FastMath Mental Math Exercises

Overview

Below are exercises designed to improve your mental math skills for consulting case interviews, and for general self-improvement. I performed exercises like these to mentally warm-up immediately prior to standardized tests like the SAT and GMAT, or a math or science exam at Harvard & MIT. Just as you wouldn't begin a sporting match without warming up prior, I took the same approach for exams. These exercises were the mental equivalent of passing the ball or taking shots to warm-up before a soccer or basketball game. I recommend you do the exercises you think you'll benefit the most from - some people may skip the Level 1 or 2 exercises.

To do the exercises, you should actually do the calculations (either pure mentally, or with a pen and paper) rather than memorizing and reciting the answers. The benefit of doing the calculations is that you will form neural connections which will enable you to process the numbers faster, which aren't formed if you memorize the answers. If you primarily use memorization, you will forget the answers once you stop practicing. Having memorized the answers probably won't help you relearn them much faster than if you had not memorized them. While memorization may be an effective short-term approach to learn specific "math facts," in my opinion, memorization **does not** have a significant long-term payoff. Unfortunately, mathematics is taught primarily through memorization in many primary schools.

On the other hand, if you actually do the calculations, you will strengthen neural connections, and get faster with each repetition. If you start using pen and paper, after repeating the exercises, you will eventually be able to do the exercises "pure mentally" (i.e. without pen & paper), and you will eventually learn and "memorize" the answers. You will also learn the relationships between numbers and be able to manipulate them more quickly and efficiently. If you learn by calculating and then stop practicing, and hence your skill diminishes, once you begin practicing again, the skills will come back very quickly, - just like any other skill you have learned like riding a bicycle, or playing an instrument. Thus learning by calculating **does** have a long-term payoff.

These exercises can be done at whatever frequency you wish (e.g. once a day to once a month). One great thing about these exercises, is that once you learn them, you can do them any time you have a free minute: such as when you are waiting on the train or bus, waiting in line, while your food is cooking, or any time you take a mental break from another task. Only a modest amount of daily practice time is needed to have a substantial improvement: a mere 10 minutes per day will have a significant impact after several weeks. Of course, spending more time per day (such as 30 - 45 minutes) will yield faster results.

Resources

For additional mental-math resources, visit the [*FastMath* web site].

FAST MATH

Level 1: Foundation Exercises

- Single-digit Addition: Practice adding single digit numbers
- Single-digit Doubling: Double all 1-digit Numbers
- Count by 10 to 200
- Multiply by 5 (Single-digit): Multiply all 1-digit numbers by 5
  - Count by 5 to 50
- 12 × 12 Multiplication Table:
  Practice multiplying two numbers where each number is between 1 & 12.
- 10's complement of 1-digit numbers:
  For each number n between 1 & 9, calculate $(10 - n)$
  $3 \Rightarrow 10 - 3 = 7$; 3 and 7 are 10's complements because they add to 10

Purpose

The purpose of the Level 1 exercises is to become proficient in the foundational math operations. You must master these these operations before you progress. That is, you need to get to the point where you don't hesitate when you need to calculate (8 + 7) or (6 × 9). For the 12 × 12 multiplication table, I recommend doing the calculations rather than memorizing the table.

You can use mental math techniques to practice and perform these calculations. For example, multiplying by 5 is equivalent to dividing by 2 and multiplying by 10. Therefore:
$8 \times 5 = (8 \div 2) \times 10 = 4 \times 10 = 40.$
$8 \times 6 = 8 \times (5 + 1) = 8 \times 5 + 8 \times 1 = 40 + 8 = 48$

Adding 8 is equivalent to adding 10 and subtracting 2 or subtracting 2 and adding 10. Therefore:
$8 + 7 = (7 - 2) + 10 = 5 + 10 = 15$

Level 2: Counting (Addition)

Description

For each **Base Number** listed below, count by multiples of the base number up to the indicated number. This is done by adding the **Base Number** to the previous multiple of the **Base Number**.

Base Numbers

- 50: up to 500
- 25: up to 200
- 20: up to 200
- 15: up to 210
- 12: up to 240

In general, a **Base Number** is any number which we will be calculating multiples of.

Example

For the **Base Number** of 25, you would mentally think the following:
"25, 50, 75, 100, 125, 150, 175, 200"

The subsequent number in the list is generated by adding 25 to the prior number.

Tips

It is important to actually "do" the mental calculation, rather than memorizing this list of numbers. If it helps, visualize the numbers written in your mind as you are doing the calculations.

Variations

Count down (subtract) by the **Base Number** from the final value listed above. For example start at 200 and count down (subtract) by 25: 200, 175, 150… .

Modify the **Base Number** by multiplying the **Base Numbers** listed above by powers of 10. For, example, count by 0.25, 25%, 250, 2.5 and 25 K (instead of 25); do this for the other **Base Numbers** as well.

Purpose

The purpose of this exercises is to become familiar with the multiples of each of these "**Base Numbers**" (50, 25, 20, 15, 12). For example, you want to be able to calculate (7 × 25) very quickly. Furthermore, you want to be able to factor numbers into multiples of these "**Base Numbers**" very quickly. That is, when you see the number 175, you want to immediately identify that (175 = 7 × 25). This is important because many of the FastMath calculation techniques rely on factoring numbers and recombining then. Therefore, you must be able to factor numbers quickly when they are multiples of the "**Base Numbers**" listed.

There are many ways to factor some numbers, so the factorizations are often not unique. For example, (150 = 3 × 50) & (150 = 6 × 25). For any given number, you want to be able to identify very quickly all the possible factorizations of that number with the "base numbers" listed. The number 12 is used in this exercise because there are 12 months in the year, so many business calculations use the number 12 frequently when multiplying a monthly amount to find an annual amount.

Level 3: Multiplying & Dividing by 2

Doubling

- Double all single digit numbers
- Double 2-digit numbers ending in 5 (e.g. 45, 3.5). Calculate left to right
- Double “random” 2-digit numbers
- Double 3-digit numbers ending in 5 (e.g. 135, 14.5)
- Double arbitrary 3-digit numbers
- Multiply by 4 by doubling twice

Halving

- Divide all even numbers (up to 20) by 2
- Divide multiples of 10 up to 200 (e.g. 130) by 2 - or divide integers under 20 by 2
- Divide even numbers less than 200 by 2
- Divide integers up to 200 by 2; or divide multiples of 10 up to 2,000 by 2
- Divide even numbers up to 2,000 by 2
- Divide by 4 by halving twice

Tips

I find it useful to work left to right (i.e. largest numbers or most significant digits, to least significant digits). This can be learned with practice. Be sure to perform your carry operations properly (e.g. $17 \times 2 = 34$).

Purpose

Multiplying and dividing by 2 is a foundational operation that is used to build more complex math operations. It as actually possible to multiply any two integers by just multiplying by two and adding. Doubling is therefore something that you want to do very quickly and therefore you need to practice it. For example, if you need to multiply a multiple digit number by 4 (e.g 135×4), you can simply double 135 twice as ($2 \times 2 = 4$). Dividing by 2 is useful for multiplying by 5 (see below) so this is another operation which you need to practice.

Level 4: Multiplying & Dividing by 5

Multiplying by 5

Multiply numbers by 5 by dividing by 2 and then multiplying by 10 (5 = 10 ÷ 2)
- Single-digit numbers
- 2-digit even numbers
- 2-digit (even & odd) numbers
- 3 digit even numbers.

Dividing by 5

Divide by 5, by dividing by 10 and then multiplying by 2.
- Two digit numbers ending in 5 or 0
- 3 digit numbers ending in 0
- 3 digit numbers ending in 5 or 0
- 4 digit numbers ending in 0

Purpose

Multiplying and dividing by 5 are other very common math operation, and they is also easy to perform using using the method described above of replacing) 5 with (10 ÷ 2). this is another skill that should be practiced.

FAST⚡MATH

Level 5: Introductory Fraction to Decimal (& Percentage) Conversions

Part 1: Fraction to Percentage (& Decimal) Conversion

Description

Convert each fraction to the equivalent percentage & decimal (using division). For each "**Base Fraction"** do the conversion for multiples of the "**Base Fraction"** up to 1.

A "**Base Fraction"** is defined as 1 divided by an integer *n.* Therefore, ($\frac{1}{2}$,$\frac{1}{4}$,$\frac{1}{5}$) are all **Base** Fractions for this exercise. By definition, the Numerator of a **Base Fraction** is 1.

Base Fractions

- $\frac{1}{2}$: Multiples of $\frac{1}{2}$
- $\frac{1}{4}$: Multiples of $\frac{1}{4}$ ($\frac{1}{4}$,$\frac{2}{4}$,$\frac{3}{4}$,$\frac{4}{4}$)
- $\frac{1}{5}$: Multiples of $\frac{1}{5}$: ($\frac{1}{5}$,$\frac{2}{5}$,$\frac{3}{5}$,$\frac{4}{5}$,$\frac{5}{5}$)
- $\frac{1}{10}$: Multiples of $\frac{1}{10}$
- $\frac{1}{20}$: Multiples of $\frac{1}{20}$

Example

For the multiples of ½, you would "mentally" do the following:
- ½ = 50% = 0.50
- $\frac{2}{2} = 100\% = 1.00$

For the multiples of ¼, you would do the following:
- ¼ = 25% = 0.25
- $\frac{2}{4} = \frac{1}{2}$ = 50% = 0.5
- $\frac{3}{4}$ = 75% = 0.75
- $\frac{4}{4}$ = 100% = 1.00Part 2: Percentage (& Decimals) to Fraction Conversion

Count (add) by the the equivalent percentages of each **Base Fraction** listed above and convert each percentage to a decimal and to the equivalent multiple of the **Base Fraction**.
The percentage equivalent of a **Base Fraction** will be called a **Base Percentage**. For each **Base Percentage** value, stop when the multiple reaches 100%. This is similar to counting exercises (e.g. counting by 0.25).

Base Percentages

- 50% (½)
- 25% (¼)
- 20% ($\frac{1}{5}$)
- 10% ($\frac{1}{10}$)
- 5% ($\frac{1}{20}$)

When doing this exercise, you may start with the same **Base Fractions** listed in the prior exercise, convert the base fraction to a percentage and then count by multiples of that percentage. That is, instead of remembering to use 5%, you would think ($\frac{1}{20} = 5\%$) so I therefore need to count by multiples of 5%, and mentally associate the percentage with the appropriate fraction (i.e. convert the percentage to the fraction).

Examples

For multiples of 50%, you would mentally do the following

- 50% = 0.5 = ½;
- 100% = 1.00 = $\frac{2}{2}$

For multiples of 25%, you would mentally do the following:

- 25% = 0.25 = $\frac{1}{4}$
- 50% = 0.5 = $\frac{2}{4} = \frac{1}{2}$
- 75% = 0.75 = $\frac{3}{4}$
- 100% = 1.00 = $\frac{4}{4}$

Variations

Count by decimal values instead of percentages (e.g. 0.25 instead of 25%), and stop at 1.00

Purpose

The goal of these two exercises is to associate the fractions with their decimal and percentage equivalents, so that you can quickly convert numbers between these formats or representations. It is very important to be able to do this in both directions: fraction to percentage and percentage to fraction. When doing the fraction to percentage conversion, calculate it as an actual division problem. When doing the percentage to fraction conversion, you may not need to do any actual calculation, as long as you mentally associate the percentage value with the fraction.

FAST MATH

Level 6: Intermediate Fraction to Decimal (& Percentage) Conversions

Convert Fractions to Decimals, and Percentages

Convert each fraction to the equivalent percentage & decimal (using division). For each "**Base Fraction**" do the conversion for multiples of the "**Base Fraction**" up to 1.

Base Fractions

- $\frac{1}{3}$
- $\frac{1}{6}$
- $\frac{1}{8}$
- $\frac{1}{9}$
- $\frac{1}{11}$
- $\frac{1}{7}$

The **Base Fractions** are listed in order of importance, and difficulty. For each fraction, do the calculations out to 4 decimal digits. This will help you recognize the patterns, and isn't as difficult as it sounds. For example (⅓ = 0.3333…) which is an easy pattern to remember as it's the digit "3" repeated. Don't worry about the correct rounding of the last digit, as this can hide the underlying pattern.

This is essentially the same exercise as the prior one with less commonly known fractions (they are not that difficult once you learn them. When combined with the **Base Fractions** from the prior exercise, these exercises cover all **Base Fractions** (and their multiples) with a denominator of 11 or less.

Reverse: Convert Percentages (& Decimals) to Fractions

The same in reverse

Purpose

This exercise has the same purpose as the prior exercise, but with additional fractions and decimal equivalents.

Level 7: Place Value

- Multiply single digit hundreds (e.g. 200 × 400)
- Multiply single digit thousands (e.g. 5 K × 3 K)
- Multiply single digit thousands by millions (e.g. 3 M × 8 K)
- Percentage Multiplication - multiply two percentages which are each multiples of 10% (e.g.10% × 20%) & express the answer as percentage (10% × 20% = 2%)
- Single digit percentage multiplication; express answer as percentage (e.g. 3% × 6% = 0.18%)

Purpose

The goal of this exercise is to get practice with place value operations (determining the location of the numbers relative to the decimal). The goal is for the place value process to be effortless so you are only concerned with multiplying the leading numbers. For example, $1{,}000 \times 1{,}000 = 1{,}000{,}000$ $(1\ K \times 1\ K = 1\ M)$. Therefore $5\ K \times 3\ K = 15\ M \quad (5 \times 3 = 15)$. You will get better at this and it will start to come effortlessly if you practice it.

The calculations are very common in case interviews and business math scenarios. Many people have trouble with the percentage calculations if they haven't practiced them, but you often need to perform percentage multiplication in business situations.

Level 8: Factoring

Count from 1 to 30. For each number do a prime factorization, & identify all 2 number factor pairs, or if the number is prime.

- 12 = 2 · 2 · 3 = 2 · 6 = 3· 4
- 14 = 2 · 7

Purpose

The goal of this exercise is to practice factoring numbers, and identifying all possible factor pairs. Again, do not memorize the results but think about it each time you do the exercise.

FAST MATH

Level 9: Exponents

- Multiply the starting value by 10, a total of 6 times:
  - 1: (1, 10, 100, 1 K, 10 K, 100 K, 1 M)
  - 2: (2, 20, 200, 2 K, 20 K, 200 K, 2 M)
  - 5:
  - Two-digit number with 1 decimal (e.g. 7.2)
- Powers of 2: 1 to 1024
- Powers of 5: 1 to 625
- Squares (and cubes) for integers from 1 to 10 (cubes are useful for the McKinsey PST)
- **Optional**: Squares for integers from 11 to 20

Tips

To square numbers between 11 and 20, you can use the following method. I'll use the example, of calculating 14^2.

1. Look at the "ones" digit (which is 4 for the example of 14).
2. Add this to the original number: $14+4=18$
3. Multiply this number by 10: $18 \times 10 = 180$
4. Calculate the square of the "ones" digit: $4^2 = 16$
5. Add these numbers: $180+16=196$

$14^2 = 196$

This works for any number between 11 and 20: Find 17^2

$17+7=24$

$24 \times 10 = 240$

$7^2 = 49$

$240+49=289$

$17^2 = 289$

In general $(10+a)^2 = 10^2 + 2 \cdot a \cdot 10 + a^2 = (10+2 \cdot a) \cdot 10 + a^2$

Purpose

This goal of this exercise is to become familiar with exponents and repeated multiplication. In many situations, you will need to multiply a number by 100, or 100,000 and you can do this by multiplying by 10 the appropriate number of times. We use different starting (e.g. 1, 2 5, and 2 digit numbers) to practice multiplying these numbers by powers of 10. This may seem simple, but I often see people making mistakes with these types of calculations.

The goal for calculating the powers of 2, is to practice doubling and to identify "on sight" each power of 2, and be able to identify the specific power of 2 that number represents. For example, when you see the number 256, you want to recognize it as a power of 2, and be able to determine that $2^8 = 256$.

Similarly, you want to recognize the squares single digit numbers. Knowing the cubes is useful for compound growth calculations done over 3 periods, which is required for the McKinsey PST.

FAST MATH

Standardized Test (e.g. SAT, GMAT, GRE) Mental Math Exercises

These exercises are useful for those who are preparing for standardized tests such as the SAT, GMAT, and GRE, which frequently have problems on these topics.

Level 10: Pythagorean Triples

Description

A **Pythagorean Triple**, is a set of 3 positive integers (a, b and c) which satisfy the equation:
$a^2 + b^2 = c^2$
This means that they numbers are the sides of a "Right Triangle" (a 90 degree angle). These Pythagorean Triples will typically be listed in ascending order, with the hypotenuse (longest side of the triangle) listed last. Many standardized tests have questions that involve solving for the third side of a right triangle given the other two sides. This is done in geometry problems, and also problems involving distances between points, given their coordinates.

One easy way to solve these problem is to simply recognize which **Pythagorean Triple** it is, as there are a limited number of Pythagorean Triples with values of less than 50. Furthermore, if you multiply all three values of a **Pythagorean Triple** by a positive integer (which we will denote by ***k***), the result is also a Pythagorean Triple. That is, if ($a^2 + b^2 = c^2$) then $(k \cdot a^2) + (k \cdot b^2) = (\mathrm{k} \cdot c^2)$. Therefore, you only need to learn a few "Base Triples" (where there is no common factor for all 3 numbers) to cover nearly all the problems that appear on standardized tests.

For each **Base Triple**, perform he calculation to verify that ($a^2 + b^2 = c^2$). Next, mentally walk through multiples of the **Base Triple**, by multiplying all numbers in the **Base Triple** by the positive integer ***k**,* starting with ***k*** = 2*,* and progressing up to the value of ***k*** indicated.

Base Triple

- (3, 4, 5) up to ***k*** = 6
- (5, 12, 13) up to ***k*** = 2
- (7, 24, 25) up to ***k*** = 2
- (8, 15, 17) up to ***k*** = 2

Example

For the **Base Triple** of (3, 4, 5), you could calculate this as $3^2 + 4^2 = 9 + 16 = 25 = 5^2$
Next, you would mentally multiply the values of the triple by 2, then 3, up to 6:

- **Base Triple**: (3, 4, 5)
  - ***k*** = 2: (6, 8, 10)
  - ***k*** = 3: (9, 12, 15)
  - ***k*** = 4: (12, 16, 20)
  - ***k*** = 5: (15, 20, 25)
  - ***k*** = 6: (18, 24, 30)

Tips

You should multiply the values of the **Base Triple** by the specified number (***k***), rather than memorizing all multiples of the **Base Triple.** It is useful to memorize the 4 Base Triples listed above, and at least memorize that (3, 4, 5) is a **Pythagorean Triple**.

Purpose

The purpose of this exercises is to be able to quickly find the third value of a Pythagorean Triple given the other two. This can be done much faster if you recognize which **Base Triple** the specific **Pythagorean Triple** is a multiple of, rather than actually solving for the missing variable using the Pythagorean formula of: $(a^2 + b^2 = c^2)$. A good method for doing this is to identify the common factors of the two given values of the Pythagorean Triple (this is finding ***k***), and divide the values by that number, to find the Base Triple, determine the missing value of the Base Triple, and then multiply ***k*** to find the missing value of the Pythagorean Triple.

For example, if you are told the long side of a Pythagorean Triple is 20, and one of the shorter sides is 12, you could first test to see if it was a multiple of a (3, 4, 5) triangle, so you would divide 20 by 5 and get 4, which is a potential value of ***k***. Then you divide 12 by 4, and get 3, which is also part of the Base Triple (3, 4, 5). Since the two values of the Base Triple are (3, 4, 5) you can conclude the missing value of the Base Triple is 4. Since ***k*** = 4, the missing side of the overall triangle is $4 \cdot 4 = 16$. You can verify that (12, 16, 20) satisfies the Pythagorean Theorem.

Be aware that just because **one** value of a Pythagorean Triple is a multiple of a particular Base Triple, does not mean the other values are a multiple of the same Base Triple. That is, specific numbers can be a multiple of more than 1 Pythagorean Triple. For example if you are told the hypotenuse or a Right Triangle is 100, you might conclude the Triple is a multiple of the (3, 4, 5) Base Triple, because $100 = 20 \cdot 5$. However, it could also be a multiple of the (7, 24, 25) Base Triple, and so you need to look at the second value of the **Pythagorean Triple** to determine the missing value.

This method only applies when the missing value is an integer. It is possible that some standardized tests will have missing values which are non-integer. This is most common in triangles which are have angles in degrees of (45°, 45°, 90°) or (30°, 60°, 90°). It is best to learn the ratios of these particular **Right Triangles** when solving for a missing side of one of these Triangles.

Level 11: Triangular Numbers

Description

Triangular Number is defined as follows where ***n*** is a positive integer:
To find the n^{th} **Triangular Number**, take the sum of the integers from 1 to ***n***.
The 3^{rd} **Triangular Number** is: (1 + 2 + 3) = 6.

The **Triangular Numbers** are solutions to wide variety of problems in combinatorics, such as, how many matches need to be played in a "Round Robin" tournament with **m** teams where each team will play every other team exactly once.

Walk through the Triangular numbers up to (**n** = 10) by starting at 1, then add 2, then add 3 to the prior sum, then add 4 to the prior sum etc. For advanced practice, calculate up to ***n*** = 15.

Example

Mentally, this would look as follows:
n = 1: 1
n = 2: 1 + 2 = 3
n = 3: 3 + 3 = 6
n = 4: 6 + 4 = 10
n = 5: 10 + 5 = 15
…..

On each successive calculation you are adding 1 more than what you added in the prior calculation. Mentally, you can simplify this to the final result as long as you keep track of the last number added, and then mentally increase this number. The first 15 **Triangular Numbers** are: 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, 66, 78, 91, 105, 120

Purpose

As noted earlier, the **Triangular Numbers** are solutions to a wide variety of problems, which appear on standardized tests, so it is very useful to be familiar with them up to ***n*** =10. The formula for the n^{th} Triangular Number is: $\frac{n \cdot (n+1)}{2}$

This is easiest to calculate using the following method. Since either ***n***, or (***n***+1) will be even, divide whichever one is even by 2, which will be either $\frac{n}{2}$, or $\frac{(n+1)}{2}$. Then multiply this number by the other term (either $\frac{(n+1)}{2}$ or $\frac{n}{2}$). For example, for n = 7: n+1 = 8 which is even. We calculate: 8 ÷ 2 = 4. Next we multiply this number (4) by 7 (because 7 is the "other term"): (4 × 7) = 28. The answer is 28. For n = 10, since 10 is divisible by 2, we calculate: 10 ÷ 2 = 5. Next we multiply 5 by (n + 1 = 11), which is the "other term": 5 × 11 = 55. The answer is 55.

While there is a formula to calculate the Triangular Numbers, it is still useful to be familiar with the first 10 triangular numbers as this will help you identify errors in your calculations.

Philosophy

Some people may not see the benefit of doing these exercises as the answers never change. I would respond that mental-math is a skill, and that any skill needs to be practiced. If you use the analogy that your brain is "like a muscle" then clearly you should regularly "exercise" your brain to keep in in top condition. Athletes stretch and workout their physical muscles regularly to achieve peak physical condition, so you also do exercises for the specific mental skills which you want to improve. People may wonder what the benefits of these exercises are, and ask, "What specifically are these skills good for." To answer these questions, I will say that many of the calculation methods I find effective in solving actual problems, and which I teach, rely on being able to do these math operations quickly and with little mental effort - almost reflexively.

To use a sports analogy, imagine you are a basketball coach and you want to teach one of your players how to do a jump-shot, but you find that your player lacks the leg strength to jump at all; or that you are a gymnastics coaching teaching parallel or uneven bars, but find your team member lacks the grip strength to hold on to the bar. In each case, you want to teach a technique that relies on a combination of skills like balance, coordination, and timing which must be practiced together. However, you find that your player lacks basic strength required to even practice the overall technique. That is, if a player can't jump, how can your teach a jump-shot, and if your gymnast can't support their body weight holding onto the bar, how can you teach any bar exercise? In these cases, you would probably have your player develop the required leg (for jumping) or grip (for gymnastics) strength and then once they had done so, you could then teach the specific technique (jump-short, or bar techniques) of interest.

These math exercises are designed to improve your foundational "*mathletic*" abilities which the more advanced FastMath calculation methods methods rely on. If you can't do the math operations in these exercises quickly and effortlessly, you will find the FastMath techniques challenging and complex. In a very real sense, you don't have the foundational math skills (analogous to physical strength in the athletic example) to perform the techniques. For example, many of the problem solving methods I teach rely on converting between percentages and fractions (e.g. $60\% = \frac{3}{5}$), or to factor numbers. If you can't do these operations quickly and without expending mental energy (i.e. automatically), many people then find the FastMath methods too difficult and intimidating, and are discouraged from learning. Once you can convert between fractions and decimals, and factor numbers quickly, then the FastMath methods become easier, and much less intimidating.

The potential impact that fast mental math skills can have is enormous. In my experience, I can often perform calculations and solve problems 10 times, and sometimes up to 20 times, faster than many (but certainly not all) of the students I work with. The students I work with are highly educated and typically have Graduate or Bachelor's degrees (or they are studying for these degrees) from/at elite and highly selective Universities. This means that in 3 seconds (s), I can do what it takes others 30 seconds or up to 1 minute (m) for others to do. In 5 m, I can do what it takes others nearly 1 hour (5 m × 10 = 50 m ≈ 1 hour), and in 15 minutes I can do what it might take others over 2 hours to complete.

The overall increase in problem solving speed which I can achieve is a result of improving the raw calculation speeds, which I have compared to "strength" in the athletics analogy. In addition, I have analyzed the most frequent types of business and interview calculations, such as the impact on revenue of simultaneous price and volume changes, break-even analysis, margin calculations, and compound growth calculations, identified the most efficient methods to solving these problems, and practiced solving those problems with a wide variety of numerical examples. This is analogous to practicing an overall skill that is frequently used in a sport, like practicing a free-throw in basketball, or a corner-kick or penalty-kick in soccer. Imagine how powerful it would be, for both interviews and professionally, if you could process quantitative information 10 times faster than anybody else in the room.

These common business calculations are covered in the FastMath Crack the Case online course. These exercises will hone the specific math operations that I use most frequently and which I find to be the most practical and effective in solving interview problems. You will greatly increase your mental calculation speed by doing these exercises. Bruce Lee (the famous martial-artist) said: “I fear **not** the man who has practiced 10,000 kicks, but the man who has practiced one kick 10,000 times.” These are the foundational math operations which are the building blocks used to perform more complex calculations; much like advanced martial arts and self-defense systems are composed individual kicks, punches and blocks which must be individually mastered.

I hope you find these exercises useful!

Sincerely,

Matthew Tambiah

