

# Multithreaded Programming

1. Make a coin-flipping class that implements `Runnable`. The `run` method should flip 1000 coins and print out whenever they get 3 or more consecutive heads. Make a task queue, and put 5 separate instances of the `Runnable` class in the queue. In the printouts, you can use the `Thread.currentThread().getName()` to identify the thread. You are following variation 1 of the basic threading approach, so your code will look something like this (except you should call `execute` from a loop):

```
public class Foo implements Runnable {
    public void run() { loop and do coin flipping }
}
-----
public class Driver {
    public static void main(String[] args) {
        ...
        tasks.execute(new Foo()); // Multiple instances of Foo
        tasks.execute(new Foo());
        tasks.execute(new Foo());
    }
}
```

2. Do a similar task, but this time make only one instance of your main class (the one that implements `Runnable`). Still have 5 tasks in the queue. Now your code will look roughly like this (but with the calls to `execute` in a loop):

```
public class Foo implements Runnable {
    public Foo() {
        ...
        tasks.execute(this);
        tasks.execute(this);
        tasks.execute(this);
    }
    public void run() { loop and do coin flipping }
}
-----
public class Driver {
    public static void main(String[] args) {
        new Foo(); // One instance of Foo, not multiple
    }
}
```

3. Pop up a `Frame` or `JFrame` (or use an applet). Change the layout manager to `GridLayout` with 5 rows and 1 column. Create 5 coin-flipping tasks and associate each with a `Label` or `JLabel`. Which approach (1 `Runnable` or 5 `Runnables`) should you use? Have each task flip 1000 coins and print the number of heads in the label. Hints:

- Use `setText` to put text in the label.
- Remember that `String.format` is the Java equivalent of C's `sprintf`.