PROJECTILES & ENERGY*

Unit 10 & 11 & 9 Dr. John P. Cise,
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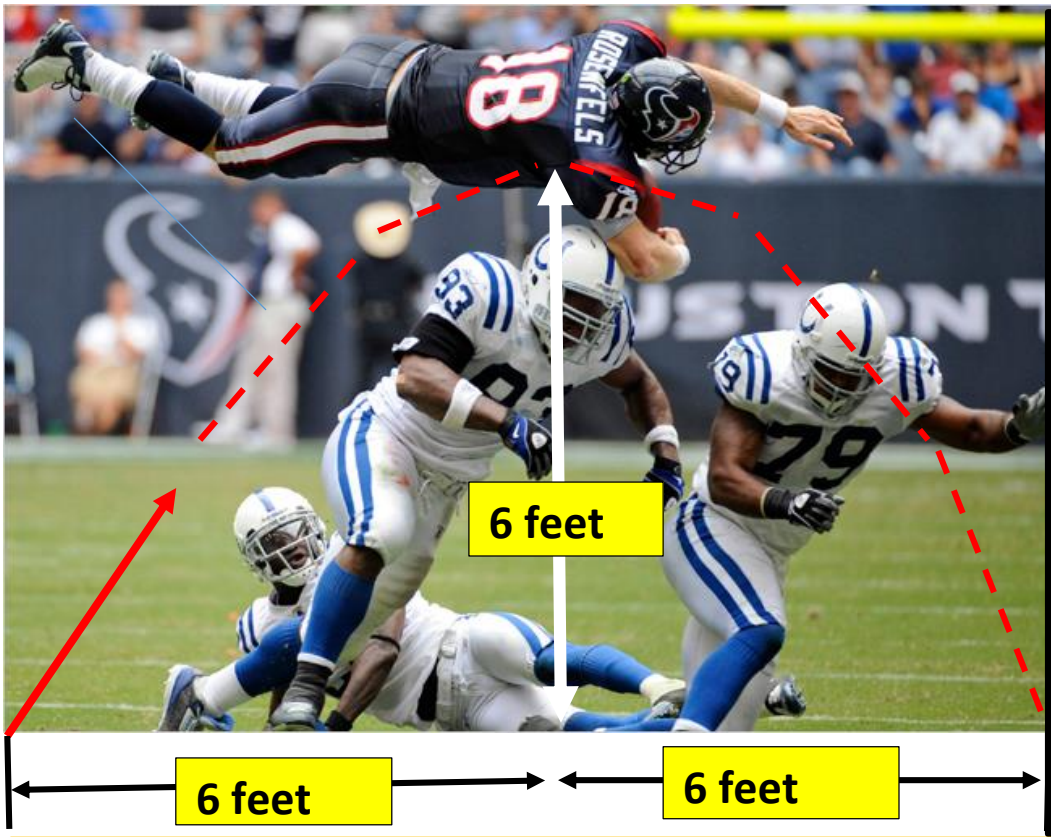

INTRODUCTION: **The initial goal is to find the football player's initial speed and angle of leap. The time to fall 6 feet is half the time to move the 12 feet horizontally. The secondary goal is to verify the total initial kinetic energy of the leap is equivalent to kinetic and potential energy at the top of the leap.**

QUESTIONS: (a) Find time to fall 6 feet? (b) Find the time to fly 12 feet horizontally? (c)Using kinematic(leap uip) equation: $y = V_0 t + \frac{1}{2} g t^2$ find v sin Θ where v is initial velocity of leap and Θ is angle above horizontal of the leap.

QUESTIONS CONTINUED: (d) From horizontal motion (of the leap) where horizontal velocity v cos Θ is constant find V cos Θ using $x = V_{horizontal}\, t$? (e) Find Θ using Tan Θ = sin Θ / cos Θ ? (f) Find initial velocity v of leap off the ground? (g) Find initial horizontal component of velocity? (h) Take the football player leaping weight = 224 lb., Find mass (in slugs) of leaping football player? (i) Find initial total kinetic energy of leaping football player? (j) Find players kinetic energy at top of leap? (k) Find gravitational potential energy of player at top of leap? (l) Does initial total energy at start of leap = total energy at top of leap (kinetic + potential)?

HINTS: **$K = \frac{1}{2} m v^2$, Potential energy = m g h , g = 32 ft./s.^{2} ,**

ANSWERS: **(a) 0.6123 s., (b) 1.22 s. , (c) v sin Θ = 19.6 ft./s. , (d) v cos Θ = 9.8 ft./s., (e) Θ = 63.43 ° (f) 21.91 ft./s. (this is about 15 mph which is quite reasonable) , (g) 9.8 ft./s., (h) 7 slugs, (i) 1680 ft. lb., (j) 336 ft. lb., (k) 1344 ft. lb., (l) yes! 1680 ft. lb. = 336 ft. lb. + 1344 ft. lb. = 1680 ft. lb.**