

Number Systems

Your Tasks (Mark these off as you go)

- ☐ Practice converting between number systems
- ☐ Write a program that prompts the user for input
- ☐ Write a program that converts a binary number to decimal
- ☐ Determine the number of digits in a number
- ☐ Write a program that converts a base 10 number to binary
- ☐ Receive credit for the group portion of this lab

☐ Practice converting between number systems

Complete the following conversions. Show your work to the write so I can see your thinking.

Octal	Decimal
107	
125	

Decimal	Octal
142	
148	

Hex	Decimal
FA9	
42A	

<table> <tr> <th>Decimal</th><th>Hex</th></tr> <tr> <td>189</td><td></td></tr> <tr> <td>344</td><td></td></tr> </table>	Decimal	Hex	189		344		
Decimal	Hex						
189							
344							
<table> <tr> <th>Decimal</th><th>Binary</th></tr> <tr> <td>32</td><td></td></tr> <tr> <td>23</td><td></td></tr> </table>	Decimal	Binary	32		23		
Decimal	Binary						
32							
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<table> <tr> <th>Binary</th><th>Decimal</th></tr> <tr> <td>11001</td><td></td></tr> <tr> <td>11100</td><td></td></tr> </table>	Binary	Decimal	11001		11100		
Binary	Decimal						
11001							
11100							

□ Determine the number of digits in a number

Recall that the number of positional values required to represent any decimal number can be determined as follows,

$$\text{positions} = \log_{10}(\text{base10Number})$$

Java does not have a built in log base 2 operation. However, the number of positions required to represent a number in any base can be determined as follows,

Consider the number 32, which is also equal to 2^5 , so,

$$32 = 2^5 = 2^{\text{positions}}$$

If we take the base 10 log of both sides,

$$\text{Log}_{10}(32) = \text{Log}_{10}(2^{\text{positions}})$$

$$\text{Log}_{10}(32) = \text{positions} * \text{Log}_{10}(2)$$

Rearranging, we see that the number of positions required to represent the number 32 in base 2 is,

- Write a program that converts a binary number to decimal

Assume `binNum` stores a binary number. Consider how you might convert the following binary number, `1110001`. Use a loop to write code to convert `binNum` to decimal. Store the converted number in a variable called `result`.

```
public class BinToDecimal{  
    public static void main(String args[]){
```

}	}
---	---

- ❑ Write a program that converts a base 10 number to binary

Assume `int base10` stores a base 10 number. Consider how you might convert the following base 10 number, 142 to binary. Use a loop to write code to convert `base10` to binary. Store the converted number in a variable called `result`.

```
public class DecimalToBin{

    public static void main(String args[]){

    }

}
```

☐ **Receive Credit for the group portion of this lab**

Before you submit your lab have Ms. Pluska check off the above tasks

Do not continue until you have Ms. Pluska's (or her designated TA's) signature _____