Pendulums, Ramps, and Falling Objects Worksheet

1. What is the period of a pendulum that is 0.50m long?

$T = 2\pi\sqrt{\frac{l}{g}} = 2\pi\sqrt{\frac{0.5}{9.8}} = 1.42s$

2. What is 'g' on a planet where a 12.0m pendulum has a frequency of 0.07Hz?

$g = \frac{4\pi^2 l}{T^2} = \frac{4\pi^2(12)}{(14.3)^2} = 2.32 m/s^2$ $\quad \frac{1}{.07} = 14.3$

3. What is the acceleration of a car down a hill 2km long with a 20^0 incline?

$a = g\sin\theta = 9.8 \sin 20 = 3.35 m/s^2$

4. What is 'g' on a planet where a car rolls down a ramp that is 3m high, and 20m down the slope with an acceleration of $20m/s^2$?

$g = a\left(\frac{d}{h}\right) = 20\left(\frac{20}{3}\right) = 133 m/s^2$

5. A depressed stock broker, having lost his money, job, wife, and dog, decides not to go into country music, and instead decides to hurl himself out of the window of his office. When he jumps, he changes his mind at the last second, and grabs onto the window ledge. Sadly however, his shoe slips off and plummets to a gruesome death on the sidewalk below. If the much lamented shoe fell 120.0m, how long did it take to hit the ground?

$v_f = x$
$v_i = 0$
$d = -120$
$a = -9.8$
$t = ?$

$d = \cancel{v_i t}^{0} + \frac{1}{2}at^2$
$-120 = \frac{1}{2}(-9.8)t^2$
$t = 4.95s$

6. The depressed stock broker decides he would rather colonize another planet, and when he gets there he decides he just can't go another minute without dropping his other shoe off the highest mountain on the planet Lookithat. His shoe plummets to the ground, 1500m below, taking 20.0 seconds to get there. What is 'g' on planet Lookithat?

$v_f = x$
$v_i = 0$
$d = -1500$
$a = ?$
$t = 20$

$d = \cancel{v_i t}^{0} + \frac{1}{2}at^2$
$-1500 = \frac{1}{2}a(20)^2$
$a = 7.5 m/s^2$