1. In this figure, four masses are at the corners of a sphere with edge length of 20.0 cm. The masses of the spheres are as labeled. Express the gravitational force on the fifth mass, $m$, at the center of the square in vector notation. What is the magnitude and direction of the force on $m$?
2. Two spheres of mass $m$ and a third sphere of mass $M$ are at the vertices of an equilateral triangle. A fourth mass, $m_4$, is at the center of the triangle. The net gravitational force on $m_4$ from the other 3 spheres is zero. (a) What is $M$ in terms of $m$? (b) If we double the value of $m_4$, what is the magnitude of the net gravitational force on the central sphere?
3. Two concentric shells have masses $M_1$ and $M_2$. Express the gravitational force on a particle of mass $m$ at distances from the center of $a$, $b$, and $c$ meters.
4) At what altitude above the earth is the acceleration due to gravity equal to 5 m/s²?

5) What will an object weigh on the Moon’s surface if it weighs 100 N on Earth? (b) How many Earth radii must this same object be from the center of the Earth if it is to weigh the same as it does on the Moon?
6) The mean diameters of Mars and Earth are $6.9 \times 10^3 \text{ km}$ and $1.3 \times 10^4 \text{ km}$, respectively. The mass of Mars is 0.11 times the mass of Earth. (a) What is the ratio of the mean density (mass per unit volume) of Mars to that of Earth? (b) What is the value of the gravitational acceleration on Mars? (c) What is the escape speed on Mars?
7) Each mass \( m \) is 2.0 kg and is at the vertex of an equilateral triangle whose sides are each 3.0 m. What is the gravitational potential energy of this system of particles?
8) Consider, in the Universe, a flat structure that is 100 pc x 100 pc (1 parsec = $3 \times 10^{16}$ m) that has a mass one million times the mass of the Sun. What is the gravitational field at a distance of 1 parsec above this flat structure? 100 parsecs from the mass?

9) What is the gravitational flux emanating from the Earth?