Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Activity 2.4.1 Octal & Hexadecimal Number Systems** |

Introduction

We all know that digital electronics use the binary number system. However, with new computers containing 32, 64, and even 128 bit data busses, displaying numbers in binary is quite cumbersome. For example, a single piece of data on a 64-bit data bus would look like this:

**0110100101110001001101001100101001101001011100010011010011001010**

Obviously, presenting data in this form would invite error. For this reason we use the hexadecimal (base 16) and, to a lesser extent, the octal (base 8) number systems.

In this activity you will learn how to convert numbers between the decimal, binary, octal, and hexadecimal number systems.

Procedure

Complete the following decimal-to-octal number conversions.

* 1. 25 (10) = 31 (8)
  2. 50 (10) = 62 (8)
  3. 187 (10) = 205 (8)
  4. 371 (10) = 1163 (8)
  5. 2879 (10) = 1377 (8)

Complete the following octal-to-decimal number conversions.

* 1. 36 (8) = \_\_\_\_\_\_\_\_\_ (10)
  2. 74 (8) = \_\_\_\_\_\_\_\_\_ (10)
  3. 143 (8) = \_\_\_\_\_\_\_\_\_ (10)
  4. 346 (8) = \_\_\_\_\_\_\_\_\_ (10)
  5. 1735 (8) = \_\_\_\_\_\_\_\_\_ (10)

Complete the following decimal-to-hexadecimal number conversions.

* 1. 25 (10) = \_\_\_\_\_\_\_\_\_ (16)
  2. 46 (10) = \_\_\_\_\_\_\_\_\_ (16)
  3. 120 (10) = \_\_\_\_\_\_\_\_\_ (16)
  4. 429 (10) = \_\_\_\_\_\_\_\_\_ (16)
  5. 1215 (10) = \_\_\_\_\_\_\_\_\_ (16)

Complete the following hexadecimal-to-decimal number conversions.

* 1. 3C (16) = \_\_\_\_\_\_\_\_\_ (10)
  2. A9 (16) = \_\_\_\_\_\_\_\_\_ (10)
  3. 159 (16) = \_\_\_\_\_\_\_\_\_ (10)
  4. 2A3 (16) = \_\_\_\_\_\_\_\_\_ (10)
  5. 1AD3 (16) = \_\_\_\_\_\_\_\_\_ (10)

Utilize the shortcut base conversion technique to complete the following table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Binary | Octal | Hexadecimal |
|  | 1010112 |  |  |
|  |  |  | 1A316 |
|  | 110101102 |  |  |
|  |  | 1378 |  |
|  | 1010111102 |  |  |

Conclusion

1. Without performing the conversion, which of the following numbers is the octal equivalent of 24510?

* 1. 3798
  2. 1748
  3. 3658

How were you able to determine this?

**Going Further – Optional**

1. With 128-bit graphic cards becoming standard on many new PCs, there has been some thought of expanding to the base 32 number system. The base 32 number system would be selected because it is the next greatest power of two after 16. Use your knowledge of number systems to convert the following base 32 number into its decimal equivalent.

4P8M (32) = \_\_\_\_\_\_\_\_\_\_\_\_ (10)