

Aufgabe 1a

0 1 2 3 4 5 6 7 8 9 10 11 12 13

1 2 4 8 16 32 42 64 128 130 243 244 289

↑ left $\text{left} + \text{right} // 2 = (0 + 13) // 2 = 6$ right ↑

$42 > 13 \Rightarrow \text{right} = 6$

0 1 2 3 4 5 6

1 2 4 8 16 32 ~~42~~ ~~64~~ ~~128~~ ~~130~~ ~~243~~ ~~244~~ ~~289~~

↑ left ↑ right

$\text{left} + \text{right} // 2 = (0 + 6) // 2 = 3$

$8 < 13 \Rightarrow \text{left} = 3 + 1 = 4$

0 1 2 3 4 5 6

~~1~~ ~~2~~ ~~4~~ ~~8~~ 16 32 ~~42~~ ~~64~~ ~~128~~ ~~130~~ ~~243~~ ~~244~~ ~~289~~

↑ left ↑ right

$\text{left} + \text{right} // 2 = (4 + 6) // 2 = 5$

$32 > 13 \Rightarrow \text{right} = 5$

0 1 2 3 4 5 6

~~1~~ ~~2~~ ~~4~~ ~~8~~ 16 ~~32~~ ~~42~~ ~~64~~ ~~128~~ ~~130~~ ~~243~~ ~~244~~ ~~289~~

↑ left ↑ right

$\text{left} + \text{right} // 2 = (4 + 5) // 2 = 4$

$16 > 13 \Rightarrow \text{right} = 4$

$\text{left} = \text{right} = 4$, somit ist die

Rekursion zu Ende und die 13 wurde nicht gefunden.

Aufgabe 2a

Handwritten solution for finding the index of the number 16 in a sorted array using binary search.

Initial array (indices 0 to 13):

0	1	2	3	4	5	6	7	8	9	10	11	12	13
289	244	243	130	128	84	42	32	16	8	4	2	1	

Step 1: $\text{left} = 0$, $\text{right} = 13$.
 $(\text{left} + \text{right}) // 2 = (0 + 13) // 2 = 6$.
 $42 > 16 \Rightarrow \text{left} = 6 + 1 = 7$.

Step 2: $\text{left} = 7$, $\text{right} = 13$.
 $(\text{left} + \text{right}) // 2 = (7 + 13) // 2 = 10$.
 $4 < 16 \Rightarrow \text{right} = 10$.

Step 3: $\text{left} = 7$, $\text{right} = 10$.
 $(\text{left} + \text{right}) // 2 = (7 + 10) // 2 = 8$.
 $16 = 16 \Rightarrow$ die 16 wurde gefunden und befindet sich auf der Stelle 8.

Aufgabe 2b

Handwritten solution for finding the Greatest Common Divisor (GCD) of two numbers using the Euclidean algorithm.

Initial numbers: $a = 2745$, $b = 1215$.

Euclidean algorithm steps:

a	b
2745	1215
1215	1530
1530	1215
1215	315
315	900
900	315
315	585
585	315
315	270
270	45
45	225
225	45
45	180
180	45
45	135
135	45
45	90
90	45
45	45
45	0

OR:

$\text{ggT}(2745, 1215) = 45$