Formula of Projectile Motion Problems

The key features to know in projectile motion problems are the initial height, the initial speed, a value of the force of gravity, and time. They are related in the formula given below:

$$s(t) = -g * t^2 + v_{0}*t + h_{0}$$

where:

s is the height at any particular time (t)

[Note: s(t) is also sometimes shown in the formula as h]

g is gravity value in feet this value is 16 and in meters this value is 4.9
[Note: In physics, the gravitational

constant is actually 32 for feet and 9.8 for meters, but the formula uses one-half this value.]

vo is the initial velocity

ho is the initial height

Q1) An object is launched directly upward at 19.6 m/s from a 58.8-meter tall platform. The equation for the object's height (s) at time (t) seconds after launch is $s(t) = -4.9t^2 + 19.6t + 58.8$ where s is in meters. When does the object strike the ground?

Q2) An object is launched from ground level directly upward at 39.2 m/s. For how long is the object at or above a height of 34.3 meters?

$s(t) = -4.9t^2 + 39.2t$

Q3) Two objects are dropped from a bridge 160 feet above ground level. One object is released with an initial velocity of zero, falling only by the force of gravity. The other is thrown straight down with a velocity of 48 ft/s. How many

seconds earlier does the thrown object reach the ground as compared with the dropped object?

dropped object: $s(t) = -16t^2 + 160$

thrown object: $s(t) = -16t^2 - 48t + 160$

Q4) An object is thrust directly down from a height of 190 feet at a velocity downward of 64 ft/s. How many seconds will it take before the object hits the ground?

Ans
1. 6 seconds
2. 6 seconds
3. 1.16 seconds
4. 5.98 seconds