The starter project includes a random number generator. To learn more about this simple method for creating random numbers, do a web search for **linear congruential multiplier**. It is a very simple function that uses two constants and a global variable, *M*. To determine a new random number, it takes the previous random number multiplies it by one constant and adds the second constant. The numbers are 32 bits long so the operation is considered formally as

$M = (1664525*M+1013904223) \text{ modulo } 2^{32}$

The problem with the random number generator is the least significant bits go through very short cycles. In general bit *n* of the random number will have a repeating cycle of length 2^{n+1}. For example if we examine the individual bits of the sequence of random numbers

bit 0 has a cycle length of 2, repeating the pattern 0,1,....
bit 1 has a cycle length of 4, repeating the pattern 0,0,1,1,....
bit 2 has a cycle length of 8, repeating the pattern 0,1,0,0,1,0,1,1,....

Therefore using the lower order bits of this random number generator is not recommended. For example

```
n = Random()&0x03;   // has the short repeating pattern 1 0 3 2
m = Random()&0x07;   // has the short repeating pattern 0 7 2 1 4 3 6 5
```

You will need to extend this random number module to provide random numbers as needed for your game. For example, if you wish to generate a random number between 1 and 5, you could use bits 31-24 of the random number and define this function

```
unsigned long Random5(void){
  return ((Random()>>24)%5)+1;  // returns 1, 2, 3, 4, or 5
}
```

Using bits 31-24 of the random number will produce a number sequence with a cycle length of 2^{24}. The random number generator in the starter file seeds the number with a constant; this means you get exactly the same random numbers each time you run the program. To make your game more random, you could 1) start SysTick, 2) wait for the user to press a button, 3) seed the random number sequence using the SysTick counter

```
Seed(NVIC_ST_CURRENT_R);
```

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