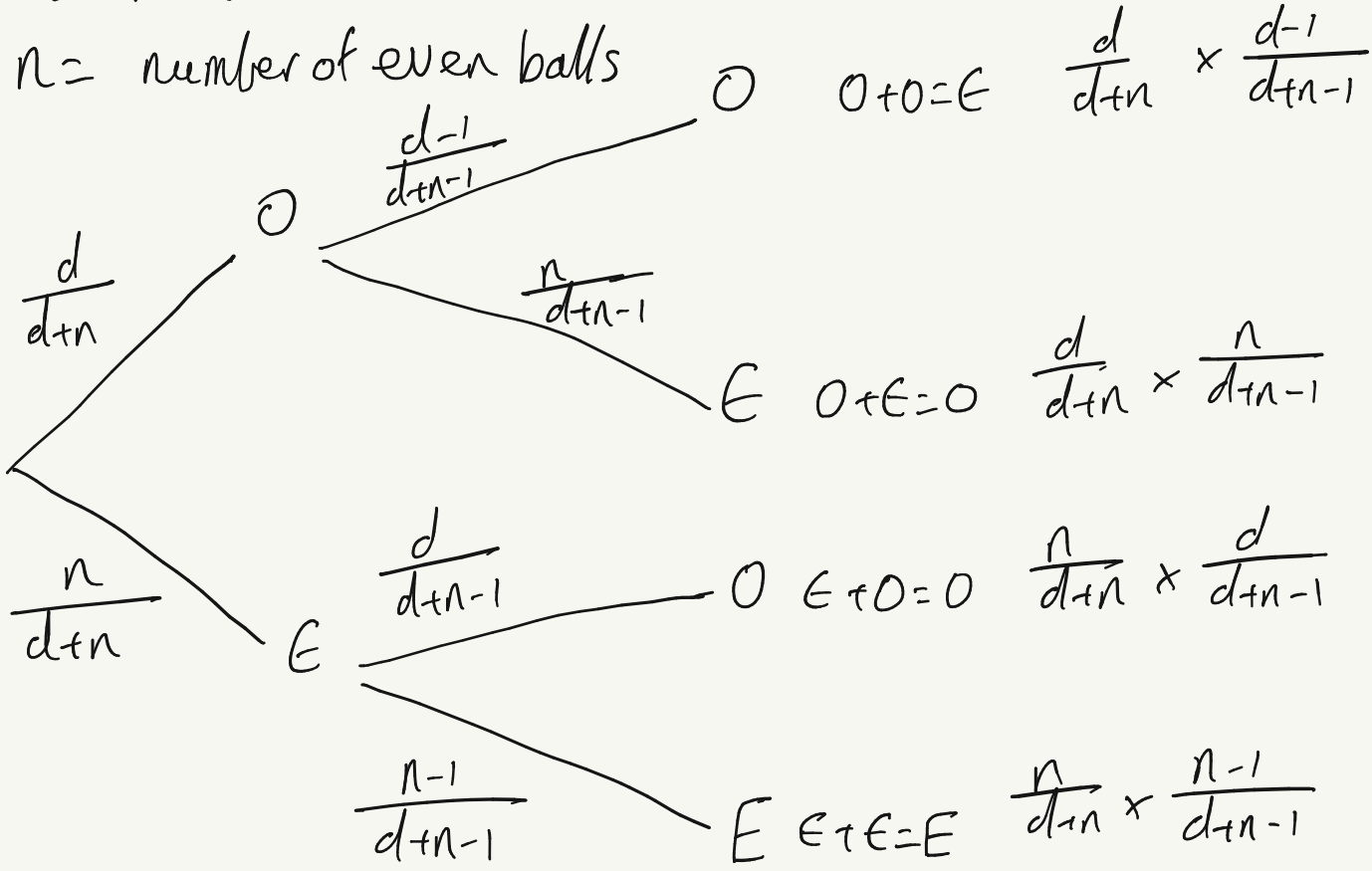
$d$ = number of odd balls

$n$ = number of even balls




$$P(E) = \frac{d(d-1)}{(d+n)(d+n-1)} + \frac{n(n-1)}{(d+n)(d+n-1)}$$

$$P(O) = \frac{d(n)}{(d+n)(d+n-1)} + \frac{n(d)}{(d+n)(d+n-1)}$$

if game is fair then $P(E) = P(O)$

$$\frac{d(d-1)+n(n-1)}{(d+n)(d+n-1)} = \frac{2dn}{(d+n)(d+n-1)}$$

$$d^2 - d + n^2 - n = 2dn$$

$$d^2 - 2dn + n^2 = d + n$$

$$(d-n)^2 = d+n$$