1. A boy tries to get the attention of his girlfriend by throwing little stones at her window. Due to the fence around the garden, and the fierce dog inside, he can not go very close to the window. If the window is 50 m away from where he is and 13 m high and if the maximum speed with which he can throw a stone is 25 m/s, can he hit the window? If not, with what speed he has to throw so that he can hit the window?

2. The unlucky lover, eventually gets the attention of his girlfriend. (Then you might ask why he is unlucky) But he also gets the attention of the father of his girlfriend, who starts chasing the boy. Trying to get advantage of his youth, he starts climbing the hill nearby at a constant speed of v_b. The angle that the the hill makes with the ground has a constant value of α. When the angry father reaches the start of the hill, the boy is already a distance d away. Since the hill is too steep for the man, he considers throwing a stone to the boy. If the maximum speed with which he can throw the stone is v_0, what is the range of the stone that he can throw as a function of the angle with which he throws the stone and the slope of the hill. What is the maximum range? What is the maximum distance d such that if d is less than that, the father has a chance to hit the boy?

3. A string passes over a frictionless, massless pulley attached to the ceiling. A mass m_1 hangs from one end of this string, and a second massless, frictionless pulley hangs from the other end. A second string passes over thesecond pulley, and a mass m_2 hangs from one end of this string, whereas the other end is attached firmly to the ground. Draw separate "free-body" diagrams for the mass m_1, the second pulley, and the mass m_2. Find the accelerations of the mass m_1, the second pulley, and the mass m_2. (H. C. Onahian, "Physics", Pr. 6.18, see also the figure in the book)

4. A Block of mass m_1 sits on top of a larger block of mass m_2 which sits on a flat surface. The coefficient of kinetic friction between the upper and lower blocks is μ_1, and that between the lower block and the flat surface is μ_2. A horizontal force $\vec{F}$ pushes against the upper block, causing it to slide; the friction force between the blocks then causes the lower block to slide also. Find the acceleration of the upper block and the acceleration of the lower block. (H. C. Onahian, "Physics", Pr. 6.42, see also the figure in the book)