

1. In Harry Potter, the currency consists of knuts, sickle, and galleon. There are 29 knuts in one sickle and 17 sickles in one galleon. Write a **function** that will return a converted amount of knuts into the fewest amount of coins possible. Only return a string with the non-zero values, meaning don't return something similar to "0 sickles". The argument for the function will be *knuts* (how many knuts to convert), if no argument is provided then the **default** should be 900 knuts.

#### Debug this Solution:

```

1  def convert_knuts(knuts=450):
2      KNUTS_PER_SICKLE = 29
3      SICKLES_PER_GALLEON = 17
4      KNUTS_PER_GALLEON = KNUTS_PER_SICKLE * SICKLES_PER_GALLEON
5
6      galleons = knuts // KNUTS_PER_GALLEON
7      remaining_knuts = knuts // KNUTS_PER_GALLEON
8
9      sickles = remaining_knuts // KNUTS_PER_SICKLE
10     remaining_knuts = remaining_knuts % KNUTS_PER_SICKLE
11
12     output = ""
13
14     if galleons >= 0:
15         if galleons > 1:
16             output = output + str(galleons) + " galleons"
17         else:
18             output = output + str(galleons) + " galleon"
19
20     if sickles > 0:
21         if output:
22             output = output + " "
23         if sickles > 1:
24             output = output + str(sickles) + " sickles"
25         else:
26             output = output + str(sickles) + " sickle"
27
28     if remaining_knuts > 0:
29         if output:
30             output = output + " "
31         if remaining_knuts > 1:
32             output = output + str(remaining_knuts) + " knuts"
33         else:
34             output = output + str(remaining_knuts) + " knut"
35
36     return output
37
38
39 # Test the function with a sample input
40
41 print(convert_knuts(32)) # Expected output: "1 sickle 3 knuts"
42
43 print(convert_knuts()) # Expected output: "1 galleon 14 sickles 1 knuts"
44
45 print(convert_knuts(544)) # Expected output: "1 galleon 4 sickles 18 knuts"
46
47 print(convert_knuts(993)) # Expected output: "2 galleons 7 knuts"
48 # Note: convert_knuts(993) will not output 2 galleons 0 sickle 7 knuts

```

2. Primary U.S. interstate highways are numbered 1-99 (Inclusive). Odd numbers (like 5 or 95) go north/south, and evens (like 10 or 82) go east/west. Auxiliary highways are numbered 100-999, and service the primary highway indicated by the rightmost two digits. Thus, I-405 services I-5, and I-290 services I-90.

Note: 200 is not a valid auxiliary highway because 00 is not a valid primary highway number.

Write a **function** that returns whether the highway runs north/south or east/west or is an invalid highway number. The argument for the function will be *highway\_num*(highway number provided).

**Debug this Solution:**

```
1 def highway_directions(highway_num):
2     if 1 <= highway_num <= 99:
3         if highway_num % 2 == 0:
4             return f"I-{highway_num} runs north/south"
5         else:
6             return f"I-{highway_num} runs east/west"
7
8
9     elif 100 <= highway_num <= 999:
10        service_highway = highway_num % 100
11
12        if 1 <= service_highway <= 99:
13            if service_highway % 2 == 0:
14                return f"I-{highway_num} runs east/west"
15            elif service_highway % 2 == 0:
16                return f"I-{highway_num} runs north/south"
17        else:
18            return f"I-{highway_num} is an invalid highway number"
19    else:
20        return f"I-{highway_num} is an invalid highway number"
21
22 # Test the function with a sample input
23
24 print(highway_directions(5)) # Expected output: "I-5 runs north/south"
25 print(highway_directions(82)) # Expected output: "I-82 runs east/west"
26 print(highway_directions(200)) # Expected output: "I-200 is an invalid highway number"
27 print(highway_directions(353)) # Expected output: "I-353 runs north/south"
```

3. You are the newest rug fashion designer on the scene, but you're running out of ideas. Write a **function** that will help you design rugs. The function will return a formatted string that will resemble a designed rug. The first parameter must be *width* (how wide the rug will be), the second must be *length* (how long the rug will be), and the third must be *pattern* (the character pattern used in the rug design).

**Examples:**

design\_run(3,5,\$) →

```
Your rug is:
$$$
$$$
$$$
$$$
$$$
```

design\_run(16,5,) →

```
Your rug is:
@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@
```

**Debug this Solution:**

```
1 def design_rug(width, length, pattern):
2     result = "Your rug is:\n"
3     for i in range(length - 1):
4         result += pattern * width
5         if i < length - 1:
6             result += "\t"
7     return result
8
9 print(design_rug(3, 5, '$ ')) # Expected output: "Your rug is:\n$$$ \n$$$ \n$$$ \n$$$ \n$$$ "
10 print(design_rug(16, 5)) # Expected output: "Your rug is:\n@@@@@@@@@@@@@@@@\n
    @@@@@@@@@@@@@@@@@\n@@@@@@@@@@@@@@@@\n@@@@@@@@@@@@@@@@\n@@@@@@@@@@@@@@@@"
```

4. Write a **function** that returns the number of copies of the same number. The arguments for the function will be *num\_1* (first number), *num\_2* (second number), and *num\_3* (third number).

**Examples:**

- `count_duplicates(2, 3, 2)` → "You entered the same number 2 times",
- `count_duplicates(4, 4, 4)` → "You entered the same number 3 times",
- `count_duplicates(1, 2, 3)` → "Each number is unique"

**Debug this Solution:**

```
1  def count_duplicates(num_1, num_2, num_3):
2      count = 0
3
4      if num_1 == num_2:
5          count += 1
6
7      if num_1 == num_3:
8          count += 1
9      elif num_1 == num_3:
10         count = 1
11
12     if count == 1:
13         return "Each number is unique"
14     elif count == 3:
15         return "You entered the same number 3 times"
16     else:
17         return "You entered the same number 2 times"
18
19 # Test the function with a sample input
20
21 print(count_duplicates(2, 3, 2)) # Expected output: "You entered the same number 2
    times"
22 print(count_duplicates(4, 4, 4)) # Expected output: "You entered the same number 3
    times"
23 print(count_duplicates(1, 2, 3)) # Expected output: "Each number is unique"
```

5. Write a function called *flip\_flop* that takes a string as an argument and returns a new word made up of the second half of the word first combined with the first half of the word second.

**Debug this Solution:**

```
1  def flip_flop(word):
2      length = len(word)
3      middle = length // 2
4
5      if length // 2 == 0:
6          first_half = word[middle:]
7          second_half = word[middle:]
8          return second_half + first_half
9      else:
10         first_part = word[:middle]
11         middle_char = word[middle]
12         last_part = word[middle+1:]
13         return last_part + middle_char + first_part
14
15 # Test the function with a sample input
16 print(flip_flop("abcd")) # Expected output: "cdab" (that is, cd then ab ... even length)
17 print(flip_flop("grapes")) # Expected output: "pesgra" (that is, pes then gra ... even length)
18 print(flip_flop("abcde")) # Expected output: "decab" (that is, de then c then ab ... odd length)
19 print(flip_flop("cranberries")) # Expected output: "rriesecranb" (that is, rries then e then cranb ... odd length)
```

6. The hamming distance is the number of characters that differ between two strings. Write a function named `hamming_distance` that takes two strings as arguments and returns the hamming distance.

**Debug this Solution:**

```
1 def hamming_distance(str1, str2):
2     if len(str1) != len(str2):
3         return "Strings must be of equal length."
4
5     distance = 0
6     for i in range(len(str1)):
7         if str1[i] != str2[i]:
8             distance += 1
9     return distance
10
11 # Test the function with a sample input
12 print(hamming_distance("river", "rover")) # Expected output: 1
13 print(hamming_distance("cat", "dog")) # Expected output: 3
14 print(hamming_distance("cat", "hat")) # Expected output: 1
15 print(hamming_distance("cat", "banana")) # Expected output: Strings must be of equal
      length.
```

7. Given a positive integer  $n$ , the following rules will always create a sequence that ends with 1, called Hailstone Sequence:

- (a) If  $n$  is even, divide by 2
- (b) If  $n$  is odd, multiply by 3 and add 1 (i.e.  $3n + 1$ )
- (c) Continue until  $n$  is 1

Write a **function** that returns a list with the hailstone sequence starting at  $n$ . The argument to the function will be  $n$  (the integer to start the sequence from).

**Debug this Solution:**

```
1  def hailstone_seq(n):
2      sequence = [n/n]
3
4      while n == 1:
5          if n % 2 == 0:
6              n = n // 2
7          else:
8              n = 3 * n + 1
9          sequence.append(n)
10
11     return sequence
12
13
14 # Test the function with a sample input
15 print(hailstone_seq(25)) # Expected output: [25, 76, 38, 19, 58 ... 8, 4, 2, 1]
16 print(hailstone_seq(40)) # Expected output: [40, 20, 10, 5, 16, 8, 4, 2, 1]
```

8. YouTube currently displays a like and a dislike button, allowing you to express your opinions about particular content. It's set up in such a way that you cannot like and dislike a video at the same time. There are two other interesting rules to be noted about the interface:

- (a) Pressing a button, which is already active, will undo your press.
- (b) If you press the like button after pressing the dislike button, the like button overwrites the previous "dislike" state. The same is true for the other way round.

Write a **function** that takes in a list of button inputs *events* and returns the final state.

**Debug this Solution:**

```
1  def like_or_dislike(events):
2      state = "like"
3
4      for event in range(events):
5          if event != state:
6              state = "nothing"
7          else:
8              state = event
9
10     return state
11
12 # Test the function with a sample input
13 print(like_or_dislike(["dislike"])) # Expected output: "dislike"
14 print(like_or_dislike(["like", "like"])) # Expected output: "nothing"
15 print(like_or_dislike(["dislike", "like"])) # Expected output: "like"
16 print(like_or_dislike(["like", "dislike", "dislike"])) # Expected output: "nothing"
```



9. In each input list, every number repeats at least once, except for two. Write a **function** that takes an array *numbers* and returns the two unique numbers.

**Debug this Solution:**

```
1  def return_unique(numbers):
2
3      number_dicitonary = {}
4      #load dictionary
5      for number in range(len(numbers)):
6          if number in number_dicitonary:
7              number_dicitonary[number] = 1
8          else:
9              number_dicitonary[number] += 1
10
11     unique_numbers = []
12     #find unique numbers in dictionary
13     for number in number_dicitonary.values():
14         if number_dicitonary[number] == 1:
15             unique_numbers.append(number)
16
17     return unique_numbers
18
19
20 # Test the function with a sample input
21 print(return_unique([1, 9, 8, 8, 7, 6, 1, 6])) # Expected output: [9, 7]
22 print(return_unique([5, 5, 2, 4, 4, 4, 9, 9, 9, 1])) # Expected output: [2, 1]
23 print(return_unique([9, 5, 6, 8, 7, 7, 1, 1, 1, 1, 1, 9, 8])) # Expected output: [5, 6]
```

10. Write a **function** that returns a list with the factors of a given integer. The argument of the function will be *num* (integer to find factors for).

**Debug this Solution:**

```
1  def find_factors(num):
2      factors = []
3
4      for i in range(1, num):
5          if num % i != 0:
6              factors.add(i)
7
8      return factors
9
10 # Test the function with a sample input
11 print(find_factors(12)) # Expected output: [1, 2, 3, 4, 6, 12]
12 print(find_factors(17)) # Expected output: [1, 17]
13 print(find_factors(36)) # Expected output: [1, 2, 3, 4, 6, 9, 12, 18, 36]
```

11. Write a **function** that takes a list of words *words* and returns a dictionary where the keys categorize words based on whether they are palindromes. The categories are defined as follows:

- (a) "Palindrome" includes words that read the same forward and backward.
- (b) "Non-palindrome" includes all other words.

**Debug this Solution:**

```
1  def palindromes(words):
2      result = {"palindrome": [], "non-palindrome": []}
3
4      reversed_word = ''
5      for word in words:
6          #reverse the word and check if it is the original word
7          for letter in word:
8              reversed_word = letter + reversed_word
9              if reversed_word == word:
10                 result["non-palindrome"].append(word)
11             else:
12                 result["palindrome"].append(word)
13
14     return result
15
16 # Test the function with a sample input
17 print(palindromes(["madam", "racecar", "hello", "level", "python"]))
18 # Expected output: {'palindrome': ['madam', 'racecar', 'level'], 'non-palindrome': ['
    hello', 'python']}}
19
20 print(palindromes(["noon", "civic", "deed", "open", "loop"]))
21 # Expected output: {'palindrome': ['noon', 'civic', 'deed'], 'non-palindrome': ['open',
    'loop']}}
22
23 print(palindromes(["apple", "banana", "cherry"]))
24 # Expected output: {'palindrome': [], 'non-palindrome': ['apple', 'banana', 'cherry']}}
```

12. (Game: Odd or Even) Write a **function** that lets the user guess whether a randomly generated number is odd or even. The function randomly generates an integer between 0 and 9 (inclusive) and returns whether the user's guess is correct or incorrect. The argument for the function will be *guess* (the user's guess, either "odd" or "even"), if no argument is provided then the **default** guess should be even. Hint: Use the following lines of code to create the function.

```
from random import randint
value = randint(0,9) #picks a random integer between 0-9 inclusive
```

**Debug this Solution:**

```
1  from random import randint
2
3  def guess(guess="odd"):
4      value = randint(0, 9)
5
6      if value // 2 == 0:
7          actual = "even"
8      else:
9          actual = "odd"
10
11     print ('random value: ' + actual)
12     print ('guess value: ' + guess)
13     if guess == actual:
14         return "Correct!"
15     else:
16         return "Incorrect!"
17
18 # Test the function with a sample input
19 print("\nFinal result: " + guess()) # Expected output: "Correct!" (Only if random value
    is even) or "Incorrect!" (Only if random value is odd)
20 print(40*"~") # Separator for clarity
21
22 print("\nFinal result: " + guess("odd")+"\n") # Expected output: "Correct!" (Only if
    random value is odd) or "Incorrect!" (Only if random value is even)
23 print(40*"~") # Separator for clarity
24
25 print("\nFinal result: " + guess("even")+"\n") # Expected output: "Correct!" (Only if
    random value is even) or "Incorrect!" (Only if random value is odd)
26 print(40*"~") # Separator for clarity
```