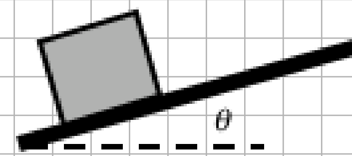


1 A box of mass m slides with an initial velocity of 3 $\frac{m}{s}$ down a ramp which is inclined 20° from the horizontal. The coefficient of kinetic friction between the ramp and box is .45.

a. Determine the direction and magnitude of the acceleration of the box as it slides down the incline.

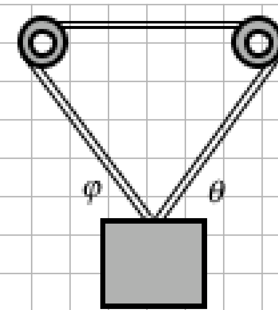
b. Discuss the subsequent motion of the box (qualitatively - no numbers are necessary).

2 $\left(G = 6.67 \times 10^{-11}\ \frac{Nm^2}{kg^2}\right)$ A satellite is said to be in *geosynchronous orbit* if it always stays above the same spot on the body that it is orbiting. It accomplishes this by having the same orbital period as the rotational period of the body that is it orbiting. (How long is that for the Earth?)

a. Determine how far from the surface of the Earth a satellite must be placed in order to be in a geosynchronous orbit. $(R_\oplus = 6,370\ km; M_\oplus = 5.97 \times 10^{24}\ kg)$

b. The space shuttle orbits the Earth with a period of around 90 minutes. Is it closer to the Earth or further from the Earth than geosynchronous satellites? Be convincing!

3 The box of mass 6 kg hangs at rest.



a. Prove that $\theta = \varphi$.

b. Determine the tension in the rope, if $\theta = 50°$.

CopM	Cons. of Momentum Model	Core Skills	Draw an IF chart describing momentum before and after an interaction
			Treat momentum as a vector, correctly and consistently
		Proficiency Indicators	Identify situations in which momentum is conserved
			Write an accurate conservation equation describing the system
			Distinguish among inelastic, completely inelastic, and elastic collisions
			Determine the change in kinetic energy due to a collision
			Analyze elastic collisions using the speeds of approach and retreat
		Advanced Indicators	Analyze collisions using the center-of-mass reference frame

Friction	Core Skills	Draw an IF chart describing momentum before and after an interaction
		Treat momentum as a vector, correctly and consistently
	Proficiency Indicators	Identify situations in which momentum is conserved
		Write an accurate conservation equation describing the system
		Distinguish among inelastic, completely inelastic, and elastic collisions
		Determine the change in kinetic energy due to a collision
		Analyze elastic collisions using the speeds of approach and retreat
	Advanced Indicators	Analyze collisions using the center-of-mass reference frame

CAPM	Core Skills	Draw an IF chart describing momentum before and after an interaction
		Treat momentum as a vector, correctly and consistently
	Proficiency Indicators	Identify situations in which momentum is conserved
		Write an accurate conservation equation describing the system
		Distinguish among inelastic, completely inelastic, and elastic collisions
		Determine the change in kinetic energy due to a collision
		Analyze elastic collisions using the speeds of approach and retreat
	Advanced Indicators	Analyze collisions using the center-of-mass reference frame

UFPM	Core Skills	Draw an IF chart describing momentum before and after an interaction
		Treat momentum as a vector, correctly and consistently
	Proficiency Indicators	Identify situations in which momentum is conserved
		Write an accurate conservation equation describing the system
		Distinguish among inelastic, completely inelastic, and elastic collisions
		Determine the change in kinetic energy due to a collision
		Analyze elastic collisions using the speeds of approach and retreat
	Advanced Indicators	Analyze collisions using the center-of-mass reference frame

UCM	Core Skills	Draw an IF chart describing momentum before and after an interaction
		Treat momentum as a vector, correctly and consistently
	Proficiency Indicators	Identify situations in which momentum is conserved
		Write an accurate conservation equation describing the system
		Distinguish among inelastic, completely inelastic, and elastic collisions
		Determine the change in kinetic energy due to a collision
		Analyze elastic collisions using the speeds of approach and retreat
	Advanced Indicators	Analyze collisions using the center-of-mass reference frame

GM	Core Skills	Draw an IF chart describing momentum before and after an interaction
		Treat momentum as a vector, correctly and consistently
	Proficiency Indicators	Identify situations in which momentum is conserved
		Write an accurate conservation equation describing the system
		Distinguish among inelastic, completely inelastic, and elastic collisions
		Determine the change in kinetic energy due to a collision
		Analyze elastic collisions using the speeds of approach and retreat
	Advanced Indicators	Analyze collisions using the center-of-mass reference frame

Vectors	Core Skills	Draw an IF chart describing momentum before and after an interaction
		Treat momentum as a vector, correctly and consistently
	Proficiency Indicators	Identify situations in which momentum is conserved
		Write an accurate conservation equation describing the system
		Distinguish among inelastic, completely inelastic, and elastic collisions
		Determine the change in kinetic energy due to a collision
		Analyze elastic collisions using the speeds of approach and retreat
	Advanced Indicators	Analyze collisions using the center-of-mass reference frame