CIS 130 - Intro to Programming - Fall 2005
Homework Assignment #4

Homework #4:
HW #4 PART 1 is due by **12:00 NOON** on **Wednesday, September 28, 2005;**
HW #4 PART 2 is due by **12:00 NOON** on **Friday, September 30, 2005**

Week "5" Lab Exercise - due at end of your registered lab section
on either 9-23 or 9-26

WEEK "5" LAB EXERCISE

1. Consider the 4 functions discussed in lecture: **profit**, **revenue**, **cost**, **attendees**. (A version can of these can also be found on p. 21 of the HtDP reading packet.)

Type these in using either **funct_play0** or **funct_play1**; then, using either funct_play1 or expr_play, "play" with the **profit** function to determine which ticket price results in the most profit. (Only consider prices that are multiples of a dime --- 5.00, 5.10, 4.90, for example.) Write down this ticket price, and the profit at this ticket price.

2. (Adapted from the HtDP Reading Packet) After studying the cost structure of a show, the owner discovers several ways of lowering the cost. As a result, she no longer has a fixed cost; she now simply pays $1.50 per attendee.

Which function(s) need to be changed to reflect this change? Change it/them, using **funct_play1**, and then use **expr_play** to determine what is now the ticket price resulting in the most profit. (Again, only consider prices that are multiples of a dime.) Write down this ticket price, and the profit at this ticket price.

Consider (just think about it, you don't have to write down): is it a good idea, programming–wise, to change to the version of profit in the right-hand-column of p. 21 in the HtDP Reading Packet?

When you have completed the above, put your name on the **Next:** list so that I can check your work. The above must be completed, and your work checked, by the end of your registered lab section.

HOMEWORK #4

You are to work **individually** on this assignment.

PART 1: (30% of the HW #4 grade) Create a file **130hw4_part1.txt** on cs-server. Inside this file, write your **contracts** for all of your functions (AND auxiliary functions) for questions 1, 2, and 3 below (and for the bonus, if you are going to try it).

You must submit this file using ~st10/130submit (typed at the cs-server prompt, from the directory where your 130hw4_part1.txt file resides!!) by **12:00 noon** on **Wednesday, September 28th** to receive **any** credit for Part 1 of HW #4.

PART 2: (70% of the HW #4 grade) Finish problems **1** through **3** below (and the bonus, if you'd like). For this part, you must enter these functions using **funct_play1**, and test them using either **funct_play1** or **expr_play**.

When you are ready, you must submit all of your **.cpp** and **.h** files --- for all of your functions and auxiliary functions for questions 1-3 and the bonus --- using **~st10/130submit**. These must be submitted by **12:00 noon** on **Friday, September 30th** to receive **any** credit for Part 2 of HW #4.

REMEMBER: You are now REQUIRED to use the **program design recipe** for all functions, from here on out, and your functions need to each include the program design recipe elements (including contract, purpose, and specific examples).

1. (Adapted from www.htdp.org) Develop a function that takes the radii of two spheres, one of which is inside the other, and computes the volume in between the larger sphere and the smaller sphere. The volume of a sphere is given by the formula $A=(4 * pi * r^3)/3$. You should find that an auxiliary function would be of use here, and you should develop this auxiliary function, too.

When you are ready, you must use **funct_play1** to enter your design recipe elements and functions; use either **expr_play** or **funct_play1** to test all of your examples (and run any further tests you would like).

2. (Adapted from the HtDP Reading Packet) Develop the function **cyl_surf_area**. The function consumes the radius of the cylinder's base disk and its height. Its result is the **surface area** of the cylinder. Be sure to use auxiliary functions as appropriate.

(Consider: how can you find the surface area of the top and bottom of the cylinder? if you were to remove those bases, and made a vertical cut down the side of the cylinder, and "flattened" it out, what shape do you get?)

When you are ready, you must use **funct_play1** to enter your design recipe elements and functions; use either **expr_play** or **funct_play1** to test all of your examples (and run any further tests you would like).

3. (Adapted from www.htdp.org) Develop the function **total_cost**. This function consumes the selling price of a house and the amount of the down payment, then produces the grand total paid by the buyer at the end of the loan.

The following terms apply. The mortgage is financed for 30 years. The base interest rate is a **simple** 6.0% per year. Extra fees total $1000.

Here are some hints: we are talking about simple interest here, not compound interest; the principal is the difference between the selling price and the down payment; only the principal is used in calculating the interest; the total cost of the loan is the selling price plus the interest plus any fees.

You should find that some auxiliary functions would be of use here; you should develop

them as well.

When you are ready, you must use **funct_play1** to enter your design recipe elements and functions; use either **expr_play** or **funct_play1** to test all of your examples (and run any further tests you would like).

up to a 10 POINT BONUS - do a second version, **total_cost_c**, which produces the grand total paid by the buyer at the end of the loan if the interest is **compounded annually** (instead of being simple interest). You should certainly reuse any auxiliary functions from problem 3 if they can be used here!

When you are ready, you must use **funct_play1** to enter your design recipe elements and (new) functions; use either **expr_play** or **funct_play1** to test all of your (new functions') examples (and run any further tests you would like).

When you are ready --- but before the deadlines above ---be sure to submit your **130hw4_part1.txt** and all of your functions' and auxiliary functions' .h and .cpp files using **~st10/130submit**. Remember to **cd** to the directory where your files are before trying to call **~st10/130submit**! And also remember: you can submit improved versions of any file up until the deadline; I'll grade the latest version of each.