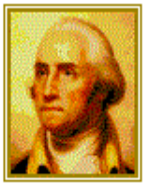

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON DC

Project 1: Asymptotic Analysis – Time Complexity

Project Options

What is the time complexity of this algorithm, in terms of n?

Option	Question	Option	Question

0	`int j = 2`
	`while (j < n) {`
	`  int k = j`
	`  while (k < n) {`
	`  Sum += a[j]*b[k]`
	`  k = k * k`
	`  }`
	`  j = 2 * j`
	`}`
		5	`int j = 5`
			`while (j < n/2) {`
			`  int k = 5`
			`  while (k < n) {`
			`  Sum += a[j]*b[k]`
			`  k = k * sqrt(2)`
			`  }`
			`  j = sqrt(3) * j`
			`}`

1	`for (int i = 1 to n) {`
	`  for (int j = i to n) {`
	`  for (int k = j to n) {`
	`  Sum += a[i]*b[j]*c[k]`
	`  }`
	`  If (gcd(i,j) == 1) {`
	`  j = n`
	`  }`
	`  }`
	`}`
		6	`int j = 2`
			`while (j < n) {`
			`  int k = j`
			`  while (k < n) {`
			`  Sum += a[k]*b[k]`
			`  k += n^1/3 log n`
			`  }`
			`  j = 2*j`
			`}`

2	`int j = 2`
	`while (j < n) {`
	`  k = 2`
	`  while (k < n) {`
	`  Sum += a[k]*b[k]`
	`  k = k * sqrt(k)`
	`  }`
	`  j += j/2`
	`}`
		7	`for (int i = 1 to n) {`
			`  for (int j = i to n) {`
			`  for (int k = j*j to n) {`
			`  Sum += a[i]*b[j]*c[k]`
			`  }`
			`  }`
			`}`

3	`for (int i = 1 to n) {`
	`  for (int j = i to n) {`
	`  for (int k = j to n) {`
	`  Sum += a[i]*b[j]*c[k]`
	`  }`
	`  If (j == 2*i) {`
	`  j = n`
	`  }`
	`  }`
	`}`
		8	`int j = 5`
			`while (j < log n) {`
			`  int k = 5`
			`  while (k < n) {`
			`  Sum += a[j]*b[k]`
			`  k = k^1.5`
			`  }`
			`  j = 1.2 * j`
			`}`

4	`for (int i = 1 to n) {`
	`  j = i`
	`  while (j < n) {`
	`  k = j`
	`  while (k < n) {`
	`  Sum += a[i]*b[j]*c[k]`
	`  k += log log n`
	`  }`
	`  j += log (j+10)`
	`  }`
	`}`
		9	`j = 2`
			`while (j < n) {`
			`  k = j`
			`  while (k < n) {`
			`  Sum += a[k]*b[k]`
			`  k = k * k`
			`  }`
			`  j += log k`
			`}`

CS6212 – Arora – Project 1

Assignment

You have to do just one of the problems from above. The last digit of your GWID determines the Option Number. For example, if your GWID ends in 2, then you do option 2.

What you need to do

1. Analyze the question (without using computer) and come up with time complexity
2. Explain your analysis
3. Create a program to include and run the code for different values of n. (You will have to play with different values of n that make sense for your question.)
    a. Document time taken for different values of n
4. Draw a graph of theoretical results (from Step 1) and experimental results (Step 2 b) to compare. You may have to change the scale (log scale, etc) to get straight lines. If the plots are curves, we cannot easily compare them.

These steps are also explained in the Asymptotic Analysis Worksheet.

Submission

1. Submit 1-2 pages (that can be printed into one page, front and back).
2. Please include your name.
3. Write-up your answers (in terms of n), theoretical results, experimental results, analysis, explanations and comparisons et al. in a document.
4. Do not submit code, but keep it ready to show the TA/Professor when asked.
5. Submit via BB, PDF only. No Word document, no RTF, etc. Don't email etc.

Example Submission

Example submission is available at the course site: https://www.notexponential.com/notes/wp-content/uploads/2022/08/SampleSubmissionStructure.pdf