**Answer Key – Thinking & Manipulating Arrays**

**A. Analysis Operations**

**1. Sum of Elements**

int[] arr = {10, 20, 30, 40, 50};

int sum = 0;

for (int num : arr) {

sum += num;

}

System.out.println(sum);

**Output:** 150

**2. Average of Elements**

int[] arr = {5, 15, 25, 35, 45};

int sum = 0;

for (int num : arr) sum += num;

double avg = (double) sum / arr.length;

System.out.println(avg);

**Output:** 25.0

**3. Maximum Value**

int[] arr = {2, 8, 6, 4, 10, 12};

int max = arr[0];

for (int num : arr) {

if (num > max) max = num;

}

System.out.println(max);

**Output:** 12

**4. Minimum Value**

int[] arr = {100, 50, 75, 25, 150};

int min = arr[0];

for (int num : arr) {

if (num < min) min = num;

}

System.out.println(min);

**Output:** 25

**5. Sum of Even Numbers**

int[] arr = {3, 6, 9, 12, 15};

int sum = 0;

for (int num : arr) {

if (num % 2 == 0) sum += num;

}

System.out.println(sum);

**Output:** 18 *(6 + 12)*

**B. Search Operations**

**6. Linear Search**

int[] arr = {5, 10, 15, 20, 25, 30};

int search = 25;

boolean found = false;

for (int num : arr) {

if (num == search) {

found = true;

break;

}

}

System.out.println(found ? "Found" : "Not Found");

**Output:** Found

**7. Find Index**

int[] arr = {10, 20, 30, 40, 50, 60, 70};

int search = 70;

for (int i = 0; i < arr.length; i++) {

if (arr[i] == search) {

System.out.println(i);

break;

}

}

**Output:** 6

**8. Count Occurrences**

int[] arr = {5, 2, 5, 3, 5, 4, 5};

int search = 5, count = 0;

for (int num : arr) {

if (num == search) count++;

}

System.out.println(count);

**Output:** 4

**9. First and Last Occurrence**

int[] arr = {10, 20, 10, 30, 40, 10, 50};

int search = 10;

int first = -1, last = -1;

for (int i = 0; i < arr.length; i++) {

if (arr[i] == search) {

if (first == -1) first = i;

last = i;

}

}

System.out.println("First: " + first + ", Last: " + last);

**Output:** First: 0, Last: 5

**C. Modification Operations**

**10. Increase All by 10**

int[] arr = {1, 2, 3, 4, 5};

for (int i = 0; i < arr.length; i++) {

arr[i] += 10;

}

System.out.println(Arrays.toString(arr));

**Output:** [11, 12, 13, 14, 15]

**11. Multiply All by 3**

int[] arr = {2, 4, 6, 8};

for (int i = 0; i < arr.length; i++) {

arr[i] \*= 3;

}

System.out.println(Arrays.toString(arr));

**Output:** [6, 12, 18, 24]

**12. Reverse Array**

int[] arr = {10, 20, 30, 40, 50};

int start = 0, end = arr.length - 1;

while (start < end) {

int temp = arr[start];

arr[start] = arr[end];

arr[end] = temp;

start++;

end--;

}

System.out.println(Arrays.toString(arr));

**Output:** [50, 40, 30, 20, 10]

**13. Left Shift by 1**

int[] arr = {1, 2, 3, 4, 5};

int first = arr[0];

for (int i = 0; i < arr.length - 1; i++) {

arr[i] = arr[i + 1];

}

arr[arr.length - 1] = first;

System.out.println(Arrays.toString(arr));

**Output:** [2, 3, 4, 5, 1]

**14. Right Shift by 1**

int[] arr = {10, 20, 30, 40, 50};

int last = arr[arr.length - 1];

for (int i = arr.length - 1; i > 0; i--) {

arr[i] = arr[i - 1];

}

arr[0] = last;

System.out.println(Arrays.toString(arr));

**Output:** [50, 10, 20, 30, 40]

**D. Special Problems**

**15. Second Largest Element**

int[] arr = {5, 10, 20, 15, 30};

int max = Integer.MIN\_VALUE, second = Integer.MIN\_VALUE;

for (int num : arr) {

if (num > max) {

second = max;

max = num;

} else if (num > second && num != max) {

second = num;

}

}

System.out.println(second);

**Output:** 20

**16. Second Smallest Element**

int[] arr = {7, 3, 9, 1, 5};

int min = Integer.MAX\_VALUE, second = Integer.MAX\_VALUE;

for (int num : arr) {

if (num < min) {

second = min;

min = num;

} else if (num < second && num != min) {

second = num;

}

}

System.out.println(second);

**Output:** 3

**17. Remove Duplicates (Basic)**

int[] arr = {1, 2, 2, 3, 4, 4, 5};

for (int i = 0; i < arr.length; i++) {

boolean duplicate = false;

for (int j = 0; j < i; j++) {

if (arr[i] == arr[j]) {

duplicate = true;

break;

}

}

if (!duplicate) {

System.out.print(arr[i] + " ");

}

}

**Output:** 1 2 3 4 5

**18. Copy Array**

int[] arr = {11, 22, 33, 44, 55};

int[] copy = new int[arr.length];

for (int i = 0; i < arr.length; i++) {

copy[i] = arr[i];

}

System.out.println(Arrays.toString(copy));

**Output:** [11, 22, 33, 44, 55]

**19. Swap First and Last**

int[] arr = {1, 2, 3, 4, 5};

int temp = arr[0];

arr[0] = arr[arr.length - 1];

arr[arr.length - 1] = temp;

System.out.println(Arrays.toString(arr));

**Output:** [5, 2, 3, 4, 1]

**20. Rotate Array k Times**

int[] arr = {1, 2, 3, 4, 5};

int k = 2;

for (int r = 0; r < k; r++) {

int last = arr[arr.length - 1];

for (int i = arr.length - 1; i > 0; i--) {

arr[i] = arr[i - 1];

}

arr[0] = last;

}

System.out.println(Arrays.toString(arr));

**Output:** [4, 5, 1, 2, 3]