



Building Programs

- Exercises
- Homework

Exercises and Homework

Exercise #1, pg 115.

For each of the following situations, answer these questions:

- a. Do you know in advance how many times the loop must repeat?
 - b. What is the loop control variable?
 - c. What should be the loop repetition condition?
 - d. What statements will initialize and update the loop control variable?
1. Write a program to compute the final volume V_2 (in liters) to which one mole of an ideal gas at absolute temperature T and initial volume V_1 must be isothermally expanded in order to perform a given amount of work W (in joules). Your program should repeatedly prompt the user to enter W , V_1 , and T until a W of zero is entered. The formula for V_2 is

$$V_2 = V_1 e^{(W/nRT)}$$

where R is the universal gas constant (8.31451 J/mol · K) and n is the number of moles.

Variables: **vol1, vol2, work, kTemp**

Constant: **R**

Exercises and Homework

- Exercise #3, page 115.

$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots$$

- Using the infinite series described in Question 2, write a program that asks the user how close to π an approximation needs to be (**MaxError**). Then add up terms of the series and calculate the associated approximations until two successive approximations differ by less than **MaxError**.

Variables: `ct`, `seriesSum`, `newApprox`, `prevApprox`,
`diffApprox`, `MaxError`

Exercises and Homework

- Exercise: How does one calculate the maximum (minimum) of a list of numbers in a file?
- -2 -4 5 2 1 -6 3 0 1 5 2 5 ...
- What variables do we need?
- Describe the basic actions in words
- Describe each of the subactions

Exercises and Homework

1. Manufacturing engineers use three principal measures of the roughness of the surface of an object. All are based on measurements at evenly spaced intervals along the surface, as diagrammed here, and labeled a, b, c, . . .

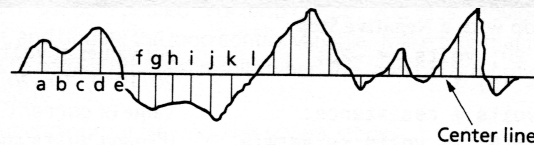


Figure from Serope Kalpakjian, *Manufacturing Engineering and Technology*, 3rd ed. (Reading, Mass.: Addison-Wesley, 1995), p. 962.

Values above the centerline are positive; values below are negative. The three roughness indicators are:

Arithmetic mean value (R_a):

$$R_a = \frac{|a| + |b| + |c| + \dots}{n}$$

Root-mean-square average (R_q):

$$R_q = \sqrt{\frac{a^2 + b^2 + c^2 + \dots}{n}}$$

Maximum roughness height:

height from level of deepest trough to highest peak

Write a program that takes surface measurements from the file `surface.txt` and computes and displays these three surface roughness indicators.

Sample file `surface.txt`

```
-4.1 -2.2 -0.5 1.2 3.3 4.6 5.1 2.1 0.2 -3.6 -4.1 0.2 0.5 2.2 4.1
-0.2 -1.2 -3.3 -4.6 -5.0 -2.2 -1.1 0.8 3.2 -0.1 -4.8
```

Exercises and Homework

- Exercise #1, #3, page 115.
- Exercise: How does one calculate the maximum (minimum) of a list of numbers in a file?
- Program 1, page 149, due 10-8 before class.
Hand in: email to ruttan@cs.kent.edu with the subject: 10061 Submission Homework 2
 - fabs(x) calculates the absolute value of the variable x
 - sqrt(x) calculates the square root of the variable x