For the same force, why is the speed of a cannonball greater when shot from a cannon with a longer barrel?
Next-Time Question

For the same force, why is the speed of a cannonball greater when shot from a cannon with a longer barrel?

Answer:
There are two main reasons for the greater speed. A cannonball with greater speed has greater momentum and greater kinetic energy. How does it get greater momentum for the same applied force? By a greater impulse, which is \( \text{force} \times \text{time} \). The time during which the force acts is longer in the long barrel! Or how does the cannonball get more kinetic energy? By greater work, which is \( \text{force} \times \text{distance} \). The greater distance the force acts in the barrel produces more work = more kinetic energy!