Newton's Law of Gravitation Practice Problems

LA, MA, HA

1. Two spherical objects have masses of 200 kg and 500 kg. Their centers are separated by a distance of 25 m. Find the gravitational attraction between them.

2. Two spherical objects have masses of 1.5×10^5 kg and 8.5×10^2 kg. Their centers are separated by a distance of 2500 m. Find the gravitational attraction between them.

3. Two spherical objects have masses of 3.1×10^5 kg and 6.5×10^3 kg. The gravitational attraction between them is 65 N. How far apart are their centers?

4. Two spherical objects have equal masses and experience a gravitational force of 25 N towards one another. Their centers are 36 cm apart. Determine each of their masses.

5. A 1 kg object is located at a distance of 6.4×10^6 m from the center of a larger object whose mass is 6.0×10^{24} kg.
    a. What is the size of the force acting on the smaller object?
    b. What is the size of the force acting on the larger object?
    c. What is the acceleration of the smaller object when it is released?
    d. What is the acceleration of the larger object when it is released?

6. Two spherical objects have masses of 8000 kg and 1500 kg. Their centers are separated by a distance of 1.5 m. Find the gravitational attraction between them.

7. Two spherical objects have masses of 7.5×10^5 kg and 9.2×10^7 kg. Their centers are separated by a distance of 2.5×10^3 m. Find the gravitational attraction between them.

8. Two spherical objects have masses of 8.1×10^2 kg and 4.5×10^8 kg. The gravitational attraction between them is 1.9×10^{-3} N. How far apart are their centers?

9. Two spherical objects have equal masses and experience a gravitational force of 85 N towards one another. Their centers are 36mm apart. Determine each of their masses.

10. A 1 kg object is located at a distance of 7.0×10^8 m from the center of a larger object whose mass is 2.0×10^{30} kg.
    a. What is the size of the force acting on the smaller object?
    b. What is the size of the force acting on the larger object?
    c. What is the acceleration of the smaller object when it is released?
    d. What is the acceleration of the larger object when it is released?

11. Two spherical objects have masses of 8000 kg and 5.0 kg. Their centers are separated by a distance of 1.5 m. Find the gravitational attraction between them.

12. Two spherical objects have masses of 9.5×10^8 kg and 2.5 kg. Their centers are separated by a distance of 2.5×10^8 m. Find the gravitational attraction between them.
13. Two spherical objects have masses of 6.3×10^3 kg and 3.5×10^4 kg. The gravitational attraction between them is 6.5×10^{-3} N. How far apart are their centers?

14. Two spherical objects have equal masses and experience a gravitational force of 25 N towards one another. Their centers are 36 cm apart. Determine each of their masses.

15. A 1 kg object is located at a distance of 1.7×10^6 m from the center of a larger object whose mass is 7.4×10^{22} kg.
    a. What is the size of the force acting on the smaller object?
    b. What is the size of the force acting on the larger object?
    c. What is the acceleration of the smaller object when it is released?
    d. What is the acceleration of the larger object when it is released?

16. Compute g at a distance of 4.5×10^7m from the center of a spherical object whose mass is 3.0×10^{23} kg.

17. Compute g for the surface of the moon. Its radius is 1.7×10^6 m and its mass is 7.4×10^{22} kg.

18. Compute g for the surface of a planet whose radius is twice that of the Earth and whose mass is the same as that of the Earth.

19. Compute g for the surface of the sun. Its radius is 7.0×10^8 m and its mass is 2.0×10^{30} kg.

20. Compute g for the surface of Mars. Its radius is 3.4×10^6 m and its mass is 6.4×10^{23} kg.

21. Compute g at a height of 6.4×10^6 m (R_E) above the surface of Earth.

22. Compute g at a height of 2 R_E above the surface of Earth.

23. Compute g for the surface of a planet whose radius is half that of the Earth and whose mass is double that of the Earth.

24. Compute g at a distance of 8.5×10^9m from the center of a spherical object whose mass is 5.0×10^{28} kg.

25. Compute g at a distance of 7.3×10^8 m from the center of a spherical object whose mass is 3.0×10^{27} kg.

26. Compute g for the surface of Mercury. Its radius is 2.4×10^6 m and its mass is 3.3×10^{23} kg.

27. Compute g for the surface of Venus. Its radius is 6.0 $x10^{6}$ m and its mass is 4.9 x 10^{24} kg.

28. Compute g for the surface of Jupiter. Its radius of is 7.1 $x10^{7}$ m and its mass is 1.9 x 10^{27} kg.

29. Compute g at a height of 4 R_E above the surface of Earth.

30. Compute g at a height of 5 R_E above the surface of Earth.

31. Compute g for the surface of a planet whose radius is double that of the Earth and whose mass is also double that of the Earth.