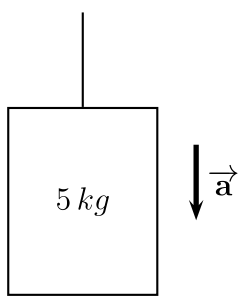
Practice Exam 2

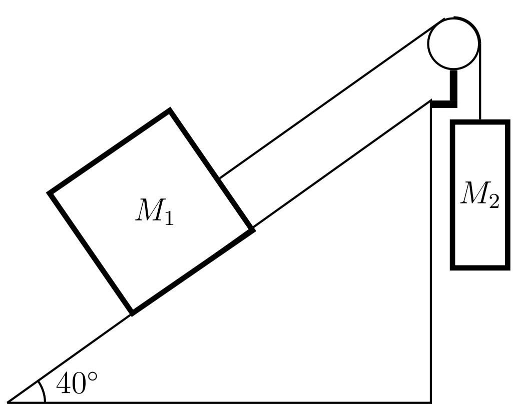
Note: These problems give you practice with the numerical questions that will be on the second exam. There will also be many conceptual questions. For those, I recommend studying your notes and the lecture slides that are available on the webpage.

(1.) A 5.0-kg mass is attached to a massless string which is accelerated downwards at $2.5\, m/s^2$. What is the tension in the string?



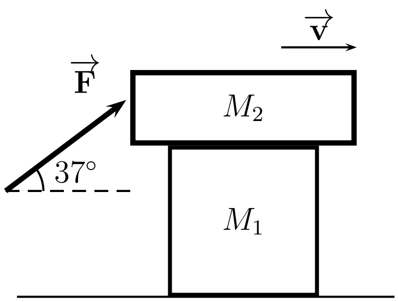
(a) 49 N	(b) 12.5 N
(c) 61.5 N	(d) 36.5 N

(2.) A $M_1 = 6.5\, kg$ mass is placed on a 40° incline and then connected by a massless string and over a perfect pulley to another mass, $M_2 = 5.0\, kg$, that is hanging vertically. The coefficient of static friction between M_1 and the incline is $\mu_s = 0.76$. If when released the two masses remain at rest, how much static friction is acting on M_1?



(a) 37.1 N	(b) 8.1 N
(c) 49 N	(d) 40.9 N

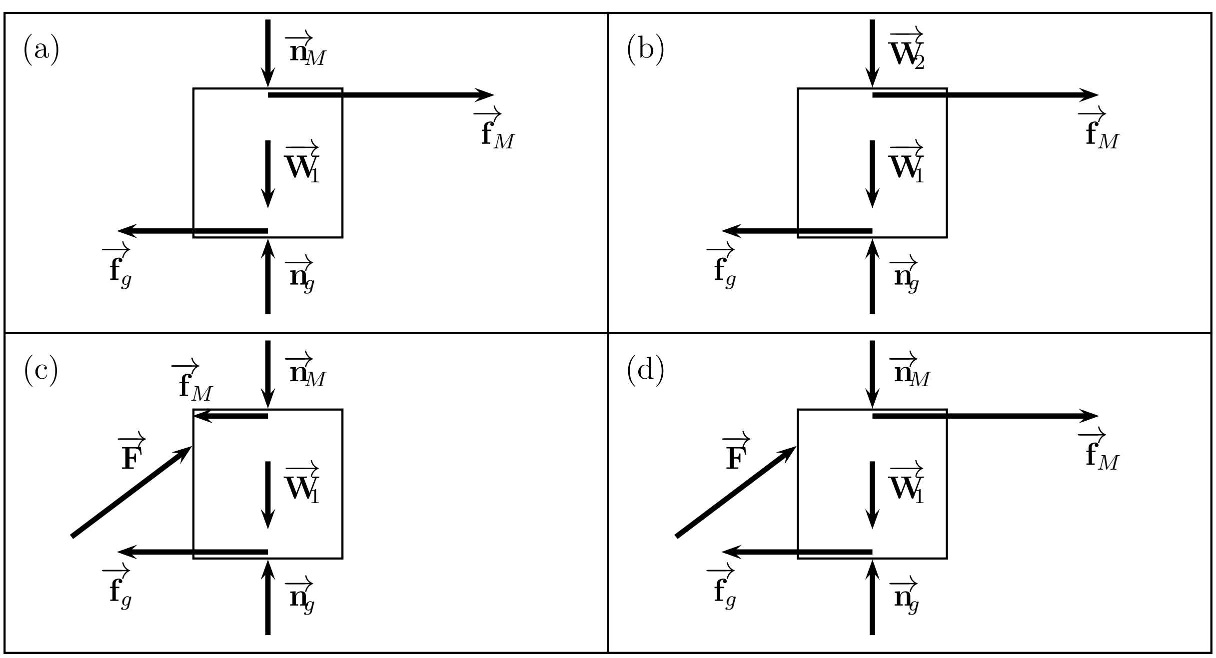
(3.) One day finds your physics instructor moving a box, M_1, of old books.



On the way to the recycling bin, he finds a box, M_2, of old physics demos, so he places it on top of the first. By exerting a force, $\vec{\mathbf{F}}$ at 37° above the horizontal, to the upper box, he gets the combination to slide to the right.

Which of the following is the correct free-body diagram for M_1? Assume the following definitions.

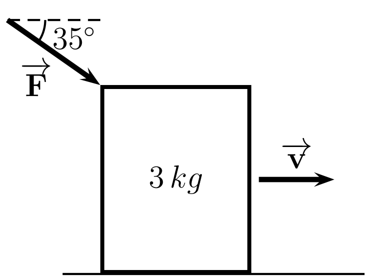
$\vec{\mathbf{W}}_1$ = Weight of M_1	$\vec{\mathbf{W}}_2$ = Weight of M_2
$\vec{\mathbf{n}}_g$ = normal force due to ground	$\vec{\mathbf{n}}_M$ = normal force between M_1 & M_2
$\vec{\mathbf{f}}_g$ = frictional force due to ground	$\vec{\mathbf{f}}_M$ = frictional force between M_1 & M_2



(4.) An 80-kg man is riding in an elevator that is accelerating upwards at $1.75\,m/s^2$. What is the *reaction* to his apparent weight?

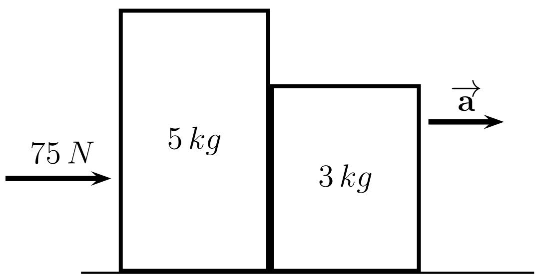
(a) The downward $784\,N$ force on the man
(b) The upward $924\,N$ force on the man
(c) The upward $784\,N$ force on the earth
(d) The downward $924\,N$ force on the elevator

(5.) A $3.0\,kg$ crate is being pushed across a horizontal floor by applying a force $\vec{\mathbf{F}}$, 35° below the horizontal. If the coefficient of kinetic friction is $\mu_k = 0.25$, what force F is needed to accelerate the crate at $2.0\,m/s^2$?



(a) $16.3\,N$	(b) $7.32\,N$
(c) $19.8\,N$	(d) $13.35\,N$

(6.) Sitting on a horizontal surface sits two crates, one $5.0\,kg$, the other $3.0\,kg$. A $75\,N$, horizontal force is exerted on the crate to the left making the two masses accelerate. Ignoring friction, how large is the contact force that the one mass exerts on the other?



(a) $46.875\,N$	(b) $28.125\,N$
(c) $75\,N$	(d) $0\,N$

(7.) A man who weighs $720\,N$ on earth, surprisingly finds himself in the middle of outer space. Luckily, he is in a spacesuit and, even better, there is a rocket next to him. What force must the rocket exert on the man in order to give him an acceleration of $9.8\,m/s^2$?

(a) $720\,N$	(b) $0\,N$	(c) $1440\,N$	(d) $360\,N$

(8.) One day finds you and your physics instructor going on a drive in his orange-colored, 1973 Gremlin. Hanging from the rear-view mirror, by a massless string, is a 0.65-kg mass pair of pink, fuzzy dice (schematically shown as a sphere in the picture below). At one point during your drive, the dice are hanging at a constant angle of $\phi = 12°$, what is the acceleration of the car at this instant? Also, given the direction of the car's velocity, is the car accelerating or decelerating? *Note:* The dice are not "swinging" on the rope. In other words, they do not have a centripetal acceleration. They only have the same acceleration as the car.