Time Manipulation Functions

```
clock_t clock(void);
double difftime(time_t time1, time_t time0);
time_t mktime(struct tm *timeptr);
time_t time(time_t *timer);
```

clock The `clock` function returns a `clock_t` value representing the processor time used by the program since execution began. To convert this value to seconds, we can divide it by `CLOCKS_PER_SEC`, a macro defined in `<time.h>`.

When `clock` is used to determine how long a program has been running, it's customary to call it twice: once at the beginning of `main` and once just before the program terminates:

```
#include <stdio.h>
#include <time.h>

int main(void)
{
  clock_t start_clock = clock();
  ...
  printf("Processor time used: %g sec.\n",
         (clock() - start_clock) / (double) CLOCKS_PER_SEC);
  return 0;
}
```

The reason for the initial call of `clock` is that the program will use some processor time before it reaches `main`, thanks to hidden "start-up" code. Calling `clock` at the beginning of `main` determines how much time the start-up code requires so that we can subtract it later.

The C89 standard says only that `clock_t` is an arithmetic type; the type of `CLOCKS_PER_SEC` is unspecified. As a result, the type of the expression

```
(clock() - start_clock) / CLOCKS_PER_SEC
```

may vary from one implementation to another, making it difficult to display using `printf`. To solve the problem, our example converts `CLOCKS_PER_SEC` to `double`, forcing the entire expression to have type `double`. In C99, the type of `CLOCKS_PER_SEC` is specified to be `clock_t`, but `clock_t` is still an implementation-defined type.

C99

time The `time` function returns the current calendar time. If its argument isn't a null pointer, `time` also stores the calendar time in the object that the argument points to. `time`'s ability to return a time in two different ways is an historical quirk, but it gives us the option of writing either

```
cur_time = time(NULL);
```

or