Worksheet 5.3 - Newton’s Gravitational Law

mEarth = 5.98x1024 kg mMoon = 7.35x1022 kg

1. Calculate the value of g at each of the locations in the table below. Express each answer as a multiple or decimal fraction of Earth’s *g*. Would the force of gravity on you be greatest on the Moon, on Ganymede (\*one of Jupiter’s Moons), or on Mercury?



1. Two students are sitting 1.50 m apart. One student has a mass of 70.0 kg and the other has a mass of 52.0 kg. What is the gravitational force between them?
2. What gravitational force does the moon produce on the Earth if their centers are 3.84x108 m apart?
3. If the gravitational force between two objects of equal mass is 2.30x10-8 N when the objects are 10.0 m apart what is the mass of each object?
4. Calculate the gravitational force on a 6.50x102 kg spacecraft that is 4.15x106 m above the surface of the Earth.
5. The gravitational force between two objects that are 2.1x10-1 m apart is 3.2x10-6 N. If the mass of one object is 55 kg, what is the mass of the other object?
6. If two objects, each with a mass of 200 kg, produce a gravitational force of 3.7x10-6 N, what is the distance between them?
7. What is the gravitational force on a 70.0 kg object standing on the Earth’s surface?
8. Three 10.0 kg objects are placed in a straight line 5.00x10-1 m apart. What is the net gravitational force on the center object due to the other two objects?
9. Three objects A, B, and C are placed 0.50 m apart along a straight line. A and B have masses of 10.0 kg and C has a mass of 15.0 kg, what is the net gravitational force on B due to A and C?

B

C

A

1. The force of gravity between two small masses A and B when placed very near each other is 3.24x10-7 N. What will the force between these objects be if both of their masses are doubled and the distance between them is tripled?

Answers:

1. a. 1.62 m/s2 or 0.17g b. 3.31 m/s2 or 0.34g c. 1.47 m/s2 or 0.15g **d. 273 m/s2 or 28 g (Weird right!?)**
2. (1.08x10-7 N)
3. (1.99x1020 N)
4. (186 kg)
5. (2.34x103 N)
6. (38 kg)
7. (0.85 m)
8. (686 N)
9. (0N)
10. (1.33x10-8 N)
11. (1.44x10-7 N)