Put these in your problem notebook! Except for FP#1, all are from The Physics Classroom Calculator Pad **Problem Set: Vectors and Projectiles.** Except for FP#1, solutions to these are online on the Physics Classroom calculator pad, and I'll have my own Screencast solutions posted after we go over these. [Solutions to FP#1 are by that problem, below]

3 SIG. FIG'S. IN GENERAL   **DUE: 1/16/2019**   *REMEMBER: What goes up, must come down*

PC # 21. Dylan and Sophia are walking along Buckeye Lake on a perfectly calm day. Dylan, determined to impress Sophia by his ability to skip rocks, picks up the flattest rock he can find and gives it a sidearm launch from the edge of the water. The rock acquires a completely horizontal velocity of 26 m/s from a height of 0.45 m above the water surface.

a. How much time does it take the rock to fall to the water surface?
b. How far from the edge of the water does the rock travel before it makes its first skip?

PC # 22. In an effort to create a cannonball-style splash, seventeen-year old **Alex Watros** runs off the edge of the board of the high dive at 4.6 m/s and falls 2.3 m to the water below.

a. Determine the time for Alex to fall the 2.3 m to the water.
b. What horizontal distance from the edge of the board will Alex plunge into the water?
c. With what speed does Alex enter the water?

FP #1. A new concept for emergency help is drones! Assume a drone is flying along at 15.0 m/s horizontally and drops a care package of medicine and food to some campers stranded by a flash flood. Assume the drone is flying at an altitude of 60.0 meters above the ground. Ignore any air resistance for the rest of the problem.

a. At what rate would the care package travel horizontally after it's dropped from the drone? Explain & show work [A: 15 m/s]
b. What is the package's initial vertical velocity just after it's dropped? Explain and show work. [A: 0 m/s]
c. At what rate does the package's vertical velocity change each second? Explain. [A: 9.8 m/s/s]
d. How much time will it take for the car package to reach the ground? [A: 3.50 s]
e. How far away horizontally should the drone release the care package in order to land on the campers? [A: 52.5 m]
f. Assuming the drone's velocity doesn't change, where would the drone be located relative to the package just as it hits the ground? Explain your logic. [A: Directly above]

PC # 27. Aaron Agin and Bud Derfenger are lab partners who last year in chemistry earned a reputation for breaking beakers, spilling acid, mixing the wrong chemicals, breaking thermometers and accidentally lighting Sophia's hair on fire with a Bunsen burner. And now to the delight of the physics class, Mr. Forrest has made the mistake of allowing them to partner again. In a recent lab, which utilized expensive tracks and carts, Aaron and Bud lived up to their reputation. Despite strong warnings from Mr. F, they allowed a cart to roll off the track and then off the table with a speed of 208 cm/s. The crash of the cart to the floor a horizontal distance of 96.3 cm from the table's edge turned the entire classroom silent. Use this information to determine the height of the lab tables in Mr. Forrest's lab.

PC # 28. Sharon Steady and Al Wayskachon won their high school's egg toss contest held during Homecoming week. In their winning toss, Sharon gave the egg an underhand toss, releasing it with a velocity of 8.06 m/s at an angle of 30° to the horizontal. To the pleasure of the crowd, Al caught the egg at the same height as the toss without even a fracture to its shell.

a. Calculate the horizontal and vertical components of the initial velocity.
b. Calculate the time for the egg to reach the midpoint of the trajectory.
c. Calculate the total time the egg is in the air.
d. Calculate the horizontal distance which the egg traveled from Sharon to Al.
e. Calculate the height of the egg (relative to the release point) when it was at the peak of its trajectory.

PC # 29. Li Ping Phar, the famous Chinese ski jumper sure to be seen in the next winter Olympics, leaves the ramp with an initial velocity of 34.9 m/s at an angle of 35°. Assume Li Ping lands at the same height as the launch.

a. Determine the total time of flight.
b. Determine the horizontal displacement.
c. Determine the peak height (relative to the starting height).