Loops (with solutions)

For exercises 1 to 15, indicate the output that will be produced. Assume the following declarations are made just before each exercise. That is, assume these initializations are in effect at the beginning of each problem:

```java
final int MIN = 10, MAX = 20;
int num = 15;
```

1. ```java
   while (num < MAX)
   {
       System.out.println (num);
       num = num + 1;
   }
```

2. ```java
   while (num < MAX)
   {
       num = num + 1;
       System.out.println (num);
   }
```

3. ```java
   do
   {
       num = num + 1;
       System.out.println (num);
   } while (num <= MAX);
```

4. ```java
   while (num < MAX)
   {
       System.out.println (num);
       num = num - 1;
   }
```

5. ```java
   while (num > MIN)
   {
       System.out.println (num);
       num = num - 1;
   }
```
6. while (num < MAX) {
    System.out.println (num);  // 15
    num += 2;                  // 17
}

7. while (num < MAX) {
    if (num%2 == 0) {  // 16
        System.out.println (num);  // 18
        num++;                  // 19
    }
}

8. do {  // 21
    num = num + 1;
    if (num*2 > MAX+num)  // 21
        System.out.println (num);
}
while (num <= MAX);

9. for (int value=0; value >= 7; value++)  // 0
    System.out.println (value);  // 1

10. for (int value=7; value < 0; value--)  // 7
    System.out.println (value);  // 6

11. for (int value=1; value <= 20; value+=4)  // 1
    System.out.println (value);  // 5
12. for (int value=num; value <= MAX; value++)
    System.out.println (value);
13. for (int value=num; value <= MAX; value++)
    if (value%4 != 0)
        System.out.println (value);
14. for (int count1=1; count1 <= 7; count1++)
    {
        for (int count2=1; count2 <= 5; count2++)
            System.out.print ("#");
        System.out.println();
    }
15. for (int count1=1; count1 <= 5; count1++)
    {
        for (int count2=1; count2 <= 5; count2++)
            System.out.print (count1*count2 + "   ");
        System.out.println();
    }

1 2 3 4 5
2 4 6 8 10
3 6 9 12 15
4 8 12 16 20
5 10 15 20 25
For exercises 16 to 29, write code segments that will perform the specified action.

16. Verify that the user enters a positive value. (use a while loop)

   while (value <= 0)
   {
     System.out.print("Enter a positive value: ");
     value = Keyboard.readInt();
   }

17. Verify that the user enters an even value (use a do loop)

do
{
  System.out.print("Enter an even value: ");
  value = Keyboard.readInt();
}
while (value%2 != 0);

18. Read and print values entered by a user until a particular sentinel value is encountered. Do not print the sentinel value. Assume the sentinel value is stored in a constant called SENTINEL.

   System.out.print("Enter a value: ");
   value = Keyboard.readInt();
   while (value != SENTINEL)
   {
     System.out.println(value);
     System.out.print("Enter another value: ");
     value = Keyboard.readInt();
   }

19. Read values from the user, quitting when a sentinel value of 0 is entered. Compute and print the product of all values entered (excluding the sentinel value).

   product = 1;
   System.out.print("Enter a value: ");
   value = Keyboard.readInt();
   while (value != 0)
   {
     product *= value;
     System.out.print("Enter another value: ");
     value = Keyboard.readInt();
   }
   System.out.println("Product: " + product);
20. Print the odd numbers between 1 and 100.
   
   for (int num=1; num <= 99; num+=2) 
       System.out.println (num);

21. Print the multiples of 3 from 300 down to 3.
   
   for (int num=300; num >= 3; num-=3) 
       System.out.println (num);

22. Print the numbers between LOW and HIGH that are evenly divisible by four but not by five.
   
   for (int count=LOW; count <= HIGH; count++) 
       if (count%4 == 0 && count%5 != 0) 
           System.out.println (count);

23. Print all of the factors of a value stored in the variable number. Assume the value is positive.
   
   for (int count=1; count <= number; count++) 
       if (number%count == 0) 
           System.out.println (count);

24. Read 10 values from the user and print the lowest and highest value entered.
   
   System.out.print ("Enter a value: ");
   value = Keyboard.readInt();
   min = max = value;
   for (int count=2; count <= 10; count++)
   {
       System.out.print ("Enter another value: ");
       value = Keyboard.readInt();
       if (value < min)
           min = value;
       if (value > max)
           max = value;
   }
   System.out.println ("Lowest: " + min);
   System.out.println ("Highest: " + max);
25. Determine and print the number of times the character 'a' appears in the String variable str.

```java
    count = 0;
    for (int index=0; index < str.length(); index++)
        if (str.charAt(index) == 'a')
            count++;
    System.out.println("Number of a's: " + count);
```

26. Print the characters stored in the String variable str backwards.

```java
    for (int index=str.length()-1; index >= 0; index--)
        System.out.print(str.charAt(index));
```

27. Print every other character in the String variable str starting with the first character.

```java
    for (int index=0; index < str.length(); index+=2)
        System.out.print(str.charAt(index));
```

28. Print a sequence of asterisk characters in the following configuration, continuing for LINES number of asterisks.

```
    *
    *
    *
    *
    *
    *
    *
    *
```

```java
    for (int line=0; line < LINES; line++)
    {
        for (int space=0; space < line; space++)
            System.out.print(" ");
        System.out.print("*");
        System.out.println();
    }
```
29. Print the characters of a `String` variable `str` in a diagonal line downward. For example, if `str` contained "Compile", the output would be:

```
C
 o
  m
   p
    i
     l
      e
```

```java
for (int line=0; line < str.length(); line++)
{
    for (int space=0; space < line; space++)
        System.out.print (" ");
    System.out.print (str.charAt(line));
}
```