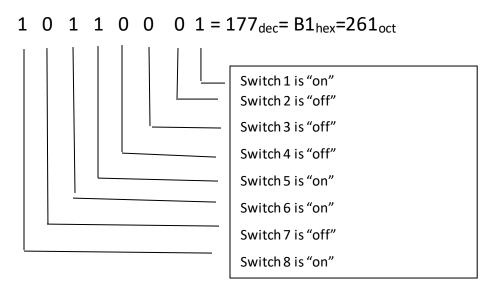
Bit Masking Telemetry Data

Telemetry is an automated communications process by which measurements and other data are collected at remote or inaccessible points and transmitted to an IT system in a different location for monitoring and analysis.

Telemetry data may be relayed using radio, infrared, ultrasonic, GSM, satellite or cable, depending on the application.

Suppose in a telemetry system in a space station each bit position with the first eight bits of an integer sent to ground control have meaning with regard to the status of certain switches onboard the space station. Assuming a 1 indicates the switch is on and a 0 indicates that it's off (diagram below)



The numbers sent to ground control never exceeds 255 (first eight bits all set to 1).

Suppose we wish to look at the sixth switch. Use a mask to bitwise AND & with the original number in order to look only at the sixth switch. The mask value will be $32(2^5)$ or 0.010000.

Notice the bitwise AND-ing of the mask and the original number leaves the resulting number = to the mask, which means switch 6 was set.

We will read in a text data file called Switches.txt which contains decimal numbers that represent successive switch information telemetry. Print the status of all eight switches.

Switches.txt file

```
22194203
```

97

```
Program Output
Switch status for data value 22:
Switch 1 is "off"
Switch 2 is "on"
Switch 3 is "on"
Switch 4 is "off"
Switch 5 is "on"
Switch 6 is "off"
Switch 7 is "off"
Switch 8 is "off"
Switch status for data value 194:
Switch 1 is "off"
Switch 2 is "on"
Switch 3 is "off"
Switch 4 is "off"
Switch 5 is "off"
Switch 6 is "off"
Switch 7 is "on"
Switch 8 is "on"
Switch status for data value 203:
Switch 1 is "on"
Switch 2 is "on"
Switch 3 is "off"
Switch 4 is "on"
Switch 5 is "off"
Switch 6 is "off"
Switch 7 is "on"
Switch 8 is "on"
Switch status for data value 97:
Switch 1 is "on"
Switch 2 is "off"
Switch 3 is "off"
Switch 4 is "off"
Switch 5 is "off"
Switch 6 is "on"
Switch 7 is "on"
Switch 8 is "off"
```