CSCI1320 Quiz 1 Design - Key

(20 points) Use your own paper, type your answers, and show work as much as possible.

We are going on a trip. Let's develop an algorithm that will help us estimate the time of arrival at our destination. The program reads in the distance to be traveled, the speed at which we will travel, and the departure time. It will calculate the amount of time the trip will take and give us our estimate arrival time. Each time is in the form hh:mm. Here is a sample run of the program (input entered by the user is underlined):

```
Distance to be traveled (miles): 615.3
Speed of travel (mph): 58.6
Departure (military) time (hh:mm): 15:45

Distance: 615.30 miles.
Speed: 58.60 mph.
Departure time: 15:45.
Travel time: 10:30.
Arrival time: 2:15.
```

Inputs: `distance`, `speed`, `depart_hours`, `depart_mins`
Outputs: `hours`, `mins`, `arrival_hours`, `arrival_mins`
Processing:

1. Read in `distance`, `speed`, `depart_hours` and `depart_mins`.
2. Calculate travel time.
   a. `travel_time` = `distance` / `speed`.
   b. Break down `travel_time` into `hours` and `mins`. (see Note 1)
3. Calculate arrival time. (see Note 2)
   a. `arrival_mins` = `depart_mins` + `mins`.
   b. If (`arrival_mins` ≥ 60) then
      i. `arrival_mins` = the excess over 60;
      ii. Add an extra hour to `arrival_hours`.
   c. `arrival_hours` = `depart_hours` + `hours`.
      i. If `arrival_hours` > 24 then `arrival_hours` = the excess over 24. (see Note3)
4. Print results including distance, speed, departure time, travel time and arrival time.

Notes:

1. So `hours` and `mins` can 1) be printed in the form hh:mm and 2) be added individually to `depart_hours`, `depart_mins`. For example, if `travel_time` is 10.5, the `hours` is 10 and `travel_time` – `hours` is 0.5. To Obtain the number of minutes, we use the formula
   `minus=(travel_time–hours)×mins_per_hour.`
   Therefore `mins` is 0.5 × 60 = 30.
2. In addition to `arrival_hours` = `depart_hours` + `hours`, we need to add a possible extra hour produced by the minutes adding up to more than 60. For example, if the departure time is 15:45, and the travel time is 10.5, then

`arrival_hours` would be 26, not 25, since the minutes add up to 75 (30+45=75).

3. The `arrival_hours` could spill over into the next day, so we should calculate the excess over 24 hours (denoted by `hours_per_day`), using the reminder (%) operator (discuss in more detail later), i.e. the reminder of dividing 26 by 24, yielding 2. `arrival_mins` is calculated in a similar manner: we use % operator to obtain the remainder of dividing 75 by 60 (denoted by `mins_per_hour`), yielding 15.
4. In this analysis we found the need for additional data including `travel_time`, `mins_per_hour` and `hours_per_day`.