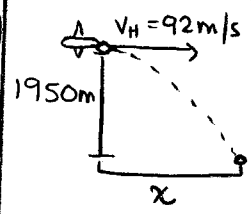
Test 1 Term 3 Review Solutions

1.a)



Vertical

$v_i = 0$
$s = 1950m$
$a = 9.8\,m/s^2$
$t = ?$

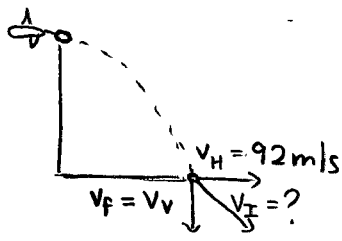
$s = v_i t + \frac{1}{2}at^2$
$1950 = 0(t) + \frac{1}{2}(9.8)(t^2)$
$t^2 = 397.96$
$t = 19.95\,s$

Horizontal

$v_a = 92\,m/s$
$t = 19.95\,s$
$s = ?$

$s = v_a t$
$s = 92\,(19.95)$
$s = 1835.3\,m \simeq 18.40m$

b)



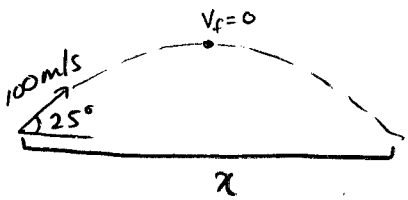
Vertical

$v_i = 0$
$v_f = ?$
$s = 1950$
$a = 9.8\,m/s^2$

$2as = v_f^2 - v_i^2$
$2(9.8)(1950) = v_f^2 - 0$
$v_f = 195.5\,m/s$

$v_I = \sqrt{v_H^2 + v_v^2}$
$= \sqrt{92^2 + 195.5^2}$
$v_I = 216\,m/s$

2.



Vertical

$v_i = 100\cos 25° = 90.6\,m/s$
$v_f = 0$
$a = -9.8\,m/s$
$t = ?$

$a = \frac{\Delta v}{t}$
$-9.8 = \frac{0 - 90.6}{t}$
$t = 9.24s$

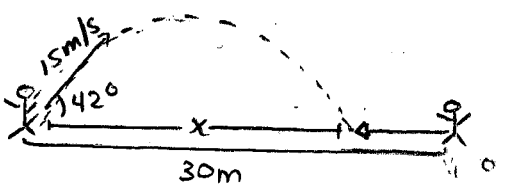
Horizontal

$v_a = 100\sin 25°$
$v_a = 42.3\,m/s$
$t = 18.49s$
$s = ?$

$s = v_a t$
$= 42.3(18.49)$
$s = 781.4\,m$

$\frac{x}{18.49s}$. $\frac{2}{}$

3.



Vertical

$v_i = 15\cos 42^\circ = 11.15\ m/s$

$v_f = 0$

$a = -9.8\ m/s^2$

$t = ?$

$a = \frac{\Delta v}{t}$

$-9.8 = \frac{0 - 11.15}{t}$

$t = 1.14\ s$

$\times 2$

$2.28\ s$

Horizontal

$v_a = 15\sin 42^\circ = 10.03\ m/s$

$t = 2.28\ s$

$s = ?$

$s = v_a t$

$s = 10.03(2.28\ s)$

$s = 22.88\ m$

Receiver must run in 2.28 s:

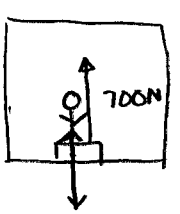
$30\ m - 22.88\ m = 7.12\ m$

$v_a = \frac{s}{t} = \frac{7.12\ m}{2.28\ s} = 3.1\ m/s$

4. B

5. $a = \frac{F_R}{m} = \frac{w_1 - w_2}{m_1 + m_2} = \frac{1.5kg(9.8\ m/s^2) - 1kg(9.8\ m/s^2)}{1.5kg + 1kg} = 1.96\ m/s^2$

6.

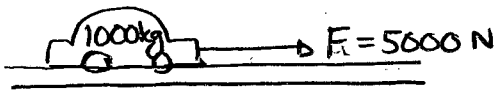


$w = 60kg(9.8\ m/s^2)$

$w = 588N$

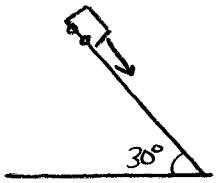
$a = \frac{F_R}{m} = \frac{700N - 588N}{60kg} = 1.87\ m/s^2$

7.



$$a = \frac{F}{m} = \frac{5000\,N}{1000\,kg} = 5\,m/s^2$$

8.



$a = g\sin A = 9.8(\sin 30°) = 4.9\,m/s^2$

$s = 1.2\,m$

$v_i = 0$

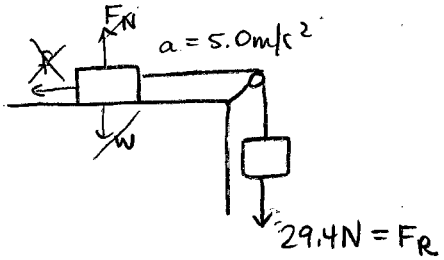
$v_f = ?$

$2as = v_f^2 - v_i^2$

$2(4.9)(1.2) = v_f^2$

$3.42\,m/s = v_f$

9.



$F_R = ma$

$29.4N = (3.0kg + x)\,5.0\,m/s^2$

$5.88 = (3.0 + x)$

$x = 2.88\,kg.$

10

$f = -F_R = ma$ ← need to find a

$v_i = 30\,m/s$

$v_f = 0$

$s = 100\,m$

$a = ?$

$2as = v_f^2 - v_i^2$

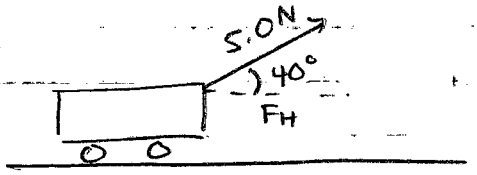
$2a(100) = -30^2$

$a = -4.5\,m/s^2$

$f = -F_R = -(1000kg)(-4.5\,m/s^2)$

$f = 4500\,N.$

11.



$$a = \frac{F_R}{m} = \frac{F_H}{m} = \frac{5.0\cos 40^\circ}{3.0\,kg}$$

$$a = 1.27\ m/s^2$$

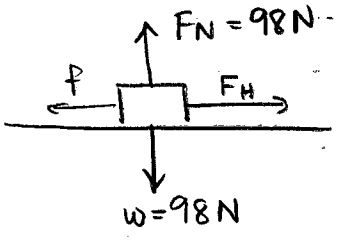
12. ① $a = \frac{F}{m}$ ② $a = \frac{F}{m} = \frac{2F}{3m} = \frac{2}{3}\left(\frac{F}{m}\right)$

$6\,m/s^2 = \frac{F}{m}$

$$a = \frac{2}{3}(6\,m/s^2)$$

$$a = 4\,m/s^2$$

13.



$F_R = F_H - f$, $F_R = ma$

$$F_H - f = ma$$

$$F_H - kF_N = ma$$

$$F_H - (0.35)(98) = 10(2)$$

$$F_H = 54.13\,N$$

OR if you remember for a horizontal plane with friction

$$a = \frac{F_H}{m} - kg$$

$$2 = \frac{F_H}{10} - 0.35(9.8) \rightarrow F_H = 54.3\,N$$

14. $m = 3.0\,kg$, $R = 1.3\,m$, $v = 6.0\,m/s$

$$F_C = \frac{mv^2}{R} = \frac{3.0(6.0)^2}{1.3} = 83\,N$$

15. $m = 400\,g = 0.4\,kg$, $R = 20.0\,m$

$$v = \frac{2\pi R \times \#rot}{t}$$

$$v = \frac{2(3.14)(20)(20)}{10} = 251.33\,m/s$$

$$F_C = \frac{mv^2}{R}$$

$$= \frac{0.4(251.33^2)}{20}$$

$$F_C = 1263.3\,N$$