Generating Random Numbers with \texttt{Math.random}

The \texttt{Math} class contains a class method called \texttt{random} that can be used to generate random numbers. Starting with the 2007 AP exam, this is the accepted way to generate random numbers. The method has the following header:

\begin{verbatim}
    static double random ()
\end{verbatim}

The \texttt{random} method returns a double value between 0.0 (inclusive) and 1.0 (exclusive). That is, its return value is greater than or equal to 0.0 and less than 1.0. Using arithmetic we can get a random number in any range we like. For example, if we want an integer in the range 1 to 10, we can use the following expression:

\begin{verbatim}
    \{(\texttt{int})(\texttt{Math.random()} * 10 + 1)\}
\end{verbatim}

This expression multiplies the return value of \texttt{random} by 10, resulting in a double value greater than or equal to 0 and less than 10, then adds 1, resulting in a double value greater than or equal to 1 and less than 11. The cast to an integer cuts off any fractional part, giving an integer in the range 1 to 10 inclusive.

Below is a version of the \texttt{RandomNumbers} program from Listing 2.10 that uses \texttt{Math.random} instead of the Random class.

\begin{verbatim}
// RandomNumbers.java       Author: Lewis/Loftus/Cocking
//
// Demonstrates the creation of pseudo-random numbers
// using Math.random.
				
public class RandomNumbers
{
    // Generates random numbers in various ranges.
    //
    public static void main (String[] args)
    {
        int num1;
        double num2;

        num1 = (\texttt{int})(\texttt{Math.random()} * 10);
        \texttt{System.out.println ("From 0 to 9: " + num1);}

        num1 = (\texttt{int})(\texttt{Math.random()} * 10 + 1);
        \texttt{System.out.println ("From 1 to 10: " + num1);}

        num1 = (\texttt{int})(\texttt{Math.random()} * 15 + 20);
        \texttt{System.out.println ("From 20 to 34: " + num1);}

        num1 = (\texttt{int})(\texttt{Math.random()} * 20 - 10);
        \texttt{System.out.println ("From -10 to 9: " + num1);}

        num2 = \texttt{Math.random()};
        \texttt{System.out.println ("A random double [between 0-1]: " + num2);}

        num2 = \texttt{Math.random()} * 6;    // 0.0 to 5.999999
        num1 = (\texttt{int}) num2 + 1;
        \texttt{System.out.println ("From 1 to 6: " + num1);}
    }
}
\end{verbatim}