Problem 2. Day of Week

Program: `dayofweek.py`

Write a program named `dayofweek.py` that accepts a date as input and write to the output the day of the week that date falls on. Your program should accept three command-line arguments: `d` (day), `m` (month), and `y` (year). For m, use `1` for January, `2` for February, and so forth. For output, write `0` for Sunday, `1` for Monday, `2` for Tuesday, and so forth. Use the following formulas for the Gregorian calendar:

$$y_0 = y - \frac{(14 - m)}{12}$$

$$x = y_0 + \frac{y_0}{4} - \frac{y_0}{100} + \frac{y_0}{400}$$

$$m_0 = m + 12 \times \left(\frac{14 - m}{12}\right) - 2$$

$$d_0 = \left(d + x + \frac{31 \times m_o}{12}\right) \% \, 7$$

The output of the program should look like the following:

```
% python dayofweek.py 4 11 2019 # Sep 11, 2001
11/9/2001 is 2                 # 2 (Tuesday)


% python dayofweek.py 4 11 2019 # Nov 6, 2019
6/11/2019 is 3                 # 3 (Wednesday)
```

FIGURE 1: SAMPLE OUTPUT FOR PROBLEM 1

Problem 3. Mercator Projection

Program: `mercprojection.py`

The Mercator projection is a conformal (angle preserving) projection that maps latitude φ and longitude λ to rectangular coordinates (`x`, `y`). It is widely used – for example, in nautical charts and in the maps that you print for the web. The projection is defined by the equations $x = \lambda - \lambda_0$, and $y = \frac{1}{2}\ln\left(\frac{1+\sin\varphi}{1-\sin\varphi}\right)$, where λ_0 is the longitude of the point in the centre of the map. Write a program named `mercprojection.py` that accepts λ_0 and the latitude and longitude of the point from the command line and write its projection. The output of the program should like the following:

```
% python mercprojection.py 0 23.242525 56.419594

(23.242525, 56.419594) is projected to point (56.419594, 0.41726516720626144)
```

FIGURE 2: SAMPLE DIALOG FOR THE PROGRAM OF PROBLEM 3

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References

Sedgewick, R., Wayne, K., & Dondero, R. (2015). *Introduction to Programming in Python* (1st ed.). Addison-Wesley Professional.