Q2 4554 x 6776

$A = mult(x_L, y_L)$

$D = mult(x_R, y_R)$

$\mathcal{E} = mult(x_L + x_R, y_L + y_R) - A - D$

$A = mult(45, 67)$

$D = mult(54, 76)$

$\mathcal{E} = mult(45+54, 67+76) - A - D$

return $Shift(A, n) + Shift(\mathcal{E}, n/2) + D$

Q3 Selection group 9 instead of 5
is it linear? reccurence? Sub?

Selection (S, k):

$S_1 = \{x_1, x_2, \ldots, x_a\}$

$S_2 = \{x_{10}, x_{11}, \ldots, x_{18}\}$

Should be

$S_{\frac{n}{9}} \{x_{n-8}, x_{n-7}, \ldots x_{n-1}, x_n\}$

takes $O(n)$ as the pivot is less than the # of elements

$$T(n) = 5\left(\left\lceil \frac{1}{2}\left(\frac{n}{9}\right)\right\rceil - 2\right) \geq \frac{2n}{9} - 10$$

$$T(n) = T\left(\frac{n}{9}\right) + T\left(\frac{13n}{18}\right) + an \quad \max(S_L, S_R)$$

$$S_L = O\left(n - \frac{5n}{18}\right)$$

$$O\left(\frac{13n}{18}\right)$$

Sub Goal Show $T(n) = O(n)$

$T(n) \leq cn \; \exists c, n_0 \; n \geq n_0$

$$\frac{n}{9} < n\frac{13n}{18} < n$$

$$T\left(\frac{n}{9}\right) \leq \frac{cn}{9} + T\frac{13n}{18} \leq \frac{13cn}{18}$$

$$T(n) \leq \frac{cn}{2} + c\frac{13n}{18} + an$$

$$c\frac{n}{9} + c\frac{13n}{18} + an \leq cn$$

$$\frac{c}{9} + \frac{13c}{18} + a < c$$

$$\frac{15c}{18} + a \leq c$$

$$a \leq \frac{3c}{18} \rightarrow \boxed{c \geq 6a}$$

Q4 0 1 1 10

a b b ba = T

S = babbabbbabab

1 2 3 4 5 6 7 8 9 10 11

P1

T = abbba

$z_2 = 0$ $r_2 = \emptyset$ $l_2 = 0$

$z_3 = 3$ $r_3 = 5$ $l_3 = 3$

$z_4 = 0$ $r_4 = 5$ $l_4 = 3$

$z_5 = 1$ $r_5 = 5$ $l_5 = 3$

$z_6 = 1$ $r_6 = 6$ $l_6 = 6$

$z_7 = 5$ $r_7 = 11$ $l_7 = 7$

$z_8 = 0$ $r_8 = 11$ $l_8 = 7$

$z_9 = 3$ $r_9 = 11$ $l_9 = 7$

$z_{10} = 0$ $r_{10} = 11$ $l_{10} = 7$

$z_{11} = 1$ $r_{11} = 11$ $l_{11} = 7$

P2 10101 = babbab = W $S = W.X$ $|X| = 20$

1 2 3 4 5

a) $z_{11} = 4$ S[12]?

S[12] = a

b) $z_{11} = 4$ S[15] = cannot be determined

c) $z_{11} = 4$ What is z_{13}?

babba a

11 12 13 14

$z_{13} = 2$