1. PWM has been called the "poor man's A/D converter". What are the advantages and disadvantages of using PWM as an A/D converter?

2. The program below outputs a square wave to an output pin on the ARM7 processor.
    A) Which pin is used for output?
    B) What is the frequency of the square wave?

```
#include "stm32f407vg.h"
int flag;
int main()
  {int tmp;
   RCC_AHB1ENR |= 1;
   RCC_APB1ENR |= 2;
   GPIOA_MODER |= 0x0400;
   GPIOA_OSPEEDER |= 0x0C00;
   TIM3_CR1 |= (1 << 7);
   TIM3_CR1 |= (1 << 3);
   TIM3_PSC = 0;
   TIM3_ARR = 16000;
   TIM3_CR1 |= 1;
   tmp = 0;
   while(1)
     {GPIOA_ODR = tmp;
      tmp = ~tmp;
      while((TIM3_CR1 & 1) != 0);
      TIM3_CR1 |= 1;
     }
  }
```

3. Modify the while loop problem 2 above so that the square wave that is output is only half as fast.

4. On reset how are the GPIO pins defined on the ARM? Why?

5. Assume that the A to D converter on the ARM Cortex STM32F407vg has been set up with the appropriate ports. Fill in the code below so that the program takes in the data from the A to D, multiplies it by 10 and divides it by 7 and sends the 10-bit converted data to PA.0 – PA.9.

```
 int y;
   while(1)
     {ADC_CR2 |= 0x40000000;  //start A/D conversion
      while((ADC_SR & 0x2) == 0); //Bit 1 is End of Conversion
      //Put your code here
```

6. Assume that PA has been set up as all output pins. Write a statement to toggle only the even bits on PA – bits 0, 2, 4, 6, … 14

7. Suppose that the following values have been set for the ARM Cortex STM32F407vg processor UART. What is the baud rate assuming a 16 MHz internal clock.

```
 USART6_CR1 = 0;   //Disable during set up. Wd len = 8,Parity = off
 USART6_BRR = 0xD05;  //Set up baud rate
 USART6_CR2 = 0;      //1 stop bit
 USART6_CR1 = 0x200C;
 USART6_CR3 = 0;     //Disable interrupts and DMA
```

8. Supposed I have a 2D grid defined by:
```
int grid[10][7];  //Declare a two-D grid
```
I can write a prototype for a function to receive the grid as:
```
void MyFunction(int grid[][10]);
```
Write a sample line for the code in the main program that could call this function and pass it the grid.

9. What is the mechanism we use to share data between an interrupt function and the main code?