Problems of Gravitational field on point masses

1) On the surface of Venus, which has a mass of 4.869×10^{24} kg, an object has a weight of 213 N and a mass of 24 kg. What is the radius of Venus?
$G = 6.674\times10^{-11}$ N·m^2/kg^2.
Answer: 6051 km.

2) There is a point between the Earth and the Moon where the total gravitational field is zero. Calculate the distance of this point from the centre of the Moon.
Mass of Moon = 7.35×10^{22} kg, mass of Earth = 5.98×10^{24} kg.
Earth–Moon distance = 384 000 km.
Answer: 38320 km.

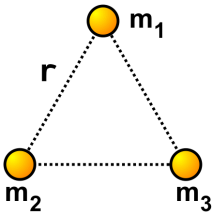
3) Find the altitude above the Earth's surface where Earth's gravitational field strength would be 75 % of its value at the surface.
Radius of Earth = 6370 km.
Answer: 985.4 km.

4) What is the gravitational field (in N/kg) 1.400×10^5 km above the surface of the Sun?
Radius of the Sun = 6.960×10^5 km, mass of the Sun = 1.989×10^{30} kg, $G = 6.674\times10^{-11}$ N·m^2/kg^2.
Answer: 190 N/kg.

5) Two spherical balls are placed so their centers are 74 m apart. The gravitational attraction between them is 2.362×10^{-7} N. If the mass of the smaller ball is 3800 kg, find the mass of the other ball.
$G = 6.674\times10^{-11}$ N·m^2/kg^2.
Answer: 5100 kg.

6) The Moon has a gravitational field strength of 1.624 N/kg. Calculate its mass.
Radius of the Moon = 1737 km, $G = 6.674\times10^{-11}$ N·m^2/kg^2.
Answer: 7.342×10^{22} kg.

7) Three masses are located in the vertices of an equilateral triangle. Calculate the magnitude and direction of the gravitational force on the mass m_1.
Given: $m_1 = 38$ kg, $m_2 = 340$ kg, $m_3 = 340$ kg, $r = 38$ m.
$G = 6.674\times10^{-11}$ N·m^2/kg^2.



Answer: 1.034×10^{-9} N, downward.

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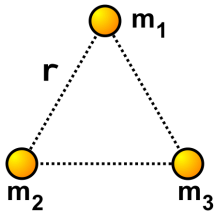
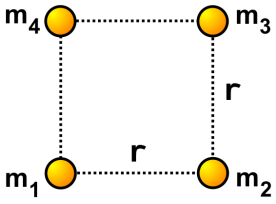
8) Three masses are located in the corners of an equilateral triangle. Find the magnitude and direction of the gravitational field at the center of the triangle.
Given: $m_1 = 22$ kg, $m_2 = 30$ kg, $m_3 = 30$ kg, $r = 12$ cm.
$G = 6.674\times10^{-11}$ N·m^2/kg^2.



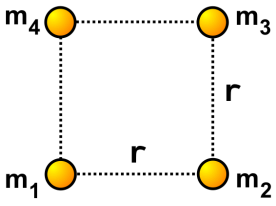
Answer: 1.112×10^{-7} N/kg, downward.

9) Four masses are at the vertices of a square. Find the magnitude of the gravitational force on the mass m_1.
Given: $m_1 = 6$ kg, $m_2 = 80$ kg, $m_3 = 80$ kg, $m_4 = 80$ kg
$r = 24$ m. $G = 6.674\times10^{-11}$ N·m^2/kg^2.



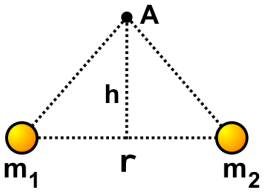
Answer: 1.065×10^{-10} N.

10) Four masses are located in the corners of a square. Calculate the magnitude and direction of the gravitational field at the center of the square.
Given: $m_1 = 85$ kg, $m_2 = 3$ kg, $m_3 = 3$ kg, $m_4 = 85$ kg
$r = 8$ m, $G = 6.674\times10^{-11}$ N·m^2/kg^2.



Answer: 2.419×10^{-10} N/kg, to the left.

11) Two masses $m_1 = 350$ kg and $m_2 = 350$ kg are at a distance of 22 m from each other. Find the magnitude and direction of the gravitational field at point A.
Data: $h = 9$ m, $G = 6.674\times10^{-11}$ N·m^2/kg^2.



Answer: 1.465×10^{-10} N/kg, downward.