More free fall + Newton's 2nd Law Practice Problems.

(1) $v_i = 0$
$a = -9.8\ m/s^2$
$t = 1.5\ s$
$v_f = ?$

$v_f = v_i + at$
$= (-9.8)(1.5)$
$= \underline{14.7\ m/s}$

(2) $v_f = 0$
$a = -9.8\ m/s^2$
$t = 1.5\ s$
$d = ?$

$v_f = v_i + at$
$0 = v_i + (-9.8)(1.5)$
$v_i = 14.7\ m/s$

$v_f^2 = v_i^2 + 2ad$
$0 = (14.7)^2 + 2(-9.8)d$
$d = 11.0\ m$

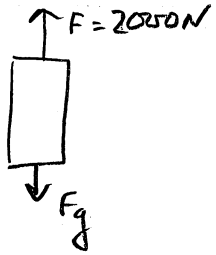
yes, she can catch it

(3) $F = ma$
$F = (1000)(-9.8) = \underline{-9800N}$

(4) $F = ma$
$200 = 100\,a$
$a = \underline{2\ m/s^2}$

(5) Weight $= F_g = mg$
$= 68(9.8) = \underline{588N}$

(6) $F_g = mg$
$16 = 28g$
$g = \underline{0.8}\ m/s^2$ or N/kg

(7) 

$F - F_g = ma$
$F - mg = ma$
$2000 - 100(9.8) = 100\,a$
$a = \underline{10.2\ m/s^2\ upwards}$

(8) $v_i = 0$
$v_f = 300 m/s$
$d = 0.45 m$
$a = ?$

$v_f^2 = v_i^2 + 2ad$
$(300)^2 = 2a(0.45)$
$a = 100\,000 \ m/s^2$

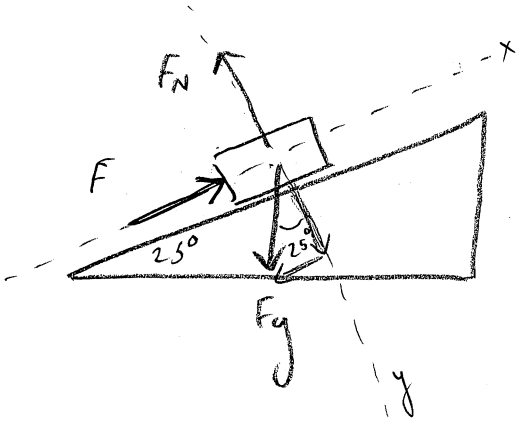
The force on the bullet is therefore

$F = ma$
$= (.017)(100\,000)$
$= 1700 N$

According to Newton's third law, this force is also exerted on the gun. Therefore, the acceleration of the gun is:

$F = ma$
$1700 = 2.8a$
$a = 607 \ m/s^2$

(9)



x
$F - F_g \sin 25° = ma$
$F - mg \sin 25 = ma$
$27 - 5(9.8) \sin 25 = 5a$

$a = 1.3 \ m/s^2$