$$\therefore \quad \hat{\mathbb{Z}}_p = \varprojlim \mathbb{Z}/p^r\mathbb{Z}$$

$$\left(\mathbb{Z}/p^r\right)\hat{}_p = \mathbb{Z}/p^r$$

$$(l,p)=1: \quad \left(\mathbb{Z}/l\right)\hat{}_p = 0$$

<u>p-completion of topological spaces</u>

$X, Y, \ldots, A, B, \ldots$ = s.c. ptd spaces

$M = M(\mathbb{Z}[\frac{1}{p}], 1)$ = Moore space

☆ 1) X is p-complete $\Leftrightarrow$ X is M-null:

$$\mathrm{map}_*(M, X) \simeq_{whe} * \Leftrightarrow$$

$$\forall i \geq 0, \ \pi_i \, \mathrm{map}_*(M, X) = [\Sigma^i M, X]_* = 0$$

---

exact: $0 \leftarrow \hom(\mathbb{Z}[\frac{1}{p}], \pi_{i+1} X) \leftarrow [\Sigma^i M, X]_* \leftarrow \mathrm{Ext}(\mathbb{Z}[\frac{1}{p}], \pi_{i+2} X) \leftarrow 0$

☆ $\therefore \Leftrightarrow \mathrm{Ext}^*(\mathbb{Z}[\frac{1}{p}], \pi_* X) = 0 \Leftrightarrow \pi_* X$ is p-complete $\forall *$