```
 1: // $Id: division.cpp,v 1.13 2016-06-13 13:44:52-07 - - $
 2:
 3: #include <cstdlib>
 4: #include <iostream>
 5: #include <locale>
 6: #include <stdexcept>
 7:
 8: using namespace std;
 9:
10: using ulong = unsigned long;
11: using uupair = pair<ulong,ulong>;
12:
13: uupair divide (const ulong& dividend, const ulong& divisor) {
14:    if (divisor == 0) throw domain_error ("divide(_,0)");
15:    ulong powerof2 = 1;
16:    ulong divisor_ = divisor;
17:    while (divisor_ < dividend) {
18:       divisor_ *= 2;
19:       powerof2 *= 2;
20:    }
21:    ulong quotient = 0;
22:    ulong remainder = dividend;
23:    while (powerof2 > 0) {
24:       if (divisor_ <= remainder) {
25:          remainder -= divisor_;
26:          quotient += powerof2;
27:       }
28:       divisor_ /= 2;
29:       powerof2 /= 2;
30:    }
31:    return uupair (quotient, remainder);
32: }
33:
```

```
34:
35: ostream& operator<< (ostream& out, const uupair& pair) {
36:    out << pair.first << " Rem " << pair.second;
37:    return out;
38: }
39:
40: uupair tests[] = {
41:    {                  0L, 1'024L},
42:    {                  5L,     7L},
43:    {                100L,     0L},
44:    {                100L,    50L},
45:    {                320L,    20L},
46:    {                963L,   71L},
47:    {12'345'678'912'345L, 9'876L},
48: };
49:
50: int main (int, char**) {
51:    cout.imbue (locale (""));
52:    uupair* testend = tests + sizeof tests / sizeof *tests;
53:    for (uupair* itor = tests; itor < testend; ++itor) {
54:       ulong dividend = itor->first;
55:       ulong divisor = itor->second;
56:       cout << dividend << " / " << divisor << " = ";
57:       try {
58:          uupair result = divide (dividend, divisor);
59:          cout << result;
60:          uupair tested = uupair (dividend / divisor,
61:                                  dividend % divisor);
62:          if (tested != result) {
63:             cout << ": wrong " << tested;
64:          }
65:       }catch (domain_error& error) {
66:          cout << "domain_error: " << error.what();
67:       }
68:       cout << endl;
69:    }
70:    return EXIT_SUCCESS;
71: }
72:
73: //TEST// ./division 2>&1 >division.output
74: //TEST// mkpspdf division.ps division.cpp* division.output
75:
```

```
    1: @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@ mkc: starting division.cpp
    2: checksource division.cpp
    3: ident division.cpp
    4: division.cpp:
    5:      $Id: division.cpp,v 1.13 2016-06-13 13:44:52-07 - - $
    6: cpplint.py.perl division.cpp
    7: Done processing division.cpp
    8: g++ -g -O0 -Wall -Wextra -Werror -Wpedantic -Wshadow -fdiagnostics-color
=never -std=gnu++17 -Wold-style-cast division.cpp -o division -lm
    9: rm -f division.o
   10: @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@ mkc: finished division.cpp
```

```
1: 0 / 1,024 = 0 Rem 0
2: 5 / 7 = 0 Rem 5
3: 100 / 0 = domain_error: divide(_,0)
4: 100 / 50 = 2 Rem 0
5: 320 / 20 = 16 Rem 0
6: 963 / 71 = 13 Rem 40
7: 12,345,678,912,345 / 9,876 = 1,250,068,743 Rem 6,477
```