

1 Probe

Add `print` statements. Use to:

- Check if a function is being called or not:

```
def f(x, y):  
    return x + 3*y
```

 →

```
def f(x, y):  
    print("HELLO FROM f")  
    return x + 3*y
```

- Check the value of a variable:

```
y = 15 / x
```

 →

```
print("x:", x)  
y = 15 / x
```

- Check what happens at a conditional:

```
if x > 5:  
    y = 10  
else:  
    y = 3
```

 →

```
if x > 5:  
    print("x > 5")  
    y = 10  
else:  
    print("x <= 5")  
    y = 3
```

2 Trace

Use multiple `probes` to understand code. Use to:

- Figure out where a value comes from:

```
def f(a):  
    g(a * 3)  
  
def g(b):  
    for i in range(b):  
        h(9-i)  
  
def h(c):  
    print(10/c)
```

 →

```
def f(a):  
    print("a:", a)  
    g(a * 3)  
  
def g(b):  
    print("b:", b)  
    for i in range(b):  
        print("i:", i)  
        h(9-i)  
  
def h(c):  
    print("c:", c)  
    print(10/c)
```

(error if `c` is 0 in function `h`)

3 Unpack

Split up a complicated expression into multiple statements. Use this to:

- Isolate an error in a complex expression:

```
x = function(  
    (a + 3*b)/(c * d),  
    b / a  
)
```

 →

```
top = a + 3*b  
bot = c * d  
fst = top / bot  
sec = b / a  
x = function(fst, sec)
```

(ZeroDivisionError on line 1)

(ZeroDivisionError on line 4, so `a` must be the problem)

4 Toggle

Turn a line of code into a comment. Use to:

- Disable (can later re-enable) optional code:

```
def f(a, b):  
    print("R: ", a/b)  
    return a + b + a
```

 ↔

```
def f(a, b):  
    #print("R: ", a/b)  
    return a + b + a
```

- Temporarily replace broken code with a dummy value:

```
x = (3*y + 4*z)/w
```

 →

```
#x = (3*y + 4*z)/w  
x = 9
```

5 Bisect

Comment out half of your code to find the half that works, and then half of the broken part, etc., until you isolate an error. Use this to:

- Find missing brackets or commas:

```
pairs = [  
    [0, 1],  
    [10, 11],  
    [20, 21],  
    [30, 31],  
]
```

 →

```
pairs = [  
    # [0, 1],  
    # [10, 11],  
    [20, 21],  
    [30, 31],  
]
```

(syntax error at end of file)

(works now, so error must be in the commented zone)