

### **Multiples in an Interval**

Given an interval  $[l, h]$  and a whole number  $a$  such that  $a > 1$  and given that  $r = a - (l \% a)$  there exist a multiple of  $a$  on the interval if  $l + r \leq h$ .

**If**  $a < l$

then  $r = a - l \% a$  which is the distance from  $l$  to next multiple of  $a$  then we can simply check if this is within the interval.

**If**  $a > l$

then it suffices to check if  $a < h$  and  $l + r = l + a - l$  since  $l \% a = l$  thus  $l + r \leq h$  simplifies to  $a < h$ .

This does not account for endpoints of the interval however so this formula only works for open intervals.

**If**  $a = l$

**If**  $a = h$