The first commands of the code reset the command window. It does this by clearing the screen and memory while also closing any other open MATLAB windows. After the command window is reset, the user will receive a prompt in a dialog box requesting a binary bit sequence. This input is the digital information that will be modulated. Only an even number of bits can be modulated. This is so because for QPSK modulation to occur, there needs to be pairs of input bits that consist of a quadrature bit and an inphase bit. These two bits are dependant on each other to determine the phase shift of the wave. For this reason, an odd number of bits in the bit sequence cannot be modulated. If, however the user enters and odd number of bits, an alert box will be displayed stating that they have entered an odd number of bits. It should also be noted that the maximum number of bits that could be entered in the bit sequence is 52 bits. This is due to the MATLAB function bin2dec used being able to only store 52 bits. The bit sequence that the user entered is then stored as a single cell string array. Calculations cannot be carried out this form. Line of code was then written to convert this string to a binary number and then to a number array vector. For QPSK modulation, the data must be represented at non return to zero form. This non return to zero form is then converted to a matrix. This matrix is constructed where the number of rows is equal to two and the number of columns is equal the amount of bit pairs present in the bit sequence. The elements of this matrix can only be 1 or -1. This matrix represents the bit splitter in a QPSK modulator. The first row of the matrix contains quadrature bits (Q bits) and the second row contains the inphase bits (I bits).

The code used a fixed bit rate of one million bits per second. For QPSK modulation the minimum carrier frequency is the same value for the bit rate. The reason for this because QPSK is a one-bit system thus from the equation $B = fb/\ N$ ($where$ N $is\ the\ number\ of\ bits$), yeilds $B = fb$ /1= 10^6/1 = 10^6. The bit duration calculation was then performed, and the one-bit information vector was then constructed.

Vectors for the quadrature signal, inphase signal and the QPSK modulated signals were then initialized. A QPSK modulator consist of an oscillator that generates a cosine wave where the angular frequency, ω, is determined by the minimum carrier frequency. This cosine wave is then split into two identical waves. One of the waves is then summed to the inphase bits (I bits) to produce the inphase signal wave. The other cosine wave is then phase shifted 90° which produces a sine wave with the same angular frequency. This sine wave is then summed to the quadrature bits (Q bits) to produce the quadrature signal wave. The QPSK modulated wave is the sum of the quadrature signal wave and inphase signal wave.

The graphs were then created to display the information. The subplot function was used to display two different graphs in the same window. One plot displays the bit sequence entered by the user and the other shows the corresponding QPSK modulated signal. It should be noted that the x axis for the bit sequence plot changes according to the number bits in the bit sequence.