

a)

k	i
0	2 = 2 ¹
1	4 = 2 ²
2	16 = 2 ⁴
3	256 = 2 ⁸
4	256 ² = 2 ¹⁶

$= 2^{2^k}$ $n = 2^{2^k}$
 $\log n = 2^k$
 $\log(\log n) = k$

runtime: $\Theta(\log(\log n))$

b)

i	n=10	$\sqrt{n}=3$
1	x	
2	x	
3	✓	
4	x	
5	x	
6	✓	
7	x	
8	x	
9	✓	

if executes \sqrt{n} times

$$\sum_{i=1}^n \Theta(i) + \sum_{i=1}^{\sqrt{n}} \left(\sum_{j=0}^{i^2-1} \Theta(1) \right) = \Theta(n) + \Theta(\sqrt{n} \cdot n^3)$$

runtime = $\Theta(n^{7/2})$

c)

$$\sum_{i=1}^n \left(\sum_{j=1}^n \left(\sum_{k=1}^n \Theta(1) \right) \right) = \sum_{i=1}^n \left(\sum_{j=1}^n (\log n) \right) = n^2 \log n$$

runtime: $\Theta(n^2 \log n)$

m	k
2 ⁰ =1	0
2 ¹ =2	1
2 ² =4	2
2 ³ =8	3

d)

$$\sum_{i=0}^{n-1} \Theta(1) + \sum_{i=0}^{n-1} \left(\sum_{j=0}^{3/2} \Theta(1) \right) = \sum_{i=0}^{n-1} 3/2 = \frac{3/2^{n+1} - 1}{3/2 - 1} = \frac{3/2^n + 3/2 - 1}{3/2 - 1} = \frac{3/2^n + 1/2}{1/2}$$

$$= (2(3/2)^n + 1/2)$$

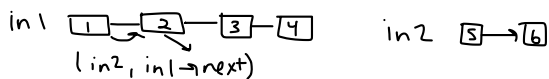
$$\Theta(n) + \Theta(3/2^n)$$

runtime

size
10
3/2 (15)
5/4 (22)
33
49
73

runs 3/2 size

a) in1 is returned



in1 in2

(1, 5)

in2(5, 2) in1

in1(2, 6) in2

in2(null, 3) in1

return in2; ← actually in1

b) in2 is returned

in1=null in2=2

in1=null ✓ return in2