

**Worksheet: Binary Search Example**

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1. A teacher has a sorted list of names from a class, as shown below. For each stage, write “s” for the start index, “m” for the middle index, and “e” for the end index in order to identify the stages of a **binary search** to find the name “**Jackson**” in the list. In order to calculate the middle index, use:  $(\text{start} + \text{end}) \text{ DIV } 2$ . The indices of the array are written above the first stage to help you. (Page 30, question 6)

	0	1	2	3	4	5	6	7	8	9
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)										
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
b)										
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
c)										
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
d)										
e)	How many times did the algorithm need to compare two names before it was able to find the name “Jackson”?									

2. Now find the name “**Linton**” in the list using the same process. Again, calculate the middle index with:  $(\text{start} + \text{end}) \text{ DIV } 2$ .

	0	1	2	3	4	5	6	7	8	9
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)										
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
b)										
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
c)										
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
d)										
e)	How many times would the algorithm need to compare two names in order to find the name “Linton”?									

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2. Now show how the binary search algorithm would search for the name “Johnson” in the list, calculating the middle using:  $(\text{start} + \text{end}) \text{ DIV } 2$ . Note that the element is not in the list and the algorithm determines this when  $\text{start} > \text{end}$ .

	0	1	2	3	4	5	6	7	8	9
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)										
b)										
c)										
d)										
e)										

- f) How many time would the algorithm need to compare two names before exiting if the list was searched for the name “Johnson”?

4. Show how the binary search algorithm would search for the name “Nielsen” in the list, calculating the middle using:  $(\text{start} + \text{end}) \text{ DIV } 2$ . Note that the element is, again, not in the list. (7)

	0	1	2	3	4	5	6	7	8	9
	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)										
b)										
c)										
d)										

- e) How many time would the algorithm need to compare two names before exiting if the list was searched for the name “Nielsen”? *Hint: the answer is not the same as part (3f).*