

[9 MARKS]

This question includes several small short-answer questions. Use any editor to type your answers, and save them in a file called `Q1_answers.txt`. Hand in this file on MarkUs.

Part (a) [4 MARKS]

Suppose we have an abstract class called `Recipe` with two implemented methods (an initializer, and a method called `shop_for`) and one abstract method called `cook`. Assume each method has one parameter, which is a string. (It doesn't matter to this question what the methods do.)

Suppose `Recipe` has two subclasses: `MainCourse` and `Appetizer`.

1. Write 1-3 lines of client code that **clearly demonstrates polymorphism**. State the exact expression that is polymorphic in your code.
2. What method do we know for sure `MainCourse` must implement?
3. Give one reason why `Appetizer` might define its own initializer? Be specific.

Part (b) [3 MARKS]

The following hypothesis test will check one aspect of the method `list.append`. Write the body of `test_append_one_more`.

```
@given(lists(integers()), integers())
def test_append_one_more(lst: List, item: int):
    """Test that if we append an item to a list, the number of occurrences of
    the item increases by 1."""
```

Part (c) [2 MARKS]

Consider the following module:

```
from typing import List

def marshmallow(lst: List[int]) -> float:
    return lst[-1] / lst[0]

def pistachio(lst: List[int]) -> float:
    return marshmallow(lst) * 100

def strawberry(lst: List[int]) -> int:
    return sum(lst)

def chocolate(lst: List[int]) -> float:
    p = pistachio(lst)
    q = strawberry(lst)
    return p + q

if __name__ == '__main__':
    try:
        print(chocolate([0, 1, 2, 3]))
    except ZeroDivisionError:
        print('Ouch!')
```

1. How many stack frames are on the call stack, including the frame for `__main__`, when an error is raised?
2. When the error is raised, how many stack frames are popped off the stack before “Ouch!” is printed?