

# 1) Code and Output

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//Code

#include <iostream>

#include <vector>

#include <ctime>

#include <cstdlib>

#include <cmath>

using namespace std;

// Function prototypes

vector<int> generateRandomArray(int size, int min, int max);

bool isEven(int num);

bool isPrime(int num);

long long factorial(int num);

vector<int> prefixSum(const vector<int>& array);

double calculateAverage(const vector<int>& array);

// Function implementations

vector<int> generateRandomArray(int size, int min, int max) {

vector<int> array(size);

srand(static\_cast<unsigned int>(time(0)));

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

array[i] = rand() % (max - min + 1) + min;

}

return array;

}

bool isEven(int num) {

return num % 2 == 0;

}

bool isPrime(int num) {

if (num <= 1) return false;

if (num == 2) return true;

if (num % 2 == 0) return false;

for (int i = 3; i <= sqrt(num); i += 2) {

if (num % i == 0) return false;

}

return true;

}

long long factorial(int num) {

if (num <= 1) return 1;

return num \* factorial(num - 1);

}

```

vector<int> prefixSum(const vector<int>& array) {
    vector<int> prefix(array.size());
    prefix[0] = array[0];
    for (size_t i = 1; i < array.size(); ++i) {
        prefix[i] = prefix[i - 1] + array[i];
    }
    return prefix;
}

double calculateAverage(const vector<int>& array) {
    int sum = 0;
    for (int num : array) {
        sum += num;
    }
    return static_cast<double>(sum) / array.size();
}

void printArray(const vector<int>& array) {
    for (int num : array) {
        cout << num << " ";
    }
    cout << endl;
}

void processArray(const vector<int>& array) {
    for (int num : array) {
        cout << "Number: " << num;
        cout << ", Even: " << (isEven(num) ? "Yes" : "No");
        cout << ", Prime: " << (isPrime(num) ? "Yes" : "No");
        cout << ", Factorial: " << factorial(num);
        cout << endl;
    }
}

int main() {
    const int size = 100;
    const int min = 1;
    const int max = 10000;

    vector<int> array = generateRandomArray(size, min, max);

    cout << "Generated array: " << endl;
    printArray(array);

    processArray(array);

    vector<int> prefix = prefixSum(array);
    cout << "Prefix sum array: " << endl;
    printArray(prefix);

    double average = calculateAverage(array);
    cout << "Average: " << average << endl;
}

```

```
    return 0;
}
```

## //Output

```
Generated array:
6288 1103 3885 4321 9342 376 3663 4023 1819 2853 8191 2562 5061 4902 6034 5322 928 6853 6580 9386 9298 1864 3590 477 290 9340 7543 8336 4205 8896 724 6844 999
8 4608 7516 5692 4983 7530 9714 3154 382 7904 5715 5442 9157 8100 764 84 1304 3695 9470 6954 5558 9411 7430 2200 8751 4972 6887 9307 220 7610 6150 6569 8569 3
665 2260 9904 1194 1973 3057 7927 6228 5123 9721 5385 9575 6836 5468 878 530 1289 7831 2439 700 1613 990 9450 2936 4229 8756 3155 8190 1257 9724 6759 4921 198
3 6662 2466
Number: 6288, Even: Yes, Prime: No, Factorial: 0
Number: 1103, Even: No, Prime: Yes, Factorial: 0
Number: 3885, Even: No, Prime: No, Factorial: 0
Number: 4321, Even: No, Prime: No, Factorial: 0
Number: 9342, Even: Yes, Prime: No, Factorial: 0
Number: 376, Even: Yes, Prime: No, Factorial: 0
Number: 3663, Even: No, Prime: No, Factorial: 0
Number: 4023, Even: No, Prime: No, Factorial: 0
Number: 1819, Even: No, Prime: No, Factorial: 0
Number: 2853, Even: No, Prime: No, Factorial: 0
Number: 8191, Even: No, Prime: Yes, Factorial: 0
Number: 2562, Even: Yes, Prime: No, Factorial: 0
Number: 5061, Even: No, Prime: No, Factorial: 0
Number: 4902, Even: Yes, Prime: No, Factorial: 0
Number: 6034, Even: Yes, Prime: No, Factorial: 0
Number: 5322, Even: Yes, Prime: No, Factorial: 0
Number: 928, Even: Yes, Prime: No, Factorial: 0
Number: 6853, Even: No, Prime: No, Factorial: 0
Number: 6580, Even: Yes, Prime: No, Factorial: 0
Number: 9386, Even: Yes, Prime: No, Factorial: 0
Number: 9298, Even: Yes, Prime: No, Factorial: 0
Number: 1864, Even: Yes, Prime: No, Factorial: 0
Number: 3590, Even: Yes, Prime: No, Factorial: 0
Number: 477, Even: No, Prime: No, Factorial: 0
Number: 290, Even: Yes, Prime: No, Factorial: 0
Number: 9340, Even: Yes, Prime: No, Factorial: 0
Number: 7543, Even: No, Prime: No, Factorial: 0
Number: 8336, Even: Yes, Prime: No, Factorial: 0
Number: 4205, Even: No, Prime: No, Factorial: 0
Number: 8896, Even: Yes, Prime: No, Factorial: 0
Number: 724, Even: Yes, Prime: No, Factorial: 0
Number: 6844, Even: Yes, Prime: No, Factorial: 0
Number: 999, Even: Yes, Prime: No, Factorial: 0
Number: 4608, Even: Yes, Prime: No, Factorial: 0
Number: 7516, Even: Yes, Prime: No, Factorial: 0
Number: 5692, Even: Yes, Prime: No, Factorial: 0
Number: 4983, Even: Yes, Prime: No, Factorial: 0
Number: 7530, Even: Yes, Prime: No, Factorial: 0
Number: 9714, Even: Yes, Prime: No, Factorial: 0
Number: 3154, Even: No, Prime: No, Factorial: 0
Number: 382, Even: No, Prime: No, Factorial: 0
Number: 7904, Even: Yes, Prime: No, Factorial: 0
Number: 5715, Even: Yes, Prime: No, Factorial: 0
Number: 5442, Even: Yes, Prime: No, Factorial: 0
Number: 9157, Even: Yes, Prime: No, Factorial: 0
Number: 8100, Even: Yes, Prime: No, Factorial: 0
Number: 764, Even: No, Prime: No, Factorial: 0
Number: 84, Even: No, Prime: No, Factorial: 0
Number: 1304, Even: No, Prime: No, Factorial: 0
Number: 3695, Even: Yes, Prime: No, Factorial: 0
Number: 9470, Even: Yes, Prime: No, Factorial: 0
Number: 6954, Even: Yes, Prime: No, Factorial: 0
Number: 5558, Even: Yes, Prime: No, Factorial: 0
Number: 9411, Even: Yes, Prime: No, Factorial: 0
Number: 7430, Even: Yes, Prime: No, Factorial: 0
Number: 2200, Even: Yes, Prime: No, Factorial: 0
Number: 8751, Even: Yes, Prime: No, Factorial: 0
Number: 4972, Even: Yes, Prime: No, Factorial: 0
Number: 6887, Even: Yes, Prime: No, Factorial: 0
Number: 9307, Even: Yes, Prime: No, Factorial: 0
Number: 220, Even: No, Prime: No, Factorial: 0
Number: 7610, Even: Yes, Prime: No, Factorial: 0
Number: 6150, Even: Yes, Prime: No, Factorial: 0
Number: 6569, Even: Yes, Prime: No, Factorial: 0
Number: 8569, Even: Yes, Prime: No, Factorial: 0
Number: 3, Even: No, Prime: No, Factorial: 0
Number: 665, Even: No, Prime: No, Factorial: 0
Number: 2260, Even: Yes, Prime: No, Factorial: 0
Number: 9904, Even: Yes, Prime: No, Factorial: 0
Number: 1194, Even: No, Prime: No, Factorial: 0
Number: 1973, Even: No, Prime: No, Factorial: 0
Number: 3057, Even: Yes, Prime: No, Factorial: 0
Number: 7927, Even: Yes, Prime: No, Factorial: 0
Number: 6228, Even: Yes, Prime: No, Factorial: 0
Number: 5123, Even: No, Prime: No, Factorial: 0
Number: 9721, Even: No, Prime: Yes, Factorial: 0
Number: 5385, Even: No, Prime: No, Factorial: 0
Number: 9575, Even: No, Prime: No, Factorial: 0
Number: 6836, Even: Yes, Prime: No, Factorial: 0
Number: 5468, Even: Yes, Prime: No, Factorial: 0
Number: 878, Even: Yes, Prime: No, Factorial: 0
Number: 530, Even: Yes, Prime: No, Factorial: 0
Number: 1289, Even: No, Prime: Yes, Factorial: 0
Number: 7831, Even: No, Prime: No, Factorial: 0
Number: 2439, Even: No, Prime: No, Factorial: 0
Number: 700, Even: Yes, Prime: No, Factorial: 0
Number: 1613, Even: No, Prime: Yes, Factorial: 0
Number: 990, Even: Yes, Prime: No, Factorial: 0
Number: 9450, Even: Yes, Prime: No, Factorial: 0
Number: 2936, Even: Yes, Prime: No, Factorial: 0
Number: 4229, Even: No, Prime: Yes, Factorial: 0
Number: 8756, Even: Yes, Prime: No, Factorial: 0
Number: 3155, Even: No, Prime: No, Factorial: 0
Number: 8190, Even: Yes, Prime: No, Factorial: 0
Number: 1257, Even: No, Prime: No, Factorial: 0
Number: 9724, Even: Yes, Prime: No, Factorial: 0
Number: 6759, Even: No, Prime: No, Factorial: 0
Number: 4921, Even: No, Prime: No, Factorial: 0
Number: 1983, Even: No, Prime: No, Factorial: 0
Number: 6662, Even: Yes, Prime: No, Factorial: 0
Number: 2466, Even: Yes, Prime: No, Factorial: 0
Prefix sum array:
6288 7391 11276 15597 24939 25315 28978 33001 34820 37673 45864 48426 53487 58389 64423 69745 70673 77526 84106 93492 102790 104654 108244 108721 109011 11835
1 125894 134230 138435 147331 148055 154899 164897 169505 177021 182713 187696 195226 204940 208094 208476 216380 222095 227537 236694 244794 245558 245642 24
6946 250641 260111 267065 272623 282034 289464 291664 300415 305387 312274 321581 321801 329411 335561 342130 350699 354364 356624 366528 367722 369695 372752
380679 386907 392030 401751 407136 416711 423547 429015 429893 430423 431712 439543 441982 442682 444295 445285 454735 457671 461900 470656 473811 482001 483
258 492982 499741 504662 506645 513307 515773
Average: 5157.73
```