Part a:

value of i after update	number of updates
i^2	1
i^4	2
i^8	3
i^{2^k}	k

$i^{2^k} = n$

$2^{2^k} = n$

$2^k = \log_2 n$

$k = \log_2(\log_2 n)$

Part b:

values of k after update	number of updates
$k+1$	1
$k+2$	2

$$\sum_{i=1}^{n} \Theta(1) + \sum_{j=0}^{\sqrt{n}} \quad + \sum_{k=0}^{(j\sqrt{n})^3} 1$$

$$n + \sum_{j=0}^{\sqrt{n}} (j\sqrt{n})^3$$

$$n + \sqrt{n}^3 \sum_{j=0}^{\sqrt{n}} j^3$$

$$n + \sqrt{n}^3 (\sqrt{n})^4$$

$$n + \sqrt{n}^7$$

$$n + n^{7/2}$$

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

Pat C

$$\sum_{i=1}^{n} \quad \sum_{k=1}^{n} \quad \sum_{m=1}^{2m} \Theta(1)$$

a

action: adding 7 a together

$$a + a + a + a + a + a + a$$

$$\sum_{i=0}^{7} a = 7 \cdot a$$

random name for the counter

$$\sum_{i=0}^{b} O(1)$$

do work that use O(1) for b times.
||
iterations.

How to solve: draw a table of

iterable variable M value after # iteration	# iterations done
2M	1

The inner most for

$4m$		2
$8m$		3
$\vdots$		$\vdots$
$2^b m$		b

loop body is executed.

* Keep in mind that after b iterations, the for loop ends.

↓ which means

value of m = the termination value $= n$

so we found

$2^b m = n$

Remember the goal: solve for b in terms of n! From what equation

From this one.

answer should $\underline{b = \cdots n}$

then substitute this exp back to the sum

$$2^b = \frac{n}{m}$$

$$b = \log_2 \frac{n}{m}$$

$$\sum_{j=1}^{n} \sum_{i=1}^{n} \Theta(1) + \sum_{m=1}^{n} \sum_{m=1}^{\log n}$$

$$\Theta(n^2) + \Theta(n \log n)$$

$$\Theta(n^2)$$

Part d

$$\sum_{i=0}^{n} \Theta(1) + \sum_{j=0}^{n} \Theta(1)$$

$$\Theta(n) + \Theta(n) = \Theta(n)$$