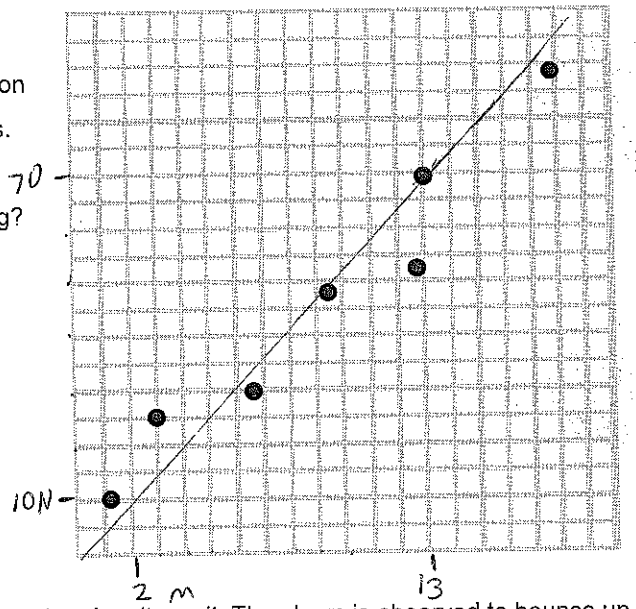
KEY

AP Physics 1: Pendulum/Spring test practice

This is not intended to copy the actual test. Instead, its purpose is to help you practice the ideas.

1. The graph on the right has force plotted on the y axis and distance in m or the x axis. Each box is 1m and 5N. What is the spring constant for the spring?



$K = \text{Slope} = \frac{70-10}{13-2} \quad \frac{60}{11}$

$K = 5.45\ N/m$

2. A 50 kg clown compress a spring vertically when he sits on it. The clown is observed to bounce up and down on the spring 25 times in 15 seconds. Find the following.

5477 k value

1.67 hz frequency

.6 s period

.089 distance spring would compress(x)

21.9 J elastic PE

.936 m/s speed of clown when x=0

1.28 s frequency a 84kg clown would vibrate

(1.) Find f

$\frac{25}{15}$ 1.67hz

(2.) Find T

1.67^{-1}

.6 s

(3.) Find K

$T = 6.28\sqrt{m/K}$

$.6 = 6.28\sqrt{50/K}$

$K = 5477\ N/m$

(4.) $F = -KX$

$(50 \cdot 9.8) = 5477X$

$X = .089m$

(5.) $U_s = \frac{1}{2}Kx^2$

$U_s = \frac{1}{2}\ 5477\ (.089)^2$

21.9 J

(6.) $U = KE$

$21.9 = \frac{1}{2}\ 50\ V^2$

$V = .936\ m/s$

(7.) $T = 6.28\sqrt{m/K}$

$T = 6.28\sqrt{84/5477}$

$T = .777 \quad F = \frac{1}{.777}$ 1.28

(1) $T = 6.28\sqrt{4/9.8}$
$T = 4.01$

(2.) $f = \frac{1}{4.01}$

(3.) $h = L(1-\cos\theta)$
$h = 4(1-\cos 8)$
$h = .0389$

(4.) $PE = mgh$
$PE = 10 \times 9.8 (.0389)$
$3.81 J$

(5.) $PE = KE$
$3.81 = \frac{1}{2} 10 v^2$
$.873 m/s$

(6.) $T = mg\cos\theta$
$T = 10 \times 9.8 \cos 5$
97.6

3. A 10 kg mass swings on 4 m long pendulum that makes a 8 degree angle from the vertical. Please find

4.01 s period

.249hz frequency

.0389 height of pendulum from the equilibrium point

97.6N tension in rope at 5 degrees

3.81J maximum potential energy

.873m/s fastest speed attained

4. A spring operated dart gun fires 0.010 kg darts. Arming the gun requires 185 N of force and results in the shortening of the spring by 10 cm.

Find the spring constant. 1850 N/M

(1.) $F = -Kx$ $185 = K \cdot .1$
$K = 1850 N/m$

Find the energy stored in the spring 9.25 j

Find the muzzle velocity of the dart. 43 m/s

If the dart is launched vertically, how high will it rise? 94.4m

(2.) $U = \frac{1}{2} K x^2$
$U = \frac{1}{2} 1850 (.1)^2$
$U = 9.25 J$

(3.) $U = KE$
$9.25 = \frac{1}{2} m v^2$
$9.25 = \frac{1}{2} .01 (V)^2$
$43 m/s$

(4.) $KE = PE$
$9.25 = mgh$
$9.25 = .01 \times 9.8 h$
$94.4 m$