

Część 1. Analiza statyczna repozytorium z użyciem narzędzia cpplint

Użyto narzędzia cpplint do statycznej analizy wszystkich plików źródłowych i nagłówkowych języka C++. Cpplint sprawdza zgodność kodu z wytycznymi Google (<https://google.github.io/styleguide/cppguide.html>).

Pełny output cpplint dla wszystkich plików .cpp/.hpp w projekcie:

knowak@pop-os:~/Repos/BSI\$ cpplint helper.hpp main.cpp solver.hpp

```
helper.hpp:0: No copyright message found. You should have a line: "Copyright [year] <Copyright Owner>" [legal/copyright] [5]
helper.hpp:0: No #ifndef header guard found, suggested CPP variable is: HELPER_HPP_ [build/header_guard] [5]
helper.hpp:7: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:17: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:21: Use int16/int64/etc, rather than the C type long [runtime/int] [4]
helper.hpp:28: public: should be indented +1 space inside class Helper [whitespace/indent] [3]
helper.hpp:31: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:33: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:36: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:37: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:38: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:40: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:41: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:42: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:43: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:44: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:45: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:46: Lines should be <= 80 characters long [whitespace/line_length] [2]
helper.hpp:51: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:52: Missing spaces around = [whitespace/operators] [4]
helper.hpp:52: Missing spaces around < [whitespace/operators] [3]
helper.hpp:52: Missing space before ( in for( [whitespace/parens] [5]
helper.hpp:52: Missing space after ; [whitespace/semicolon] [3]
helper.hpp:53: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:54: Missing spaces around == [whitespace/operators] [3]
helper.hpp:54: Missing space before ( in if( [whitespace/parens] [5]
helper.hpp:54: Missing space after , [whitespace/comma] [3]
helper.hpp:55: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:58: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:58: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:59: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:59: Missing spaces around == [whitespace/operators] [3]
helper.hpp:59: Missing space before ( in if( [whitespace/parens] [5]
helper.hpp:59: Missing space after , [whitespace/comma] [3]
helper.hpp:60: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:62: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:62: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:63: An else should appear on the same line as the preceding } [whitespace/newline] [4]
```

helper.hpp:63: Missing spaces around == [whitespace/operators] [3]
helper.hpp:63: Missing space before (in if([whitespace/parens] [5]
helper.hpp:63: Missing space after , [whitespace/comma] [3]
helper.hpp:64: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:66: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:66: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:67: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:67: Missing spaces around == [whitespace/operators] [3]
helper.hpp:67: Missing space before (in if([whitespace/parens] [5]
helper.hpp:67: Missing space after , [whitespace/comma] [3]
helper.hpp:68: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:70: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:70: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:71: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:71: Missing spaces around == [whitespace/operators] [3]
helper.hpp:71: Missing space before (in if([whitespace/parens] [5]
helper.hpp:71: Missing space after , [whitespace/comma] [3]
helper.hpp:72: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:74: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:74: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:75: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:75: Missing spaces around == [whitespace/operators] [3]
helper.hpp:75: Missing space before (in if([whitespace/parens] [5]
helper.hpp:75: Missing space after , [whitespace/comma] [3]
helper.hpp:76: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:78: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:78: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:79: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:79: Missing spaces around == [whitespace/operators] [3]
helper.hpp:79: Missing space before (in if([whitespace/parens] [5]
helper.hpp:79: Missing space after , [whitespace/comma] [3]
helper.hpp:80: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:82: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:82: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:83: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:83: Missing spaces around == [whitespace/operators] [3]
helper.hpp:83: Missing space before (in if([whitespace/parens] [5]
helper.hpp:83: Missing space after , [whitespace/comma] [3]
helper.hpp:84: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:86: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:86: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:87: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:87: Missing spaces around == [whitespace/operators] [3]
helper.hpp:87: Missing space before (in if([whitespace/parens] [5]
helper.hpp:87: Missing space after , [whitespace/comma] [3]
helper.hpp:88: { should almost always be at the end of the previous line [whitespace/braces] [4]
helper.hpp:90: At least two spaces is best between code and comments [whitespace/comments] [2]
helper.hpp:90: Should have a space between // and comment [whitespace/comments] [4]
helper.hpp:91: An else should appear on the same line as the preceding } [whitespace/newline] [4]
helper.hpp:91: Missing spaces around == [whitespace/operators] [3]
helper.hpp:91: Missing space before (in if([whitespace/parens] [5]
helper.hpp:91: Missing space after , [whitespace/comma] [3]

helper.hpp:92: { should almost always be at the end of the previous line [whitespace/braces] [4]
 helper.hpp:94: At least two spaces is best between code and comments [whitespace/comments] [2]
 helper.hpp:94: Should have a space between // and comment [whitespace/comments] [4]
 helper.hpp:95: An else should appear on the same line as the preceding } [whitespace/newline] [4]
 helper.hpp:95: Missing spaces around == [whitespace/operators] [3]
 helper.hpp:95: Missing space before (in if([whitespace/parens] [5]
 helper.hpp:95: Missing space after , [whitespace/comma] [3]
 helper.hpp:96: { should almost always be at the end of the previous line [whitespace/braces] [4]
 helper.hpp:98: At least two spaces is best between code and comments [whitespace/comments] [2]
 helper.hpp:98: Should have a space between // and comment [whitespace/comments] [4]
 helper.hpp:99: An else should appear on the same line as the preceding } [whitespace/newline] [4]
 helper.hpp:99: Missing spaces around == [whitespace/operators] [3]
 helper.hpp:99: Missing space before (in if([whitespace/parens] [5]
 helper.hpp:99: Missing space after , [whitespace/comma] [3]
 helper.hpp:100: { should almost always be at the end of the previous line [whitespace/braces] [4]
 helper.hpp:102: At least two spaces is best between code and comments [whitespace/comments] [2]
 helper.hpp:102: Should have a space between // and comment [whitespace/comments] [4]
 helper.hpp:105: Missing space before (in switch([whitespace/parens] [5]
 helper.hpp:106: { should almost always be at the end of the previous line [whitespace/braces] [4]
 helper.hpp:117: Lines should be <= 80 characters long [whitespace/line_length] [2]
 helper.hpp:120: Lines should be <= 80 characters long [whitespace/line_length] [2]
 helper.hpp:126: Line ends in whitespace. Consider deleting these extra spaces.
 [whitespace/end_of_line] [4]
 helper.hpp:124: Add #include <string> for string [build/include_what_you_use] [4]
 helper.hpp:128: Could not find a newline character at the end of the file.
 [whitespace/ending_newline] [5]
 Done processing helper.hpp
 main.cpp:0: No copyright message found. You should have a line: "Copyright [year] <Copyright Owner>" [legal/copyright] [5]
 main.cpp:4: Line ends in whitespace. Consider deleting these extra spaces.
 [whitespace/end_of_line] [4]
 main.cpp:5: { should almost always be at the end of the previous line [whitespace/braces] [4]
 main.cpp:9: Could not find a newline character at the end of the file. [whitespace/ending_newline] [5]
 Done processing main.cpp
 solver.hpp:0: No copyright message found. You should have a line: "Copyright [year] <Copyright Owner>" [legal/copyright] [5]
 solver.hpp:0: No #ifndef header guard found, suggested CPP variable is: SOLVER_HPP_ [build/header_guard] [5]
 solver.hpp:2: Found C system header after C++ system header. Should be: solver.h, c system, c++ system, other. [build/include_order] [4]
 solver.hpp:5: Redundant blank line at the start of a code block should be deleted.
 [whitespace/blank_line] [2]
 solver.hpp:6: public: should be indented +1 space inside class Solver [whitespace/indent] [3]
 solver.hpp:7: Lines should be <= 80 characters long [whitespace/line_length] [2]
 solver.hpp:7: Is this a non-const reference? If so, make const or use a pointer: std::vector<float>&prod_p [runtime/references] [2]
 solver.hpp:7: Is this a non-const reference? If so, make const or use a pointer: std::vector<float>&nondef_p [runtime/references] [2]
 solver.hpp:8: { should almost always be at the end of the previous line [whitespace/braces] [4]
 solver.hpp:32: Missing spaces around != [whitespace/operators] [3]

solver.hpp:32: Missing space before (in if([whitespace/parens] [5]
solver.hpp:34: Missing space before (in if([whitespace/parens] [5]
solver.hpp:35: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:36: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:36: Should have a space between // and comment [whitespace/comments] [4]
solver.hpp:37: Should have a space between // and comment [whitespace/comments] [4]
solver.hpp:38: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:38: Should have a space between // and comment [whitespace/comments] [4]
solver.hpp:39: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:40: Missing space before (in for([whitespace/parens] [5]
solver.hpp:41: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:45: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:46: Missing space before (in for([whitespace/parens] [5]
solver.hpp:47: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:52: Missing spaces around = [whitespace/operators] [4]
solver.hpp:52: Missing spaces around < [whitespace/operators] [3]
solver.hpp:52: Missing space before (in for([whitespace/parens] [5]
solver.hpp:52: Missing space after ; [whitespace/semicolon] [3]
solver.hpp:53: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:59: Missing spaces around = [whitespace/operators] [4]
solver.hpp:59: Missing spaces around < [whitespace/operators] [3]
solver.hpp:59: Missing space before (in for([whitespace/parens] [5]
solver.hpp:59: Missing space after ; [whitespace/semicolon] [3]
solver.hpp:60: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:61: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:63: Line ends in whitespace. Consider deleting these extra spaces.
[whitespace/end_of_line] [4]
solver.hpp:67: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:69: Redundant blank line at the start of a code block should be deleted.
[whitespace/blank_line] [2]
solver.hpp:70: Missing space after , [whitespace/comma] [3]
solver.hpp:71: Missing spaces around = [whitespace/operators] [4]
solver.hpp:71: Missing spaces around < [whitespace/operators] [3]
solver.hpp:71: Missing space before (in for([whitespace/parens] [5]
solver.hpp:71: Missing space after ; [whitespace/semicolon] [3]
solver.hpp:73: Missing spaces around = [whitespace/operators] [4]
solver.hpp:73: Missing spaces around < [whitespace/operators] [3]
solver.hpp:73: Missing space before (in for([whitespace/parens] [5]
solver.hpp:73: Missing space after ; [whitespace/semicolon] [3]
solver.hpp:78: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:79: Missing spaces around <= [whitespace/operators] [3]
solver.hpp:79: Missing space before (in for([whitespace/parens] [5]
solver.hpp:79: Missing space after ; [whitespace/semicolon] [3]
solver.hpp:80: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:81: Lines should be <= 80 characters long [whitespace/line_length] [2]
solver.hpp:87: { should almost always be at the end of the previous line [whitespace/braces] [4]
solver.hpp:98: Missing space before (in switch([whitespace/parens] [5]
solver.hpp:103: Line ends in whitespace. Consider deleting these extra spaces.
[whitespace/end_of_line] [4]
solver.hpp:110: Weird number of spaces at line-start. Are you using a 2-space indent?
[whitespace/indent] [3]

solver.hpp:110: Line ends in whitespace. Consider deleting these extra spaces.
 [whitespace/end_of_line] [4]
 solver.hpp:115: Lines should be <= 80 characters long [whitespace/line_length] [2]
 solver.hpp:115: Missing space after , [whitespace/comma] [3]
 solver.hpp:119: Lines should be <= 80 characters long [whitespace/line_length] [2]
 solver.hpp:119: Use int16/int64/etc, rather than the C type long [runtime/int] [4]
 solver.hpp:120: { should almost always be at the end of the previous line [whitespace/braces] [4]
 solver.hpp:125: Missing space after , [whitespace/comma] [3]
 solver.hpp:127: Missing spaces around = [whitespace/operators] [4]
 solver.hpp:127: Missing spaces around < [whitespace/operators] [3]
 solver.hpp:127: Missing space before (in for([whitespace/parens] [5]
 solver.hpp:127: Missing space after ; [whitespace/semicolon] [3]
 solver.hpp:128: { should almost always be at the end of the previous line [whitespace/braces] [4]
 solver.hpp:129: Lines should be <= 80 characters long [whitespace/line_length] [2]
 solver.hpp:129: Missing space after , [whitespace/comma] [3]
 solver.hpp:135: { should almost always be at the end of the previous line [whitespace/braces] [4]
 solver.hpp:140: { should almost always be at the end of the previous line [whitespace/braces] [4]
 solver.hpp:141: Missing spaces around < [whitespace/operators] [3]
 solver.hpp:7: Add #include <vector> for vector<> [build/include_what_you_use] [4]
 solver.hpp:35: Add #include <string> for string [build/include_what_you_use] [4]
 solver.hpp:143: Could not find a newline character at the end of the file.
 [whitespace/ending_newline] [5]
 Done processing solver.hpp
Total errors found: 195

187 błędów ma label „whitespace”, tj. dotyczy formatowania kodu (np. obecność spacji przed/po danych znakach).

Błędy niezwiązane z formatowaniem kodu (po zawężeniu filtrem, **cpplint --filter=-whitespace** helper.hpp main.cpp solver.hpp).

helper.hpp:0: No copyright message found. You should have a line: "Copyright [year] <Copyright Owner>" [legal/copyright] [5]
 helper.hpp:0: No #ifndef header guard found, suggested CPP variable is: HELPER_HPP_
 [build/header_guard] [5]
 helper.hpp:21: Use int16/int64/etc, rather than the C type long [runtime/int] [4]
 helper.hpp:124: Add #include <string> for string [build/include_what_you_use] [4]
 Done processing helper.hpp
 main.cpp:0: No copyright message found. You should have a line: "Copyright [year] <Copyright Owner>" [legal/copyright] [5]
 Done processing main.cpp
 solver.hpp:0: No copyright message found. You should have a line: "Copyright [year] <Copyright Owner>" [legal/copyright] [5]
 solver.hpp:0: No #ifndef header guard found, suggested CPP variable is: SOLVER_HPP_
 [build/header_guard] [5]
 solver.hpp:2: Found C system header after C++ system header. Should be: solver.h, c system, c++ system, other. [build/include_order] [4]
 solver.hpp:7: Is this a non-const reference? If so, make const or use a pointer: std::vector<float>&prod_p [runtime/references] [2]
 solver.hpp:7: Is this a non-const reference? If so, make const or use a pointer: std::vector<float>&nondef_p [runtime/references] [2]
 solver.hpp:119: Use int16/int64/etc, rather than the C type long [runtime/int] [4]
 solver.hpp:7: Add #include <vector> for vector<> [build/include_what_you_use] [4]

solver.hpp:35: Add #include <string> for string [build/include_what_you_use] [4]

Done processing solver.hpp

Total errors found: 13

Podsumowanie błędów niezwiązanych z formatowaniem kodu [ilość_błędów]:

- Brak copyright w sprawdzanych plikach [3]
- Brak tzw. include guard zapobiegających wielokrotnym includom [2]
- Użycie typu long ze standardu języka C zamiast nowszych typów fixed-width (np. int64_t) z nagłówka <stdint> (od C++11). [2]
- Brak includowania plików nagłówkowych zawierających definicję użytego symbolu (vector, string) [3]
- Niepoprawna kolejność includowania (C system header after C++ system header) [1]
- Non-const referencja: zalecane dodanie modyfikatora const lub użycie pointera [2]

Uzasadnienie złamanych reguł programowania wg cpplint:

- Whitespace: brak zastosowania narzędzia do automatycznego formatowania kodu (np. ClangFormat).
- Pozostałe: widoczny pozorny brak wpływu na działanie programu – należy stworzyć proponowany patch z fixem po zastosowaniu ClangFormat w celu eliminacji pozostałych błędów, również z uwzględnieniem copyright headers z uwagi na przechowywanie kodu w publicznym repozytorium.

Część 2. Testy jednostkowe

W projekcie został stworzony osobny, dedykowany target do testów jednostkowych (BSI_calc_tests). Napisano testy jednostkowe do każdej funkcji z pliku solver.hpp (zaktualizowany kod znajduje się w repozytorium <https://github.com/Sequindo/BSI>), co łącznie dało 11 testów używających 7 test suites.

Ostatnie uruchomienie testów miało miejsce 1 grudnia 2021 r – poniżej zostaje załączony output.

Osoba odpowiedzialna za run testów: Kacper Nowak

Output:

```
knowak@pop-os:~/Repos/BSI/build$ ./BSI_calc_tests
```

```
[=====] Running 11 tests from 7 test suites.
```

```
[-----] Global test environment set-up.
```

```
[-----] 2 tests from ProportionalTest
```

```
[ RUN    ] ProportionalTest.givenProperArgumentListResultIsProperlyEvaluated
```

```
[   OK   ] ProportionalTest.givenProperArgumentListResultIsProperlyEvaluated (0 ms)
```

```
[ RUN    ] ProportionalTest.givenAnotherProperArgumentListResultIsProperlyEvaluated
```

```
[   OK   ] ProportionalTest.givenAnotherProperArgumentListResultIsProperlyEvaluated (0 ms)
```

```
[-----] 2 tests from ProportionalTest (0 ms total)
```

```
[-----] 2 tests from ProportionalTestException
```

```
[ RUN    ]
```

```
ProportionalTestException.givenBothOfArgumentVectorsEmptyCorrectExceptionIsThrown
```

```
[   OK   ]
```

```
ProportionalTestException.givenBothOfArgumentVectorsEmptyCorrectExceptionIsThrown (0 ms)
```

```
[ RUN    ]
```

```
ProportionalTestException.givenArgumentVectorsOfNonEqualSizedCorrectExceptionIsThrown
```

```
[   OK   ]
```

```
ProportionalTestException.givenArgumentVectorsOfNonEqualSizedCorrectExceptionIsThrown (0 ms)
```

```

[-----] 2 tests from ProportionalTestException (0 ms total)

[-----] 1 test from ParallelReliabilityTest
[ RUN    ] ParallelReliabilityTest.givenProperArgumentsThenCalculateProbabilityOfRemainingOperativeForEachCombination
[ OK ] ParallelReliabilityTest.givenProperArgumentsThenCalculateProbabilityOfRemainingOperativeForEachCombination (0 ms)
[-----] 1 test from ParallelReliabilityTest (0 ms total)

[-----] 1 test from BinomialTest
[ RUN    ] BinomialTest.givenProperArgumentsThenBinomialIsProperlyCalculated
/home/knowak/Repos/BSI/tests/main.cpp:92: Failure
Expected equality of these values:
  455
  Solver::binomial(15,3)
  Which is: -1
/home/knowak/Repos/BSI/tests/main.cpp:93: Failure
Expected equality of these values:
  1140
  Solver::binomial(20,3)
  Which is: 1
[ FAILED ] BinomialTest.givenProperArgumentsThenBinomialIsProperlyCalculated (0 ms)
[-----] 1 test from BinomialTest (0 ms total)

[-----] 1 test from FactorialTest
[ RUN    ] FactorialTest.givenProperArgumentThenFactorialIsProperlyCalculated
[ OK ] FactorialTest.givenProperArgumentThenFactorialIsProperlyCalculated (0 ms)
[-----] 1 test from FactorialTest (1 ms total)

[-----] 3 tests from CardDeckTest
[ RUN    ] CardDeckTest.given1AsArgumentProperlyCalculateChancesOfDiamondsOnDeckTop
[ OK ] CardDeckTest.given1AsArgumentProperlyCalculateChancesOfDiamondsOnDeckTop (0 ms)
[ RUN    ] CardDeckTest.given1AsArgumentProperlyCalculateChancesOfBlacksOnDeckTop
[ OK ] CardDeckTest.given1AsArgumentProperlyCalculateChancesOfBlacksOnDeckTop (0 ms)
[ RUN    ] CardDeckTest.given1AsArgumentProperlyCalculateChancesOfNinesOnDeckTop
[ OK ] CardDeckTest.given1AsArgumentProperlyCalculateChancesOfNinesOnDeckTop (0 ms)
[-----] 3 tests from CardDeckTest (0 ms total)

[-----] 1 test from FailureProbTest
[ RUN    ] FailureProbTest.givenProperArgumentsProbabilityOfFailureIsProperlyCalculatedForEachCombination
[ OK ] FailureProbTest.givenProperArgumentsProbabilityOfFailureIsProperlyCalculatedForEachCombination (0 ms)
[-----] 1 test from FailureProbTest (0 ms total)

[-----] Global test environment tear-down

```

```
[=====] 11 tests from 7 test suites ran. (1 ms total)
[ PASSED ] 10 tests.
[ FAILED ] 1 test, listed below:
[ FAILED ] BinomialTest.givenProperArgumentsThenBinomialIsProperlyCalculated
```

1 FAILED TEST

Podsumowanie: 10 testów passujących, 1 failujący.

Opis failujących test cases: Failujący test dotyczy funkcji `binomial()` liczącej dwumian Newtona z zadanych argumentów `uint8_t k`, `uint8_t n`. Funkcja `binomial()` jest typu `int`, jednak wspomniany przypadek testowy nie powinien powodować przepełnienia. Jednak wewnątrz tej funkcji wołana jest funkcja `factorial()` typu `int`, która w sposób rekurencyjny liczy silnię. W tym przypadku doszło do przepełnienia przy liczeniu silni z 15 i 20 (co przekracza rozmiar `int`). Należałoby zmienić sygnaturę funkcji (zwracanie typu odpowiedniego dla tak dużych wartości).