

Extra Inclined plane - connected objects example:

A 5 kg object sits on a 30 degree inclined plane and is connected by a rope over a frictionless pulley to a hanging 10 kg object as in the diagram. If $\mu = 0.20$ for the surface what is the acceleration rate of the object and the tension in the rope?

$\sin \theta = \frac{F_{gx}}{F_g}$
 $F_{gx} = F_g \sin \theta = 49.05 \sin 30 = 24.5 \text{ N}$
 $f = (\mu)(49.05) = 9.81 \text{ N}$
 $F_{gy} = 49.05 \cos 30 = 42.5 \text{ N}$
 $F_{gA} = (10)(9.81) = 98.1 \text{ N}$
 $F_{gB} = 5(9.81) = 49.05 \text{ N}$
 $F_n = F_{gA} - f - F_{gx} = 98.1 - 9.81 - 24.5 = 63.79 \text{ N}$
 $a = \frac{F_n}{m} = \frac{63.79}{5} = 12.76 \text{ m/s}^2$

b) Tension

$F_n = F_{gA} - T$
 $T = F_{gA} - F_n = 98.1 - (10)(12.76) = 98.1 - 127.6 = -29.5 \text{ N}$

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