

The purpose of this assignment is to provide some practice with the implementation of JAVA inheritance and polymorphism concepts.

Description:

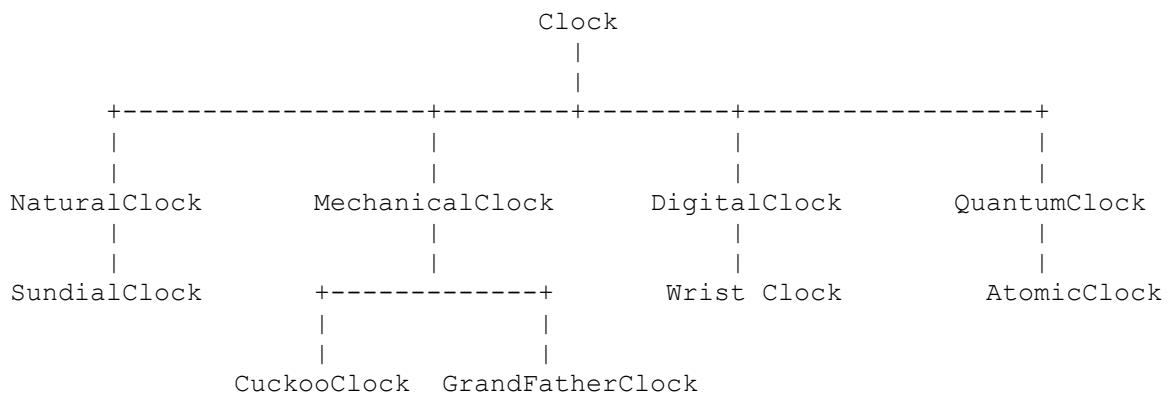
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Write a program to simulate the simultaneous running of a collection of clocks for a period of one (1) week, where each drifts a specified amount of time per second.

Class Hierarchy:

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The following classes are related in a class hierarchy and represent a family of clock types:



=> The class diagram governing the required architecture for the implementation is found in [PA4 class diagram](#).

HIERARCHY NOTES:

- 1) Classes "Clock", "NaturalClock", "MechanicalClock", "DigitalClock", and "QuantumClock" are abstract base classes.
- 2) Classes "**SundialClock**", "**CuckooClock**", "**GrandFatherClock**", "**WristClock**", and "**AtomicClock**" are concrete derived classes.
- 3) Each class in the hierarchy has a constructor which takes the same arguments as those shown in the constructor for abstract base class "Clock". Make sure the arguments passed to a concrete derived class's constructor on instantiation are passed up through the hierarchy via base class constructor invocation.
- 4) The constructor defined in abstract base class "Clock" is the only one with an implementation. The constructors in all other classes are empty.
- 5) The destructor defined in abstract base class "Clock" is the only one with an implementation. The destructors in all other classes are empty.

- 6) The following methods are defined in each class:
 - a) void reset ();
 - b) void tick ();
 - c) void displayTime ();
- 7) The virtual methods noted in (6) are only implemented in the concrete derived classes while the implementation of these methods in the abstract base classes is empty.
- 8) The implementation of method "reset" in each concrete derived class simply calls method "reset" defined on protected data member "**clockTime**", which is located in abstract base class "Clock".
- 9) The implementation of method "tick" in each concrete derived class simply calls method "tick" defined on protected data member "**clockTime**", which is located in abstract base class "Clock".
- 10) The implementation of method "displayTime" in each concrete derived class contains some formatting logic to ensure the proper output and makes use of method "display" defined on protected data member "**clockTime**", which is located in abstract base class "Clock".

Simulation Workflow:

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What follows is a characterization of the workflow governing the clock simulation:

Create collection of clocks, initializing each as follows:

- 1) Time = [00:00:00]
- 2) Seconds per tick = 1
- 3) Drift per second = Value defined in Table 1

Display time of each clock before clocks runs.

Perform 604,800 ticks (1 week) per clock in the collection

Display time of each clock after clocks run

Destroy collection of clocks.

Clock Drifts:

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Each clock has a specified drift, quantified in terms of an amount of drift per second. See Table 1 for an enumeration of clock drifts.

Output:

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Between the dashed lines is the output expected from your
Implementation of the clock simulation. Note that the dashed lines
are NOT part of the expected output.

Reported clock times after resetting:

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Sundial Clock time [00:00:00] - total drift = 0 seconds
Cuckoo Clock time [00:00:00] - total drift = 0 seconds
Grandfather Clock time [00:00:00] - total drift = 0 seconds
Wrist Clock time [00:00:00] - total drift = 0 seconds
Atomic Clock time [00:00:00] - total drift = 0 seconds

Running the clocks for one (1) week...

Reported clock times after running:

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Sundial Clock time [24:00:00] - total drift = 0 seconds
Cuckoo Clock time [24:00:00] - total drift = 420 seconds
Grandfather Clock time [24:00:00] - total drift = 210 seconds
Wrist Clock time [24:00:00] - total drift = 20.9999 seconds
Atomic Clock time [24:00:00] - total drift = 0 seconds

Table 1 - Clock Drifts

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Clock Type	Drift (amount per second)	Comment
Sundial Clock	0.0	No drift
Atomic Clock	0.0	No drift
Cuckoo Clock	0.000694444	60 seconds per day
Grandfather Clock	0.000347222	30 seconds per day
Wrist Clock	0.000034722	3 seconds per day