cc-assignments

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March 10, 2024

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1 Pgm 2: Your height in light-years[1]

1.1 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.

1.2 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.

[1] The idea for this program came from a new book, "Quantum Field Theory? A first introduction for mathematicians" (Talagrand, 2022).

1.3 Submission

Submit your solution as an Emacs Org-mode file including the usual header information (title, author, pledged), in Schoology.

The solution should contain the output after the code block. It should look like this:

```
: 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
```

1.4 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);
```

```
Marcus Birkenkrahe's height:1.80 m = 1.90e-16 light-years
Michael Jordan's height: 1.98 m = 2.09e-16 light-years
Napoleon Bonaparte's height:1.67 m = 1.77e-16 light-years
```