=== 演習1 解答例 ============================
--- compile-and-run.txt ---
```
$ g++ -std=c++17 ex03-1.cpp
$ ./a.out
3
2.5
xyz
abc
```

--- prsmall.hpp ---
```
#include <iostream>
template<typename T>
void print_smaller(T a, T b) {
   if (a < b)
      std::cout << a <<"\n";
   else
      std::cout << b <<"\n";
}
```

--- ex03-1.cpp ---
```
#include "prsmall.hpp"
int main()
{
   print_smaller(5, 3);
   print_smaller(2.5, 4.8);
   print_smaller("abc", "xyz");
   print_smaller<std::string>("abc", "xyz");
}
```

```
=== 演習2 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-2.cpp
$ ./a.out
xyz: 20


--- prsmall.hpp ---
#include <iostream>
template<typename T>
void print_smaller(T a, T b) {
   if (a < b)
      std::cout << a <<"\n";
   else
      std::cout << b <<"\n";
}


--- ex03-2.cpp ---
#include <iostream>
#include "prsmall.hpp"
class Sales { // 売上情報
    std::string name; int num; // 名前と個数
  public:
    Sales(std::string a, int b) :name(a), num(b){}
    bool operator<(const Sales& p)const
         { return num < p.num; }
    friend auto&
    operator<<(std::ostream& o, const Sales& p)
         { return o << p.name <<": "<< p.num; }
};

int main()
{
   Sales a{"abc", 40}, b{"xyz", 20};
   print_smaller(a, b);
}
```

```
=== 演習3 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-3.cpp
$ ./a.out
2 4 8 1 5
2.4 4.3 9


--- prsmall.hpp ---
#include <iostream>
template<typename T>
void print_smaller(T a, T b) {
   if (a < b)
      std::cout << a <<"\n";
   else
      std::cout << b <<"\n";
}


--- ex03-3.cpp ---
#include <iostream>
#include <vector>
#include "prsmall.hpp"

template<typename T> auto&
operator<<(std::ostream& o, const std::vector<T>& v)
{
   for (auto& e : v) o << e <<" ";
   return o;
}

int main()
{
   std::vector a{3,4,5,6}, b{2,4,8,1,5};
   print_smaller(a, b);

   std::vector<double> c{2.4,5.6}, d{2.4,4.3,9.0};
   print_smaller(c, d);
}
```

```
=== 演習4 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-4.cpp
$ ./a.out
3 6
ab abcdef


--- ex03-4.cpp ---
#include <iostream>

template<typename T>
T sum(T a, T b, T c =T{})
{
   return a + b + c;
}

int main()
{
   using std::cout;
   cout << sum(1,2)<<" "<< sum(1,2,3)<<"\n";
   using namespace std::string_literals;
   cout << sum("a"s, "b"s)<<" "
        << sum("a"s, "bc"s, "def"s)<<"\n";
}
```

```
=== 演習5 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-5.cpp
$ ./a.out
5 4 2
x y z
xyz 0123


--- ex03-5.cpp ---
#include <iostream>
#include <vector>
using std::cout, std::vector, std::string;

template<typename T>
void print_max(const T& a, const T& b) {
   // ここを答える
   for (auto& e : std::max(a,b))
      cout << e <<" ";
   cout <<"\n";
}

int main()
{
   vector x{3,4,2,5,8}, y{5, 4, 2};
   print_max(x, y);

   using namespace std::string_literals;
   print_max("xyz"s, "abcde"s);

   vector s{"ab"s, "cde"s}, t{"xyz"s, "0123"s};
   print_max(s, t);

}
```

```
=== 演習6 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-6.cpp
$ ./a.out
1
2
3


--- vec3d.hpp ---
#include <vector>
class Vec3d {
    std::vector<int> vec;
  public:
    Vec3d(int a=0, int b=0, int c=0)
    :vec{a,b,c} {}
    int  operator[](size_t i) const { return vec[i]; }
    int& operator[](size_t i)       { return vec[i]; }
};


--- ex03-6.cpp ---
#include <iostream>
#include "vec3d.hpp"
int main()
{
   Vec3d x {1,2,1};
   x[2] = 3;
   for (int i = 0; i < 3; i++)
      std::cout << x[i] <<"\n";
}
```

```
=== 演習7 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-7.cpp
$ ./a.out
a,b =>(3,-4)


--- point.hpp ---
#include <iostream>
template<typename T>
class Point {
  public:
    T x, y;
    Point(T a, T b): x{a},y{b}{}
    bool operator==(const Point<T>& p)const
      { return x == p.x && y == p.y; }
};

template<typename T> auto&
operator<<(std::ostream& o, const Point<T>& p)
{
   return o <<"("<< p.x <<","<< p.y <<")";
}


--- ex03-7.cpp ---
#include <iostream>
#include "point.hpp"
int main()
{
   Point<int> a{3,-4}, b{3,-4};
   if (a == b)
      std::cout <<"a,b =>"<< a <<"\n";
}
```

```
=== 演習8 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-8.cpp
$ ./a.out
ok
ok
ok


--- equal.hpp ---
#include <cmath>
template<typename T>
bool is_equal(T x, T y) { return x == y; }

template<>
bool is_equal(double x, double y) {
   const double eps = 0.01;
   return std::abs(x-y) < eps;
}


--- ex03-8.cpp ---
#include <iostream>
#include "equal.hpp"

int main()
{
   if (is_equal(1+2, 3))
      std::cout << "ok\n";

   std::string s1{"ab"}, s2{"abc"};
   if (is_equal(s1+"c", s2))
      std::cout << "ok\n";

   if (is_equal(0.1+0.2, 0.3))
      std::cout << "ok\n";
}
```

```
=== 演習9 解答例 ============================
--- compile-and-run.txt ---
$ g++ -std=c++17 ex03-9.cpp
$ ./a.out
(3,40)


--- point.hpp ---
#include <iostream>
template<typename T>
class Point {
  public:
    T x, y;
    Point(T a, T b): x{a},y{b}{}
    bool operator==(const Point<T>& p)const
      { return x == p.x && y == p.y; }
    bool operator<(const Point<T>& p) const
      { return (x*x+y*y) < (p.x*p.x+p.y*p.y); }
};

template<typename T> auto&
operator<<(std::ostream& o, const Point<T>& p)
{
   return o <<"("<< p.x <<","<< p.y <<")";
}


--- prsmall.hpp ---
#include <iostream>
template<typename T>
void print_smaller(T a, T b) {
   if (a < b)
      std::cout << a <<"\n";
   else
      std::cout << b <<"\n";
}


--- ex03-9.cpp ---
#include "point.hpp"
#include "prsmall.hpp"
int main()
{
   Point<int> a{3, 40}, b{2, 50};
   print_smaller(a, b); // (3,40)
}
```