

Week 6

Creating and Using Objects

EXPLORING
Java



This Week

Lecture: Creating and using objects &

Case study: catch me if you can

Java Genesis:

–Ch7: Objects and classes

Lab Assessment 5

Quick Quiz for Chapter 6

```
import genesis.*;

public class GoWalking {

    public static void main (String [ ] args) {
        int posn = 0;
        while (true) {
            Transcript.print(posn+" ");
            Delay.milliseconds(500);
            if (Math.random() > 0.5) posn = posn + 1;
            else posn = posn - 1;
        }
    }
}
```

```

public class Walker {

    private int posn;           // instance variable

    public Walker ( ) {        // constructor methods
        posn = 0;
    }
    public Walker (int x) {
        posn = x;
    }

    public void move ( ) {
        if (Math.random( ) > 0.5) posn = posn+1;
        else posn = posn - 1;
    }
    public String toString ( ) {
        return posn+" ";
    }
    public int getPosn ( ) {
        return posn;
    }
}

```

```

import genesis.*;

public class GoWalkingAgain {

    public static void main (String [ ] args) {
        Walker phantom = new Walker(-2);
        Walker devil = new Walker(2);
        Transcript.println(phantom+" "+devil);
        while
            (phantom.getPosn( ) != devil.getPosn( )) {
                Delay.milliseconds(50);
                phantom.move();
                devil.move();
                Transcript.println(phantom+" "+devil);
            }
        }
    }
}

```



Problem

Catching Kangaroos

Kangaroos are placed at position 0 and hop around the circuit below. If they land on position 7 they are captured and can no longer hop.

1	2	3	4	5	6
0					7
13	12	11	10	9	8

1	2	3	4	5	6
0					7
13	12	11	10	9	8

- At each stage a kangaroo not at 7 hops a random distance of 1, 2, ..., 6 positions clockwise around the circuit.
- A kangaroo at position 7 cannot hop.

The class **Kangaroo**

- three instance variables: integers **numHops** and **posn**, and boolean **caught**
- one (default) constructor method that sets **posn** to 0, **numHops** to 0 and **caught** to **false**.
- four instance methods:
 - **hop()** (kangaroo hops) and **toString()**
 - getter methods **isCaught()** to return **caught** and **getNumHops()** to return **numHops**

```
public class Kangaroo {  
  
    // instance variables  
    private int numHops;  
    private boolean caught;  
    private int posn;  
  
    // constructor  
    public Kangaroo ( ) {  
        numHops = 0;  
        caught = false;  
        posn = 0;  
    }  
  
    public int getNumHops ( ) {  
        return numHops;  
    }  
  
    public boolean isCaught ( ) {  
        return caught;  
    }  
}
```

```

public void hop ( ) {
    if (!caught) {
        numHops++;
        int rand = (int)(6*Math.random( ))+1;
        posn = (posn + rand)%14;
        if (posn == 7) caught = true;
    }
}

```

```

public String toString ( ) {
    String s = "number of hops: "+numHops+"\t";
    s = s+posn+"\t";
    if (caught) s = s+"caught";
    else s = s+"free";
    return s;
}
}

```

```
import genesis.*;
```

```
public class TestKangaroo {
```

```
    public static void main (String [ ] args) {
```

```
        Kangaroo skippy = new Kangaroo( );
```

```
        Transcript.println(skippy);
```

```
        while (!skippy.isCaught( )) {
```

```
            skippy.hop( );
```

```
            Transcript.println(skippy);
```

```
        }
```

```
    }
```

```
}
```

The class **KangarooPopulation**

- instance variables: integers **numCaught** and **numHopAll**, and array **kangas** of **Kangaroo** objects
- constructor method that sets the values of **numCaught** and **numHopAll** to 0 and initialises the array **kangas**
- four instance methods:
 - getter methods **getNumCaught()** and **getNumHopAll()**
 - **allHop()** whereby all free kangaroos **hop**
 - **toString()** to return information about the population

```

public class KangarooPopulation {

    // instance variables
    private Kangaroo [ ] kangas;
    private int numCaught;
    private int numHopAll;

    // constructor
    public KangarooPopulation (int numKangas) {
        kangas = new Kangaroo [numKangas];
        numCaught = 0;
        for (int i=0; i<kangas.length; i++) {
            kangas[i] = new Kangaroo( );
        }
        numHopAll = 0;
    }

    public int getNumCaught ( ) {
        return numCaught;
    }
}

```

```

public int getNumHopAll ( ) {
    return numHopAll;
}

public void allHop ( ) {
    if (numCaught < kangas.length) {
        numHopAll++;
        for (int i=0; i<kangas.length; i++)
            if (!kangas[i].isCaught( )) {
                kangas[i].hop( );
                if (kangas[i].isCaught( )) numCaught++;
            }
    }
}

public String toString ( ) {
    return "number times all hopped: "+numHopAll
        +"\tnumber caught: "+numCaught;
}
}

```

```

import genesis.*;

public class TestKangarooPopulation {

    public static void main (String [ ] args) {
        int popSize =
            DialogBox.requestInt("population size:");
        KangarooPopulation k =
            new KangarooPopulation(popSize);
        Transcript.println(k);
        while (k.getNumCaught( ) < popSize) {
            k.allHop( );
            Transcript.println(k);
        }
    }
}

```

```
import genesis.*;

public class CatchMeIfYouCan {

    public static void main (String [ ] args) {
        int popSize =
            DialogBox.requestInt("population size");
        KangarooPopulation k =
            new KangarooPopulation(popSize);
        while (k.getNumCaught( ) < 100) k.allHop( );
        Transcript.println(k.getNumHopAll( ));
    }
}
```