Rotation Homework Problems:
p. 92: #20, 21, 22, 27, 30, 35

Problems taken from the school's old textbook:
Giancoli, D. (1980). *Physics*, 2nd Ed. Englewood Cliffs, NJ: Prentice Hall.

Some helpful numbers and constants:

- $G = 6.67 \times 10^{-11}$ N(m^2/kg^2)
- Radius of the earth: 6.38×10^6 meters
- Radius of the moon: 1.7×10^6 meters
- Mean earth-sun distance: 1.50×10^{11} meters
- Mass of the earth: 5.98×10^{24} kg
- Mass of the moon: 7.4×10^{22} kg

20. Calculate the force of gravity between two bowling balls each of which has a mass of 8.0 kg, when they are 0.50 m apart (center to center).

21. Calculate the force of gravity on a spacecraft 12,800 km above the earth's surface if it's mass is 700 kg.

22. Calculate the acceleration due to gravity on the moon's surface.

27. At the surface of a certain planet the gravitational acceleration *g* has a magnitude of 2.0 m/s^2. A 4.0-kg brass ball is transported to this planet. Give:

a) the mass of the brass ball on the earth and on the other planet.
b) the weight of the brass ball on the earth and on the other planet.

30. Determine the mass of the sun using the known value for the period (the time for one revolution or rotation) of the earth and its distance from the sun.

35. Four 8.0-kg spheres are located at the corners of a square of side 0.50 m. Calculate the magnitude and direction of the gravitational force on one sphere due to the other three.

ANSWERS:

20. 1.71×10^{-8} N
21. 758.6 N
22. 1.71 m/s^2
27a. the mass of the object is independent of the force of gravity and will be the same on both planets
27b. 39.2 N, 8 N
30. 2.01×10^{30} kg
35. 3.27×10^{-8} N is the force acting on each mass, and in all cases is directed towards the mass in the opposite corner of the square.