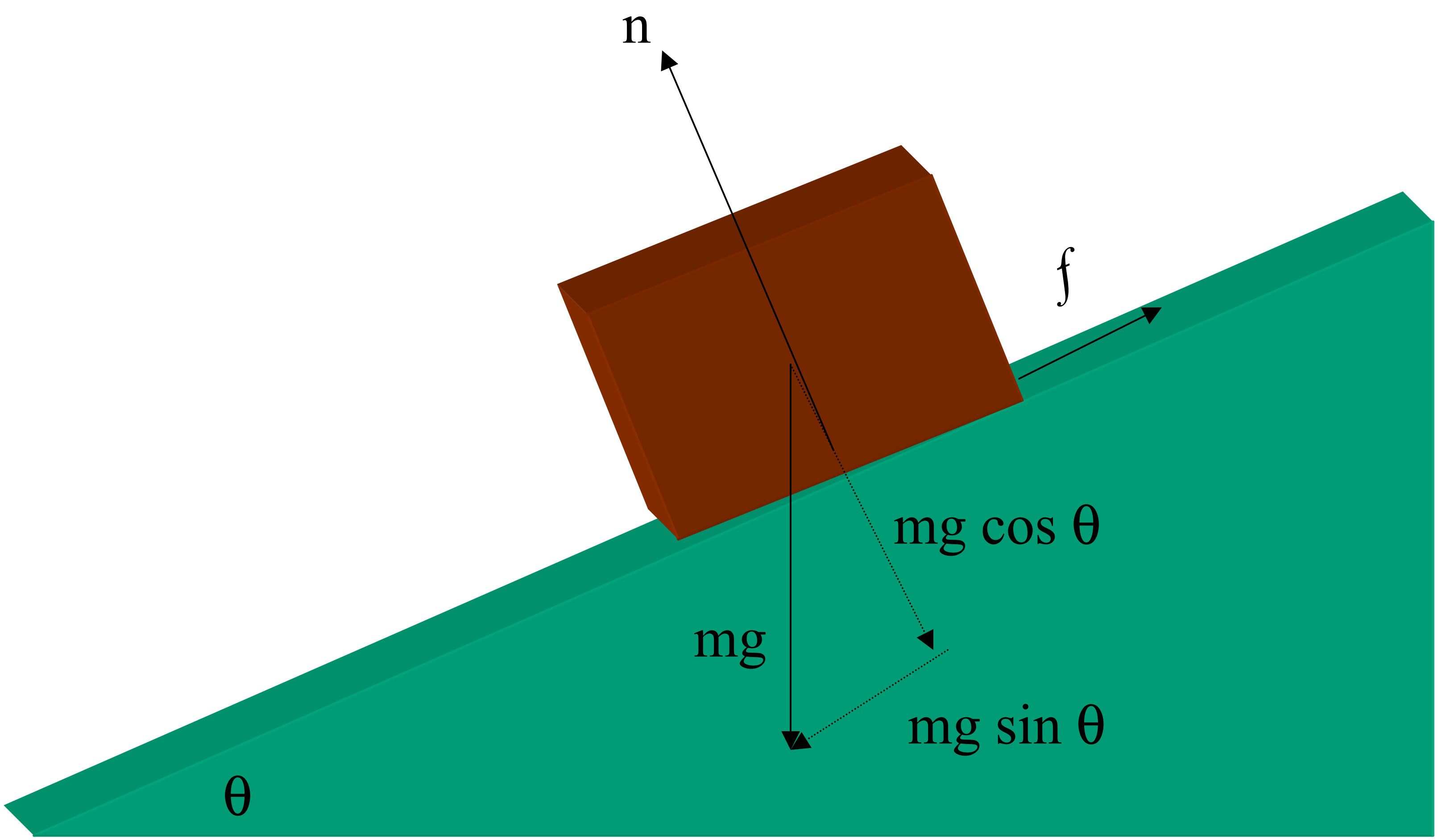
Announcements

1. First hour test – Wed. Sept. 25, 2002
   a. May bring 1 sheet of paper with your favorite equations
   b. Practice tests available on line
   c. Extra tutorial sessions?
2. Zac Caulder – please see me after class

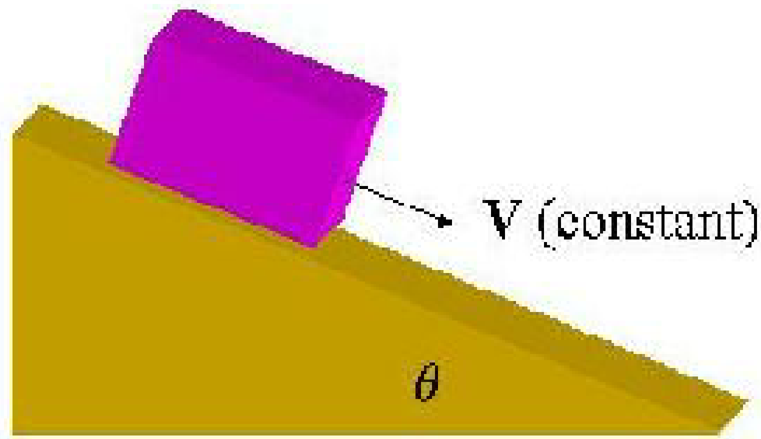


just before block slips:

$$f_{s,max} - mg \sin\theta = \mu_s n - mg \sin\theta = \mu_s mg \cos\theta - mg \sin\theta = 0$$

➔ $\mu_s = \tan\theta$

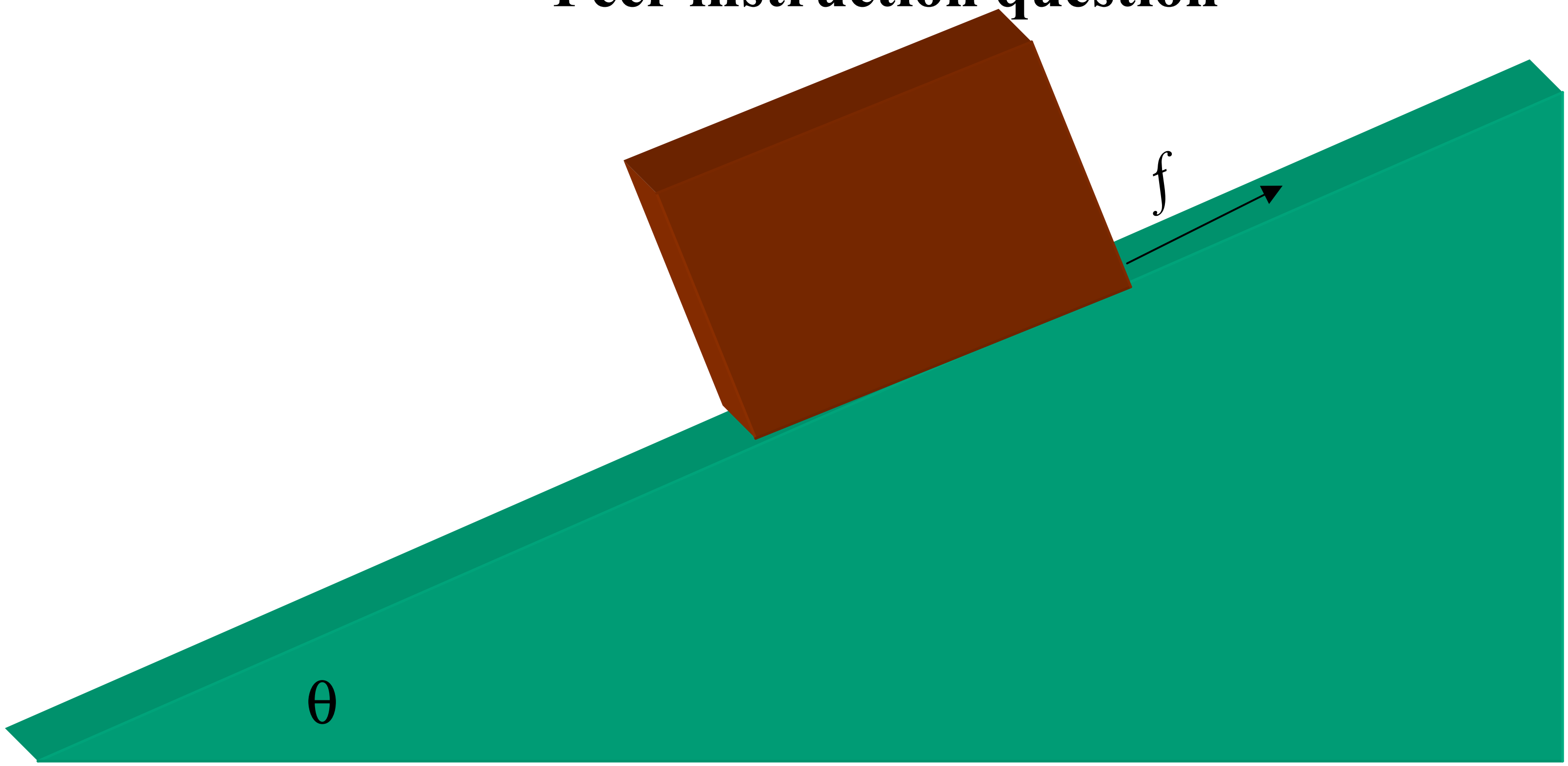
Online Quiz for Lecture 9
Application of Newton's Laws -- Sept. 16, 2002



Suppose you place a rectangular box on an inclined surface as shown in the figure and you notice that the box slides down the incline at constant velocity. (Assume that the box and incline are near the surface of the Earth.) Which of the following statements might be true?

1. There is no net force acting on the box.
2. There is a net force acting on the box.
3. The coefficient of static friction for the sliding box is equal to $\tan\theta$.
4. The coefficient of kinetic friction for the sliding box is equal to $\tan\theta$.

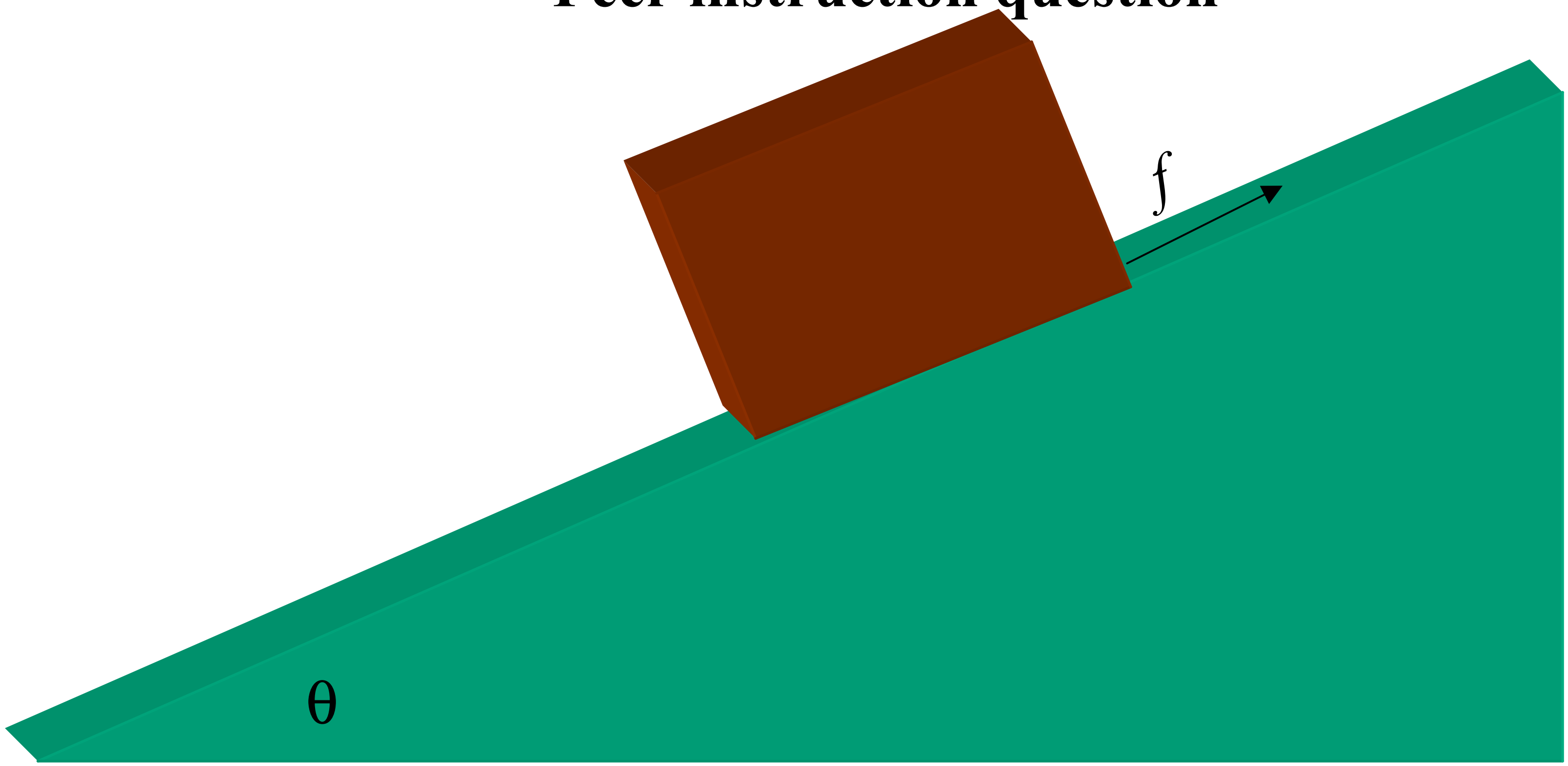
Peer instruction question



Suppose that μ_s=0.75 which means that the block starts to slide when θ= 37°. What is f when θ= 20°?

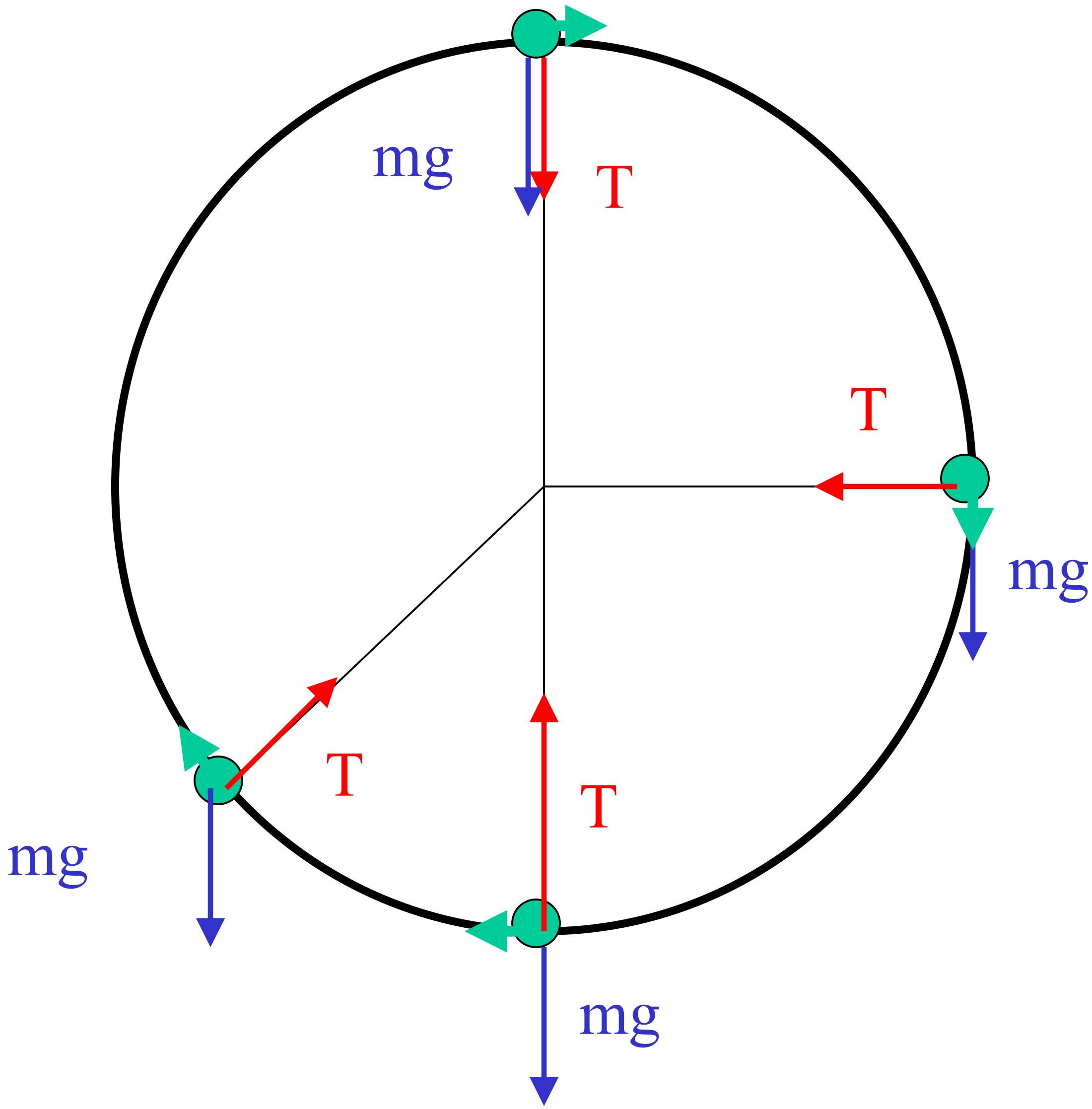
(a) mg sinθ (b) μ_s mg sinθ (c)mg cosθ (d) μ_s mg cosθ

Peer instruction question



Suppose that μ_s=0.75 which means that the block starts to slide when θ= 37°. What is f when θ= 40°?

(a) mg sinθ (b) μ_k mg sinθ (c)mg cosθ (d) μ_k mg cosθ

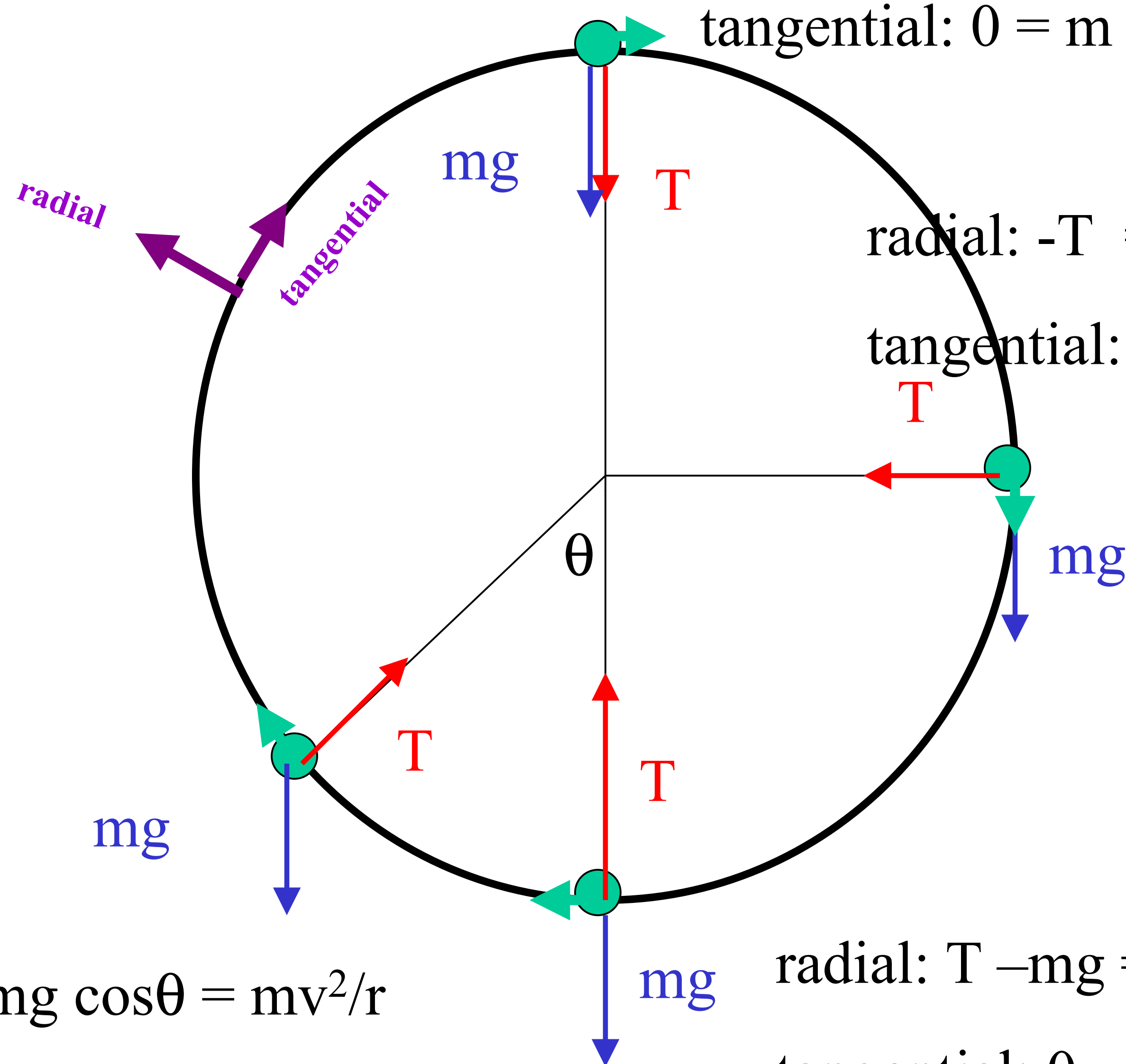

mg
T
T
mg
T
mg
T
mg

$$\text{radial: } -T - mg = -mv^2/r$$

$$\text{tangential: } 0 = m\, a_\theta$$

$$\text{radial: } -T = -mv^2/r$$

$$\text{tangential: } mg = m\, a_\theta$$



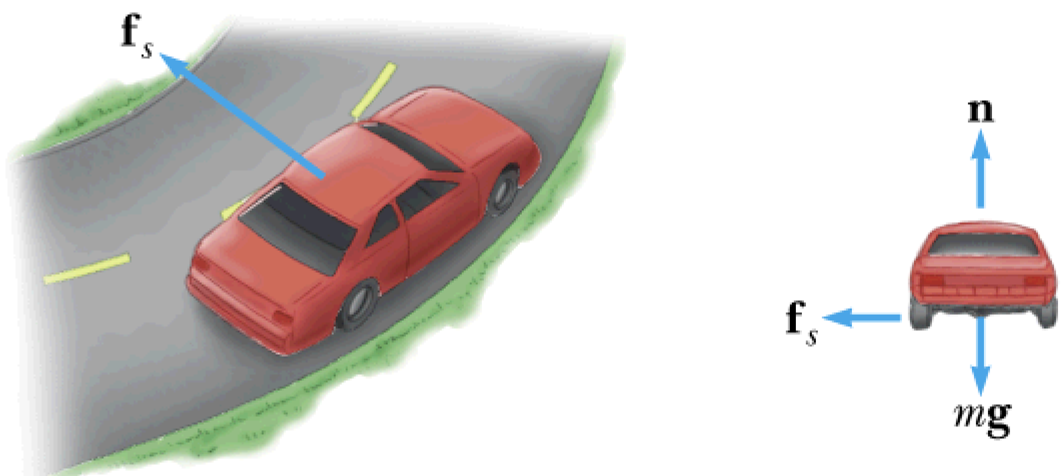
$$\text{radial: } T - mg = mv^2/r$$

$$\text{tangential: } 0 = m\, a_\theta$$

$$\text{radial: } T - mg\cos\theta = mv^2/r$$

$$\text{tangential: } -mg\sin\theta = m\, a_\theta$$

Serway, Physics for Scientists and Engineers, 5/e
Figure 6.5

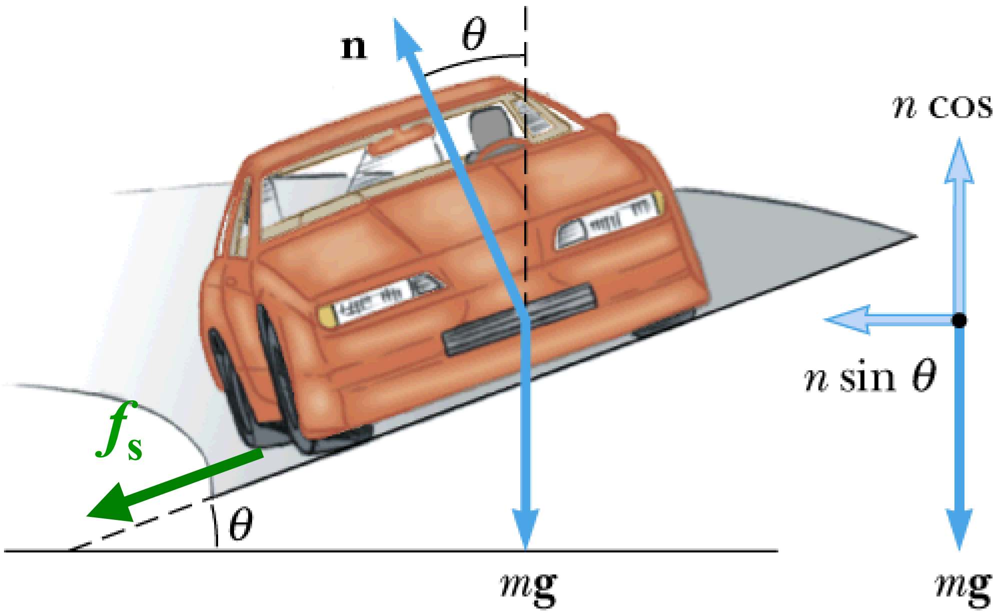


(a) (b)

radial: $-f_s = -m\, v^2/r$

extreme condition: $f_{s,max} = \mu_s\, n = \mu_s\, mg \;\rightarrow\; v_{max} = \sqrt{\mu_s g r}$

Serway, Physics for Scientists and Engineers, 5/e
Figure 6.6



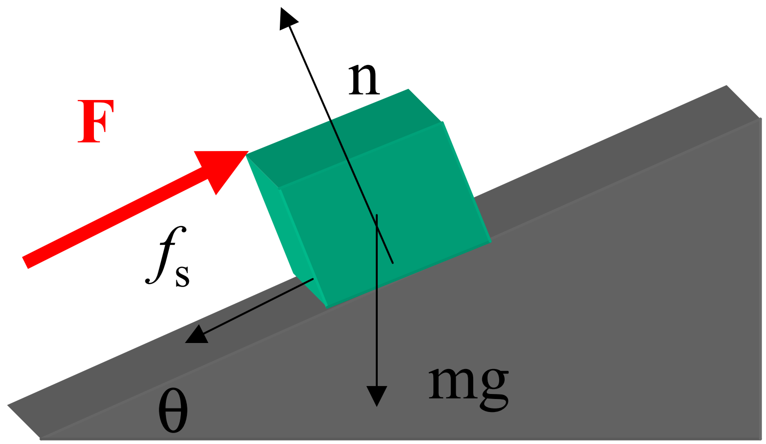
$$n\cos\theta - mg = 0$$

$$n = \frac{mg}{\cos\theta}$$

Banked curve (ignoring friction): $n\sin\theta = \frac{mv^2}{r}$

Optimal banking angle: $\tan\theta = \frac{v^2}{rg}$

More practice with Newton's laws:



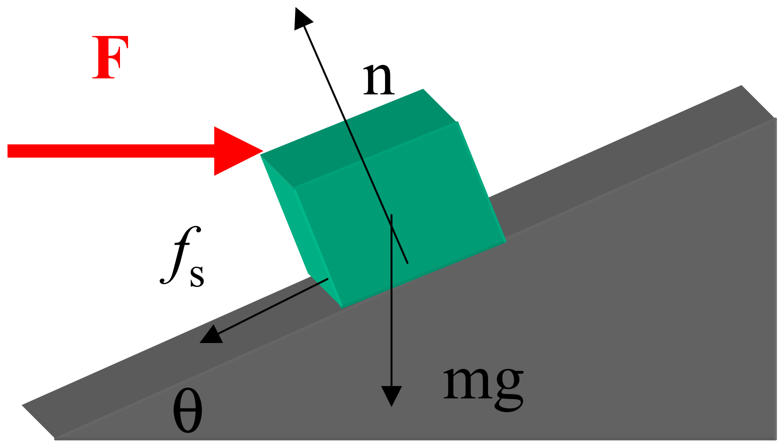
along surface: $F - mg\sin\theta \pm f_s = 0$

perpendicular to surface: $n - mg\cos\theta = 0 \rightarrow n = mg\cos\theta$

Condition for pushing up the incline:

$F > mg(\sin\theta + \mu_s\cos\theta)$

More practice with Newton's laws:



along surface: $F\cos\theta - mg\sin\theta - f_s = 0$

perpendicular to surface: $n - F\sin\theta - mg\cos\theta = 0$

Condition for pushing up the incline:

$$F = \frac{mg(\sin\theta + \mu_s\cos\theta)}{\cos\theta - \mu_s\sin\theta}$$