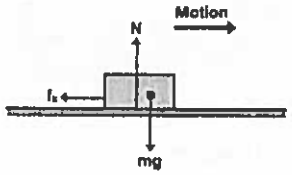
Ayman Ghannam
Bb Examples
Chapter 6

Example 1

A box is hit and given an initial speed of 20.0 m/s on a horizontal surface. Determine the coefficient of kinetic friction between the box and the surface, if it slides 115 m before coming to rest.



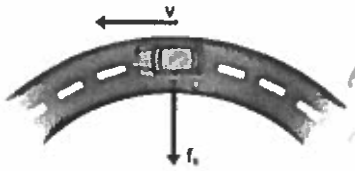
Example 2

A force F, parallel to a surface inclined 15° above the horizontal, acts on a 45 N block. The coefficients of friction for the block and surface are Mus= 0.50 and Muk =0.34. If the block is initially at rest, determine the magnitude and direction of the frictional force acting on the block for the following magnitudes of F

(a) 5.0 N
(b) 8.0 N
(c) 15 N.

Example 3

A 1500 kg car moving on a flat curved road whose radius is 35 m as in the figure. If the coefficient of static friction between the tires and the dry pavement is 0.5, find the maximum speed the car can have in order to make the turn successfully.



$F_{net} = ma$

$f_s = ma$

$mg\mu_s = m\frac{v^2}{R}$

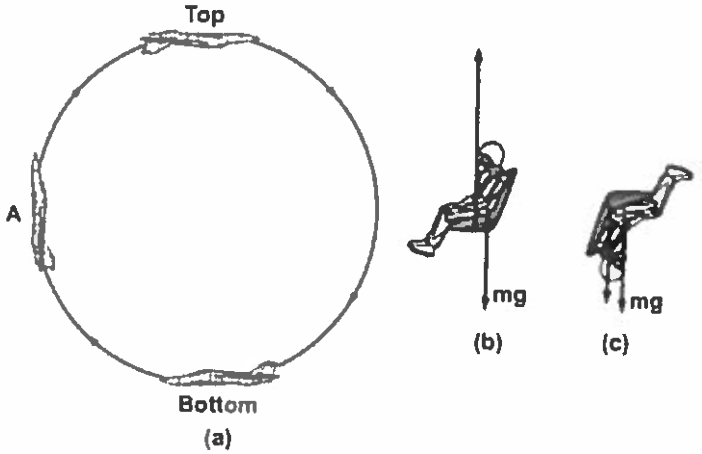
$v = \sqrt{Rg\mu_s}$

Example 4

A pilot of mass m in a jet aircraft executes a "loop-the-loop" maneuver as illustrated in the figure. In this flying pattern, the aircraft moves in a vertical circle of radius 2.70 km at a constant speed of 225 m/s. Determine the force of the seat on the pilot at:

(a) the bottom of the loop
(b) the top of the loop.

Express the answers in terms of the weight of the pilot, mg.



b)

$F_{net} = ma$

$N + mg = ma$

$N = m(a - g)$

$= m\left(\frac{v^2}{R} - g\right)$

$F_{net} = ma$

$N - mg = ma$

$N = m(g + a)$

$= m\left(g + \frac{v^2}{R}\right)$

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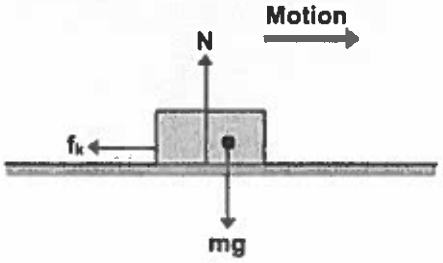
Example 1



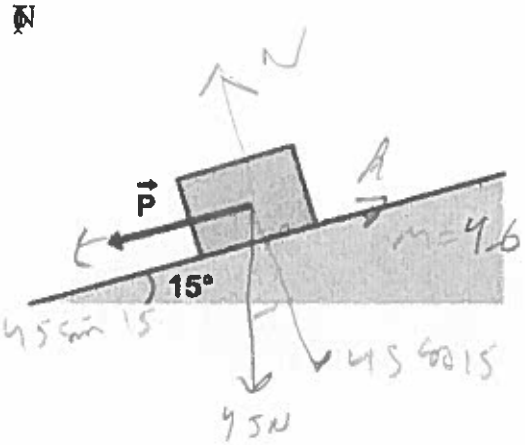
$v_i = 20\ m/s$
$\mu_k = ?$
$\Delta x = 115\ m$
$v_f = 0$

$f_k = \mu N$
$= \mu m g$

$v^2 = v_i^2 + 2a\Delta x$
$0 = 20^2 + 2a(115)$
$a = -1.74\ m/s^2$

$F_{net} = ma$
$-f = ma$
$-\mu mg = ma$
$\mu = \frac{a}{-g} = \frac{-1.74}{-9.8}$

Example 2



$F_{net} = ma$
$F + 45\sin 15 - \mu 45\cos 15 = ma = \quad$ (1)
$5 + 11.6 - \mu(43.5) = 4.6a$

$N = 45\cos 15 = (43.5)\ N$
$f_k = \mu_k N$

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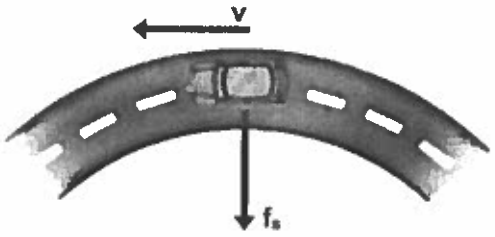

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