gravity Inverse Square Law Problems Answer Key
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Gravity Inverse Square Law Problems Answer Key
  - Setting Reading Goals Gravity Inverse Square Law Problems Answer Key
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Gravity Inverse Square Law Problems Answer Key
  - Fact-Checking eBook Content of Gravity Inverse Square Law Problems Answer Key

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
- 14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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