55. We neglect air resistance, which justifies setting $a = -g = -9.8$ m/s^2 (taking *down* as the $-y$ direction) for the duration of the motion. We are allowed to use Table 2-1 (with Δy replacing Δx) because this is constant acceleration motion. The ground level is taken to correspond to the origin of the y axis. The time drop 1 leaves the nozzle is taken as $t = 0$ and its time of landing on the floor t_1 can be computed from Eq. 2-15, with $v_0 = 0$ and $y_1 = -2.00$ m.

$$y_1 = -\frac{1}{2}gt_1^2 \implies t_1 = \sqrt{\frac{-2y}{g}} = \sqrt{\frac{-2(-2.00)}{9.8}} = 0.639 \text{ s} .$$

At that moment,the fourth drop begins to fall, and from the regularity of the dripping we conclude that drop 2 leaves the nozzle at $t = 0.639/3 = 0.213$ s and drop 3 leaves the nozzle at $t = 2(0.213) = 0.426$ s. Therefore, the time in free fall (up to the moment drop 1 lands) for drop 2 is $t_2 = t_1 - 0.213 = 0.426$ s and the time in free fall (up to the moment drop 1 lands) for drop 3 is $t_3 = t_1 - 0.426 = 0.213$ s. Their positions at that moment are

$$\begin{aligned} y_2 &= -\frac{1}{2}gt_2^2 = -\frac{1}{2}(9.8)(0.426)^2 = -0.889 \text{ m} \\ y_3 &= -\frac{1}{2}gt_3^2 = -\frac{1}{2}(9.8)(0.213)^2 = -0.222 \text{ m} , \end{aligned}$$

respectively. Thus, drop 2 is 89 cm below the nozzle and drop 3 is 22 cm below the nozzle when drop 1 strikes the floor.