Flip a coin until 1st head appears.
Let $X$ be the # of flips until (and including) the first head.

$S = \{H, TH, TTH, TTTH, \ldots, \underbrace{TTT\cdots TH}_{j-1}, \ldots\ldots \quad TTTT\ldots.\}$

probs $\quad \frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{8} \quad \frac{1}{16} \qquad\qquad (\frac{1}{2})^j$

Check: $\sum_{j=1}^{\infty} (\frac{1}{2})^j = 1$ ✓

$P(X=1) = P(\{H\}) = \frac{1}{2}$

$P(X=2) = P(\{TH\}) = \frac{1}{4}$

$P(X=j) = P(\{\underbrace{T\cdots TH}_{j-1}\}) = (\frac{1}{2})^j$

$P(X \le 3) = P(\{H, TH, TTH\}) = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}$

$P(X > 3) = P(S \setminus \{H, TH, TTH\}) = 1 - P(X \le 3) = 1 - \frac{7}{8} = \frac{1}{8}$

($\setminus$ = setminus $= S \cap \{H, TH, TTH\}^c$)

↓

Only way $X > 3$ is if first 3 flips are tails $P(X>3) = \frac{1}{8}$

$$P(2 \le X \le 5) = P(X=2) + P(X=3) + P(X=4) + P(X=5)$$
$$= \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32}$$
$$= \frac{8+4+2+1}{32}$$
$$= \frac{15}{32}$$