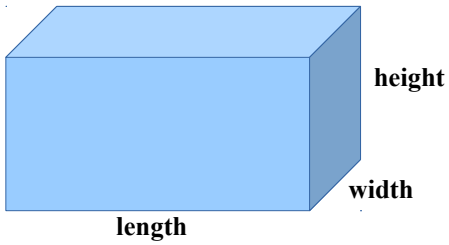
CS 218
Homework, MIPS Asst. #2

Purpose:	Become familiar with RISC Architecture concepts, the MIPS Architecture, and SPIM (the MIPS simulator).
Due:	Thursday (4/18)
Points:	45

Assignment:

Write a MIPS assembly language program to calculate the volume for each rectangular prism[1] in a series of rectangular prism's. Once the volumes are computed, the program should find the minimum, maximum, estimated median, sum, and average for the volumes array.



Below are the formulas to calculate the volume of a rectangular prism is:

$$volumes[n] = lengths[n] \times widths[n] \times heights[n]$$

After volumes have been calculated, the program should find the minimum, estimated median, maximum, sum, and average. Since the list is not sorted, we will estimate the median value as follows. For an odd length list, the estimated median is computed by summing the first, last, and middle value and dividing by 3. For an even length list, the estimated median is computed by summing the first, last, and two middle values and dividing by 4. *Note*, include the code for both even and odd lengths and do not hard code the length.

The program must display the results to the console window with 8 numbers per line (with two spaces between each number). The output should look something like the following (with the correct answers displayed):

```
MIPS Assignment #2
  Rectangular Prism Volumes Program:
  Also finds minimum, middle value, maximum, sum, and average for the volumes.

  9163848  10315872  9719740  18176292  8339760  13470275  15410688  10133466
  9520200  12099472  9543285  19373172  11992050  13301604  10657332  9286875
  ?????  ?????  ?????  ?????  ?????  ?????  ??????
  ?????  ?????  ?????  ?????  ?????  ?????  ??????
  ?????  ?????  ?????  ?????  ?????  ?????  ??????
    [display all numbers...]

Volumes Minimum     = ?
Volumes Est. Median = ?
Volumes Maximum     = ?
Volumes Sum         = ?
Volumes Average     = ?
```

1 For more information, refer to: https://www.mathsisfun.com/definitions/rectangular-prism.html

Submission:
When complete, submit:

- A copy of the **source file** via the class web page before class time.

Assignments received after that time will not be accepted! Do not submit a hard-copy.

MIPS Assignment #2 – Data Declarations
Use the following data declarations:

```
lengths:   .word       327,   344,   310,   372,   324,   325,   316,   362,   328,   392
           .word       317,   314,   315,   372,   324,   325,   316,   362,   338,   392
           .word       321,   383,   333,   330,   337,   342,   335,   358,   323,   335
           .word       327,   326,   326,   327,   227,   357,   387,   399,   311,   323
           .word       324,   325,   326,   375,   394,   349,   326,   362,   331,   327
           .word       377,   399,   397,   375,   314,   364,   341,   342,   373,   366
           .word       304,   346,   323,   356,   363,   321,   318,   377,   343,   378
           .word       312,   311,   310,   335,   310,   377,   399,   377,   375,   314
           .word       394,   324,   312,   343,   376,   334,   326,   332,   356,   363
           .word       324,   319,   322,   383,   310,   391,   392,   329,   329,   322

widths:    .word       226,   252,   257,   267,   234,   217,   254,   217,   225,   253
           .word       223,   273,   235,   261,   259,   225,   224,   263,   247,   223
           .word       234,   234,   256,   264,   242,   233,   214,   273,   231,   255
           .word       264,   273,   274,   223,   256,   244,   252,   231,   242,   256
           .word       255,   224,   236,   275,   246,   253,   223,   253,   267,   235
           .word       254,   229,   264,   267,   234,   256,   253,   264,   253,   265
           .word       236,   252,   232,   231,   246,   250,   254,   278,   288,   292
           .word       282,   295,   247,   252,   257,   257,   267,   279,   288,   294
           .word       234,   252,   274,   286,   297,   244,   276,   242,   236,   253
           .word       232,   251,   236,   287,   290,   220,   241,   223,   232,   245

heights:   .word       124,   119,   122,   183,   110 ,   191,   192,   129,   129,   122
           .word       135,   226,   162,   137,   127 ,   127,   159,   177,   175,   144
           .word       179,   153,   136,   140,   235 ,   117,   114,   115,   172,   124
           .word       125,   116,   162,   138,   192 ,   111,   183,   133,   130,   127
           .word       111,   115,   158,   113,   115 ,   117,   126,   116,   117,   227
           .word       177,   199,   177,   175,   114 ,   194,   124,   112,   143,   176
           .word       134,   126,   132,   156,   163 ,   112,   154,   128,   113,   132
           .word       161,   192,   151,   213,   126 ,   269,   114,   122,   115,   131
           .word       194,   124,   114,   143,   176 ,   134,   126,   122,   156,   163
           .word       149,   144,   114,   134,   167 ,   143,   129,   161,   165,   136

len:       .word      100

volumes:   .space     400

vMin:      .word      0
vMid:      .word      0
vMax:      .word      0
vSum:      .word      0
vAve:      .word      0
```

Note, the **`.space 400`** directive reserves 400 bytes which will store 100 words.