Java Loops

CSCI 111

What are loops?

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  - Suppose you have 64 Student objects and you want to print out all of their schedules.

  - Suppose you have 78 Ship objects and you want to print out all of their fuel consumed values.

  - Suppose you have a game that you want to allow the user to keep playing until they select the quit option.

  - Suppose you want to see how many die rolls it takes to roll a 6.

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  1. For Loop.
     - Best used when you know exactly how many times you want a block of code to be executed.

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  1. For Loop.

     - Best used when you know exactly how many times you want a block of code to be executed.

  2. While Loop.

     - Best used when you don't know how many times you want a block of code to be executed.

     - You are saying: "Execute _____ until the boolean expression _____ is no longer true."

For loop or While loop?

For: # iterations know ahead of time.

While: # iterations cannot be predicted.

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- Suppose you want to see how many die rolls it takes to roll a 6.

(general) For loop

```
for (initialVariable; loopCondition; variableModifier)
{
    //code to be looped
}
```

(general) For loop

```
for (initialVariable; loopCondition; variableModifier)
{
    //code to be looped
}
```

initialVariable – Either a new local variable (local to just the for-loop) or an existing variable set to an initial value.

loopCondition – Execute the following block of code IF loopCondition is true.

variableModifier – modify the variable in the first slot according to variableModifier after each iteration of the for-loop.

(general) For loop

```
for (initialVariable; loopCondition; variableModifier)
{
    //code to be looped
}
```

Execution Process:

1. Initialize variable.
2. Check loopCondition.
3. If true, execute block of code.
4. Modify variable.
5. Check loopCondition.
6. if true, execute block of code.
7. Modify variable.
8. Check loopCondition.
9. …

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

Example For loop

```java
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What happens?

sum = 0

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
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}

System.out.println(sum);
```

What happens?

sum = 0

For-loop Iteration: 1

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 0

For-loop Iteration: 1

i = 1

Example For loop

```java
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

                              sum = 0

For-loop Iteration: 1

                              i = 1 <= 3?

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 1

For-loop Iteration: 1

i = 1

Example For loop

```java
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 1

For-loop Iteration: 1

i = 2

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 1

For-loop Iteration: 2

i = 2

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 1

For-loop Iteration: 2

i = 2 <= 3?

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 3

For-loop Iteration: 2

i = 2

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 3

For-loop Iteration: 2

i = 3

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 3

For-loop Iteration: 3

i = 3

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 3

For-loop Iteration: 3

i = 3 <= 3?

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 6

For-loop Iteration: 3

i = 3

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 6

For-loop Iteration: 3

i = 4

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 6

For-loop Iteration: 4

i = 4

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 6

For-loop Iteration: 4

i = 4 <= 3?

Example For loop

```
int sum = 0;

for (int i = 1; i <= 3; i++)
{
    sum += i;
}

System.out.println(sum);
```

What happens?

sum = 6

6

(general) While loop

```
while (loopCondition)
{
    //code to be looped
}
```

(general) While loop

```
while (loopCondition)
{
    //code to be looped
}
```

loopCondition – Execute the following block of code IF loopCondition is true.

(general) While loop

```
while (loopCondition)
{
    //code to be looped
}
```

Execution Process:
1. Check loopCondition.
2. If true, execute block of code.
3. Check loopCondition.
4. if true, execute block of code.
5. Check loopCondition.
6. …

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}

System.out.println(numRolls);
```

What happens?

numRolls = 0

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}


System.out.println(numRolls);
```

Die Class

value = 0

What happens?

numRolls = 0

While-loop Iteration: 1

Example While loop

```
int numRolls = 0;

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    numRolls++;
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System.out.println(numRolls);
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Die Class

value = 0

What happens?

numRolls = 0

While-loop Iteration: 1

die.getValue() != 6?

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int numRolls = 0;

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System.out.println(numRolls);
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What happens?

numRolls = 1

While-loop Iteration: 1

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}


System.out.println(numRolls);
```

Die Class

value = 4

What happens?

numRolls = 1

While-loop Iteration: 1

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}


System.out.println(numRolls);
```

Die Class

value = 4

What happens?

numRolls = 1

While-loop Iteration: 2

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}

System.out.println(numRolls);
```

Die Class

value = 4

What happens?

numRolls = 1

While-loop Iteration: 2

die.getValue() != 6?

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}


System.out.println(numRolls);
```

Die Class

value = 4

What happens?

numRolls = 2

While-loop Iteration: 2

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}


System.out.println(numRolls);
```

Die Class

value = 6

What happens?

numRolls = 2

While-loop Iteration: 2

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}


System.out.println(numRolls);
```

Die Class

value = 6

What happens?

numRolls = 2

While-loop Iteration: 3

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}

System.out.println(numRolls);
```

Die Class

value = 6

What happens?

numRolls = 2

While-loop Iteration: 3

die.getValue() != 6?

Example While loop

```
int numRolls = 0;

while (die.getValue() != 6)
{
    numRolls++;
    die.roll();
}
```

System.out.println(numRolls);

Die Class

value = 6

What happens?

numRolls = 2

While-loop Iteration: 3

2