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Homework Set 1

1. Give a brief description about the following concepts:
   1. **Von Neumann Architecture** – is based on a stored program. Consists of and a CPU that has an arithmetic/logic unit, control unit, and registers. It also consists of memory and input/output devices.
   2. **Stored Program** – is an idea where instructions and data are logically the same and both are stored in the same memory.
   3. **Fetch-Execute Cycle** – is the basic operation cycle of a computer. The way the cycle works is that the computer retrieves (fetches) a program instruction from its memory and then establishes (decodes) and carries (executes) out the actions required for that instruction.
2. Convert Numbers:
3. Convert binary numbers to decimals and hexadecimals
   1. (1101 0110)­2 = **(214)10 = (D6)16**
   2. (1010 1010)2 = **(170)10 = (AA)16**
   3. (1100 1011 1011 1001)2 = **(52153)10 = (CBB9)16**
   4. (0101 0100 1100 0110)2 = **(21702)10 = (54C6)16**
4. Convert decimal numbers to binaries and hexadecimals
   1. 2020 = **(0111 1110 0100)2 = (7E4)16**
   2. 789 = **(0011 0001 0101)2 = (315)16**
   3. 123 = **(0111 1011)2 = (7B)16**
   4. 999 = **(0011 1110 0111)2 = (3E7)16**
5. Convert hexadecimal numbers to binaries and decimals
   1. (CBA)16 = **(1100 1011 1010)2 = (3258)10**
   2. (2020)16 = **(0010 0000 0010 0000)2 = (8224)10**
   3. (999)16 = **(1001 1001 1001)2 = (2457)10**
   4. (321)16 = **(0011 0010 0001)2 = (801)10**
6. Convert the following decimal numbers to numbers in other number systems:
7. 2020 = **(3744)8 = (2202211)3 = (5614)7 = (BC5)13**
8. 1919 = **(3577)8 = (2122002)3 = (5411)7 = (B48)13**
   1. Octal Number System (Base 8 Number System)
   2. Base 3 Number System
   3. Base 7 Number System
   4. Base 13 Number System

1. Specify the range of 5-digit number in the following systems, and how many numbers can be represented in these number systems:
   1. Binary: Range [0, 25 – 1] = **[0, 31]**
      * **32** numbers can be represented
   2. Decimal: Range [0, 105 – 1] = **[0, 99999]**
      * **100000** numbers can be represented
   3. Hexadecimal: Range [0, 165 – 1] = **[0, 1048575]**
      * **1048576** numbers can be represented
   4. Octal Decimal: Range [0, 85 – 1] = **[0, 32767]**
      * **32768** numbers can be represented
   5. Base 7 Number System: Range [0, 75 – 1] = **[0, 16806]**
      * **16807** numbers can be represented
   6. Base 3 Number System: Range [0, 35 – 1] = **[0, 242]**
      * **243** numbers can be represented