## 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

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);
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!
```

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## Worksheet solution: Avoiding Dynamic Order Deadlocks

- The solution is to induce a lock ordering lacksquare
- Here, uses an existing unique numeric key, acctld, to establish an order

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

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