- Example

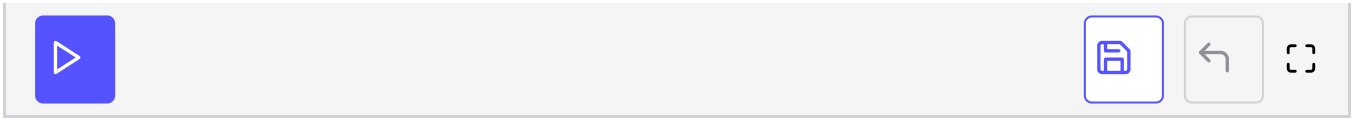
This example demonstrates cyclic references when using std::shared_ptr.

WE'LL COVER THE FOLLOWING

Example

```
// cyclicReference.cpp

#include <iostream>
#include <memory>

struct Son;
struct Daughter;

struct Mother{
  ~Mother(){
    std::cout << "Mother gone" << std::endl;
  }
  void setSon(const std::shared_ptr<Son> s ){
    mySon=s;
  }
  void setDaughter(const std::shared_ptr<Daughter> d ){
    myDaughter=d;
  }
  std::shared_ptr<const Son> mySon;
  std::weak_ptr<const Daughter> myDaughter;
};

struct Son{
  Son(std::shared_ptr<Mother> m):myMother(m){}
  ~Son(){
    std::cout << "Son gone" << std::endl;
  }
  std::shared_ptr<const Mother> myMother;
};

struct Daughter{
  Daughter(std::shared_ptr<Mother> m):myMother(m){}
  ~Daughter(){
    std::cout << "Daughter gone" << std::endl;
  }
```

```
  std::shared_ptr<const Mother> myMother;
};

int main(){
  std::cout << std::endl;
  {
    std::shared_ptr<Mother> mother= std::shared_ptr<Mother>( new Mother);
    std::shared_ptr<Son> son= std::shared_ptr<Son>( new Son(mother) );
    std::shared_ptr<Daughter> daughter= std::shared_ptr<Daughter>( new Daughter(mother) );
    mother->setSon(son);
    mother->setDaughter(daughter);
  }
  std::cout << std::endl;
}
```



Explanation

- In line 41 – 47, due to the artificial scope, the lifetime of the mother, the son, and the daughter are limited. In other words, `mother`, `son`, and `daughter` go out of scope, and therefore the destructor of the class `Mother` (line 10 - 12), `Son` (line 25 - 27), and `Daughter` (line 33 - 35) should automatically be invoked.
- We state *should*, because only the destructor of the class `Daughter` is called.
- The graphic of the source code shows that we have a cyclic reference of `std::shared_ptr` between mother and son. Therefore, the reference counter is always greater than 0, and the destructor will not automatically be invoked.
- That observation does not hold true for mother and daughter. If the daughter goes out of scope, the reference counter of the `std::shared_ptr` `myMother` (line 36) becomes 0 and the resource will automatically be deleted.

Let's test our understanding with an exercise in the next lesson.