Guidelines for preparing Questions and Answers

"Questions and Answers" (Q&As)

One topic of class meetings for COS 488 is to develop good questions for future exams.

Properties of a good exam question.

- Easy to understand.
- Easy to grade.
- Solvable in 10 minutes or less (but not trivial).
- Tests understanding of an important topic.
- "Fair" (no tricks)
- Teaches something (optional but desirable)

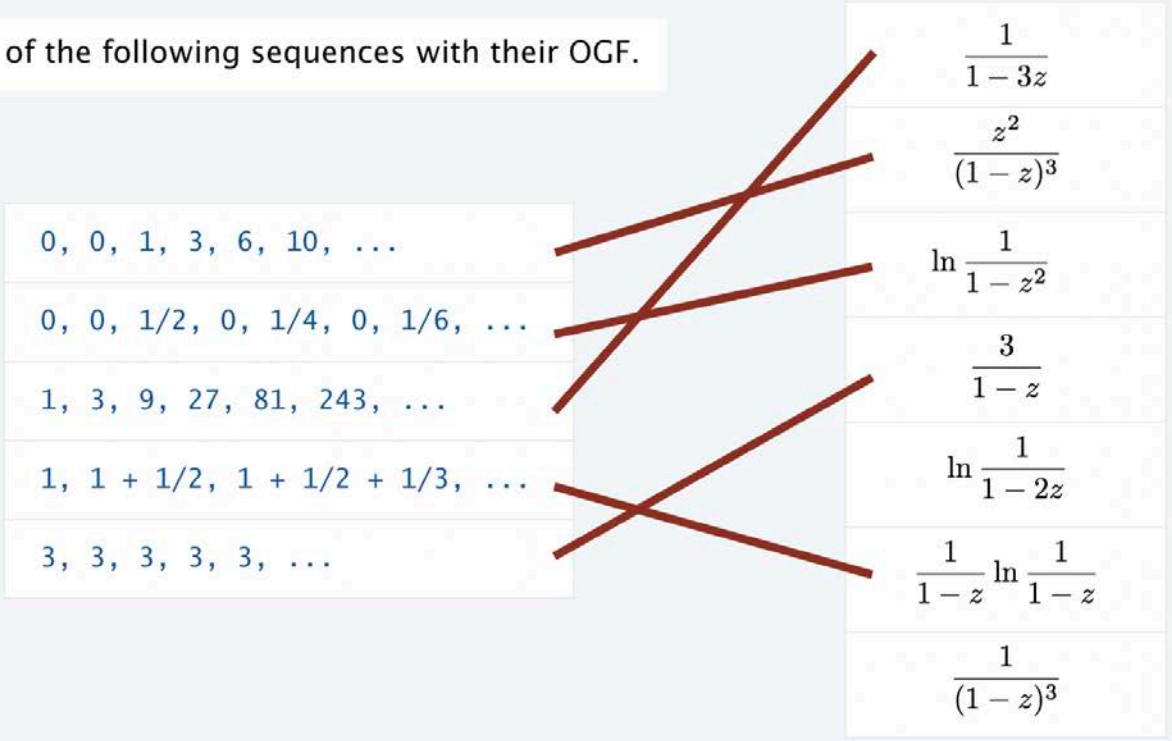
Your grade will be based on these criteria!

For examples, see Q&A from *Analysis of Algorithms* (selected examples to follow).

Easy to understand

AofA GFs Q&A 1

Q. Match each of the following sequences with their OGF.



Easy to grade

AofA GFs Q&A 2

Q. Suppose that a_n satisfies $a_n = 9a_{n-1} - 20a_{n-2}$ for $n > 1$ with $a_0 = 0$ and $a_1 = 1$

What is $\lim_{n\to\infty} a_n/a_{n+1}$?

A. **5**

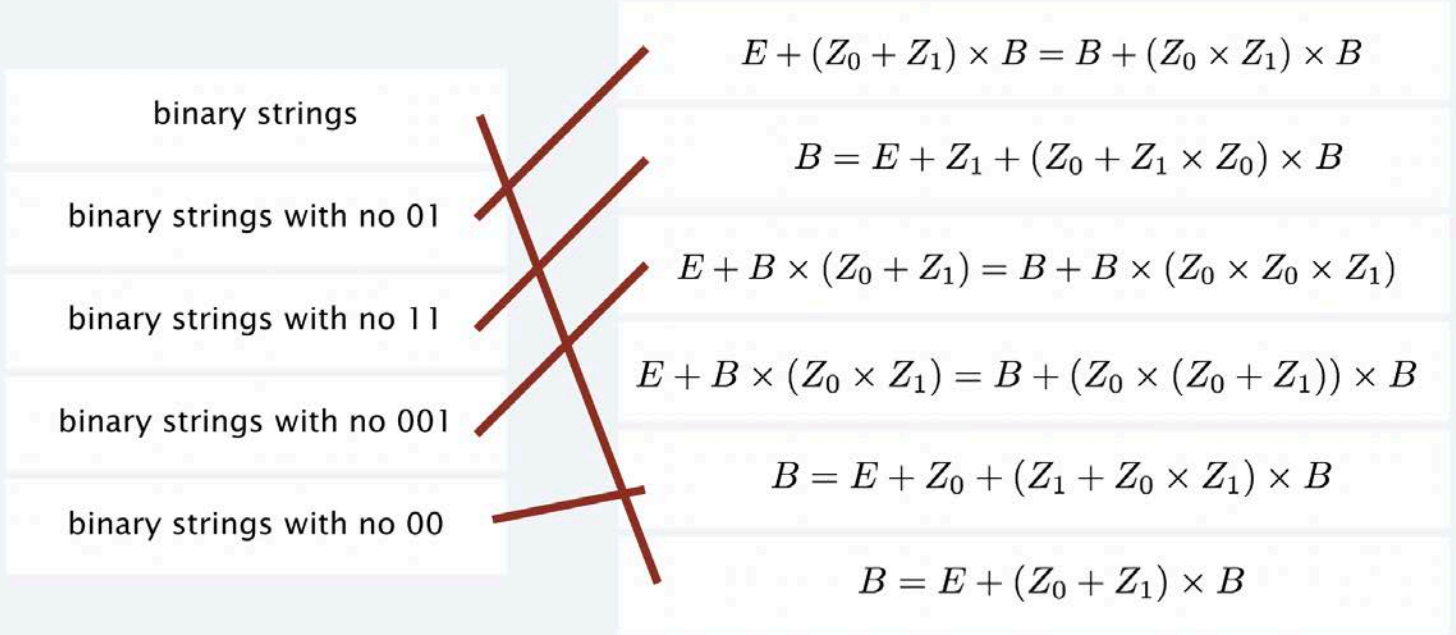
$$a(z) = \frac{z}{1 - 9z + 20z^2} = \frac{z}{(1-4z)(1-5z)} = \frac{1}{1-5z} - \frac{1}{1-4z}$$

$$a_n = 5^n - 4^n$$

Solvable in 10 minutes or less (but not trivial)

AofA Analytic Combinatorics Q&A 1 (improved version)

Q. Match each combinatorial class with a construction.

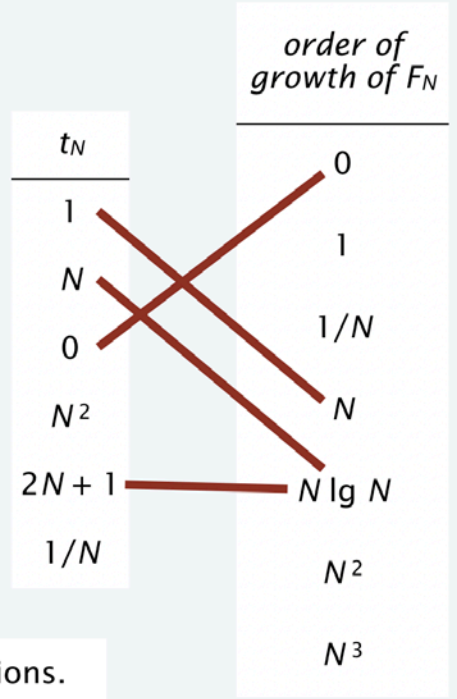


Tests understanding of an important topic

AofA Intro Q&A 1

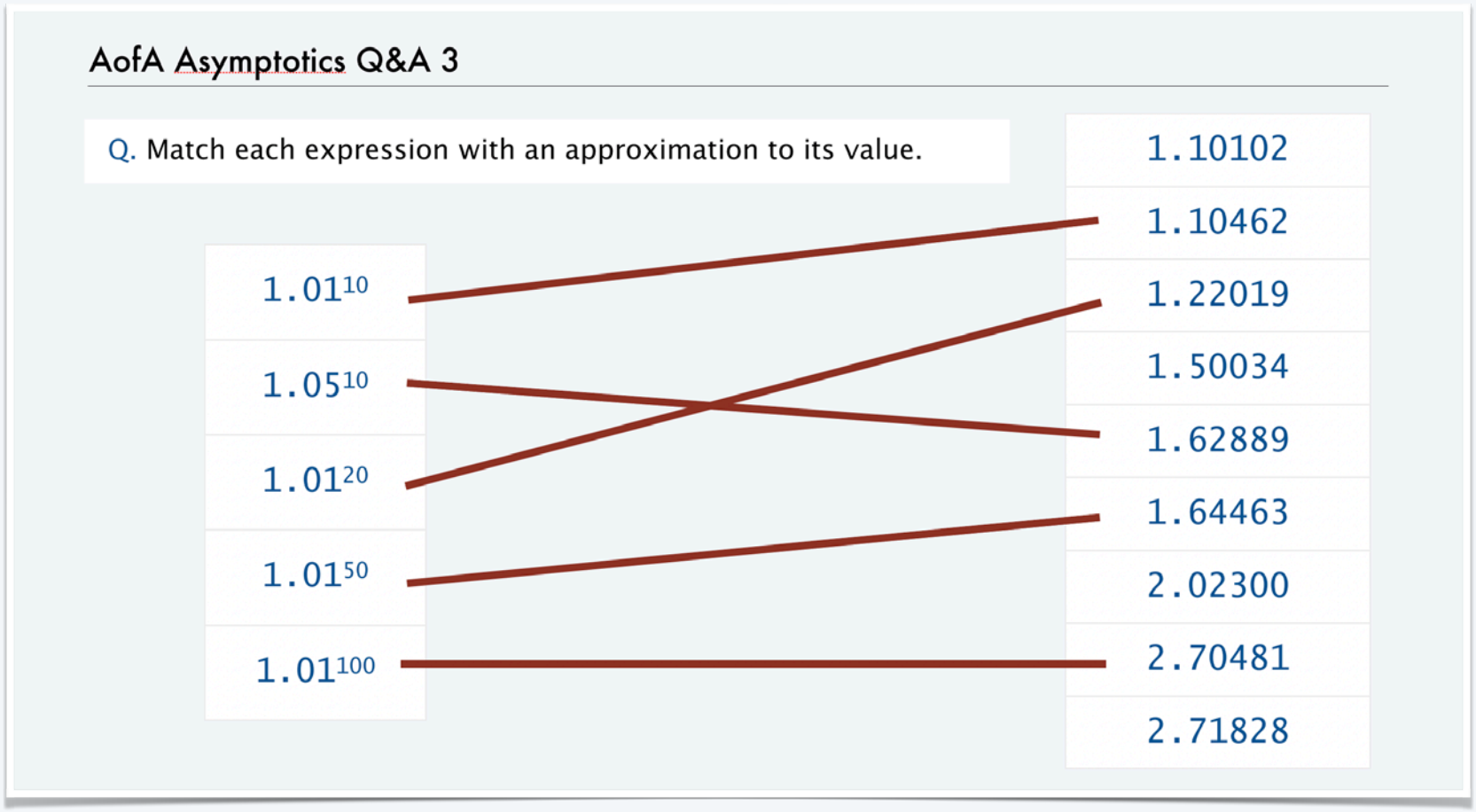
Q. Match each "toll function" at left with the order of growth of the solution at right for the Quicksort recurrence

$$F_N = t_N + \frac{1}{N} \sum_{1 \le k \le N} (F_{k-1} + F_{N-k}) \quad \text{with} \quad F_0 = 0$$



Note. We try hard to avoid answers that depend on detailed calculations.

"Fair" (no tricks)



Teaches something

AofA GFs Q&A 3

Q. Fill the circle corresponding to the value of

$$[z^n] \sum_{0 \le k \le n} \binom{2k}{k} \binom{2n-2k}{n-k}$$

and justify your answer.

○ 2^n ● 4^n ○ $2^{n/2}$

It is $[z^n]\left(\frac{1}{\sqrt{1-4z}}\right)^2$

Summary of guidelines for preparing Questions and Answers

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Suggestion. Iterate with a partner (or yourself).