

Feedback — Analysis of Algorithms

You submitted this quiz on **Thu 18 Feb 2016 2:31 PM PST**. You got a score of **3.00** out of **3.00**.

To specify an array or sequence of values in an answer, separate the values in the sequence by whitespace. For example, if the question asks for the first ten powers of two (starting at 1), then the following answer is acceptable:

```
1 2 4 8 16 32 64 128 256 512
```

If you wish to discuss a particular question and answer in the forums, please post the entire question and answer, including the seed (which can be used by the course staff to uniquely identify the question) and the explanation (which contains the correct answer).

Question 1

(seed = 664261)

Suppose that you time a program as a function of N and produce the following table.

N	seconds
512	0.000
1024	0.002
2048	0.008
4096	0.036
8192	0.156
16384	0.683
32768	2.992
65536	13.176
131072	57.740
262144	253.902
524288	1113.802

Estimate the order of growth of the running time as a function of N . Assume that the running time obeys a power law $T(N) \sim a N^b$. For your answer, enter the constant b . Your answer will be marked as correct if it is within 1% of the target answer - we recommend using two digits after the decimal separator, e.g., 2.34.

You entered:

2.14

Your Answer		Score	Explanation
2.14	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

The theoretical order-of-growth is $N^{(32/15)} = 2.13$

The empirical order-of-growth is $N^{(\log_2 \text{ ratio})}$

N	seconds	ratio	\log_2 ratio

512	0.000	-	-
1024	0.002	-	-
2048	0.008	4.00	2.00
4096	0.036	4.50	2.17
8192	0.156	4.33	2.12
16384	0.683	4.38	2.13
32768	2.992	4.38	2.13
65536	13.176	4.40	2.14
131072	57.740	4.38	2.13
262144	253.902	4.40	2.14
524288	1113.802	4.39	2.13

Question 2

(seed = 321601)

What is the order of growth of the worst case running time of the following code fragment as a function of N?

```
int sum = 0;
for (int i = 1; i <= N*N; i++)
    for (int j = 1; j <= i; j++)
        sum++;
```

Your Answer	Score	Explanation
<input type="radio"/> 1		
<input type="radio"/> log N		
<input type="radio"/> $N^{(1/2)}$		
<input type="radio"/> N		
<input type="radio"/> N log N		

☐

$N^{(3/2)}$

☐

N^2

☐

$N^2 \log N$

☐

$N^{(5/2)}$

☐

N^3

☒

N^4



1.00

☐

N^5

☐

N^6

☐

N^7

Total

1.00 / 1.00

Question Explanation

The answer is : N^4

The body of the innermost loop executes $1 + 2 + 3 + 4 + \dots + N^2 \sim 1/2 N^4$ times.

Question 3

(seed = 654703)

Given the following definition of a MysteryBox object:

```
public class MysteryBox {  
    private final long x0, x1, x2, x3;  
    private final boolean y0, y1;  
    private final double z0;  
    private final int[] a = new int[288];  
  
    ...  
}
```

Using the 64-bit memory cost model from lecture, how many bytes does each object of type MysteryBox use? Include all memory allocated when the client calls `new MysteryBox()`.

