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CSE 3342-001

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Assignment 1

Python Program:
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```python
#recursive function that converts decimal to its equivalent of any base
#when base is 2=binary, 3=ternary, 4=quarternary, 8=octal
def convert_decimal(decimal_value, base):
    if(decimal_value>1):
        convert_decimal(decimal_value//base, base)
    print(decimal_value%base, end='')   #prints remainder


#converts decimal to hex
def convert_to_hex(decimal_value):
    if(decimal_value > 1):
        convert_to_hex(decimal_value//16) #recursive call, passes in dividend
    hex_value = decimal_value % 16
    if(hex_value > 9): #if number is not decimal, convert to letter equivalent
        if(hex_value == 10):
            print("A", end='')
        elif(hex_value == 11):
            print("B", end='')
        elif(hex_value == 12):
            print("C", end='')
        elif(hex_value == 13):
            print("D", end='')
        elif(hex_value == 14):
            print("E", end='')
        elif(hex_value == 15):
            print("F", end='')
    else:
        print(hex_value, end='')


#converts binary to decimal
def convert_to_decimal(binary_value):
    decimal = 0
    i = 0
    digit = 0
    while(binary_value != 0):
        digit = binary_value % 10
        decimal = decimal + digit * pow(2, i)
        binary_value = binary_value//10
        i+= 1
```

```python
        return decimal


#accepts a decimal value from the user to be converted
while True:
    try:
        decimal_value = int(input("Enter a positive decimal value to display to: "))
    except ValueError:
        print("Error: Please enter a positive decimal value.")
    else:
        for i in str(decimal_value):
            if i in '1234567890':
                decimal = True
            else:
                decimal = False
                break

        if decimal == False:
            print("Please enter a positive decimal value.")
        else:
            break

print("Binary:     ", end=")
convert_decimal(decimal_value, 2)
print("")
print("Ternary:    ", end=")
convert_decimal(decimal_value, 3)
print("")
print("Quarternary: ", end=")
convert_decimal(decimal_value, 4)
print("")
print("Octal:      ", end=")
convert_decimal(decimal_value, 8)
print("")
print("Hex:        ", end=")
convert_to_hex(decimal_value)
print("")


#accepts a binary value from the user to be converted
while True:
    try:
        binary_value = int(input("Enter binary value to display to: "))
    except ValueError:
        print("Error: Enter a binary value to display to:")

    #checks to make sure that the number entered is binary (made of 1s and 0s)
    else:
```

```python
        for j in str(binary_value): #converts to string
            if j in '10': #looks for 1 or 0 in string
                binary = True
            else:
                binary = False #the number is not made entirely of 1 and 0, not binary
                break

        if binary == False:
            print("Please enter a binary number.")
        else:
            break


#turns binary number into decimal to use in all future conversions
decimal_value = convert_to_decimal(binary_value)

print("")
print("Ternary:     ", end="")
convert_decimal(decimal_value, 3) #decimal to ternary
print("")
print("Quarternary: ", end="")
convert_decimal(decimal_value, 4) #decimal to quarternary
print("")
print("Octal:       ", end="")
convert_decimal(decimal_value, 8) #decimal to octal
print("")
print("Decimal:    ", decimal_value) #prints decimal value calculated in line 100
print("Hex:         ", end="")
convert_to_hex(decimal_value) #decimal to hex
print("")
```

Output:

```
======= RESTART: /Users/elizabethhanna/Desktop/hanna_numbers_system.py =======
Enter a positive decimal value to display to: 56
Binary:      111000
Ternary:     02002
Quarternary: 0320
Octal:       070
Hex:         038
Enter binary value to display to: 100011

Ternary:     1022
Quarternary: 0203
Octal:       043
Decimal:     35
Hex:         023
```

Test Cases:

- Test Case 1:
  - Decimal: 0, Binary: 0
  - Output:

```
Enter a positive decimal value to display to: 0
Binary:     0
Ternary:    0
Quarternary: 0
Octal:      0
Hex:        0
Enter binary value to display to: 0

Ternary:    0
Quarternary: 0
Octal:      0
Decimal:    0
Hex:        0
>>>
```

- Test Case 2:
  - Decimal: 10, Binary: 1010
  - Output:

```
Enter a positive decimal value to display to: 10
Binary:     1010
Ternary:    101
Quarternary: 022
Octal:      12
Hex:        0A
Enter binary value to display to: 1010

Ternary:    101
Quarternary: 022
Octal:      12
Decimal:    10
Hex:        0A
>>>
```

- Test Case 3:
  - Decimal: 10000, Binary: 10011100010000
  - Output:

```
Enter a positive decimal value to display to: 10000
Binary:        10011100010000
Ternary:       111201101
Quarternary: 02130100
Octal:         023420
Hex:           02710
Enter binary value to display to: 10011100010000

Ternary:       111201101
Quarternary: 02130100
Octal:         023420
Decimal:       10000
Hex:           02710
>>>
```

- Test Case 4:
  - Decimal: -1, Binary: -1
  - Output:

```
Enter a positive decimal value to display to: -1
Please enter a positive decimal value.
Enter a positive decimal value to display to: -2
Please enter a positive decimal value.
Enter a positive decimal value to display to: 1
Binary:        1
Ternary:       1
Quarternary: 1
Octal:         1
Hex:           1
Enter binary value to display to: -1
Please enter a binary number.
Enter binary value to display to: 1

Ternary:       1
Quarternary: 1
Octal:         1
Decimal:       1
Hex:           1
```

- Test Case 5:
  - Decimal: A, Binary: A
  - Output:

```
Enter a positive decimal value to display to: A
Error: Please enter a positive decimal value.
Enter a positive decimal value to display to: 0
Binary:      0
Ternary:     0
Quarternary: 0
Octal:       0
Hex:         0
Enter binary value to display to: A
Error: Enter a binary value to display to:
Enter binary value to display to: 0

Ternary:     0
Quarternary: 0
Octal:       0
Decimal:     0
Hex:         0
```

- Test Case 6:
    - Decimal: 50, Binary: 50
    - Output:

```
Enter a positive decimal value to display to: 50
Binary:      110010
Ternary:     1212
Quarternary: 0302
Octal:       062
Hex:         032
Enter binary value to display to: 50
Please enter a binary number.
Enter binary value to display to: 0

Ternary:     0
Quarternary: 0
Octal:       0
Decimal:     0
Hex:         0
```

- Test Case 7:
    - Decimal: 700, Binary: 700
    - Output:

```
Enter a positive decimal value to display to: 700
Binary:      1010111100
Ternary:     0221221
Quarternary: 022330
Octal:       1274
Hex:         02BC
Enter binary value to display to: 700
Please enter a binary number.
Enter binary value to display to: 0101

Ternary:     12
Quarternary: 11
Octal:       05
Decimal:     5
Hex:         05
```