Minimum Screens Required for App Icons

Each screen is a 5×3 grid:

$$\text{Total cells per screen} = 5 \times 3 = 15$$

App Sizes

- A 1×1 app uses 1 cell.
- A 2×2 app uses 4 cells and must be placed in a square of size 2×2.

Maximum 2×2 Apps per Screen

Since:

- There are 5 rows: $\Rightarrow$ can fit two 2-row sections (row 0–1 and 2–3)
- There are 3 columns: $\Rightarrow$ only one 2×2 block fits per 2-row section

Therefore:

$$\text{Max 2×2 icons per screen} = 2$$

Let

$$x = \text{number of } 1 \times 1 \text{ apps}, \quad y = \text{number of } 2 \times 2 \text{ apps}$$

Step 1: Screens for 2×2 apps

$$\text{Screens for 2×2} = \left\lceil \frac{y}{2} \right\rceil$$

$$\text{Used cells by 2×2 apps} = 4 \cdot y$$

$$\text{Total cells from those screens} = 15 \cdot \left\lceil \frac{y}{2} \right\rceil$$

$$\text{Remaining cells for 1×1} = 15 \cdot \left\lceil \frac{y}{2} \right\rceil - 4y$$

Step 2: Remaining 1×1 apps

Let:

$$r = x - \left(15 \cdot \left\lceil \frac{y}{2} \right\rceil - 4y\right)$$

Then:

$$\text{Extra screens for 1×1} = \left\lceil \frac{\max(0, r)}{15} \right\rceil$$

Final Formula

$$\text{Total Screens} = \left\lceil \frac{y}{2} \right\rceil + \max\left(0, \left\lceil \frac{x - \left(15 \cdot \left\lceil \frac{y}{2} \right\rceil - 4y\right)}{15} \right\rceil\right)$$