Good Code:

This code is a simple calculator that performs basic arithmetic operations such as addition, subtraction, multiplication, and division. Each arithmetic operation has its own separate function. Each function takes in two parameters and performs the appropriate arithmetic operation and returns the result. The calculate() function manages user input and decides which operation to perform.

The code implements these best practices:

KISS (Keep It, Simple, Stupid):

The code is simple and straightforward. The code is very easy to follow and is not complex. Each function does what it is intended to do without any unnecessary steps.

DRY (Don’t Repeat Yourself):

There is no spaghetti code or code duplication in the code. Instead of repeating all the operation logic in the calculate() function, I have put the logic of each operation into its own function.

YAGNI (You Aren’t Gonna Need It)

The code does not have any extra features that are unnecessary for a simple calculator. The code only implements the basic arithmetic operations. Features such as doing multiple operations at once were avoided to keep it simple since that functionality is not needed for a simple calculator.

Bad Code:

The bad code did violate the common software development principles such as KISS (keep it simple, stupid), YAGNI (You Aren't gonna need it), and DRY (Don't Repeat Yourself).

Here are the examples of the violations:

KISS (Keep it Simple, Stupid):

There are multiple instances where the code violated KISS and it is commented on in the code. Here are a few examples of KISS violations.

- The first example is in the add function:

```
def add(a , b):
        if a == 0: print("The first number is 0")
         notNeeded = a + b
         print("ADDING NUMBERS")
         return notNeeded
```

This function violates KISS in two different ways:

1. The variable notNeeded = a + b is unnecessary because it adds no value to the function and as you can see in the good code there is a much simpler way to do this.
2. The print statement ADDING NUMBERS is another KISS violation because the print statement is not needed. The goal of the function is to return the addition of 2 numbers.

- The second example would be in the subtract function:

```
def subtract(a , b):
        randomVar = a - b
        total = randomVar - 0
        return total
```

The function violates KISS because the line of code total = randomVar - 0 is completely not needed. It does not change or add to the function at all. All it does is subtract 0 which changes nothing.

DRY (Don't repeat yourself)

There are multiple instances where the code violated DRY and it is commented on in the code. Here is an example of DRY violations.

- The example is during the exit loop

```
should_continue = input("Do you want to perform another calculation? (Y/N): ").lower()
        if should_continue == 'y':
                print("Continuing...")
                 Continue
        elif should_continue == 'n':
                 print("Exiting the calculator. Goodbye!")
                 break
        else:
                 print("Invalid input for exiting! Exiting anyway...")
```

Break

This loop violates both KISS and DRY. It violates DRY because the code itself is very repetitive and it expands on code that doesn't really need to be expanded. We can see this in the good code where the exit is nice and short. This code and redundant conditions and unnecessary clauses like the else clause that cause it to violate DRY and KISS conditions.

YAGNI(You Aren't Gonna Need it)

There are multiple instances where the code violated YAGNI and it is commented on in the code. Here are a few examples of YAGNI violations.

- The first example is the placeholder for quantum equations

```
print("5. Quantum Equations")
```

The code cannot calculate quantum equations therefore there was no need for adding such code.

- The second example would be checking for 0

```
if user_choice == 1:
        if num1 == 0 or num2 == 0:
                print("Adding a zero!")
```

This is an example of YAGNI because it doesn't need a special condition for zeros therefore you aren't gonna need it.

There are other instances of YAGNI including an image of charizard, adding unused variables like num0 and num3, and much more.