1. Earth orbits the Sun in 1 year. It is 1 A.U from the Sun. a) Neptune is 30.6 AU from the Sun. How long is the year for Neptune? b) Mars orbits the Sun in 1.87 Earth years. How far is Mars from the Sun? Answer: a) 169 years. b) 1.52 AU.

2. The moon Io orbits Jupiter in 1.77 days, and is $4.2 \times 10^8$ m from the planet. The moon Europa also orbits Jupiter, and is $6.7 \times 10^8$ m from the planet. How many days does it take Europa to orbit once? Answer: 3.57 days.

3. A satellite is in a circular orbit around an unknown planet. The satellite has a speed of $1.70 \times 10^4$ m/s, and the radius of the orbit is $5.25 \times 10^6$ m. A second satellite also has a circular orbit around this same planet. The orbit of this second satellite has a radius of $8.60 \times 10^6$ m. What is the orbital speed of the second satellite? Answer: $1.33 \times 10^4$ m/s

4. A distance of 2.0 m separates two objects of equal mass. If the gravitational force between them is $1.04 \times 10^{-8}$ N, find the mass of each object. Answer: 25 kg.

5. What is the gravitational field strength at a point $6.38 \times 10^6$ m above Earth’s surface? At what distance from Earth’s surface is the acceleration due to gravity 7.33 m/s²? Data: G, $M_{Earth}$ and $R_{Earth}$. Answer: a) 2.45 m/s². b) $9.97 \times 10^5$ m.

6. At what altitude above the Earth’s surface would your weight be one-half of what it is at the Earth's surface? Data: $g_0$ and $R_{Earth}$. Answer: 2650 km.

7. On the surface of planet Y, which has a mass of $4.83 \times 10^{24}$ kg, a 30 kg object weighs 50 N. What is the radius of the planet? Data: G. Answer: 1.39 \times 10^7 m

8. A satellite orbits at a height of 3185 km above the surface of the Earth. Determine the speed and orbital period of the satellite. Data: G, $M_{Earth}$ and $R_{Earth}$. Answer: a) 6641 m/s. b) 2.6 h.

9. NASA places a 100.0 kg satellite in a circular orbit just above the surface of the Earth. How much gravitation force does the Earth exert on the satellite? What is the satellite’s orbital speed? What is the satellite’s orbital period? Data: G, $M_{Earth}$ and $R_{Earth}$. Answer: a) 983 N. b) 7912 m/s. c) 5059 s.

10. A satellite is in a circular orbit 300 km above the surface of the Earth. Find its speed and its period of revolution. Data: $g_0$ and $R_{Earth}$. Answer: a) 7721 m/s. b) 90,4 min.

11. A 150 kg object is launched into orbit at a height of 12800 km above the Earth’s surface. a) What is the weight of the satellite on the surface of the Earth? b) What is the weight of the satellite in orbit? c) What is the speed of the satellite in orbit? Data: $g_0$, G, $M_{Earth}$ and $R_{Earth}$. Answer: a) 1470 N. b) 160 N c) 4500 m/s
12. Given the following data: Mass of Mars: $6.42 \times 10^{23}$ kg, mass of the Sun: $1.991 \times 10^{30}$ kg, mars’s distance from the Sun: $2.279 \times 10^{11}$ m a) Find the velocity with which Mars moves around the Sun. b) How long in days does it take Mars to make one revolution about the Sun? c) What is the force of gravity experienced by Mars from the Sun? Data: G. Answer: a) $2.4 \times 10^4$ m/s. b) 691 días. c) $1.64 \times 10^{24}$ N.

13. A satellite is placed in orbit $6.00 \times 10^5$ m above the surface of Jupiter. Jupiter has a mass of $1.90 \times 10^{27}$ kg and a radius of $7.14 \times 10^7$ m. Data: G. Find the orbital speed of the satellite. Answer: $4.20 \times 10^4$ m/s.

14. The period of the Moon is approximately 27.2 days. Determine the radius of the Moon’s orbit and the orbital speed of the Moon. Data: G and $M_{Earth}$. Answer: $r = 3.82 \times 10^6$ m; $v = 1.02 \times 10^3$ m/s

15. Io, a satellite of Jupiter, has an orbital period of 1.77 days and an orbital radius of $4.22 \times 10^5$ km. From these data and G, determine the mass of Jupiter. Answer: $1.9 \times 10^{27}$ kg.

16. The Earth travels around the Sun once per year in an approximately circular orbit whose radius is $1.50 \times 10^{11}$ m. Determine: a) The mass of the Sun. b) The orbital speed of the Earth. Data: G. Answer: a) $2.00 \times 10^{30}$ kg. b) $2.98 \times 10^4$ m/s.

17. A geosynchronous satellite is one which stays above the same part of the Earth all of the time (in other words, it's period is the same as that of the earth). Data: G, $M_{Earth}$ and $R_{Earth}$. How high above the surface of the Earth is this satellite? Answer: $3.59 \times 10^7$ m.

18. Venus rotates slowly about its axis, the period being 243 days. The mass of Venus is $4.87 \times 10^{24}$ kg. Determine the radius for a geosynchronous orbit around Venus. Data: G. Answer: $5.57 \times 10^6$ m

19. At what distance above the surface of the Earth would a satellite have a period of 5 h? What would be the satellite’s linear speed at this distance? Data: $g_0$ and $R_{Earth}$. Answer: a) $8.47 \times 10^6$ m. b) 5180 m/s.

20. On July 19, 1969, Apollo 11’s orbit around the Moon was adjusted to an average altitude of 111 km. The radius of the Moon is 1785 km and the mass of the Moon is $7.36 \times 10^22$ kg. Data: G. a) At what velocity did it orbit the Moon? b) How many minutes did it take to orbit once? Answer: a) 1610 m/s. b) 123 min.

21. A satellite has a mass of 5850 kg and is in a circular orbit $4.1 \times 10^5$ m above the surface of the planet. The period of the orbit is two hours. The radius of the planet is $4.15 \times 10^6$ m. What is the weight of the satellite when it is at rest on the planet’s surface? Data: G. Answer: $2.45 \times 10^4$ N

Data: $G = 6.67 \times 10^{-11}$ N·m²/kg²; $M_{earth} = 5.98 \times 10^{24}$ kg, $R_{earth} = 6.37 \times 10^6$ m $g_0 = 9.8$ m/s²