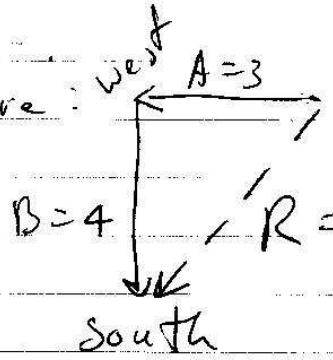
Picture Quizes:

14-1 Make a picture:



$4 < R < 7$

14-2 Constant velocity $\Rightarrow \vec{F}_{NET} = 0 \left(\vec{a} = 0\right)$

Mass irrelevant

No directions for forces given so

$\Sigma \vec{F}_{max} = (5 + 15 + 20)\,N = 39\,N$ (if all in same direction)

$\Sigma \vec{F}_{min} = (20 - 5 - 15)\,N = 0$

With various angles among the forces, any R between these two limits is possible.

14-3 Free body diagram: 1 mass (elevator) $\Rightarrow$ 1 diagram

One direction of motion (y) so One Equation

$\Sigma F_y = T - mg = -ma$ a given in problem

$T = -ma + mg = m(g - a) = 1000\,kg\,(9.8 - 1.8)\,\frac{m}{s^2}$

$T = 8000\,kg\,\frac{m}{s^2}\,(N)$

14-4 A mass ⇒ one free body diagram

$\Sigma F_x = F - T\sin\theta = ma_x = 0$

$\Sigma F_y = T\cos\theta - mg = ma_y = 0$

Eliminate T: $\frac{T\sin\theta = F}{T\cos\theta = mg}$ divide one equation by the other

$\tan\theta = \frac{F}{mg} = \frac{200N}{1000N} = 0.2$

$\arctan(0.2) = \underline{\theta = 11.3^\circ}$

14-5 Two ways to do it!

(A) $PE_i = KE_f$

$mgh = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{2gh} = \sqrt{450.8}\frac{m}{s}$

(B) $v^2 = v_0^2 + 2g\Delta y \Rightarrow v = \sqrt{2g\Delta y}$

($v_0 = 0$)

or (C) remember the formula from class!

14-6 Want time in air → so need kinematics

$v_{y0} = v_0\sin\theta = \sqrt{2g\Delta y}$ from previous problem.

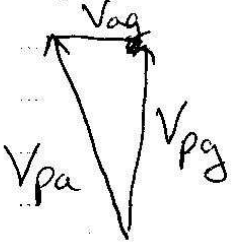
$\Delta y = v_{oy}t - \frac{1}{2}gt^2$ where t = time to go up

Sub. for Δy: $\frac{v_0^2\sin^2\theta}{2g} = v_0\sin\theta\, t - \frac{1}{2}gt^2$

Solve quadratic: $t = \frac{v_0\sin\theta}{g} =$

time in air $= 2t = \underline{0.835\ s}$

14-7 Plane must be flying a little west of north to buck the wind from the west.



$\vec{V}_{pa} = \vec{V}_{pg} + \vec{V}_{ag}$

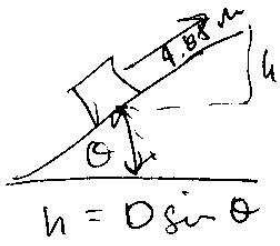
use Pythagorus: $V_{pa}^2 = V_{pg}^2 + V_{ag}^2$

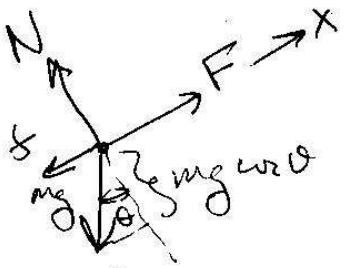
$V_{pg} = \sqrt{V_{pa}^2 - V_{ag}^2}$

$= \sqrt{40000 - 900} = 197.7 \frac{m}{hr}$

14-9 to 14-13

$W_f =$





ΣF_x: $F - f = ma_x$

ΣF_y: $N - mg\cos\theta = 0$

$F - \mu N = ma_x$ & $N = mg\sin\theta$

(a) $W_g = -mgh = -mgD\sin\theta = -139\ J$

(b) $W_f = fD = \mu mg\cos\theta D = 181.8\ J$

(c) $W_F = FD = 100N \cdot 4.85m = 485\ J$

(d) $\Delta KE = W_F - W_f - PE_G =$

$485 - 182 - 139 = 164\ J$

(e) $KE = KE_i + \Delta KE = \frac{1}{2}mv_i^2 + \Delta KE$

$= \frac{1}{2}10kg\left(1.5\frac{m}{s}\right)^2 + 164\ J$

$= 175\ J$

$v_f = \sqrt{\frac{2KE}{m}} = \sqrt{\frac{350}{10}} = 5.92\frac{m}{s}$