10. The weight of the object is $W = m g$

$$W = (10 \text{ kg}) (9.8 \text{ m / s}^2) = 98 \text{ N}$$

On the free body diagram the weight is directed downward, and the external applied force, F_e, is directed upward. We can calculate the net force using Newton's Second Law as

$$F = m a$$

$$F = (10 \text{ kg}) (2 \text{ m / s}^2) = 20 \text{ N}$$

The external force and the weight act in opposite directions, so the net force is the difference between them or in equation form,

$$F = F_e - W$$

We know the weight and the net force, so we can solve for the external applied force as

$$F_e = F + W$$

$$F_e = 20 \text{ N} + 98 \text{ N}$$

$$F_e = 118 \text{ N}$$

Note that a force greater than the object's weight is required to accelerate it upwards. Part of the force is required to overcome the force of gravity and part of it is required to give the desired acceleration. Compare this problem to problem 2 where the motion is in a horizontal direction and the force of gravity was perpendicular to the motion.