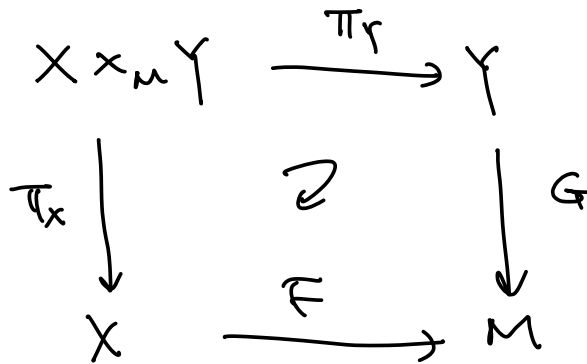Usually fiber product is denoted by $X \times_M Y$. It satisfies the

following diagram:

(sometimes called pullback)

$$
\begin{array}{ccc}
X \times_M Y & \xrightarrow{\pi_Y} & Y \\
\pi_X \downarrow & \circlearrowleft & \downarrow G \\
X & \xrightarrow{F} & M
\end{array}
$$

<u>Rmk</u> Fiber product can be defined in a rather general setting

(cf. cat def).

<u>Rmk</u> $X \times_M Y$ satisfies the following "universal property":

$$
\begin{array}{ccc}
\forall P & \xrightarrow{q_Y} & \\
q_X \left(\begin{array}{c} \exists ! \\ \downarrow \\ X \times_M Y \xrightarrow{\pi_Y} Y \\ \pi_X \downarrow \circlearrowleft \downarrow G \\ X \xrightarrow{F} M \end{array} \right) &
\end{array}
$$