

Part a

~~log n~~
0 $i = 2$
1 $i = 4$ 2^2
2 $i = 16$ 2^4
3 $i = 256$ 2^8
4 $i = 2^{16}$
 ~~$i = 2^{2^k}$~~
 $i = 2^{2^k}$

stops when $i \geq n$

$$2^k \geq n$$

$$2^k \geq \log n$$

$$k \geq \log \log n$$

$$O(\log(\log(n)))$$