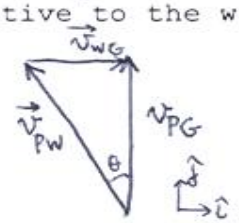
0 The pilot of an airplane flies due north relative to the
0 ground with a speed of 80 km/h. A wind is blowing towards
0 the east with a speed of 40 km/h. What is the speed of the
0 airplane relative to the wind?
0
1) 89 km/h
2 85 km/h
3 81 km/h
4 76 km/h
5 72 km/h



$\vec{v}_{PW} = \vec{v}_{PG} + \vec{v}_{GW} = \vec{v}_{PG} - \vec{v}_{WG}$

$= 80\hat{j} - 40\hat{i}$

$|\vec{v}_{PW}| = \sqrt{80^2 + 40^2} = 89$ Km/h

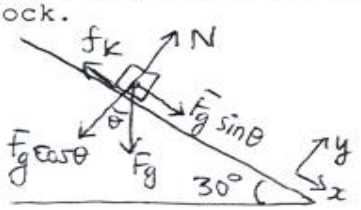
0 A student is standing on a scale in an elevator. The apparent
0 weight of the student is greatest when the elevator:
0
1) accelerates upward.
2 moves upward at a constant velocity.
3 moves downward at a constant velocity.
4 accelerates downward.
5 is not moving.
0
0 A roller-coaster car has a mass of 500 kg when fully loaded
0 with passengers. The car passes over a hill of radius 15 m
0 (Fig 4). At the top of the hill, the car has a speed of 8 m/s.
0 What is the force of the track on the car at the top of the
0 hill?
0
1) 2800 N up
2 7000 N down
3 7000 N up
4 2800 N down
5 0 N
0

$F_g - N = m a_r = m\frac{v^2}{r}$

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

$= 2767\,N \simeq 2800\,N$

0 A 1.8 kg block is released from rest at the top of a rough
0 30 degrees inclined plane. As the block slides down the
0 incline, its acceleration is 3.0 m/s**2 down the incline.
0 Determine the magnitude of the force of friction acting
0 on the block.
0
1) 3.4 N
2 4.2 N
3 3.0 N
4 3.8 N
5 2.3 N
0



$N - F_g\cos\theta = 0 \Rightarrow N = F_g\cos\theta$

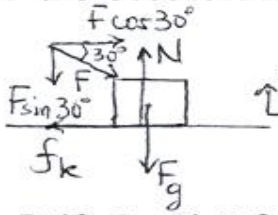
$F_g\sin\theta - f_k = ma \Rightarrow f_k = F_g\sin\theta - ma$

$f_k = mg\sin\theta - ma = m(g\sin\theta - a)$

$= 1.8(9.8\times\sin 30^\circ - 3)$

$= \boxed{3.4\,N}$

0 A 3.0 kg block is pushed across a horizontal surface by
0 a force F=20 N making an angle of 30 degrees with the
0 horizontal (Fig 5). If the coefficient of kinetic friction
0 between the block and the surface is 0.3, what is the
0 magnitude of the acceleration of the block?
0
1) 1.8 m/s**2
2 2.8 m/s**2
3 3.3 m/s**2
4 5.4 m/s**2
5 2.5 m/s**2
0



$\Sigma F_x = F\cos 30^\circ - f_k = ma$ but $f_k = \mu_k N$

$\Sigma F_y = N - F\sin 30^\circ - F_g = 0 \Rightarrow N = F_g + F\sin 30^\circ$

$\Rightarrow F\cos 30^\circ - \mu_k(F_g + F\sin 30^\circ) = ma$

$20\times\cos 30^\circ - 0.3(3\times 9.8 + 20\sin 30^\circ) = 3\times a$

$\Downarrow$

$a = 1.83\,\frac{m}{s^2}$

0 In Fig (6), F=40 N and M=2 kg. What is the magnitude of the
0 acceleration of the suspended object M ?
0 (All surfaces are frictionless)
0
1) 2.5 m/s**2