875 - Koko Eating Bananas

piles = [3, 6, 7, 11], h = 8

Start r at max(piles) = 11 (here), l at 1

$1 \le k \le \max(piles)$, going larger does not help, going smaller not possible

m = (l + r) // 2 = 6, hours taken = 6 <= 8 ⇒ k ↓
r = m = 6, m = 3, hours taken = 10 > 8 ⇒ k ↑
l = m + 1 (since m is not a solution) = 4, m = 5,
hours taken = 8 <= 8 ⇒ k ↓
r = m = 5, m = 4, hours taken = 8 <= 8 ⇒ k ↓
r = m = 4 ⇒ l >= r, break, return m = 4 ✓

piles = [30, 11, 23, 4, 20], h = 6

l = 1, r = 30, m = 15, hours taken = 8 > 6 ⇒ k ↑
l = m + 1 = 16, m = 23, hours taken = 6 <= 6 ⇒ k ↓
r = m = 23, m = 19, hours taken = 8 > 6 ⇒ k ↑
l = m + 1 = 20, m = 21, hours taken = 7 > 6 ⇒ k ↑
l = m + 1 = 22, m = 22, hours taken = 7 > 6 ⇒ k ↑
l = m + 1 = 23, ⇒ l >= r, break, return m = 22 ✗

Issue: m is correct when we squeeze in on the correct value from the right but not the left, don't return m, return l or r instead (both should be equal when we break out of the loop).

If len(piles) > h, there is no solution, however we are guaranteed that $1 \leq \text{len(piles)} \leq h$

1. If len(piles) == h, return max(piles)
2. Set $l = 1$, $r = \max(\text{piles})$
3. Perform binary search while $l < r$
   - Calculate $m = (l + r) // 2$
   - Find hours taken (x) with $k = m$
   - If $x > h$, $l = m + 1$ (since m is not a solution)
   - If $x <= h$, $r = m$ (since m may be a solution)
4. Return l (or r, they should be equal when we break)