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:

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

1.
```
while (num < MAX)
{
    System.out.println (num);
    num = num + 1;
}
```
    15
16
17
18
19

2.
```
while (num < MAX)
{
    num = num + 1;
    System.out.println (num);
}
```
    16
17
18
19
20

3.
```
do
{
    num = num + 1;
    System.out.println (num);
}
while (num <= MAX);
```
    16
17
18
19
20
21

4.
```
while (num < MAX)
{
    System.out.println (num);
    num = num - 1;
}
```
    15
14
13
infinitely...

5.
```
while (num > MIN)
{
    System.out.println (num);
    num = num - 1;
}
```
    15
14
13
12
11

6.
```
   while (num < MAX)                                    15
   {                                                    17
      System.out.println (num);                         19
      num += 2;
   }
```

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

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

9.
```
   for (int value=0; value >= 7; value++)               0
      System.out.println (value);                        1
                                                          2
                                                          3
                                                          4
                                                          5
                                                          6
                                                          7
```

10.
```
   for (int value=7; value < 0; value--)                7
      System.out.println (value);                         6
                                                          5
                                                          4
                                                          3
                                                          2
                                                          1
```

11.
```
   for (int value=1; value <= 20; value+=4)             1
      System.out.println (value);                         5
                                                          9
                                                          13
                                                          17
```

12.    ```
for (int value=num; value <= MAX; value++)
    System.out.println (value);
```
**15**
**16**
**17**
**18**
**19**
**20**

13.    ```
for (int value=num; value <= MAX; value++)
    if (value%4 != 0)
        System.out.println (value);
```
15
17
18
19

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`.

```
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.

```
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.

```
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.

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

```
for (int line=0; line < LINES; line++)
{
   for (int space=0; space < line; space++)
      System.out.print (" ");
   System.out.print ("*");
}
```

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));
}
```