EE2020 (Part 1)
Tutorial 2 - Solutions

1. (a) $(250)_{10} = (11111010)_2$

   (b)

   (i). $11111010(\textbf{signed magnitude}) \longrightarrow -122$

   (ii). $11111010(\textbf{1's}) \xrightarrow{\textbf{complement.}} 00000101(\textbf{magnitude}) \longrightarrow -5$

   (iii). $11111010(\textbf{2's}) \xrightarrow{-1} 11111001(\textbf{1's}) \xrightarrow{\textbf{complement}} 00000110(\textbf{magnitude}) \rightarrow -6$

2. (a) (-1) + 45

$$\begin{array}{r} 11111111 \\ +\ \underline{00101101} \\ \mathbf{100101100} \end{array} \longrightarrow 44$$

   (Adding these two numbers causes a carry over into the 9^{th} bit position, which is ignored in the 8-bit arithmetic system.)

   (b) (-128) + (-60)

$$\begin{array}{r} 10000000 \\ +\ \underline{11000100} \\ 01000100 \end{array} \longrightarrow 68$$

   (Reflect an overflow situation i.e. the correct result cannot be represented with the available number of bits

3. $(00100)_{SM} = (00100)_{2's}$ [the number is positive]

   $(10100)_{2's} + (00100)_{SM} = (10100)_{2's} + (00100)_{2's} = (11000)_{2's}$

   Convert to integers and add to verify your result!

4. $\underbrace{0100}_{4}\underbrace{0110}_{6}\underbrace{0010}_{2}\underbrace{0011}_{3}$

   $= 4623$