

Mr. Fahrenbacher
 Binary Search Practice
 AP Computer Science A

Example:

0	1	2	3	4	5	6	7	8	9
-90	-89	-50	-2	1	13	14	17	23	104

Target: 2
 Stage 1: lo = 0 hi = 9 mid = (hi+lo)/2 = 4
 Middle value (1) is less than target (2), so search right

Stage 2: lo = mid + 1 = 5 hi = 9 mid = 7
 Middle value (17) is greater than target (2), so search left

Stage 3: lo = 5 hi = mid - 1 = 6 mid = 5
 Middle value (13) is greater than target (2), so search left

Stage 4: lo = 5 hi = mid - 1 = 4 STOP!
 Hi index (4) is less than lo index (5), so target value (2) cannot be found

Directions: Practice binary search on the following arrays. You only need to keep track of the low, hi, and mid indexes - I added the extra english for instructive purposes.

1. Target Value: 4

0	1	2	3	4	5	6	7	8	9
-2	-1	0	1	2	4	8	16	32	64

L	H	M
0	9	4
5	9	7
5	6	5 ✓

2. Target Value: 5

0	1	2	3	4	5	6	7	8
5	6	10	13	24	42	81	82	83

L	H	M
0	8	4
0	3	1
0	0	0 ✓

3. Target Value: 32

0	1	2	3	4	5	6	7	8	9
-2	-1	0	1	2	4	8	16	32	64

L	H	M
0	9	4
5	9	7
8	9	8 ✓

4. Target Value: 14

0	1	2	3	4	5	6	7	8
5	6	10	13	24	42	81	82	83

L	H	M
0	8	4
0	3	1
2	3	2
3	3	3
4	3	X

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Binary Search Practice #2

Directions: Practice binary search on the following arrays. You only need to keep track of the low, hi, and mid indexes. These arrays are unsorted... I wonder what happens...

1. Target Value: 4

0	1	2	3	4	5	6	7	8	9
5	-2	7	9	-3	6	2	4	3	1

L	H	M
0	9	4
5	9	7 ✓

2. Target Value: 5

0	1	2	3	4	5	6	7	8
9	8	7	6	1	3	4	10	5

L	H	M
0	8	4
5	8	6
7	8	7
7	6	X

3. Target Value: 32

0	1	2	3	4	5	6	7	8	9
-10	5	-9	2	0	5	11	41	3	6

L	H	M
0	9	4
5	9	7
5	6	5
6	6	6
7	6	X

4. Target Value: 14

0	1	2	3	4	5	6	7	8
14	21	56	10	-10	6	13	21	0

L	H	M
0	8	4
5	8	6
7	8	7
7	6	X

5.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
-5	-3	-2	-1	1	3	6	10	12	15	16	20	23	24	29	33	37	38	41	44	49

a) What is the maximum number of checks required to decide if a value is in the array? $\approx \log_2(21)$

≈ 5 (round up)

b) hi-lo-mid record for finding 10:

L	H	M
0	20	10
0	9	4
5	9	7 ✓