23 A 30.0 N force is continuously applied to the right on a 12.0 kg object. The object accelerates on a horizontal frictionless surface. After a certain amount of time, another force of 8.0 N is applied to the left on the object.

a. Calculate the object's acceleration **before** the 8.0 N force is applied. Show your calculations and include units in your answer.

b. Calculate the object's acceleration **after** the 8.0 N force is applied. Show your calculations and include units in your answer.

c. Is the direction of acceleration in parts (a) and (b) the same or different? Explain your answer.

The object is then pushed onto a slightly rough surface that exerts an additional 20 N frictional force to the left on the object.

d. Will the object come to rest on the slightly rough surface? Explain your answer.