

CS 2500, Spring 2013
Homework 1

Due date: 11:59pm, Tuesday January 15, 2013

What to submit:

Using Blackboard, submit a *single* Racket file containing all of the code and documentation for this assignment. Place your name and your husky name in a comment at the beginning of your file.

Name your file: hw1-yourlastname.rkt

For example, my file would be named hw1-razzaq.rkt. Late homework is not accepted.

Make sure to write a contract and purpose statement for each function.

Problem 1. A typical exercise in an algebra book asks the reader to evaluate an expression like

$$\frac{n}{3} + 2$$

for $n = 2$, $n = 5$, and $n = 9$. Using Racket, we can formulate such an expression as a program and use the program as many times as necessary. Here is the program that corresponds to the above expression:

```
(define (f n)
  (+ (/ n 3) 2))
```

You can determine the result of the expression at $n = 2$, $n = 5$, and $n = 9$ in DrRacket by typing in the interaction window:

```
(f 2)
(f 5)
(f 9)
```

Formulate the following three expressions as programs in Racket:

- a) $100/n - 35$
- b) $(n^2 + 300) / (13n)$
- c) $(1/n) * (5/n)$

Determine their results for $n = 2$ and $n = 9$ with DrRacket.

Problem 2. A boy gets retained by a neighborhood association to mow the grass and trim hedges, collect dues, and do miscellaneous chores. Just to make sure he is around when needed, he gets 50 dollars a month (he doesn't have to work for that). For every hour he works, he gets \$10.50.

How much does he get if he works 5 hours? 10 hours? 18 hours? per month.

Make a table that shows the results (comment this out).

Create a program for calculating how much the boy earns if he works H hours.

Use the program and the Interactions Window in DrRacket to find out how much the boy earns when a major event forces him to work for 100, 122, and 135 hours in a single month.

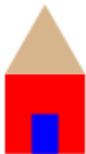
Problem 3. A clothing store is having a sale on its products. Customers will get 20% off of the most expensive item, 30% off of the second most expensive item and 50% off of the third most expensive item. No other discounts will be applied. The store needs a program that can compute the value of the discount applied to each customer. Define the program `total-discount`. It consumes three numbers: the price of the most expensive item, the price of the second most expensive item (or zero if only one item is bought) and the price of the third most expensive item (or zero if only one or two items are bought) in that order. It produces the value of the discount.

Problem 4. Define the program `meters->miles` that converts meters/second to miles/hour. The function consumes a velocity in meters/second and produces the velocity in miles/hour. Look up the conversion factor to convert from meters/second to miles/hour.

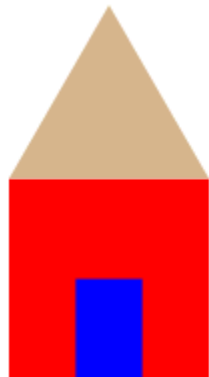
Problem 5. Define the program `draw-house` which draws a house from a triangle, square and rectangle. The function consumes one number and draws the shapes and places them using values derived from this one number.

For instance,

`(draw-house 40)` produces the image:



And `(draw-house 100)` produces the image:



Use the DrRacket help desk to find functions (available in the 2htdp/image library) that you might consider using for this problem such as `triangle`, `above`, `overlay/xy`...