

CS 60

Programming Assignment #2

Due Date: April 15, 2010 (1:00 PM). 60 Points.

Remember: Points will be deducted if turned in after the Due Date.

Deadline: April 16, 2010 (1:00 PM)

Remember: No homework will be accepted after the Deadline

You must work on this assignment independently.

**TURN IN YOUR ASSIGNMENT USING THE TURNIN PROGRAM to
hw02@cs60 (SEE CLASS WEB PAGE)**

The Gonzalez Boat Company manufactures a line of custom-built pleasure craft. A buyer can choose his/her particular vessel by specifying combinations from the following list of characteristics:

- (a) Length can be from 15 to 75 feet, in increments of 1 foot.
- (b) Width can be from 5 to 25 feet, in increments of 1 foot.
- (c) Number of sleeping accommodations can be from 0 to 14.
- (d) Engine horsepower can be anyone of 10, 20, 50, 150, 250, 350, 500, or 1000.

The price of a Gonzalez boat is \$25 times the square of the length, plus \$150 for each berth, plus \$9 per unit horsepower. The tax is 8.5% of the sales price.

Some combinations of the specifications listed above would result in ludicrous boat designs; so certain constraints must be introduced. Specifically, the length of a boat must be at least three times, but no more than five times, its width. The horsepower can be no greater than 0.6 times the product of length and width. And the number of sleeping berths cannot exceed 1/100 of the length times the width. Should any of these constraints be violated, the customer is to receive the following notifications:

- the design request is too wide for its length,
- the design request is too narrow for its length,
- the design request is overpowered,
- too many sleeping accommodations requested for a boat of this size.

Also, if a customer specifies a design parameter outside the range of values given by (a) - (d), there should be a notification.

For this assignment you are to design and test a C program which could be used by the Gonzalez Boat Company to check for the acceptability of lists of design parameters submitted by its sales agents. It will also compute the total sales by each of the agents (before taxes), as well as the commission earned by each sales agent, the parts that need to be ordered to build the boats, and the total tax that was paid. The input for your program consists of lines of data with five integer values (assume the values are acceptable C integer values (`int`)). The first four values in each data line correspond to the length, width, sleeping accommodations

and engine horsepower. The fifth one is for the sales agent. There are only 5 sales agents identified by the integers 0 - 4. The five values in each line should be separated by a blank. Your program should read in an arbitrary number of these lines and should stop with a line with five zero values. Every time your program reads in a line, it should print the design parameters (properly identified) and the sales agent. Your program should print ALL the errors it finds (design parameters out of range, violation of design constraints, non-existent sales agent) in the order given in the bottom of page 4. Only for acceptable designs, compute and print the price (before taxes). Also print the commission and the tax. These acceptable designs are the valid sales made by the sales agents. At the end your program should print the total dollar sales for each sales agent (before taxes), the total commission earned by each agent, and the total dollar sales for the five agents (before taxes) as well as the total commission earned by the agents. It should also identify the sales agents with the largest dollar sales (before taxes). Note that there may be more than one. Your program should also print the total taxes paid. Your program should print at the end the total number of sleeping accommodations in all the acceptable designs as well as the total number of engines of the different horsepower needed for the acceptable designs. Your program should have meaningful comments. You should test your program with a file with at least 20 lines of designs parameters which you must turn in. You should use arrays to keep track of the total sales of the agents as well as the different engines that need to be ordered.

The calculation of the commission is as follows. For any valid design, let `price` be the price of the vessel corresponding to an acceptable design. The commission is computed by the following rules.

- For a vessel with price at most \$50,000, the commission is 2% of the `price`.
- For a vessel with price at most \$75,000 but more than \$50,000, the commission is 2% of \$50,000 plus 1.7% of (`price` - \$50,000).
- For a vessel with price at most \$100,000 but more than \$75,000, the commission is 2% of \$50,000 plus 1.7% of \$25,000, plus 1.6% of (`price` - \$75,000).
- For a vessel with price at most \$120,000 but more than \$100,000, the commission is 2% of \$50,000 plus 1.7% of \$25,000, plus 1.6% of \$25,000, plus 1.5% of (`price` - \$100,000).
- For a vessel with price at most \$130,000 but more than \$120,000, the commission is 2% of \$50,000 plus 1.7% of \$25,000, plus 1.6% of \$25,000 plus 1.5% of \$20,000 plus 1% of (`price` - \$120,000).
- For a vessel with price more than \$130,000, the commission is 2% of \$50,000 plus 1.7% of \$25,000, plus 1.6% of \$25,000 plus 1.5% of \$20,000 plus 1% of \$10,000, plus 0.5% of (`price` - \$130,000).

Below you will find a sample input file.

Input lines:

```
30 10 4 50 3
30 15 15 150 5
```

```
10 20 2 50 1
60 30 4 150 0
15 5 4 20 0
90 30 4 50 3
30 12 2 150 2
60 20 2 100 1
100 30 4 150 4
0 0 0 0 0
```

Below you will find a sample output. It **DOES NOT** correspond to the sample input. Your output must follow the same format.

```
Length          5
Width           5
Sleeping Accommodations  4
Engine horsepower  12
Sales Agent     10
```

```
    engine horsepower is out of range
    the design request is too wide for its length
    too many sleeping accommodations requested for a boat this size
    sales agent does not exist
```

```
Length          20
Width           5
Sleeping Accommodations  1
Engine horsepower  50
Sales Agent     4
```

```
Valid Design
Price of Vessel  10600.00
Tax              901.00
Commission       212.00
```

```
Length          60
Width           20
Sleeping Accommodations  12
Engine horsepower  500
Sales Agent     4
```

```
Valid Design
Price of Vessel  96300.00
Tax              8185.50
Commission       1765.80
```

...

Total Sales and Commissions

Agent	Dollar Amount	Commission
0	200000	1500.21
1	150000	1200.13
2	100000	800.22
3	300000	2010.33
4	300000	2050.00

Agents 3, 4, brought in the largest dollar amount

Total Sales 1050000.00

Total Commission 7560.89

Total Taxes 89250.00

Sleeping accommodations that need to be ordered

35

Engines to be ordered

Number	Engine horsepower
0	10
2	20
1	50
4	150
1	250
0	350
1	500
5	1000

The possible error lines (should be printed in this order) are:

length is out of range

width is out of range

number of sleeping accommodations is out of range

engine horsepower is out of range

the design request is too wide for its length,

the design request is too narrow for its length,

the design request is overpowered,

too many sleeping accommodations requested for a boat of this size.

sales agent does not exist