



## [0] Instructions

Please supply your responses in an email to <mailto:ellel@elle-investments.com>. Include each question with your answer. Also, make sure to attach your resume and cover letter.

## [1] Basic Information

1. First name, last name, residential address
2. Email address and phone #
3. Highest level of formal education
4. List colleges/universities attended, areas of study, and degrees obtained
5. College grade point average (GPA) & grading system
6. **(Analysts Only)** Skills desired. List & explain your skills, coursework and experience with any of the following:
  - Financial Statements (P&L, BS, Cash Flow)
  - Business Valuation, DCF
  - Stocks & Investing
  - SEC filings
  - Accounting rules and bookkeeping
  - Excel
7. **(Programmers Only)** Skills. List & explain your familiarity and proficiency with the following tools:
  - Complete familiarity with Windows and/or Mac OS;
  - MySQL
  - Excel & VBA
  - Object Oriented Programming (Java, C++, ..)
  - Web development HTML, PHP, CSS, etc.
  - use IDEs such as NetBeans and collaborative environments such as GitHub.

## [2] Programming Logic

Consider the function below written in an unknown language. The questions below will refer to this function. Assume that this programming language has the following characteristics:

1. It uses zero based indexing of arrays (so 0 is the location of an array's first item).
2. The function size() is used to get the number of elements in an array.
3. Code crashes if you access an element of an array that doesn't exist.
4. In functions, it passes arrays by reference, not value.
5. Variable types do not need to be explicitly specified, but the variable ara is an array.

1 function cyk(ara):

```

2 i=0
3 s = ara[0]
4 while i < size(ara):
5   ara[i] = ara[i+1]
6   i=i+1
7 if size(ara) > 1: ara[size(ara)-1] = s
8 return ara

```

1. Which of the following statements best describes the purpose of the function `cyk()`?

- a) It rearranges the order of the elements in `ara`.
- b) It reverses the elements in `ara`.
- c) If `ara` has `n` elements, it moves the element in position 0 to position `n-1`, the element in position 1 to position 0, the element in position 2 to position 1, etc.
- d) If `ara` has `n` elements, it moves the element in position `n-1` to position 0, the element in position `n-2` to position `n-1`, the element in position `n-3` to position `n-2`, etc.
- e) If `ara` has `n` elements, it swaps the element in position 0 with the element in position `n-1`, swaps the element in position 1 with the element in position `n-2`, etc.

2. If this function `cyk()`, implemented as above, were applied to the array `ara=[1,3,2,4]`, then:

- a) The code would crash
- b) It would return `[]`
- c) It would return `[4,1,3,2]`
- d) It would return `[3,2,4,1]`
- e) It would return `[4,2,3,1]`
- f) It would return `[2,3,1,4]`

### [3] Programming (optional for analysts - but good for extra consideration)

Suppose there are about 500 records with a unique ID between 1-1000 (so there are gaps in the number sequence). We wish to renumber these records in sequence so that the IDs are as small as possible - with the caveat that some of the records are "locked" and their ID cannot be changed. Write pseudocode to do this task "efficiently" (e.g sample input: records numbered 2, 4, . . . 1000. Records 100, 200, 300, etc. are locked).

### [4] Logic

1. There are 4 shut doors in front of you. You know that each door has an animal painted on one side and a plant painted on the other side. The four doors have the following painted on the sides that you can see (one per door): a lily, a pine tree, a fox, and an eagle. You have been told that these doors satisfy the rule "if a door has a flower on its plant side, then it has a bird on its animal side". Which is the smallest set of doors that you must check the hidden side of to determine conclusively whether this rule is true or false for these doors?

2. Suppose that in a group of people you find that `X` percent of people in the group have heights that are greater than the average (that is, the mean) height in that group. Which of the following is a true statement about `X`?

- a) `X` can be any percentage.
- b) `X` cannot be bigger than 25%.
- c) `X` can be bigger than 25% but cannot be bigger than 50%.
- d) `X` can be bigger than 50% but cannot be as high as 99.9%.
- e) `X` can be bigger than 99.9% but cannot be equal to 100%.

3. Suppose that you are at a casino playing roulette. The strategy you are using is to, before each bet, flip a coin to determine whether to place your bet on red or on black (which, according to the rules of the game, should each have almost a 50% chance of occurring). After you've placed each bet, the roulette wheel is then spun. Suppose that you lose 59 times in a row (i.e. for 59 consecutive plays, when you place your bet on black the ball then lands on red, and when you place your bet on red the ball then lands on black). From this experience, it is most rational to conclude that:

- a) Using a coin toss to determine whether to bet on red or black is in general a very bad strategy for playing roulette
- b) The game is somehow rigged against you and the casino or its employees are cheating you
- c) You are very likely to win on your next bet if you continue this coin flip based strategy
- d) The roulette game is broken, but there is no reason to assume that it was broken intentionally
- e) You were merely very unlucky
- f) One cannot reasonably conclude which of the above options is more likely

4. Suppose that you have an enormous grapefruit that is 92% water (by weight). The grapefruit weighs 100 pounds. If the water content of the grapefruit evaporates until it is 90% water (by weight), then approximately how much does the grapefruit now weigh?

- a) 92 pounds   b) 90 pounds   c) 82pounds   d) 80 pounds   e) 72 pounds   f) 70 pounds

## [5] Risk

Consider a purely probabilistic game that you have the opportunity to play. Each time you play there are  $n$  potential known outcomes  $x_1, x_2, \dots, x_n$  (each of which is a specified gain or loss of dollars according to whether  $x_i$  is positive or negative). These outcomes  $x_1, x_2, \dots, x_n$  occur with the known probabilities  $p_1, p_2, \dots, p_n$  respectively (where  $p_1 + p_2 + \dots + p_n = 1.0$  and  $0 \leq p_i \leq 1$  for each  $i$ ).

Furthermore, assume that each play of the game takes up one hour of your time, and that only you can play the game (you can't hire someone to play for you).

Let  $E$  be the game's expected value and  $S$  be the game's standard deviation.

- 1. In the real world, should a rational player always play this game whenever the expected value  $E$  is not negative? Why or why not?
- 2. Does the standard deviation  $S$  do a good job of capturing how risky this game is? Why or why not?
- 3. If YOU PERSONALLY had to decide whether or not to play this game, how would you decide?

## [6] Quick Business Analysis (Analysts Only)

For the following company, (ATHX) How much cash do they have on hand? Will they need to raise cash in the next year and if so when and how much? The analysis needs not be thorough or complete – just get the data and explain what you would look at.

**[7] Accounting (Analysts Only)** What is the difference between a business expense, an asset acquisition, and a payment? Give a simple example of each showing how they would be reported on the income statement or balance sheet.

## **[8] Valuation (Analysts Only)**

For the current year, company XYZ earned EBITDA of \$350M. Their depreciation/amortization expense was \$125M, interest expense was \$75M, and tax rate was 21%. Their current market cap is \$1,350M.

For the following year, company XYZ has given EBITDA guidance of \$550M. Their depreciation/amortization expense, interest expense, and tax rate will remain the same.

1. Show your steps in calculating net income for the current year and the trailing P/E ratio.
2. Show your steps in calculating net income for the following year and the forward P/E ratio.
3. What rate of return does the forward P/E ratio from question 2 correspond to?
4. A few items from company ABC's current balance sheet are shown below. Project the balance sheet 12 months from now assuming the following: FCF will be zero for the next 12 months, their long-term debt does not mature for another 5 years, their annual depreciation and amortization expense is \$125M, and they utilize the straight-line method of depreciation.

### ASSETS

Cash	\$300M
Property, plant, and equipment	\$1,000M
Accumulated depreciation, depletion, and amortization	\$250M
Net property, plant, and equipment	\$750M

### LIABILITIES

Current maturities of long-term debt	\$200M
Long-term debt (net of current maturities)	\$600M

## **[9] Other**

1. Suggest a question that might be added to this questionnaire that would be helpful in evaluating candidates (either analysts, programmers, or both) and explain why. Also supply the correct answer and if this is a multiple-choice question, a list of possible answers.
2. If you feel that any of the questions in this questionnaire are unreasonable, ambiguous or poorly worded, please tell us which ones. We appreciate your feedback, but this is entirely optional.