Demo BankTest

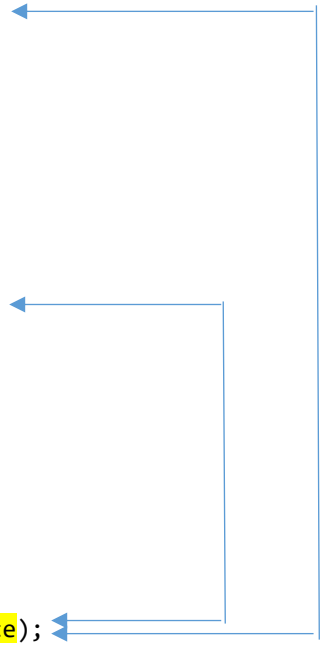
Issue Description (Data Races)

- Main() accesses account.Balance while two other threads t1 and t2 call account.Deposit and Withdraw concurrently.
- As only Deposit and Withdraw are synchronized and auto-property getter account.Balance is not, there occurs a data race between the read access in the property and the write accesses in Deposit and Withdraw

```
File BankAccount.cs:
…
public void Deposit(int amount)
{
    lock (sync)
    {
        Balance += amount;
    }
}

public bool Withdraw(int amount)
{
    lock (sync)
    {
        if (Balance >= amount)
        {
            Balance -= amount;
            return true;
        }
        return false;
    }
}

File BankTest.cs:
…
t1.Start();
t2.Start();
Console.WriteLine(account.Balance);
```



Checker Output (2 Issues, 4 Locations)

```
Issue: #0 Data race on BankTest.BankAccount.Balance
  caused by write at "Balance += amount" in BankAccount.cs line 11
    caused by call Deposit at "account.Deposit(100)" in BankTest.cs line 13
      caused by thread or task at "() => { account.Deposit(100); }" in BankTest.cs line 11
        caused by call BankTest.BankTest.Main()
          caused by initial thread at "Main" in BankTest.cs line 8
  caused by read at "account.Balance" in BankTest.cs line 22
    caused by call BankTest.BankTest.Main()
      caused by initial thread at "Main" in BankTest.cs line 8
```

```
Issue: #1 Data race on BankTest.BankAccount.Balance
  caused by write at "Balance -= amount" in BankAccount.cs line 21
    caused by call Withdraw at "account.Withdraw(50)" in BankTest.cs line 17
      caused by thread or task at "() => { var result = account.Withdraw..." in BankTest.cs line 15
        caused by call BankTest.BankTest.Main()
          caused by initial thread at "Main" in BankTest.cs line 8
  caused by read at "account.Balance" in BankTest.cs line 22
```

```
    caused by call BankTest.BankTest.Main()
      caused by initial thread at "Main" in BankTest.cs line 8
```

Problem Fixing (2 Options)

Option 1: Thread Joins

In BankTest.Main(): Join the two threads before accessing account.Balance.

```
t1.Start();
t2.Start();
t1.Join();
t2.Join();
Console.WriteLine(account.Balance);
```

Option 2: Monitor Lock

Use an explicit backup field for the BankAccount.Balance property and acquire a monitor lock in in getter. Use a full getter statement block.

```
private int balance;

public int Balance {
    get
    {
        lock (sync)
        {
            return balance;
        }
    }
}
```