A Complex Course

You have spent years practicing parkour, a method of moving through an obstacle course using the obstacles themselves to help you get to the finish. Many of your moves involve tight flips, long leaps, firm grips, swift climbs, and lots of balance. You ask your professional trainer to help you analyze the parkour course mathematically to visualize how you might best move through it. Below are the problems you solve.

Directions: Record your responses on a separate sheet of paper and show your work.

1. You encounter a free stretch of ground in front of a vertical wall. You attempt to flip and land on top of the wall.
   a. You know that the stretch of ground in front of you is 4 feet long, and the wall is 3 feet high. Write an equation that will help you determine the length of your flip. Assume that you travel in a straight line. Evaluate the equation you wrote above. What is the distance of your flip?

2. You see a square pedestal onto which you want to jump to launch yourself over a wall.
   a. The area of the top of the pedestal is 16 square inches. What is the length of each of the sides of the top of the pedestal?
   b. How might you write your answer to the previous question as an exponential expression with a base of 2?
   c. The height of the wall over which you want to launch yourself is 2^4 times the length of the side of the top of the pedestal. How tall is the wall? Use the properties of integer exponents to help you. Write your answer both in exponential form and standard form.

3. The volume of the training room is 343 cubic meters. The training room is a perfect cube.
   a. Write an expression that represents the length of the training room.
   b. Evaluate the expression you wrote in part a. How long is the training room?

4. You learn of a parkour training room nearby that is 49 times as big as the one that you are currently in.
   a. What exponential expression describes the volume of the parkour training room that you are currently in?
   b. What exponential expression describes how much bigger the larger parkour room is compared to the one you are currently in?
   c. Use exponents to write a multiplication expression describing the volume of the larger parkour training room.
   d. What is the volume of the larger parkour training room?