Work and Energy Problems

Fun With Fiziks

July 8, 2022

Practice Problems

1. Jonathan is dropping his egg drop project off of a $10\,m$ high balcony. How fast is it going just before it hits the ground?
2. Andrew loves to be carried! Luke wants to get big muscles, so he exercises by lifting Andrew. Andrew weighs $55\ kg$ and Luke lifts him $2\ m$ off the ground every time. If Luke is able to get 8 reps before his arms collapse, how much work does Luke do?
3. Bob has three identical balls that he wants to throw off a building. He throws ball A at an angle above the horizontal, ball B horizontally, and ball C at an angle below the horizontal. Rank the speeds of the three balls just before they hit the ground.
4. A $1000kg$ rocket ship is moving at $10m/s$, which is way too slow! To travel faster, the astronauts turn on the rocket engine, which provides $100\ N$ of thrust. After the rocket moves $10\ m$, how fast is it traveling?
5. For her physics lab, Chris wants to determine the spring constant of a spring. She does this by holding the spring vertically, dropping a $1\ kg$ potato on it, and measuring how far the spring compresses. She throws the potato down at an initial speed of $2\ m/s$ at a height $1\ m$ above the spring. The spring compresses $0.5\ m$. What is the spring constant?
6. A roller coaster has a steep drop that immediately goes into a circular loop that is $20\,m$ in diameter. What is the minimum height that the roller coaster needs to drop from so that it can successfully make it around the loop?
7. Sid is skiing (assume there is no friction) at $5\ m/s$. Unfortunately, he is distracted and doesn't notice that there is a concrete floor ahead, where there is friction. The coefficient of friction $\mu = 0.5$. Sid weighs $10\ kg$.
   (a) How far does he travel before coming to a stop?
   (b) Sid wants to install rocket boosters to his skis so that he can continue traveling at a constant velocity of $5\ m/s$ on the concrete. What is the power required?