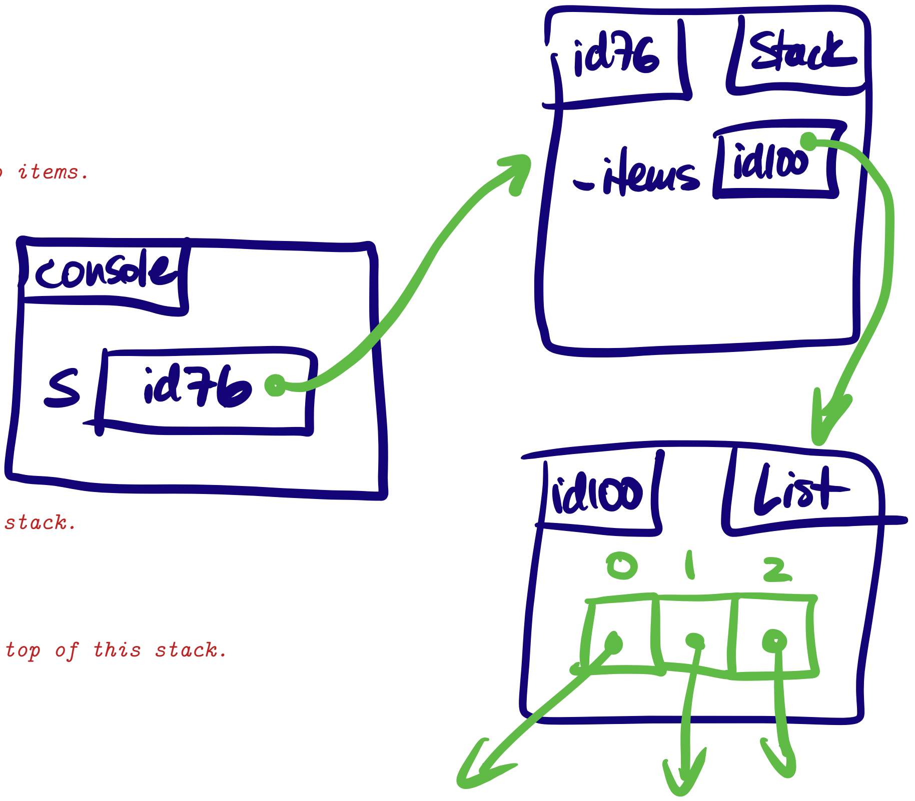
CSC148 - A client function for class Stack: size

```python
class Stack:
    """A last-in-first-out (LIFO) stack of items.

    Stores data in a last-in, first-out order. When removing an item from the
    stack, the most recently-added item is the one that is removed.
    """
    # === Private Attributes ===
    # _items:
    #     The items stored in this stack. The end of the list represents the top of the stack.
    _items: List

    def __init__(self) -> None:
        """Initialize a new empty stack."""

    def is_empty(self) -> bool:
        """Return whether this stack contains no items.

        >>> s = Stack()
        >>> s.is_empty()
        True
        >>> s.push('hello')
        >>> s.is_empty()
        False
        """

    def push(self, item: Any) -> None:
        """Add a new element to the top of this stack.
        """

    def pop(self) -> Any:
        """Remove and return the element at the top of this stack.

        >>> s = Stack()
        >>> s.push('hello')
        >>> s.push('goodbye')
        >>> s.pop()
        'goodbye'
        """
```



We are writing client code and need a function (outside the class) to determine the number of items on a stack.

1. Is the following a good solution? Explain.

```python
def size(s: Stack) -> int:
    """Return the number of items in s.

    >>> s = Stack() ✓
    >>> size(s) ✓
    0
    >>> s.push('hi') ✓
    >>> s.push('more') ✓
    >>> s.push('stuff') ✓
    >>> size(s) ✓
    3
    """
    count = 0
    for _ in s:
        count += 1
    return count
```

a function
(outside the class, no "self" parameter)

Class we define, are not automatically "iterable". → but it can be done.

∴ error.

count = ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ 5

2. Is the following a good solution? Explain.

~~Gilbert~~
~~d~~
~~c~~
~~b~~
~~a~~

```
def size(s: Stack) -> int:
    """Return the number of items in s.
    """
    count = 0
    while not s.is_empty():
        s.pop()
        count += 1
    return count
```

does report the correct size
BUT destroys the stack.

Bad.
Don't do more than docstring says even if we think it's good.

3. Is the following a good solution? Explain.

```
def size(s: Stack) -> int:
    """Return the number of items in s.
    """
    return len(s._items)
```

gives correct answer. **BUT** accesses a private instance variable
∴ function vulnerable.

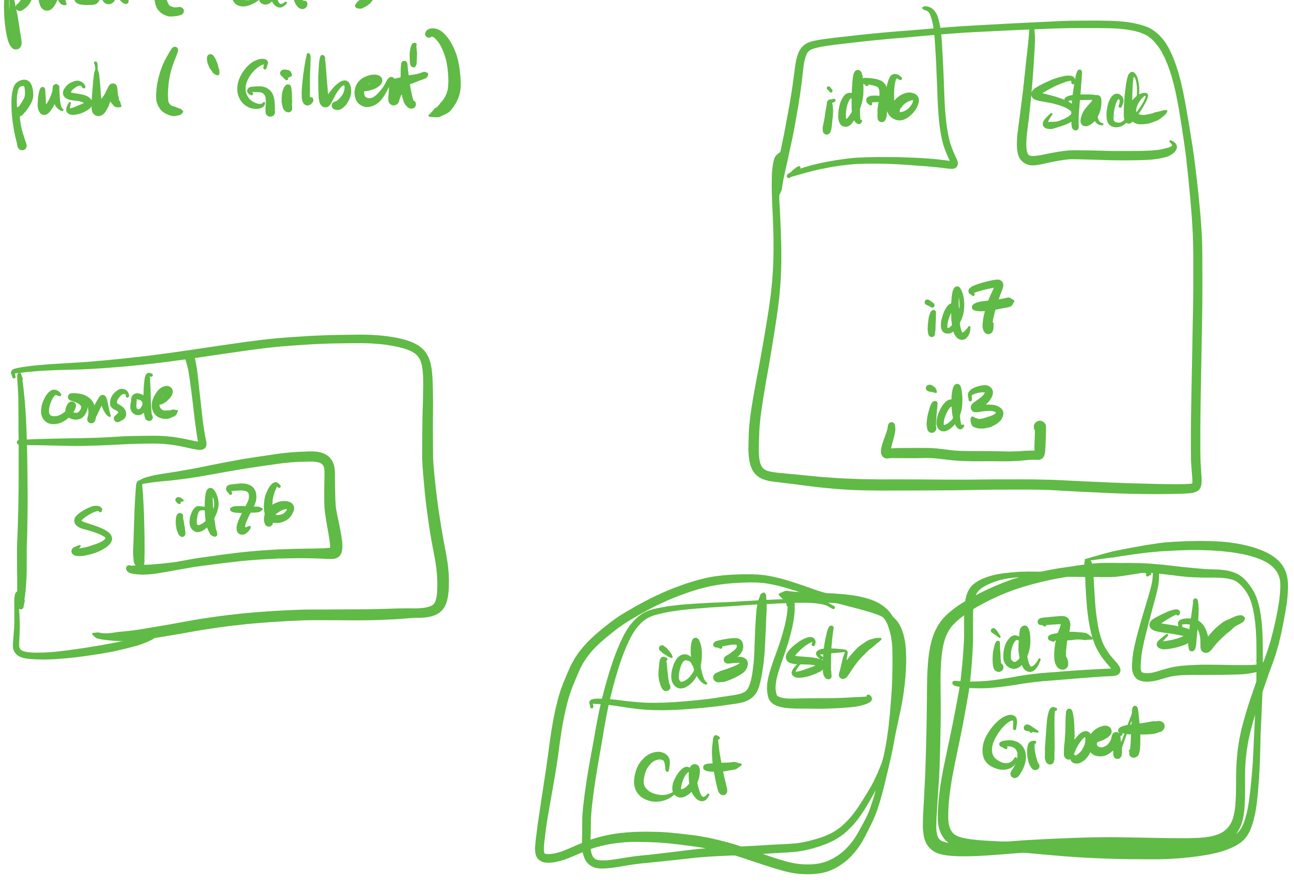
4. Is the following a good solution? Explain.

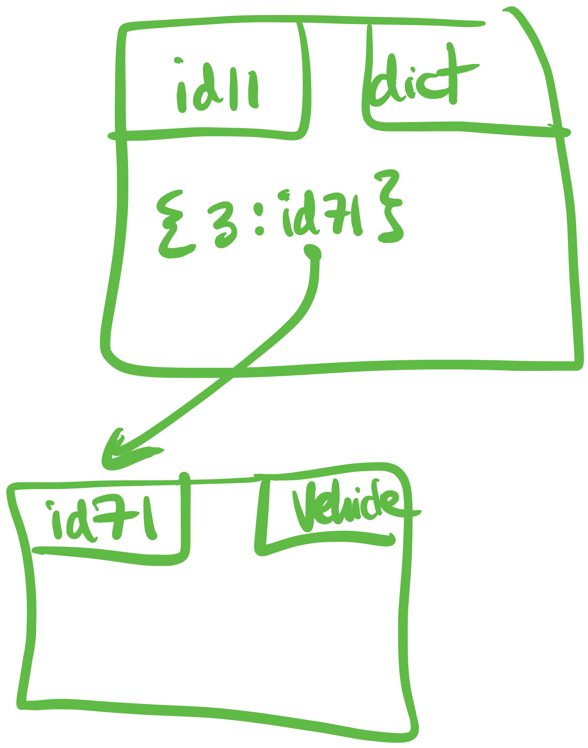
```
def size(s: Stack) -> int:
    """Return the number of items in s.
    """
    s_copy = s
    count = 0 ✓
    while not s_copy.is_empty(): ✓
        s_copy.pop()
        count += 1 ✓
    return count ✓
```

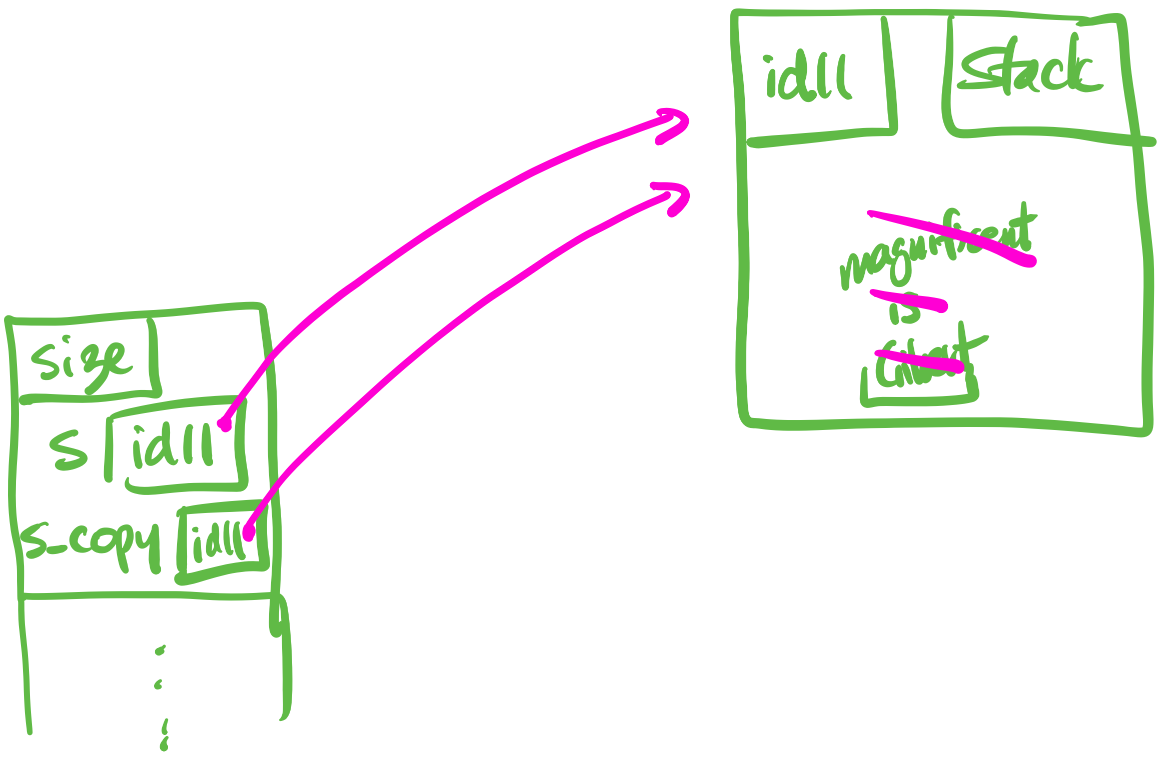
Does give correct answer.

5. Given what you've learned, implement the function yourself on a separate sheet of paper.

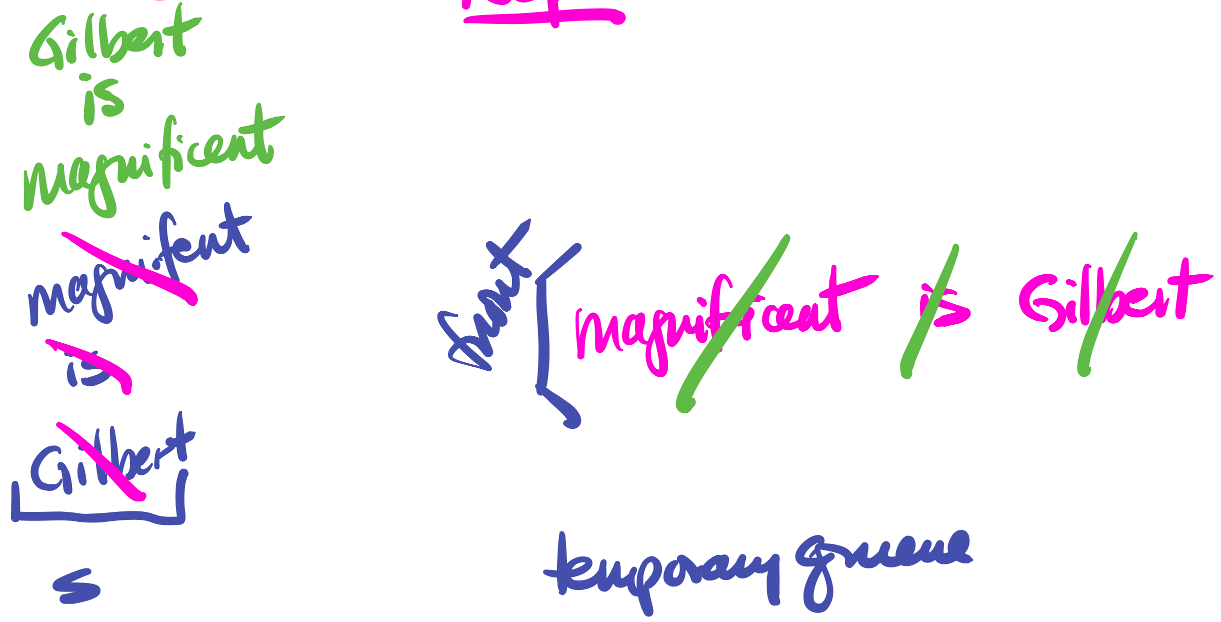
```
s = Stack()
s.push('cat')
s.push('Gilbert')
```







Can we solve this by popping into a Queue + restoring from the Queue? Nope.



What about a temp. Stack? Try that.