

Quantitative Assessment Quiz Solutions & Scoring Guidelines

Overview

Below are the answers, solution methods, and scoring guidelines for the *FastMath Ace the Case Quantitative Assessment Quiz*. A major focus of the [FastMath Ace the Case Online Course](#) is to teach **fast** and **efficient** and methods for performing calculations. Therefore, full scores on the Quantitative Assessment Quiz are only given for the **most efficient** solution methods, and even if you have calculated the correct answer you may not receive full credit. My experience working with many students (often from top universities) is that the majority of people do not use the most efficient solution methods for these problems, so don't feel bad about yourself if you don't use an "efficient" method. I specifically designed these questions to identify where you can improve your calculation efficiency and these questions are representative of real Case Interview quant questions.

I use the term "**Typical Solution Method**" for the methods that the **majority** of people use to solve these problems, which are **not** the most efficient methods. Again, this is how the the majority of people solve these problems, so don't feel bad if you didn't use the most efficient methods. There is a section on interpreting your score at the end of the document. The last last page of this document is a scoring sheet, which you can print and use to record your score.

This tool uses very "stringent" scoring guidelines, and the results will only be meaningful if you adhere to these guidelines. Do not be discouraged if you receive what you consider to be a "low" score, as these questions are very challenging, and these questions are very different from a typical academic test in that they were designed to test your limits, rather than to assess knowledge of a specified set of material. Taking this Quantitative Assessment Quiz will highlight areas for improvement prior to your Case Interviews.

I don't believe that there is a single "correct" method to solve particular problems, but I do believe that some solution methods are much simpler and more efficient than other methods. The scoring guidelines describe both inefficient, and my suggested efficient solution methods. If you found another method for solving a problem which is comparable in efficiency and simplicity to the recommended solutions then feel free to give yourself full credit.

Difficult Test

This is a difficult test, and it is very challenging to receive to score above even 70% using the scoring guidelines. The average scores on this test will be well below what people score in standard academic subjects. Many people who **have** worked at some of the world's leading Management Consulting firms probably would **not** score above 70%, if you score 50%, you can still likely receive offers from top-firms. Therefore, do not become discouraged, upset, or angry if you don't receive as high a score on this tool, as you do in your other academic subjects. People have requested that I develop a tool to assess their quant skills, and identify quickly whether this course can help them improve, and this resource is the result. This Quiz and Scoring Guidelines reflect my best forecast for how you would fare in consulting interviews, encapsulated into a self-service resource, and also identify whether you can benefit from the [FastMath Ace the Case Online Course](#). If you are not prepared for an objective third-party assessment then do not use these resources.

Also, I recommend against comparing scores with your friends (unless the same person does the scoring for a group of people) as other people may inflate their score, or may not adhere to the stringent scoring rules.

Solutions Begin on Next Page

Solutions

1. What is $5,000 \times 17,000$? (4 Pts)

Answer: 85 Million (85,000,000)

Typical Solution Methods

This question also tests place value and handling of zeroes. A typical solution will use long multiplication and write out all the zeroes, or calculate 17×5 and then add six "0"s to the end.

Scoring Guide-lines: 4 Points Total

- 2 Pt: Correct answer with longhand calculation and writing out all "0"s
- 4 Pts: Correct answer calculated by handling all "0"s mentally without writing them down. You can write out the calculation 17×5 if necessary.
- 0 Pts: Incorrect answers

Question 1 Score: _____

2. A major automobile manufacturer is launching a luxury electric sedan. They expect their average selling price to be \$75,000, and to sell 28,000 cars next year. What will their expected revenue be from this car next year? (8 Pts)

Answer: \$2.1 Billion

Typical Solution Methods

The first Typical Solution Method for calculating this answer is to use “long multiplication” and write out:

$$\begin{array}{r} 75,000 \\ \times 28,000 \\ \hline \end{array} \quad \text{or} \quad \begin{array}{r} 75 \\ \times 28 \\ \hline \end{array} \quad \text{and then add the appropriate number (six) of “0”s,}$$

The second Typical Solution Method is to multiply $20,000 \times 75,000$ and add $8,000 \times 75,000$ which is effectively the same calculation.

FastMath Solution Method

Decomposes relevant terms into fractions multiplied by powers of 10, and efficiently handles the zeroes.

Scoring Guide-lines: 8 Points Total

- 2 Pt: In-exact answers in range of \$2 B – \$2.5 B
- 4 Pts: Answer of \$2.1 Billion calculated with long-hand method and writing out all “0”s
- 6 Pts: Answer of \$2.1 Billion calculated with “standard multiplication” of 75×28 , and then adding six “0”s or multiplying by 1 Million. This score only applies if you did not write out all the zeroes.
- 8 Pts: Using *FastMath* methods described above that and that
- 0 Pts: Answers outside the range of \$2 B – \$2.5 B

Question 2 Score: _____

3. What is $570 \div 15$? (4 Pts)

Answer: 38

Typical Solution Methods

Calculating with using long division.

FastMath Solution Method

Rounds to appropriate values and compensates.

Scoring Guide-lines: 4 Points Total

- 2 Pt: Correct answers with long division
- 4 Pts: Using a more efficient method
- 0 Pts: Incorrect answers

Question 3 Score: _____

Give the following three answers as percentages to **three significant digits**. Example:
 $4 \div 16 = 25.0\%$

4. What is $1,200 \div 1,800$? (4 Pts)

Answer: 66.7% (rounded), or 66.6% (truncated). The true value is a repeating decimal: $66.66\dots\% = 66\frac{2}{3}\%$

Typical Solution Methods

Calculating this using long division, perhaps after canceling the zeroes.

FastMath Solution Method

Reduce this fraction to $\frac{2}{3}$, and know that $\frac{2}{3}$ is 66.66...% (it's a repeating decimal with the digit '6' only).

Scoring Guide-lines: 4 Points Total

- 1 Pts: Answers beginning with 66% but incorrect other digits
- 2 Pts: Correct answer of 66.6% or 66.7% with long division
- 4 Pts: Reducing to $\frac{2}{3}$, and the converting to 66.6% or 66.7% without long division.
- 0 Pts: Other incorrect answers

Question 4 Score: _____

5. What is $400 \div 2,400$? (6 Pts)

Answer: 16.7% (rounded), or 16.6% (truncated). True value is $16\frac{2}{3}\%$.

Typical Solution Methods

A typical solution is to calculate this using long division, or reduce to $\frac{1}{6}$ and then do long division from there.

FastMath Solution Methods

Better solutions are to learn the decimal/percentage equivalent of $\frac{1}{6}$ or to divide the decimal equivalent of $\frac{1}{6}$ by 2.

Scoring Guide-lines: 6 Points Total

- 3 Pts: Answer of 16.6% or 16.7% with long division (or any answer from 16% – 17%)
- 6 Pts: Reducing to $\frac{1}{6}$, and the converting to percentage format by knowing that fraction, or dividing 33.3% ($\frac{1}{3}$) by 2.
- 0 Pts: Incorrect answers

Question 5 Score: _____

6. What is $340 \div 120$? (6 Pts)

Answer: 283.3%

Typical Solution Methods

Using long division and not simplifying the division problem by canceling common terms.

FastMath Solution Method

You can factor out a 20 from both terms which gives $17 \div 6$. 17 is one less than 18 which is a multiple of 6. Therefore, the answer is: $(3 - \frac{1}{6}) = 300\% - 16\frac{2}{3}\% = 283\frac{1}{3}\%$

Scoring Guide-lines: 6 Points Total

- 2 Pts: Failing to cancel common terms when doing division, or final answers in range of 270% – 300%.
- 4 Pts: Canceling common terms and reducing to $17 \div 3$, with final answer in range of 280% – 290%.
- 6 Pts: Reducing to $3 - \frac{1}{6}$, and then calculating $\frac{1}{6}$, or similar methods, with final answer in the range of 283% – 284%
- 0 Pts: Incorrect answers outside of the range 270% – 290%.

Question 6 Score: _____

7. A firm had revenue of \$500 *Million* in 2013. Their revenue is expected to grow by 5% for the foreseeable future. What will their approximate revenue be in 2017 if these forecasts hold? (4 Pts)

Exact Answer: Approximately \$607.75 *Million*

Scoring Guidelines: 4 Points Total

- 2 Pts: Answers in the range of \$600 *M* – \$630 *M* which took complex multiplication. If you did this with compounding calculations, you would benefit from the *FastMath Ace the Case Online Course*.
- 4 Pts: Fast estimates in the same range.
- 0 Pts: Answers outside this range

Question 7 Score: _____

8. Your client manufactures a product which costs \$50 per unit to produce. They want to have 20% margin on all sales. What should their sales price be? (8 Pts)

Answer: \$62.50

Typical Solution Methods

Calculate the markup by taking 20% of the production cost:

$20\% \cdot \$50 = \10 . Therefore, the typical solution will find the selling price to be: $(\$50 + \$10 = \$60)$. This is incorrect because the **Profit Margin** is then:

$$\frac{\$10}{\$60} = \frac{1}{6} = 16\frac{2}{3}\% \neq 20\%$$

FastMath Solution Method

Understand that the Margin is different from the Markup, and understand the relationship between the two. Be able to calculate the **Price** without using algebra or division.

Scoring Guidelines: 8 Points Total

- 2 Pts: Answer in range of \$60 (which is incorrect)
- 4 Pts: Correct answer with algebra.
- 6 Pts: Correct answer without algebra
- 8 Pts: Correct answer done purely mental.
- 0 Pts: Other incorrect answers.

Question 8 Score: _____

9. Your client sells 1.5 *Million* cases of canned food per year at \$30 per case. If they lower their prices by 10% which increases their sales volume by 20%, what is their percentage change in annual revenue? (14 Pts)

Answer: 8% increase in revenue.

Typical Solution Methods

A typical solution will solve for the initial revenue, the new prices and sales volumes (after the price change) the new revenue and then calculate the change in revenue, and then divide the change by the initial revenue.

This is not the most efficient solution, and it is also error prone. Many people make mistakes in this calculation, or cannot do the last step efficiently of dividing the change in revenue by the initial revenue to calculate the percentage change.

FastMath Solution Method

The FastMath method uses only the percentage changes of **Price** and **Quantity** to calculate the percentage change in **Revenue**. *The FastMath Ace the Case Online Course* explains how to do this in detail.

Scoring Guidelines: 14 Points Total

- 0 Pts: Answers outside the range of 5% – 15%.
- 4 Pts: Rounding values for the new **Price** and **Quantity** which leads to different answers, or mistakes in the calculations which give an answer inside the range of 5% – 15%.
- 8 Pts: Correct answer by calculating the **Initial** and **Final Revenue**, and the final **Price** and **Quantity**, correctly finding the change in revenue (\$3.6 *M*), and dividing by the initial revenue of \$45 *M*, using long division.
- 14 Pts: *FastMath* method using just the percentage changes, and not solving for the **Initial** or **Final Revenue**, or the **Final Price** or **Quantity**.

Question 9 Score: _____

10. Your client sells a product at \$30 per unit and sells 140,000 units per year. If they drop their price by 20%, what percentage increase in units sold do they need to break-even on revenue? (18 Pts)

Answer: 25% increase in units sold

Typical Solution Method

A typical solution will calculate the initial **Revenue**, the new **Price**, and then calculate the new require number of units sold and then calculate this as a percentage of the initial value. This is not the most efficient method and is also error prone.

FastMath Solution Method

The answer can be calculated solely from knowing that the **Price** dropped by 20%, and this method is explained in the [FastMath Ace the Case Online Course](#).

- 4 Pts: Assuming the volume increase is the same as the price change, but in the opposite direction (i.e. 20% increase in sales volume) with no supporting calculations.
- 8 Pts: Minor mistakes or approximations with answer in the range of 20% – 30%
- 12 Pts: Correct answer of 25% increase determined by calculating the initial Revenue, the new Price and then the new number of units and then calculating the percentage change.
- 18 Pts: Correct answer of 25% increase calculated from the percentage price change only. This method is explained in the [FastMath Ace the Case Online Course](#). This score is only received if you don't calculate the **Revenue** or the new **Price**.
- 0 Pts: Answers outside the range of 20% – 30%.

Question 10 Score: _____

11. Estimate the number of gas stations in the United States? (12 Pts)

Answer: There are 120 *K* – 170 *K* gas stations in the US depending on the source.

Typical Solution Methods

There are many ways in which people do market sizing and estimation problems, and I could not describe them all. Many people make their calculations too complex and with 8 – 10 parameters. There is a tradeoff of complexity and accuracy, and the increased complexity takes significantly more time and yields only small increases in accuracy.

FastMath Solution Method

Quickly estimate the ratio that represents the number residents per gas station in the United States; use knowledge of the population of the United States to quickly calculate the estimated number of gas stations.

The [FastMath Ace the Case Online Course](#) gives more detail about how to estimate the ratio of residents per gas station, and covers methods for Market Sizing and Estimation problems in detail. The Online Course has a detailed solution method for the problem and 10 other Marketing Sizing Problems.

Scoring Guidelines: 12 Points Total

This is difficult to give a comprehensive scoring guidelines for because there are so many ways to estimate this.

- 12 Pts: Using a ratio of residents per gas station which gives an estimate in the range of 100 *K* – 200 *K* gas stations. Other methods which give values in this range should receive the same score, if the calculations are done relatively quickly.
- 10 Pts: Similar estimates based on population ratios with final answers in the range of 50 *K* – 300 *K*, (but outside the range of 100 *K* – 200 *K*).
- 8 Pts: Answers in the range of 50 *K* – 300 *K* which take more than a few minutes to calculate, and use several parameters. For example, if you calculated how often people fill their car with gas, and then the throughput of customers at a gas station, and then the number of gas stations necessary to service the US population, that fit into this category.
- 6 Pts: Similar frameworks as above, but answers outside of 50 *K* – 300 *K*.
- 4 Pts: No structured framework for answering this question, but uses a pure “guesstimate” with no data to back up that answer.
- 2 Pts: If you don’t know that the population of the US is about 300 *Million* (320 *M*), and you are applying to a consulting firm’s office located in the US.

Question 11 Score: _____

12. Your client manufacturers and sells a consumer product. Each unit sells for \$75. Their factory has monthly rent of \$80,000, utility costs of \$50,000, and equipment maintenance costs of \$70,000. The materials cost is \$35 per unit, and the labor cost is \$15 per unit.

A) How many units do they need to sell each month to break-even? (6 Pts)

Answer: 8,000 units per month

Typical Solution Method

Many candidates will solve this problem with algebra using the Total Revenue = Total Costs, which can be very cumbersome.

FastMath Solution Method

Solves the answer without algebra and uses the properties of the relevant numbers to quickly perform the division operation. The [FastMath Ace the Case Online Course](#) will teach you how to identify patterns in the numbers and utilize specific properties of those numbers to make the calculations more efficient.

Scoring Guidelines: 6 Points Total

- 3 Pts: Correct answer with extensive algebra without immediately calculating total Fixed Costs and Marginal Profit.
- 6 Pts: Solving problem without using Algebra.
- 0 Pts: Incorrect answers.

Question 12A Score: _____

B) How many units do they need to sell to have a profit of \$1 *Million* per month? (6 Pts)

Answer: 48 K units per month

Typical Solution Method

Most candidates will set up an algebra equation for the profit based on the sales volume, which takes into account the Fixed Costs, and all the relevant manufacturing costs, and then set that equal to \$1 M and solve for the sales volume. This approach does not make use of the break-even sales volume calculated earlier, which makes the calculations easier.

FastMath Solution Method

Use the Break-Even sales volume from the prior problem to calculate the incremental Quantity needed to sell beyond the Breakeven Quantity. The [FastMath Ace the Case Online Course](#) discuss this in detail and has numerous practice problems with detailed solution methods.

Scoring Guidelines: 6 Points Total

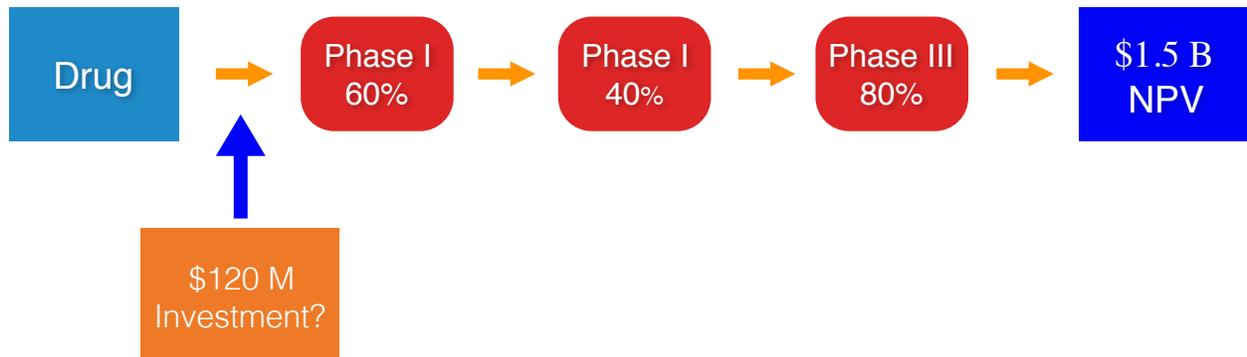
- 3 Pts: Correct answer calculated with algebra without using the break-even sales volume calculated earlier.
- 6 Pts: Calculating the increment sales volume by dividing \$1 M by the **Marginal Profit** of \$25. Zeroes are handled in an efficient manner.
- 0 Pts: Incorrect answers.

Question 12B Score: _____

Total Time: _____

Extra Credit Problem

13. Your client is a pharmaceutical manufacturer who is about to begin FDA clinical trials on a new drug. If the new drug successfully passes all three phases of clinical trials, your client will gain a profit stream which has a **Present Value** of \$1.5 Billion. The historical success rates for each phase of the clinical trial are 60%, 40%, and 80% for Phase I, Phase II, and Phase III respectively. The drug must pass all three phases in order to generate revenue.



Your client is considering making a \$120 Million investment which would increase the number of participants in the Phase II trials which they believe will boost the success rate of the Phase II trials. This investment must be made prior to entering Phase I. What percentage increase in the Phase II success rate would your client need to achieve in order to justify this investment? (10 Pts)

Answer: $16\frac{2}{3}\%$. The **Phase II** Success Rate must increase by $16\frac{2}{3}\%$ from 40% to $56\frac{2}{3}\%$.

FastMath Solution Method

You'll have to enroll in the [FastMath Ace the Case Online Course](#) course to see the *FastMath* solution method.

Typical Solution Method

Don't feel bad if you had trouble with this problem as this is the toughest quant problem I have seen in a consulting case interview. A very similar problem (with different numerical values) was given by a top tier management consulting firm in first-round interviews. In my experience, most MBA students have trouble setting up the conceptual structure to solve this problem. The barriers to solving this problem for most candidates are more than just not being able to do calculations without a calculator. Some candidates have the proper structure, but then have difficulty calculating a numerical answer. I would estimate that very few MBA students would correctly solve this problem under interview conditions, in less than 10 minutes.

Interpreting Your Score

It is difficult to make predictions based on the results of the *FastMath Ace the Case* Quant Self-diagnostic Quiz because I do not have enough data on people's score on this **Quiz** and the outcomes of their consulting interviews. Interpreting the results will become easier as I collect this data.

Below is are my current predictions for how somebody's score on these questions would correlate with your results interviewing at the top Management Consulting Firms. The ranges below are rough guidelines. While the exact numbers for each range are subject to change, and be updated as more people take the Quiz, I believe the rough categorizations are accurate: there are people who are weak at quant and need to improve, there are people who have adequate quant skills for consulting interviews, and there are people who excel in the quant portion.

Scoring Ranges

Scores Under 40 Points

People who score in this range would likely struggle with the quantitative component of case interviews. Many interviewers are likely to believe that your quant skills aren't strong enough for the job, and as a result, you may not move forward in the interview process. You may still receive offers from top firms if you are truly **outstanding** in other areas of the interview. Most likely, your current level of quant skills are an obstacle or a hurdle to you getting offers from some or many of the firms you interview with. You would certainly learn quite a lot from the [FastMath Ace the Case Online Course](#).

Scores from 40 – 70 Points

People who score in this range are likely to have quant skills which sufficient to perform the calculations required in most consulting interviews: they're not holding you back, but they aren't differentiating you either. Many successful candidates will likely have scores in this range— but so will many **unsuccessful** candidates. In order to succeed in consulting interviews with this level of quant ability, you will need to stand out from candidates in other aspect of the interview. Note that if you have a very strong quantitative background, or are a PhD candidate in a STEM field, the interviewer may have higher expectations of your quant skills than they would expect from a typical MBA student.

The [FastMath Ace the Case Online Course](#) course can help you take your skills to the next level, where you will truly excel in the quantize portion of interviews and stand out from other candidates.



Scores of over 70 Points

People who score in this range are likely to excel in the quantitative portion of the case interview. You will come across “sharp” and “quick” with numbers during the interview, which will differentiate you from other candidates. Some firms, such as McKinsey, place heavy emphasis on quant skills, and having very strong quant skills is seen as very positive. At other firms, one must simply have quant skills above a “minimum” level (or bar) and you are exceeding this bar.

While you’re likely to do well in the quant component of Case Interviews, unless you received a perfect score of 100, and you solved the Extra Credit Problem correctly, then there is still room for improvement. The [FastMath Ace the Case Online Course](#) can help further refine your quant skills; given that you probably like math (based on your score), you might even enjoy the course.

Time

Ideally, you should be able to solve all the problems in the *FastMath Ace the Case* Quant Self-diagnostic Quiz in under 1 hour (not including the Extra Credit Problem). Note that you typically have 5-10 minutes to solve the quantitative problems in a case interview, so there are implicit time constraints during the case interviews, and interviewers will notice if you are slow with the quant component. If you took significantly longer than 1 hour to solve the problems in the Self-diagnostic Quiz, then you will likely run into time pressure in case interviews. You should take this into account as you continue your interview preparation and keep in mind that you may have received a lower score on the Self-diagnostic Quiz had you limited yourself to 1 hour. If you took longer than 1 hour on the Self-diagnostic Quiz, the [FastMath Ace the Case Online Course](#) can help improve your calculation speed and could be a great benefit during interviews.

Resources

To improve your quant skills, take the [FastMath Ace the Case Online Course](#). This course covers all the quant skills you need to succeed in Case Interviews. The first half of the course teaches techniques to perform numerical calculations quickly and efficiently without using a calculator or spreadsheet (as required in case interviews). The second half of the course reviews the most common types of quantitative problems given in case interviews. More information is available on the course page (see above link).

Scoring Sheet

Question	Points	Maximum Points
1		4
2		8
3		4
4		4
5		6
6		6
7		4
8		8
9		14
10		18
11		12
12 (A & B)		12
Total		100
Extra Credit		10
Final Total		

Total Time	
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