More Practice: Inclines, Pulleys, Tension, etc.
ANSWERS

1) ① $F_{g_A} = mg$
$= (30kg)(9.8 m/s^2)$
$= 294N$

② $F_{g_B} = mg$
$= (20kg)(9.8 m/s^2)$
$= 196N$

$F_{g_{Ax}} = 294N \sin 60°$
$= 254.6N$

$F_{g_{Bx}} = 196N \sin 45°$
$= 138.6N$

② $F_{g_{Ax}} > F_{g_{Bx}}$ So the masses move "to the left"

$F_{net} = F_{g_{Ax}} - F_{g_{Bx}}$
$= 254.6N - 138.6N$
$= 116N$

③ $F_{net} = ma$
$a = \frac{F_{net}}{m}$
$= \frac{116N}{50kg}$
$= 2.32 m/s^2$

④ Isolate A

$F_{net} = F_{g_{Ax}} - T$
$ma = 254.6N - T$
$(30kg)(2.32 m/s^2) = 254.6N - T$
$T = 254.6N - 69.6N$
$T = 185N$

2) ① $F_{g_B} = mg$
$= (2.0\,kg)(9.8\,m/s^2)$
$= 19.6\,N$

② $F_{g_A} = mg$
$= (2.5\,kg)(9.8\,m/s^2)$
$= 24.5\,N$

$F_{g_{Ax}} = 24.5\,N \sin 25°$
$= 10.35\,N$
$F_{g_{Ay}} = 24.5\,N \cos 25°$
$= 22.2\,N$

③ $F_f = \mu F_N$
$= (0.30)(22.2\,N)$
$= 6.66\,N$

$*F_N = F_{g_{Ay}}$

④ $F_{net} = F_{g_B} - F_{g_{Ax}} - F_f$
$= 19.6\,N - 10.35\,N - 6.66\,N$
$= 2.59\,N$

⑤ $F_{net} = ma$
$a = \frac{F_{net}}{m}$
$= \frac{2.59\,N}{4.5\,kg}$
$a = 0.58\,m/s^2$

3) ① $F_{g_5} = mg$
$= (5.0kg)(9.8 m/s^2)$
$= 49N$

② $F_{g_2} = mg$
$= (2.0kg)(9.8 m/s^2)$
$= 19.6N$

③ $F_{net} = F_{g_5} - F_{g_2}$
$= 49N - 19.6N$
$= 29.4N$

④ $F_{net} = ma$
$a = \frac{F_{net}}{m}$
$= \frac{29.4N}{7kg}$
$= 4.2 m/s^2$

⑤ Isolate 5kg

↓+ $F_{net} = F_{g_5} - T$
$ma = 49N - T$
$(5kg)(4.2 m/s^2) = 49N - T$
$21N = 49N - T$
$T = 49N - 21N$
$\underline{\underline{T = 28N}}$

4) ① Find a

$v_i = 0$

$\Delta d = 0.600\,m$

$a = ?$

$\Delta t = 0.70\,s$

$\Delta d = \cancel{v_i \Delta t}^{\,0} + \frac{1}{2} a (\Delta t)^2$

$a = \frac{\Delta d}{\frac{1}{2}(\Delta t)^2}$

$= \frac{0.600\,m}{\frac{1}{2}(0.700\,s)^2}$

$= 2.45\,m/s^2$

② $F_{g_1} = mg$

$= (10.0\,kg)(9.8\,m/s^2)$

$= 98\,N$

$F_{g_1 x} = 98\,N \sin 28° = 46\,N$

$F_{g_1 y} = 98\,N \cos 28° = 86.5\,N$

③ $F_f = \mu F_N$

$= (0.20)(86.5\,N)$

$= 17.3\,N$

④ $F_{net} = F_{g_2} - F_{gx_1} - F_f$

$(10kg + m_2)(2.45\,m/s^2) = m_2(9.8\,m/s^2) - 46N - 17.3N$

$24.5N + m_2(2.45\,m/s^2) = m_2(9.8\,m/s^2) - 46N - 17.3N$

$m_2(9.8\,m/s^2) - m_2(2.45\,m/s^2) = 24.5N + 46N + 17.3N$

$m_2(7.35\,m/s^2) = 87.8N$

$m_2 = \frac{87.8N}{7.35\,m/s^2}$

$m_2 = 11.9\,kg$