

**Question 1:** Suppose a digital camera has a storage capacity of 500MB. How many black-and-white photographs could be stored in the camera if each consisted of 512 pixels per row and 512 pixels per column if each pixel required one bit of storage?  
(6 Points)

$$500 \text{ MB} = 500 \times 1024 \times 1024 \times 8 = 4 \times 10^{23} \text{ bits}$$

$$512 \times 512 = 2^{18} \text{ bits}$$

$$4 \times 10^{23} / 2^{18} = 4 \times 10^5 = 400,000 \text{ photographs}$$

**Question 2:** What bit patterns are represented by the following hexadecimal notations?  
a. 8A9      b. DCB      c. A01      d. C99 (8 Points)

- a) 0000 1000 1010 1001  
b) 0000 1101 1100 1011  
c) 0000 1010 0000 0001  
d) 0000 1010 1001 1001

- A - 10  
B - 11  
C - 12  
D - 13  
E - 14  
F - 15

**Question 3:** What is the value of the least significant bit in the bit patterns represented by the following hexadecimal notations?  
a. 9A      b. 90      c. 1B      d. 6E (8 Points)

- a) 0000 0000 1001 1010 = L.S.B = 0  
b) 0000 0000 1001 0000 = L.S.B = 0  
c) 0000 0000 0001 1011 = L.S.B = 1  
d) 0000 0000 0110 1110 = L.S.B = 0

**Question 4:** Convert each of the following base 10 representations to its equivalent excess sixteen representation:  
a. -12      b. 0      c. 10      d. -8 (8 Points)

a) 0000 0000 0000 1100 = 12  
1111 1111 1111 0011 = one's comp.  
+  
1111 1111 1111 1100 = 0x FFFC

b)  $0 = 0 \times 0000$

c)  $0000 \ 0000 \ 0000 \ 1010 = 0 \times 000A$

d)  $0000 \ 0000 \ 0000 \ 1000 = 8$

$$\begin{array}{r}
 + \quad 1111 \quad 1111 \quad 1111 \quad 0111 \\
 \hline
 1111 \quad 1111 \quad 1111 \quad 1000 = 0 \times FFF8
 \end{array}$$

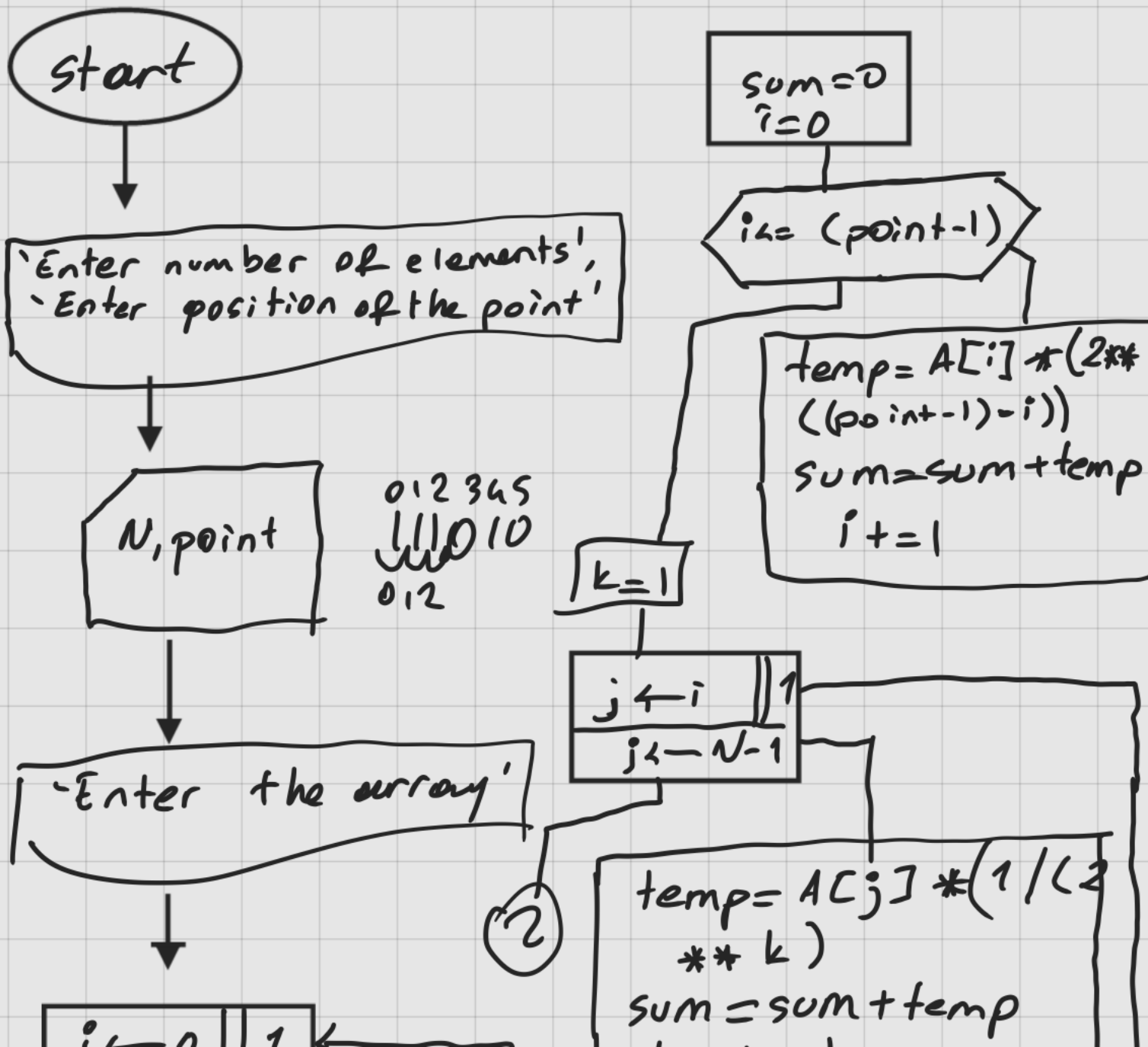
**Algorithm 1:** Design an algorithm which converts the given zeros and ones into a fractional number (use base 10 representation) using the given point position? (70 Points)

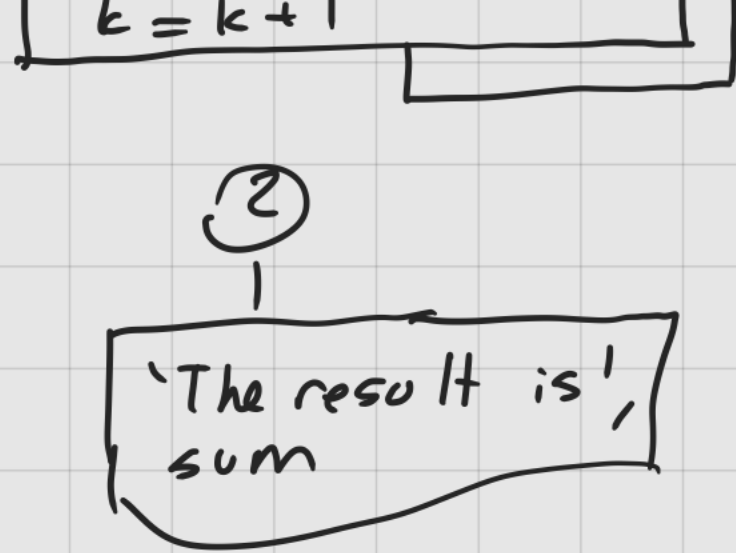
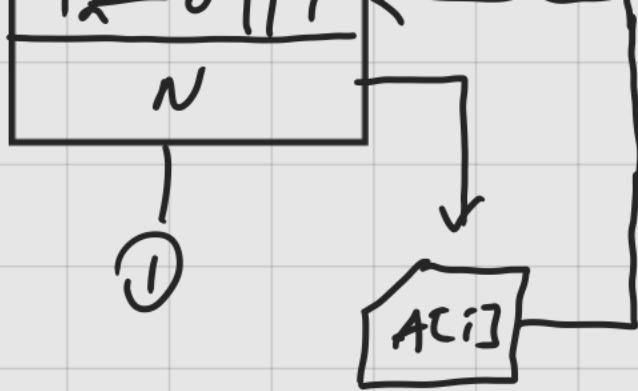
**Input (should be given by the user) :**

**N :** the number of elements of the given array

**Array:** consists of zeros and ones

**Point:** the position of the point





## Analysis

<u>N</u>	<u>point</u>	<u>sum</u>	<u>i</u>	<u>temp</u>	<u>j</u>	<u>k</u>	<u>array</u>
6	3	0	0	—	—	—	111010
6	3	4	1	$1 * (2 \wedge 1) = 4$	—	—	0, 2, 3, 4, 5
6	3	6	2	$1 * (2 \wedge 1) = 2$	—	—	
6	3	7	3	$1 * (2 \wedge 0) = 1$	3	1	
		7		$0 * (1 / (2 \wedge 1)) = 0$	4	2	
		7.25		$1 * (1 / (2 \wedge 2)) = 0.25$	5	3	
		7.25		$0 * (1 / (2 \wedge 3)) = 0$			

<u>N</u>	<u>point</u>	<u>sum</u>	<u>i</u>	<u>temp</u>	<u>j</u>	<u>k</u>	<u>array</u>
5	2	0	0	$1 * (2 \wedge 1) = 2$	—	—	10011
		2	1	$0 * (2 \wedge 0) = 0$	—	—	0, 1, 2, 3, 4
		2	2	$0 * (1 / 2 \wedge 1) = 0$	2	1	
		2	—	$1 * (1 / 2 \wedge 2) = 0.25$	3	2	
		2.25	—	$1 * (1 / 2 \wedge 3) = 0.125$	4	3	
		2.375					

$$10.011 = 2 + 2^{-2} + 2^{-3} = 2.375$$

Sonuç 2.675 denmiş ama hatalı yazılmış sanırım.

<u>N</u>	<u>point</u>	<u>sum</u>	<u>i</u>	<u>temp</u>	<u>j</u>	<u>k</u>	<u>array</u>
4	1	0	0	$1 * 2 \wedge 1 = 1$	—	—	1100
		1	1	$1 * 1 / 2 \wedge 1 = 0.5$	1	1	

$$\begin{array}{rcl}
 1.5 & - & 0 * 1/2 + 2 = 0 \quad 2 \\
 1.5 & - & 0 * 1/2 + 3 = 0 \quad 3 \\
 \star & \boxed{1.5} & 
 \end{array}$$

<u>N</u>	<u>point</u>	<u>sum</u>	<u>i</u>	<u>temp</u>	<u>j</u>	<u>k</u>	<u>array</u>
3	2	0	0	$0 * (2 + 2) = 0$	-	-	010
		0	1	$1 * (2 + 1) = 1$	-		
		$\star \boxed{1}$		$0 * (1/2 + 1) = 0$	1	1	