Q3

Medetkan
Kutlu

$A =$ | 9 | 12 | 17 | 21 | 33 | 41 |

| 33 | 41 | 9 | 12 | 17 | 21 |

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

- for $n = 2^{16}$, $k = 1$:

$$\Theta((2^{16}-1)1)$$

$$= \Theta(65535) \quad //$$

- for $n = 2^{16}$, $k = 2n/16$

$$\Theta(nk - k^2)$$

$$= \frac{2n^2}{16} - \frac{4n^2}{16^2}$$

$$= \frac{2.2^{32}}{2^4} - \frac{2^2.2^{32}}{2^8}$$

$$= 2^{29} - 2^{26}$$

$$= 2^{26}(2^3 - 1)$$

$$= 2^{26}.7 \Rightarrow \Theta(2^{26}.7) \quad //$$

Q3

Mecletkan
Kutlu

- for $n = 2^{16}$, $k = 3n/16$

$$\Theta(nk - k^2)$$

$$= \frac{3n^2}{16} - \frac{3^2 n^2}{16^2}$$

$$= \frac{3.2^{32}}{2^4} - \frac{3^2.2^{32}}{2^8}$$

$$= 3.2^{28} - 3^2.2^{24}$$

$$= 3.2^{24}(2^4 - 3)$$

$$= 2^{24}.13.3 \Rightarrow \Theta(2^{24}.13.3) //$$

- for $n = 2^{16}$, $k = 4n/16$

$$= \frac{4n^2}{16} - \frac{16n^2}{16^2}$$

$$= \frac{2^{32}}{2^2} - \frac{2^{32}}{2^4}$$

$$= 2^{30} - 2^{28}$$

$$= 2^{28}(2^2 - 1)$$

$$= 2^{28}.3 \Rightarrow \Theta(2^{28}.3) //$$

Q3

Medettan
Kutlu

- for $n = 2^{16}$, $k = 5n/16$

$$= \frac{5n^2}{16} - \frac{5^2 n^2}{16^2}$$

$$= \frac{5 \cdot 2^{32}}{2^4} - \frac{5^2 \cdot 2^{32}}{2^8}$$

$$= 5 \cdot 2^{28} - 5^2 \cdot 2^{24}$$

$$= 5 \cdot 2^{24}(2^4 - 5)$$

$$= 2^{24} \cdot 11 \cdot 5 \Rightarrow \Theta(2^{24} \cdot 11 \cdot 5) //$$

- for $n = 2^{16}$, $k = 6n/16$

$$= \frac{6n^2}{16} - \frac{6^2 n^2}{16^2}$$

$$= \frac{6 \cdot 2^{32}}{2^4} - \frac{6^2 \cdot 2^{32}}{2^8}$$

$$= 6 \cdot 2^{28} - 6^2 \cdot 2^{24}$$

$$= 6 \cdot 2^{24}(2^4 - 6)$$

$$= 2^{26} \cdot 15 \Rightarrow \Theta(2^{26} \cdot 15) //$$

Q3

Nedeltan
Kutlu

- for $n = 2^{16}$, $k = 7n/16$

$$= \frac{7n^2}{16} - \frac{7^2 n^2}{16^2}$$

$$= 7.2^{28} - 7^2.2^{24}$$

$$= 7.2^{24}(2^4 - 7)$$

$$= 2^{24}.7.3^2 \Rightarrow \textcircled{\sim}(2^{24}.7.3^2) //$$

- for $n = 2^{16}$, $k = 8n/16$

$$= \frac{8n^2}{16} - \frac{8^2 n^2}{16^2}$$

$$= \frac{2^{32}}{2} - \frac{2^{32}}{2^2}$$

$$= 2^{31} - 2^{30}$$

$$= 2^{30}(1) \Rightarrow \textcircled{\sim}(2^{30}) //$$

Q3

Medetkan
Kutlu

- for $n = 2^{16}$, $k = 9n/16$

$$= \frac{9n^2}{16} - \frac{9^2 n^2}{16^2}$$

$$= 9.2^{28} - 9^2.2^{24}$$

$$= 9.2^{24}\left(2^4 - 9\right)$$

$$= 2^{24}.3^2.7 \Rightarrow \sim\left(2^{24}.3^2.9\right) //$$

- for $n = 2^{16}$, $k = 10n/16$

$$= \frac{10n^2}{16} - \frac{10^2 n^2}{16^2}$$

$$= 10.2^{28} - 10^2.2^{24}$$

$$= 10.2^{24}\left(2^4 - 10\right)$$

$$= 2^{26}.15 \Rightarrow \sim\left(2^{26}.15\right) //$$

Q3

Medetkan Kutlu

- for $n = 2^{16}$, $k = 11n/16$

$$= \frac{11n^2}{16} - \frac{11^2 \cdot n^2}{16^2}$$

$$= 11 \cdot 2^{28} - 11^2 \cdot 2^{24}$$

$$= 11 \cdot 2^{24}\left(2^4 - 11\right)$$

$$= 2^{24} \cdot 11 \cdot 5 \Rightarrow \Theta\left(2^{24} \cdot 11 \cdot 5\right) //$$

- for $n = 2^{16}$, $k = 12n/16$

$$= \frac{12n^2}{16} - \frac{12^2 n^2}{16^2}$$

$$= 12 \cdot 2^{28} - 12^2 \cdot 2^{24}$$

$$= 12 \cdot 2^{24}\left(2^4 - 12\right)$$

$$= 2^{28} \cdot 3 \Rightarrow \Theta\left(2^{28} \cdot 3\right) //$$

Q3

Medeltan
Kutlu

- for $n = 2^{16}$, $k = 13n/16$

$$= \frac{13n^2}{16} - \frac{13^2 n^2}{16^2}$$

$$= 13 \cdot 2^{28} - 13^2 \cdot 2^{24}$$

$$= 13 \cdot 2^{24}(2^4 - 13)$$

$$= 2^{24} \cdot 3 \cdot 13 \Rightarrow \textcircled{\sim}(2^{24} \cdot 3 \cdot 13) //$$

- for $n = 2^{16}$, $k = 14n/16$

$$= \frac{14n^2}{16} - \frac{14^2 n^2}{16^2}$$

$$= 14 \cdot 2^{28} - 14^2 \cdot 2^{24}$$

$$= 14 \cdot 2^{24}(2^4 - 14)$$

$$= 2^{26} \cdot 7 \Rightarrow \textcircled{\sim}(2^{26} \cdot 7) //$$

Q3

Medetkan
Kutlu

- for $n = 2^{16}$, $k = 15n/16$

$$= \frac{15n^2}{16} - \frac{15^2 \cdot n^2}{16^2}$$

$$= 15 \cdot 2^{28} - 15^2 \cdot 2^{24}$$

$$= 15 \cdot 2^{24}(2^4 - 15)$$

$$= 2^{24} \cdot 15 \Rightarrow \textcircled{\sim}(2^{24} \cdot 15)_{//}$$

- for $n = 2^{16}$, $k = n/16$

$$= \frac{n^2}{16} - \frac{n^2}{16^2}$$

$$= 2^{28} - 2^{24}$$

$$= 2^{24}(2^4 - 1)$$

$$= 2^{24} \cdot 15 \Rightarrow \textcircled{\sim}(2^{24} \cdot 15)_{//}$$

- for $n = 2^{16}$, $k = n - 1$

$$= n^2 - n - (n^2 - 2n + 1)$$

$$= n^2 - n - n^2 + 2n - 1$$

$$= n - 1$$

$$= 2^{16} - 1 \Rightarrow \textcircled{\sim}(65535)_{//}$$

k	Running Time
1	65535
n/16	251658240
2n/16	469762048
3n/16	654311424
4n/16	805306368
5n/16	922746880
6n/16	1006632960
7n/16	1056964608
8n/16	1073741824
9n/16	1056964608
10n/16	1006632960
11n/16	922746880
12n/16	805306368
13n/16	654311424
14n/16	469762048
15n/16	251658240
n-1	65535