Shipping

Requirements: Write a MIPS assembly language program to help a delivery company find the appropriate postage cost to ship packages. The program will first prompt the user to enter information about the package and preferred shipping speed. The program will then ask a nested series of if- questions to determine the appropriate postage charge.

Keyboard Input of Package Information The program will first prompt the user to enter an integer between 1 and 8000 inclusive for the package volume in cubic inches. If the user enters a value out of range repeat the prompt message and integer input until a valid value is entered. Next prompt the user to enter an integer for the package weight in pounds between 1 and 100 inclusive. If the user enters a value out of range repeat the prompt message and integer input until a valid value is entered.

Keyboard Input of Preferred Shipping Speed After entering the values for the package, print a menu of available shipping speeds, and read in the user's choice as an integer value. Display the following menu.

```
1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3:
```

If the user enters a choice less than 1 OR greater than 3 repeat the menu, prompt, and integer input of shipping speed until a valid choice is made.

Calculate Shipping Cost The shipping cost will be calculated based on the volume of the package, weight of package, and the selected shipping speed represented by the menu selection integer value of 1, 2, or 3.

Ground shipping

Package volume	Package weight	Cost
Up to 1000 cubic inches	AND Up to 60 pounds	$8
Up to 8000 cubic inches	AND Up to 100 pounds	$12

Super saver air shipping

Package volume	Package weight	Cost
Up to 1000 cubic inches	AND Up to 40 pounds	$12
Up to 8000 cubic inches	AND Up to 100 pounds	$16

Next day shipping

Package volume	Package weight	Cost
Up to 1000 cubic inches	AND Up to 30 pounds	$15
Up to 8000 cubic inches	AND Up to 100 pounds	$25

Assume that all categories are inclusive so for example interpret up to 50 pounds as <= 50.

Print Out of Shipping Invoice After finding the shipping cost, the program will print an invoice. Print out the package volume, weight, selected shipping speed, and the cost.

Ship Another Package? After printing the invoice prompt the user to enter 1 to repeat

and ship another package or 0 to quit.

Use of Boolean Logic and Branches The input validation loops will require a logical OR while the package weight calculations will use the logical AND. Throughout the program you must utilize the test-and-set instructions, unconditional branch, and conditional branch. Each if or loop does not require you to use ALL of these operators. Just pick the most appropriate instructions to implement each part.

Grading Criteria

Keyboard input of package information and shipping speed	10%
Printed prompt and menu messages	10%
Loops to re-do prompts and input for invalid entries	20%
if-else statements to decide shipping cost	20%
Print out of summarized shipping bill	15%
Loop and prompts to repeat shipping for another package	10%
Comments, pledged statement, good coding style	15%

Testing your Program Be sure to test your program by entering a variety of different package volume, weight, and shipping speed choices so that you know that your program will work correctly for any valid user input.

Comment your Program While you do not have to comment every line, you may find it helpful to do so. Certainly if you want help debugging this program, you must comment everything. The only way to know easily where you are going wrong is to make sure the comment (what you meant to do) matches the code (what you actually did) Everyone's logic is a bit different.

Deliverables Upload 2 files to Brightspace : a single MIPS assembly source file named Shipping.asm and the text file described below.

Capture and print 9 complete runs as follows:

1. For the first run, use numbers outside of the valid range for each input before giving the program a valid value.
2. For each valid shipping speed, use appropriate test data sets so that EACH possible shipping cost is used. That will be 3 data sets per shipping speed.
   (a) One run with the lower levels of both size and weight, prove that invalid inputs work for both size and weight before giving valid values.
   (b) One run where the size qualifies for the lower cost, but the weight puts the cost in the upper level (e.g. 800 cubic inches, 80 lbs, ground shipping),
   (c) One where the both the size and weight are in the upper level.
3. For Extra Credit(10 pts): After the base program is working perfectly, add logic to count the number of each type of package and the total collected for the day. Display that information after the "ask the user loop" exits.

Please copy and past to notepad and set the font to 10pt leave the font face Courier New!!

The following pages show three different sample runs of the program along with some testing. Please use a welcome message with YOUR name in it so that your name is on your output.

Sample Program Run

```
Welcome to Applin Shipping

Please enter package volume in cubic inches between 1 and 8000: 0

Please enter package volume in cubic inches between 1 and 8000: 8001

Please enter package volume in cubic inches between 1 and 8000: 999

Please enter package weight in pounds between 1 and 100: 0

Please enter package weight in pounds between 1 and 100: 101

Please enter package weight in pounds between 1 and 100: 59

1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3: 0

1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3: 4

1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3: 1

Shipping Invoice
Package volume in cubic inches: 999
Package weight in pounds: 59
Ship via:  Ground
Cost $8

Do you want to ship another package? Enter 1 for Yes or 0 for No:
3
Do you want to ship another package? Enter 1 for Yes or 0 for No:
1
Welcome to Applin Shipping

Please enter package volume in cubic inches between 1 and 8000: 1000

Please enter package weight in pounds between 1 and 100: 60
```

```
1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3: 1

Shipping Invoice
Package volume in cubic inches: 1000
Package weight in pounds: 60
Ship via:  Ground
Cost $8

Do you want to ship another package? Enter 1 for Yes or 0 for No: 1

Welcome to Applin Shipping

Please enter package volume in cubic inches between 1 and 8000: 1001

Please enter package weight in pounds between 1 and 100: 60

1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3: 1

Shipping Invoice
Package volume in cubic inches: 1001
Package weight in pounds: 60
Ship via:  Ground
Cost $12

Do you want to ship another package? Enter 1 for Yes or 0 for No: 1

Welcome to Applin Shipping

Please enter package volume in cubic inches between 1 and 8000: 1000

Please enter package weight in pounds between 1 and 100: 61

1) Ground 5-10 business days
2) Super saver air 2-4 business days
3) Next day air
Please select your shipping speed. Enter 1, 2, or 3: 1

Shipping Invoice
Package volume in cubic inches: 1000
Package weight in pounds: 61
Ship via:  Ground
```

```
Cost $12

Do you want to ship another package? Enter 1 for Yes or 0 for No: 0
Goodbye.
```

Here are the input data sets for a full testing run of 12 packages. The first set (Package 1) tests the validation loops for all 3 inputs for a package. The other 11 test packages test the logic for each set of 3 inputs.

```
Package 1 test all limits:
0
8001
999

0
101
59

0
4
1
Package 2:
1000
60
1
Package 3:
1001
60
1
Package 4:
1000
61
1
Package 5:
999
39
2
Package 6:
1000
40
2
Package 7:
1001
40
2
Package 8:
1000
```

```
41
2
Package 9:
999
29
3
Package 10:
1000
30
3
Package 11:
1001
30
3
Package 12:
1000
31
3
```

Select ([CTRL]+[A]) the output to the console. Copy it [CTRL]+[C], and then paste it into a TEXT document. I will run some tests to make sure that your output matches the output you hand in. The results of the output will verify that your code does what it is supposed to do.