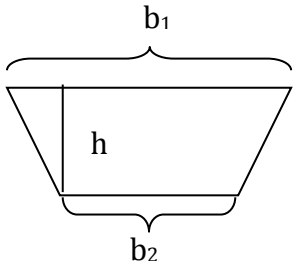
Lab 02: Designing functions

Create a separate file for each question. Keep them in your "Labs" folder, with the name `lijqk` for Lab `ij`, question `k`. See **Helpful tips** for information on creating and naming files. Download the headers for each function from the file `labinterface02.rkt` linked off the "Labs" page on the course Web site. For this lab, the interface file also includes steps of the design recipe which you will learn about in Module 02. For future labs and all assignments, you will be required to complete the design recipe steps yourself.

You can obtain feedback on your work (except warm-up exercises) by submitting it and requesting a public test. Follow the instructions given in the Style Guide. The same process is used to perform basic checks on your assignment work.

Language level: Beginning Student.

1. *[Class exercise with lab instructor assistance]* Consider a trapezoid with parallel bases of lengths b1 and b2, and height h:



   Its area is given by the formula [(b1+b2)/2]*h. Create the function *trapezoid-area* that consumes three positive numbers *(b1, b2* and *h*), and produces the area of the corresponding trapezoid.

2. *Warm-up exercise* [Adapted from HtDP exercise 2.4.2] Type each of the following definitions, one by one, into the *Definitions* window and click Run. Read the error messages and fix the errors.

   (**define** (*f* 1) (+ *x* 10))
   (**define** (*g x*) + *x* 10)
   (**define** *h*(*x*) (+ *x* 10))

3. *Warm-up exercise* [Adapted from HtDP exercise 2.4.4] Enter the following Racket program into the *Definitions* window and click Run:
   (**define** (*somef x*)
   (*sin x x*))

   Then, in the *Interactions* window, evaluate the expressions (*somef* 10 20) and (*somef* 10). Read the error messages and note what DrRacket highlights.

4. Create a function *onehalf* that consumes a positive integer (*nbr*) and produces the closest integer less than or equal to *nbr* divided by 2. That is, (*onehalf* 16) and (*onehalf* 17) will both produce 8. Hint: use *quotient*.

5. Create the function *middle-digit* that consumes an integer (called *nnn*) between 100 and 999, inclusive, and produces the middle digit of *nnn*. For example, *(middle-digit 345)* produces *4*, and *(middle-digit 803)* produces *0*. Hint: use *quotient* and *remainder*.

6. Create the function *set-middle-to-zero* that consumes an integer (called *nnn*) between 100 and 999, inclusive, and produces a number like *nnn*, except that the middle digit has been set to 0. For example, *(set-middle-to-zero 345)*produces 305 and *(set-middle-to-zero104)* produces104. You may wish to use the function *middle-digit* that you just created

7. Create a function *trim-string* that consumes a string (called *s*) and a natural number (called *n*), and produces a string with the first and last n characters from *s* removed. For example, *(trim-string "example" 2)* produces *"amp"*. You can assume that *s* will always contain at least 2*n*+1 characters.

8. *Optional open-ended questions*
   Read Section 1 of the world.rkt documentation, available on the "DrRacket & Teachpacks" page on the course Web site, and the section "Loading the world.rkt teachpack" under "Helpful tips" below. Try to create some several different basic images.

Helpful tips Except as marked, the tips refer to DrRacket.

Opening a new file: Under “File” on the menu bar, select “New” (or “New Tab”, if you wish to add tabs to a current window).

Opening an existing file: Under “File” on the menu bar, select “Open...”. This will bring up a window that lets you select a file to open.

Saving a file: Press the “Save” button on the window. If this is a new file, you will see a window that lets you choose a name for your file and a directory to put it in.

Copying from a file: You can copy information from one file to another by highlighting text, choosing “Copy” in the “Edit” menu on the menu bar, clicking on the tab or window of another file, and using “Paste” in the “Edit” menu on the menu bar. The menu also shows keyboard shortcuts.

Downloading a file (Web browser): Teachpacks and documentation files can be found on the “Dr Racket & Teachpacks” page on the course Web site. Bring up the page in a browser and right-click on the link to download and save the file. Make sure that you save it to your personal folder (labeled with your userid) and that you keep track of where you have saved it. Ask your lab instructor if you need help finding a Web browser on the Mac.

Loading the world.rkt teachpack: A teachpack is a file with Racket definitions in it. Loading a teachpack means you can use any of the definitions as if they were built-in definitions. Under “Language” on the main menu bar, select “Add Teachpack…” The left column in the window that pops up is labeled “Preinstalled HtDP Teachpacks”. Choose “world.rkt” and click on “OK”. You will now be able to create images as described in our documentation.

Clearing all teachpacks: Under “Language” on the menu bar, select “Clear All Teachpacks”.

Managing files (general advice): You might wish to organize your account so that you have folders for labs, assignments, teachpacks, and other downloads from the course Web site.