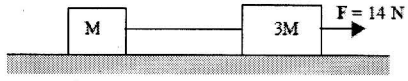
PHYS101
QUIZ#5 - CHAPTER 5
DATE: 7/10/12

Name: Key Id#: Sect#

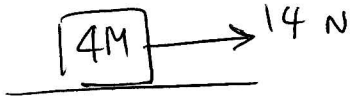
In the figure M = 1 kg. Calculate

(a) The acceleration of mass M.

(b) The tension in the rope.

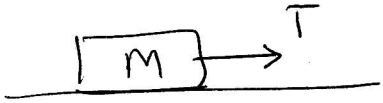


a)



$F_{net} = ma \Rightarrow 4a = 14 \Rightarrow a = \frac{14}{4} = \boxed{3.5\ m/s^2}$

b)



$F_{net} = ma \quad 1 \times a = T$

$1 \times 3.5 = T \Rightarrow \boxed{T = 3.5N}$

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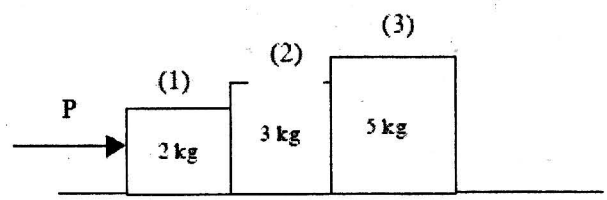
In the figure the three blocks are pushed by a force P = 30 N. Assume the surface is frictionless.

(a) Calculate the acceleration of block (2).

(b) What is the magnitude of the force exerted by block (1) on block (2)?



a) $P \rightarrow |10kg|$ $\quad F_{net} = Ma$

$30 = 10 \times a \Rightarrow \boxed{a = 3\ m/s^2}$

b) $P \rightarrow |2kg| \leftarrow F_{12}$ $\quad F_{21} \rightarrow |3kg| \leftarrow F_{23}$ $\quad F_{32} \rightarrow |5kg|$

$F_{21} = F_{12}$

$P - F_{12} = m_1 a$

$30 - F_{12} = 2 \times 3 = 6 \Rightarrow F_{12} = 30 - 6 = \boxed{24N}$

$\boxed{F_{21} = 24N}$

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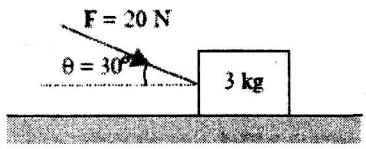
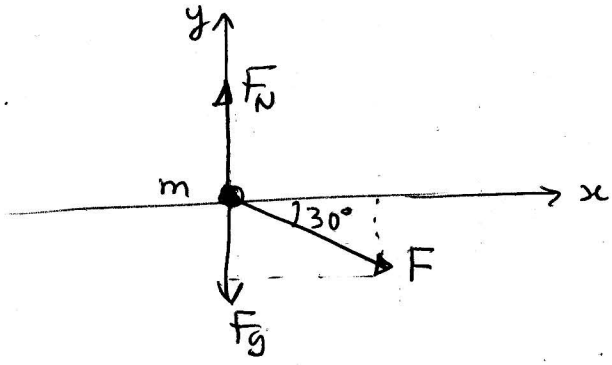
A 3.0 kg block is pushed across a horizontal surface by a force F = 20 N as shown in the figure.



(a) What is the magnitude of the acceleration of the block? (Assume the surface to be frictionless)

(b) What is the magnitude of the normal force?



a) $\vec{F}_{net} = m\vec{a}$

$F_{net,x} = m a_x \Rightarrow F\cos 30^\circ = m a$

$F_{net,y} = m a_y^{\,0}$

$\Downarrow$

$a = \frac{F\cos 30^\circ}{m} = \frac{20 \times \cos 30^\circ}{3}$

$\boxed{a = 5.77\ m/s^2}$

b) $F_N - F_g - F\sin 30^\circ = 0$

$F_N = F_g + F\sin 30^\circ = mg + F\sin 30^\circ$

$F_N = 3 \times 9.8 + 20 \times \cos 30^\circ = \boxed{39.4\ N}$