

COMP3506/COMP7505—Algorithms and Data Structures

School of Information Technology and Electrical Engineering

Week 11 Tutorial Sample Solutions

Question 1.

Draw a figure illustrating the comparisons done by brute-force pattern matching for the text "aaabaadaabaaa" and pattern "aabaaa".

a	a	A	b	a	a	d	a	a	b	a	a	a
a 1	a 2	b 3	a	a	a							
	a 4	a 5	b 6	a 7	a 8	a 9						
		a 10	a 11	b	a	a	a					
			a 12	a	b	a	a	a				
				a 13	a 14	b 15	a	a	a			
					a 16	a 17	b	a	a	a		
						a 18	a	b	a	a	a	
							a 19	a 20	b 21	a 22	a 23	a 24

Question 2.

Draw a figure illustrating the comparisons done by Boyer-Moore pattern matching algorithm for the text "aaabaadaabaaa" and pattern "aabaaa". Also show the last occurrence table.

c	'a'	'b'	'd'
$L(c)$	5	2	-1

$$i = i + m - \min(j, 1 + L(c))$$

<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
a	a	A	b	a	a	d	a	a	b	a	a	a
a	a	B	a 3	a 2	a 1			$6 = 3 + 6 - \min(3, 1 + 2)$				
	a	A	b	a	a	a 4		$12 = 6 + 6 - \min(5, 0)$				
							a 10	a 9	b 8	a 7	a 6	a 5

Question 3.

For the following unsorted list of $n = 9$ numbers, find the median ($k = 5$) using quick-select:

68, 10, 37, 58, 12, 33, 11, 17, 55.

Always pick the value in the last element as the pivot x .

Show the lists L(ess), E(qual) and G(reater), and track the value of k until the median is found.

Solution:

68 10 37 58 12 33 11 17 55

L = 10 37 12 33 11 17

E = 55

G = 68 58

$k = 5$ because $5 \leq |L|$

10 37 12 33 11 17

L = 10 12 11

E = 17

G = 37 33

Since $k > |L| + |E|$

$k' = k - |L| - |E| = 5 - 4 = 1$

37 33

E = 33

G = 37

$K > |L|$ and $\leq |L| + |E|$

Median is 33