

Problem Set 4 Exercise #33: Knob

Reference: Lecture 10 OOP Unit 3 notes

Learning objectives: Object-oriented programming; Algorithm design

Estimated completion time: 45 minutes



Problem statement:

A four-way knob has 4 positions: “up”, “right”, “down” and “left”. The knob can only be turned in the clockwise direction. For example, if the current position is “right”, it takes 3 stops to reach position “up”. After one more stop, it will be in position “right” again.

Moreover, a knob is used to control an attached device and the latter has two states: “on” or “off”. For every stop we take to turn the knob, the device would toggle its state. For example, if the knob's current position is “right” and its attached device's state is “on”, then turning the knob to “down” position would turn off the device, and turning the knob to “left” position would turn on the device again.

In **PS4_Ex33_Knob.java**, write a **Knob** class that supports the following operations:

- Constructor **Knob(String initialPosition, String initialState)**
- **void turnKnob(int stops)** to turn a knob **stops** times.
- **String getPos()** to return the position of a knob.
- **String getDevStat()** to return the state of the attached device.

You are to decide the attributes of this class (**be careful!**).

Write a user program **PS4_Ex33_TurnKnob.java** to read in information about a knob (current position and device's state) and create a **Knob** object. Subsequently read in the number of stops to operate on the **Knob** object, and print out the final position of the **Knob** object and the state of its attached device.

Sample run #1:

```
Enter the current position and device state: up on
How many stops to turn the knob? 2
Final position: down; device state: on
```

Sample run #2:

```
Enter the current position and device state: left off
How many stops to turn the knob? 2
Final position: right; device state: off
```

Sample run #3:

```
Enter the current position and device state: right on  
How many stops to turn the knob? 5  
Final position: down; device state: off
```

Sample run #4:

```
Enter the current position and device state: down off  
How many stops to turn the knob? 12345  
Final position: left; device state: on
```

Challenge yourself by not reading the tips at the bottom of this page 😊

Useful tips:

1. You may find that there is no need to define a **Device** class as it is too simple.
2. In the **Knob** class, you may consider using integers to represent positions of a knob, e.g. 0 for “up”, 1 for “right”, etc. This may ease your processing when you turn over knobs, but you need to parse a command to “translate” between string direction (e.g., “up”) and integer position (e.g., 0).