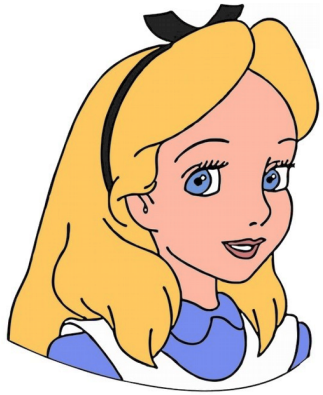
A Sample Exercise

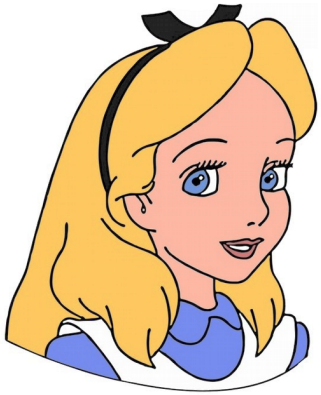
- Alice and Bob are fighting over who gets the last slice of pizza.
- They decide to settle the dispute by playing $n = 2k + 1$, $k \in \mathbb{N}$ rounds of Heads of Tails.
- Alice (resp. Bob) wins if the majority of the coin flips land on Heads (resp. Tails).
- Design an algorithm that, given n and the outcomes of the coin flips, decides who gets the last pizza slice.



A Sample Exercise

Input. The input consists of T instances, or *test cases* of the previous problem. The first line of the input contains the integer T. Each of the following lines represents a test cases and consists of the number n and of a string s of n characters, where the i-th character of s is H if the i-th coin landed on heads and T otherwise.

Output. The output consists of T lines, one per test case, each containing a single character. In particular the i-th line should be "A" if alice won the i-th instance, and "B" otherwise.



A Sample Exercise

Example

Input: example.in

```
3
1 H
5 HHTHT
3 TTH
```

Output: example.out

```
A
A
B
```

Notes

A reasonable implementation should not require more than 1 second for each input file.

A Possible Solution

```
#include<cstdlib>
#include<string>
#include<iostream>

int main()
{
    int T;
    std::cin >> T;

    while(T--)
        solve_testcase();

    return EXIT_SUCCESS;
}
```

A Possible Solution

```
void solve_testcase()
{
    int n;
    std::string s;
    std::cin >> n >> s;

    int number_of_H = 0;
    for(const char c : s)
        if(c == 'H')
            number_of_H++;

    std::cout << ((number_of_H>n/2)?"A":"B") << "\n";
}
```

Compiling

```
g++ -std=c++20 -Wall -pedantic  -O3  solution.cpp -o solution
```

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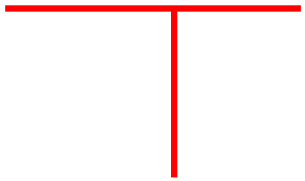

- We will use C++20

Compiling

```
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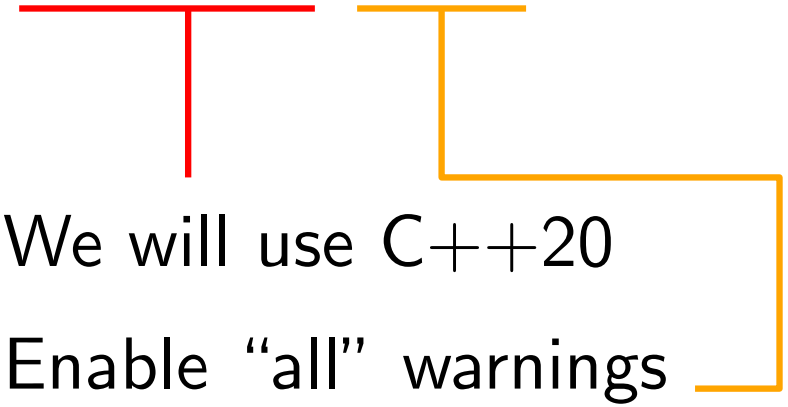

- We will use C++20
- Enable “all” warnings

Compiling

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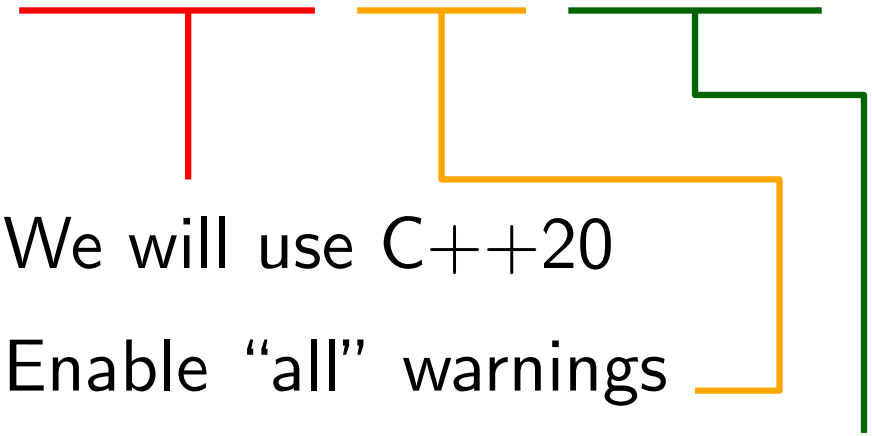
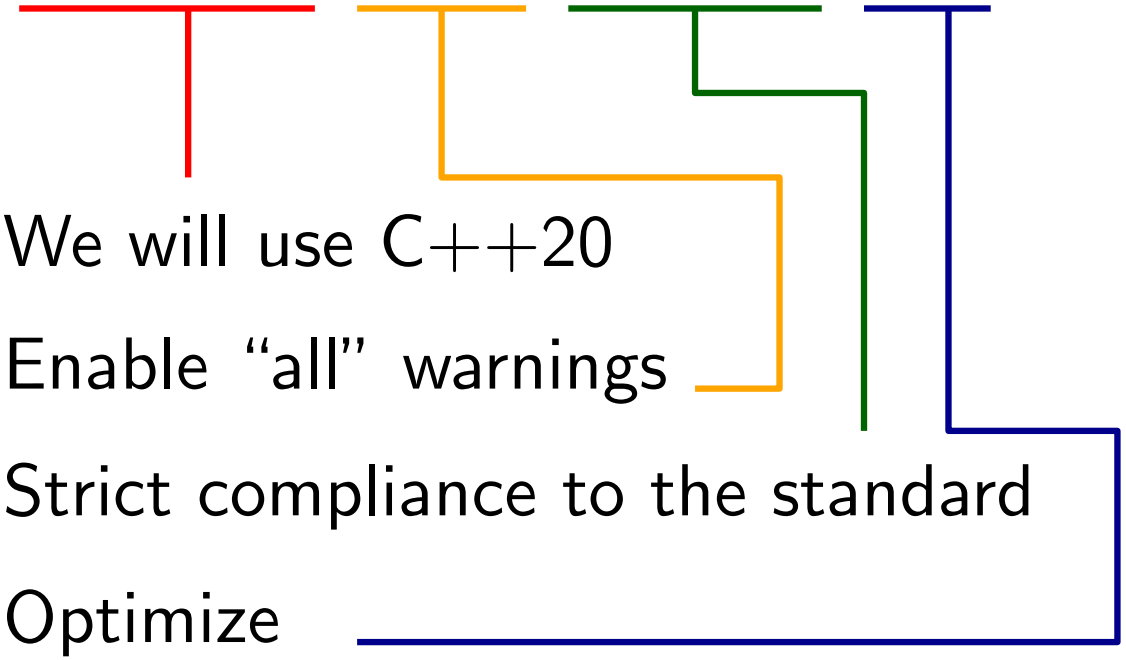


- We will use C++20
- Enable “all” warnings
- Strict compliance to the standard

Compiling

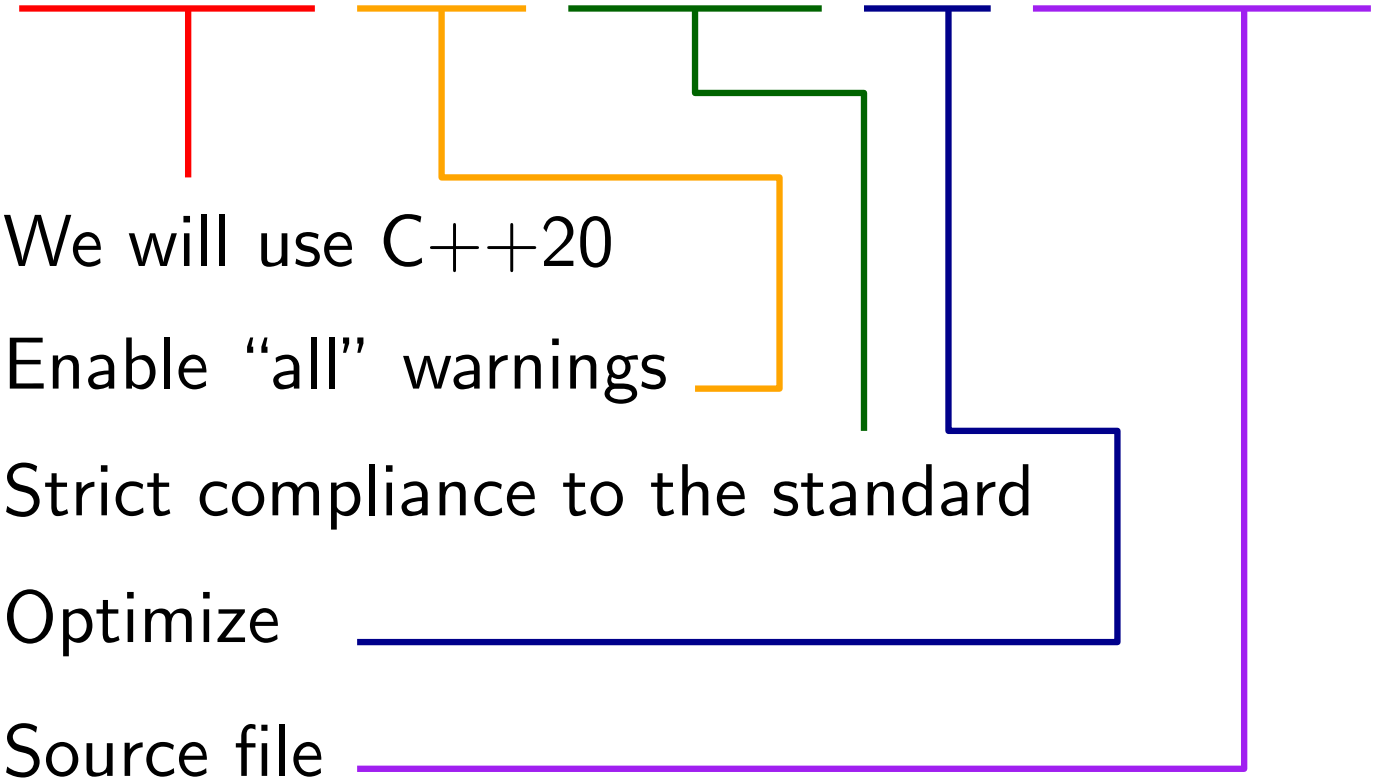
```
g++ -std=c++20 -Wall -pedantic  -O3  solution.cpp -o solution
```



- We will use C++20
- Enable “all” warnings
- Strict compliance to the standard
- Optimize

Compiling

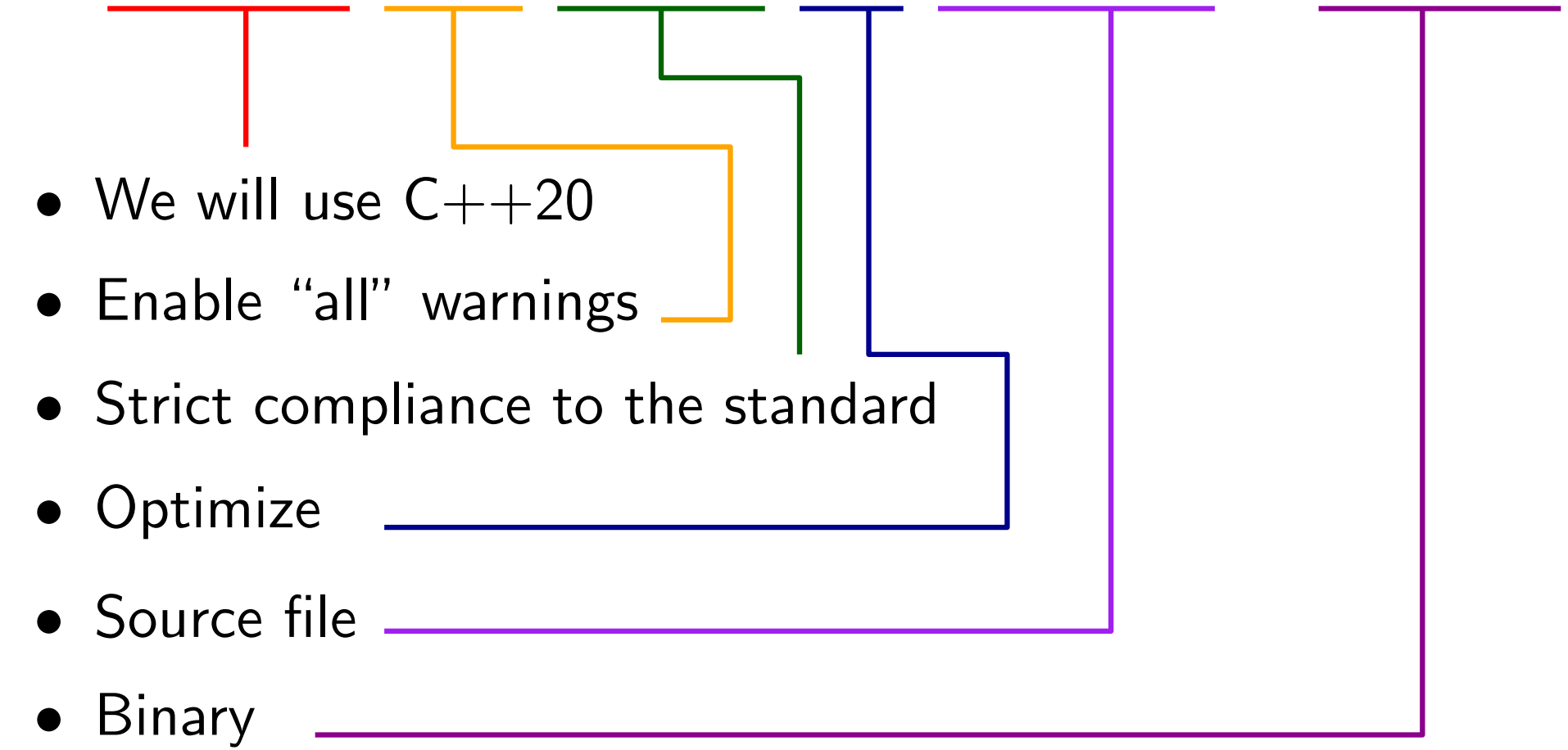
```
g++ -std=c++20 -Wall -pedantic  -O3  solution.cpp -o solution
```



- We will use C++20
- Enable “all” warnings
- Strict compliance to the standard
- Optimize
- Source file

Compiling

```
g++ -std=c++20 -Wall -pedantic  -O3  solution.cpp -o solution
```



- We will use C++20
- Enable “all” warnings
- Strict compliance to the standard
- Optimize
- Source file
- Binary

Checking the solution

```
$ ./solution < example.in  > solution.out
```

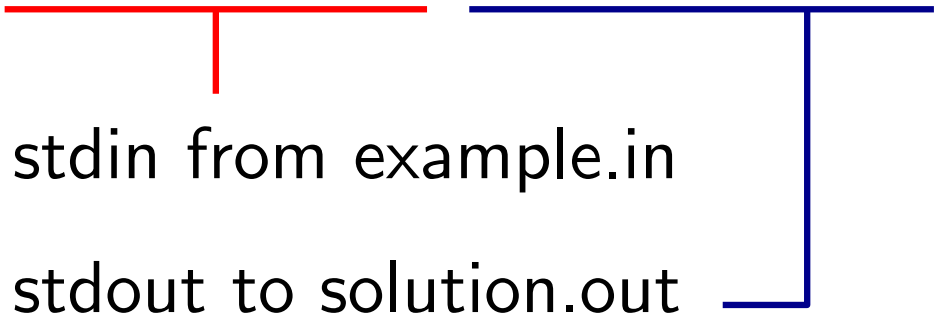
Checking the solution

```
$ ./solution < example.in  > solution.out
```

- Redirect stdin from example.in

Checking the solution

```
$ ./solution < example.in  > solution.out
```



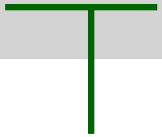
- Redirect stdin from example.in
- Redirect stdout to solution.out

Checking the solution

```
$ ./solution < example.in  > solution.out
```

- Redirect stdin from example.in
- Redirect stdout to solution.out

```
$ diff -bBZ  solution.out example.expected
$
```



- Ignore white space

Checking the solution

```
$ ./solution < example.in  > solution.out
```

- Redirect stdin from example.in
- Redirect stdout to solution.out

```
$ diff -bBZ  solution.out example.expected
$
```

- Ignore white space
- No output = files are identical.

Timing your solution

```
$ time ./solution < example.in  > solution.out

real    0m0.005s
user    0m0.000s
sys     0m0.005s
```

Timing your solution

```
$ time ./solution < example.in  > solution.out

real    0m0.005s
user    0m0.000s
sys     0m0.005s
```

Everything in a single command

```
$ (time ./solution < example.in) | diff -bBZ - example.expected
```

Tips

- Use the `assert()` macro in the `cassert` header.
- Test the assumptions you are making in your program.
- Perform sanity checks of your intermediate results.

```
#include<cassert>

void solve_testcase()
{
    int n;
    std::string s;
    std::cin >> n >> s;
    assert(s.size() == n);

[...]
```

Tips

- Use the `assert()` macro in the `cassert` header.
- Test the assumptions you are making in your program.
- Perform sanity checks of your intermediate results.

- Beware: checking assertions can take time.
- Disable assertions by defining the NDEBUG macro.

```
g++ -std=c++20 -Wall -pedantic -O3 -DNDEBUG solution.cpp -o solution
```

Tips

- Use the `assert()` macro in the `cassert` header.
- Test the assumptions you are making in your program.
- Perform sanity checks of your intermediate results.

- Beware: checking assertions can take time.
- Disable assertions by defining the NDEBUG macro.

```
g++ -std=c++20 -Wall -pedantic -O3 -DNDEBUG solution.cpp -o solution
```

- If your program requires heavy I/O, this might help

```
std::ios_base::sync_with_stdio(false);
```