Assignment 1
Expressions, basic types, and drawing

Programming Fundamentals 1

Submit by: Friday, 25 Sep 2020 at 23:00

1 The language

Develop this assignment in DrRacket, using the **Beginning Student Language** (BSL). The official documentation for BSL is available here (as well as through DrRacket's *Help* menu).

2 The assignment

This assignment is in two parts: one part is about expressions of basic types, and one part is about drawing shapes.

2.1 Expressions and basic types

1. Sam is a first-year informatics student at USI, who's working very hard on her PF1 assignments. She programs for 5 hours the first week, for 8 hours the second week, for 12 hours the third week, an for 10 hours the fourth week. For how many hours did she program in total during these four weeks? Define a constant `TOTAL-HOURS`, computed as a suitable expression of the number of the hours worked each week.

2. The *weekly average* working hours are the total number of hours divided by the number of weeks. How many hours did Sam work *on average per week*? Define a constant `AVERAGE-HOURS` that contains the correct value, computed as an expression involving `TOTAL-HOURS`.

3. A train travels at 80 km/h for 22 minutes, then at 120 km/h for 1 hour, and then at 90 km/h for 1 hour 20 minutes. How much distance (in km) did the

train travel in total? Define a constant `DISTANCE-TRAVELED` that contains the correct value, computed as an expression. Remember that if you travel at S km/h for H hours, you will have traveled $S \times H$ km in total. If you need to convert minutes to hours, introduce a constant for the conversion factor, and use it in the definition of `DISTANCE-TRAVELED`.

4. A local pizzeria offers pizzas in two sizes: *standard* and *baby*. A standard-size pizza costs 12 francs and is 33 cm in diameter; a baby-size pizza costs 9 francs and is 18 cm in diameter. Which size provides the better value? In other words, is a standard pizza's price per square centimeter *greater or less than* a baby pizza's price per square centimeter? Define an expression that evaluates to `#true` if a standard pizza's price per square centimeter is **less than** a baby pizza's, and to `#false` otherwise; save the result of the expression evaluation in a constant `STANDARD-BETTER?`

   Hints:

   - assume pizzas are circles
   - the area of a circle with diameter D is $\frac{\pi D^2}{4}$
   - in DrRacket, `pi` evaluates to the mathematical constant π
   - you don't need to use a conditional expression: just compare the expressions of the two prices per square centimeter with the "less than" operator

5. Write an expression that builds a string `"Hello [YourName], welcome to PF1!"`, where `[YourName]` is your first name. Use function `string-append` to concatenate the parts of the string. Save the result of the expression evaluation in a constant `HI-TO-ME`.

6. Define a function `greet` that inputs a string representing a person's name and outputs the string `"Hello [InputName], welcome to PF1!"`, where `[InputName]` is the input string.

2.2 Drawing shapes

For this part of the assignment we'll use DrRacket's library `2htdp/image`:

- Add `(require 2htdp/image)` at the top of the definitions you wrote in this assignment, and click *Run* to load the library (so that you can use it in the interactions area)
- Browse the library's documentation online or through DrRacket's *Help* menu

This page describes the road signs that you can find in Switzerland. Pick **three** of them that you like; for each of them, write an expression that evaluates to an image of the sign, and save the expression in a constant named after the sign.

Here's an example (which is not a valid road sign though):

```
(define STAR-SIGN (overlay (star 60 "solid" "Medium Sea Green")
                           (star 100 "solid" "Dark Orange")))
```

`STAR-SIGN` evaluates to the image:

Hints:

- For complex images, introduce constants for parts of the image and compose them with functions such as `above`, `beside`, and `overlay`
- You can find a list of color names online here
- Don't worry about matching the sign's colors or dimensions exactly; it's enough that your image looks like the sign even if it's not a perfect replica.

3 How and what to turn in

Using *iCorsi*'s website for Programming Fundamentals 1, upload under **Assignment 1** a single Racket source file named `YourLastName_YourFirstName_PF1_Assignment1.rkt` including `(require 2htdp/image)` at the top and *all definitions* described in this assignment.

The submission **deadline** is hard, and late submissions will not be accepted. If you have a justified reason that prevents you from submitting this assignment on time, ask the instructors for an extension **well before** the deadline.

4 Points

This assignment will be graded on a *four-step scale*:

not submitted: you didn't submit anything (or barely anything)

fail: the submission shows some work has been done, but it is clearly insufficient

pass: the submission is incomplete or has flaws, but it is overall acceptable

good: the submission is generally complete and satisfactory

According to your grade, you will receive the following points for this assignment (out of the 100 points awarded in this course):

- *not submitted*: 0 points
- *fail*: 1 point
- *pass*: 3 points
- *good*: 4 points

5 Plagiarism policy

Assignments must be done alone. Students are allowed to generally discuss assignments and solutions among them, but each student must work on and write down their assignment independent of other students. In particular, sharing solutions of assignments is not allowed and constitutes cheating.

Remember that cheating and plagiarism are unacceptable. The penalty for cheating or copying – including allowing others to copy your work – is up to 100% of your grade for the course.