Introduction to Programming

March 1, 2023

Bonus program 1: height in light-years

Preamble

The numerical value of many physical quantities depends on the unit one chooses to measure them. My height is 1.8 m or 180 cm, or 1.90e-16 light-years.

The use of light-years as a unit of distance is weird but common in physics: since 1983, the speed of light is defined to be exactly c = 299,792,458 m/s, and this serves as a definition of the meter given the unit of time.

Problem

Write a C program that computes three heights in light-years:

HEIGHT [m]	WHO
1.8	Marcus Birkenkrahe
1.98	Michael Jordan
1.67	Napoleon Bonaparte

Not considering leap years, a year is 31,536,000 seconds long.

Submission

- Submit your solution as an Emacs Org-mode file including the usual header information (title, author, pledged), in Schoology.
- Add the following meta data on one line at the top of your Org-mode file: `#+STARTUP:overview hideblocks indent`
- The Org-mode file should also contain the output for the three test cases after the code block.

```
: Marcus Birkenkrahe's height: 1.80 m = 1.9039e-16 light-years
: Michael Jordan's height:     1.98 m = 2.0943e-16 light-years
: Napoleon Bonaparte's height: 1.67 m = 1.7664e-16 light-years
```

Solution

- Constants: `SPEED_OF_LIGHT = 299792458.f`, `YEAR_IN_SECONDS = 31536000.f`
- Variables: h1 = 1.8f, h2 = 1.98f, h3 = 1.67f

```
const float  SPEED_OF_LIGHT = 299792458.f;
const float  YEAR_IN_SECONDS = 31536000.f;
float h1 = 1.8f, h2 = 1.98f, h3 = 1.67f;

printf("Marcus Birkenkrahe's height:%.2f m = %.2e light-years\n",
       h1, h1/SPEED_OF_LIGHT / YEAR_IN_SECONDS);
printf("Michael Jordan's height:\t%.2f m = %.2e light-years\n",
       h2, h2/SPEED_OF_LIGHT / YEAR_IN_SECONDS);
printf("Napoleon Bonaparte's height:%.2f m = %.2e light-years\n",
       h3, h3/SPEED_OF_LIGHT / YEAR_IN_SECONDS);
```