

Worksheet: Dynamic Order with Synchronized Statements

Consider a method to transfer a balance from one account to another. Could this result in a deadlock? If not, please explain why not. If so, explain why it can and if there's a solution to prevent it.

```
public class IsThereDeadlock {  
    public void transferFunds(Account from,  
                               Account to,  
                               int amount) {  
        synchronized (from) {  
            synchronized (to) {  
                from.subtractFromBalance(amount);  
                to.addToBalance(amount);  
            }  
        }  
    }  
}
```



Worksheet solution: Dynamic Order with Synchronized Statements

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```

- What if one thread tries to transfer from A to B while another tries to transfer from B to A ?
Inconsistent lock order again – Deadlock!



Worksheet solution: Avoiding Dynamic Order Deadlocks

- The solution is to **induce** a lock ordering
 - Here, uses an existing unique numeric key, `acctId`, to establish an order

```
public class SafeTransfer {
    public void transferFunds(Account from, Account to, int amount) {
        Account firstLock, secondLock;
        if (from.acctId == to.acctId)
            throw new Exception("Cannot self-transfer");
        else if (from.acctId < to.acctId) {
            firstLock = from;
            secondLock = to;
        }
        else {
            firstLock = to;
            secondLock = from;
        }
        synchronized (firstLock) {
            synchronized (secondLock) {
                from.subtractFromBalance(amount);
                to.addToBalance(amount);
            }
        }
    }
}
```

