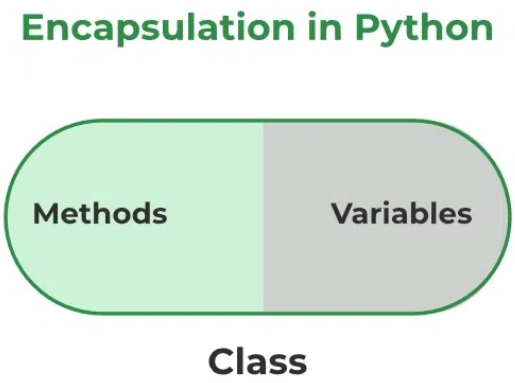
Encapsulation

Class Creation Considerations:



1. **Encapsulation:** the bundling of Variables and Methods in a Class to ensures that the behavior of an object can only be affected through its Public API. It lets us control how much a change to one object will impact other parts of the system by ensuring that there are no unexpected dependencies between unrelated components.
   - Attributes: Variables are assigned attributes within a __init__ function
   - Public API: Methods are functions that manipulate the Attributes, such as get/set
2. **Information Hiding:** Restricting access to implementation details and violating state invariance
   - Protected Variable:
     - Members of the class that cannot be accessed outside the class but can be accessed from within the class and its subclasses
     - In Python, Using underscore (_name) to denote Protected
   - Private Variable:
     - Members can neither be accessed outside the class nor by any base class
     - In Python, double underscore (__name) to denote Private.
   - Note that Python is not a true Protected or Private enforced by the language like C++
     - Can still access protected and private variables via dot notation (hello._name)

```
from dataclasses import dataclass
from enum import Enum
```

```
from typing import Any



class PaymentStatus(Enum):
    CANCELLED = "cancelled"
    PENDING = "pending"
    PAID = "paid"



class PaymentStatusError(Exception):
    pass



@dataclass
class OrderNoEncapsulationNoInformationHiding:
    """Anyone can get the payment status directly via the instance variable.
    There are no boundaries whatsoever."""

    payment_status: PaymentStatus = PaymentStatus.PENDING



@dataclass
class OrderEncapsulationNoInformationHiding:
    """There's an interface now that you should use that provides encapsulation.
    Users of this class still need to know that the status is represented by an enum type."""

    _payment_status: PaymentStatus = PaymentStatus.PENDING

    def get_payment_status(self) -> PaymentStatus:
        return self._payment_status

    def set_payment_status(self, status: PaymentStatus) -> None:
        if self._payment_status == PaymentStatus.PAID:
            raise PaymentStatusError(
                "You can't change the status of an already paid order."
            )
        self._payment_status = status



@dataclass
```

```
class OrderEncapsulationAndInformationHiding:
    """The status variable is set to 'private'. The only thing you're supposed to use is the is_paid
    method, you need no knowledge of how status is represented (that information is 'hidden')."""

    _payment_status: PaymentStatus = PaymentStatus.PENDING

    def is_paid(self) -> bool:
        return self._payment_status == PaymentStatus.PAID

    def is_cancelled(self) -> bool:
        return self._payment_status == PaymentStatus.CANCELLED

    def cancel(self) -> None:
        if self._payment_status == PaymentStatus.PAID:
            raise PaymentStatusError("You can't cancel an already paid order.")
        self._payment_status = PaymentStatus.CANCELLED

    def pay(self) -> None:
        if self._payment_status == PaymentStatus.PAID:
            raise PaymentStatusError("Order is already paid.")
        self._payment_status = PaymentStatus.PAID


@dataclass
class OrderInformationHidingWithoutEncapsulation:
    """The status variable is public again (so there's no boundary),
    but we don't know what the type is - that information is hidden. I know, it's a bit
    of a contrived example - you wouldn't ever do this. But at least it shows that
    it's possible."""

    payment_status: Any = None

    def is_paid(self) -> bool:
        return self.payment_status == PaymentStatus.PAID

    def is_cancelled(self) -> bool:
        return self.payment_status == PaymentStatus.CANCELLED

    def cancel(self) -> None:
        if self.payment_status == PaymentStatus.PAID:
```

```
            raise PaymentStatusError("You can't cancel an already paid order.")
        self.payment_status = PaymentStatus.CANCELLED

    def pay(self) -> None:
        if self.payment_status == PaymentStatus.PAID:
            raise PaymentStatusError("Order is already paid.")
        self.payment_status = PaymentStatus.PAID



def main() -> None:
    test = OrderInformationHidingWithoutEncapsulation()
    test.pay()
    print("Is paid: ", test.is_paid())



if __name__ == "__main__":
    main()
```

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