We are delighted to bring to you this issue of ALU Mathematics News, a monthly newsletter dedicated to the emerging field of Mathematics. This is the first visible —output from the Department of Mathematics, Alagappa University. We are committed to make ALU Mathematics News a continuing and effective vehicle to promote communication, education and networking, as well as stimulate sharing of research, innovations and technological developments in the field. However, we would appreciate your feedback regarding how we could improve this publication and enhance its value to the community. We are keen that this publication eventually grows beyond being a mere —news letter to become an invaluable information resource for the entire Mathematics community, and look forward to your inputs to assist us in this endeavor.

Dr. N. Anbazhagan

MATHEMATICS IS THE QUEEN OF SCIENCES

In the 17th century, the great scientist and mathematician *Galileo Galilei* noted that the book of nature "cannot be understood unless one first learns to comprehend the language and read the characters in which it is written. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures, without which it is not humanly possible to understand a single word of it."

The history of mathematics concerns one of the most magnificent, surprising, and powerful of all human achievements. In the early 19th century, the noted German mathematician **Carl Friedrich Gauss** called mathematics the **"queen of the sciences"** because it was so successful at uncovering the nature of physical reality.

FRACTAL THEORY

A Fractal is generally "a rough or fragmented geometric shape that can be split into parts, each of which is (at least approximately) a reduced-size copy of the whole," a property called self similarity.

Example of Fractal

Broccoli

Approximate fractals are easily found in nature. These naturally occurring fractals include like clouds, mountains, river networks, systems of blood vessels and etc.

Applications of Fractal

Medical Image Processing
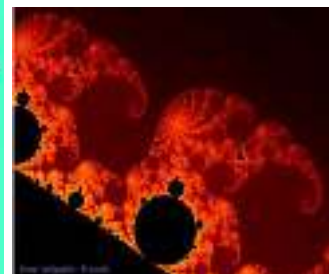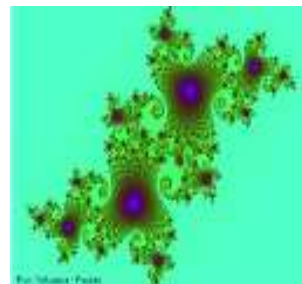
Image Compression
Signal Processing
Time Series Analysis
Bio-Medical Engineering
Mathematical Modeling of
Dynamical Systems

Some Images of Fractals

ONE, TWO, THREE

1 x 1 = 1

11 x 11 = 121

111 x 111 = 12321

1111 x 1111 = 1234321

11111 x 11111 = 123454321

111111 x 111111 = 12345654321

1111111 x 1111111 = 1234567654321

11111111 x 11111111 = 123456787654321

111111111 x 111111111 = 12345678987654321

1 x 9 + 2 = 11

12 x 9 + 3 = 111

123 x 9 + 4 = 1111

1234 x 9 + 5 = 11111

12345 x 9 + 6 = 111111

123456 x 9 + 7 = 1111111

1234567 x 9 + 8 = 11111111

12345678 x 9 + 9 = 111111111

123456789 x 9 +10 = 1111111111

Math Tricks

Math Trick 1

How to multiply a two digit number by 11

For example, 43×11. Take the original number and imagine a space between the two digits: 4_3 Now add the two numbers together and put them in the middle: 4_(**4+3**)_3 which is the same as 4_7_3 The answer... 473 If the numbers in the middle add up to a two digit number, insert the second number and add 1 to the first: For example, 67×11 6_(**6+7**)_7 (**6+1**)_3_7 which is the same as 7_3_7 The answer... 737.

Math Trick 2

How to square a two digit number ending in 5

If you need to square a two digit number ending in 5, multiply the first digit by itself + 1, and put 25 on the end. For example, 65^2 (which can be written as 65×65) 6x(6+1) or 6×7 = **42** Put a **25** on the end of it... The answer... 4225.

Math Trick 3

How to multiply big numbers by 5

Take any number, then divide it by **2**. Then... If the result is **whole** (that is, theres's no remainder), **add a 0** at the end. If it is not whole, ignore the remainder and **add a 5** at the end of the number. For example, 4252×5 = (4252/2) and add a 5 or 0 to the end of the number 4252/2 = 2126 (it's a whole number so add a 0 to

the end) The answer… 21260 Here's another example: 8667×5 Divide the number by two: 4333.5 (there's a remainder so add 5 to the end) The answer… 43335.

How to multiply by 4

The trick here is to simply multiply by two, then multiply by two again. Ultimately, you want to work with smaller numbers that are easier to work with in your head. For example 82 x 4 = (82 x 2) x 2 = (164) * 2 = 328 To multiply by 8, just multiply by 2 one more time (656).

How to multiply by 9, or 99, or 999

Multiplying by 9 is really like multiplying by 10-1. 9×9 is the same as 9x(10-1) which is (9×10)-9 which is 90-9 or 81. Let's try a harder example: 56×9 = 56×10-56 = 560-56 = 504 To multiply by 99, it's the same idea, except you multiply by 100-1. So, 56×99 = 56x(100-1) = 5600-56 = 5544. Multiplying by 999 is similar to multiplying by 9 and by 99, except now you multiply by 1000-1 22×999 = 22x(1000-1) = (22×1000) – (22×1) = 22000-22 = 21978.

Multiplying by doubling and halving

There are cases when you're multiplying two numbers together and one of the numbers is even. In this case you can divide that number by two and multiply the other number by 2. You can do keep doing this until you get numbers that are easy to work with in your head. Let's say you want to multiply 14 by 16. You can double and halve the numbers till you get your answer: 14×16 = 28×8 = 56×4 = 112×2 = **224** Another example: 12×15 = 6×30 = 6×3×10 = **180** Here's another example: 48×17 = 24×34 = 12×68 = 6×136 = 3×272… this may seem large, but you can break it down further into: 3×270 + 3×2 = 810 + 6 = **816 .**

Working with Percentages

Remember that "per cent" is like saying "parts of one hundred". So, it follows that 8 percent of 100, is 8. As another example 23.89% is the same as saying "23.89 parts of 100". Find 8% of 200. 8% of the first hundred is **8**. 8% of the second hundred is also **8**. So it follows that 8% of of 200 is **8 + 8 = 16**. Therefore 8% of 200 is 16%. Another bonus trick: you can flip percents. For example 35% of 8 is the same as 8% of 35. Using percents has a very practical application when you're at a restaurant. Let's say you want to leave a tip of 15% on a $50 dinner. You can quickly calculate it in your head: 15% of $100 is $15, so then 15% of 50 is half of that, or **$7.50**. Let's try one more example: Calculate a 15% tip on a $60 dinner. Using

the same approach, 15% of $100 is $15, so then 15% of 50 is half of that, or $7.50. Also, you know that 15% of $10 is $1.50. So then 15% of 60 is the same as 15% of 50 + 15% of 10... which equals $7.50 + $1.50, or $9.00.

Quick Addition using the left-to-right approach (instead of the familiar right-to-left)

Instead of using a right to left approach, we can start from the left and move to the right. Take the following example: 45 + 34 Usually, you would first sum up 4 to 45, and then add 30 to the result. But by using the left to right approach, you first sum up 30 to 45, and then you add 4 to the result. Although this example is very simple, you'll see the advantages of this method as you start to use it. If you're working with three digit numbers, the process is the same. 459 + 637

This example is a bit more complicated than the previous one, yet it's very easy to solve using the left to right approach. You first start by adding 600 to 459, which results in 1059. Now the problem is simplified to 1059 + 37. You simplify it even further by adding 30 to 1059, and then adding 7 to the result... which is 1096.

Subtracting a large number from 1000.

To subtract a large number from 1000 you can use this basic rule: subtract all but the last number from 9 (taking the absolute value... that is, ignoring if the number is negative), then subtract the last number from 10: 1000 – 736 **Step 1**: subtract 7 from 9 = **2 Step 2**: subtract 3 from 9 = **6 Step 3**: subtract 6 from 10 = **4** Your answer: **264.**

Multiplication rules... Multiply by 5

Multiply by 10 and divide by 2 **Multiply by 6:** Multiplying by 3 and then 2 is easy **Multiply by 9:** Multiply by 10 and subtract the original number **Multiply by 12:** Multiply by 10 and add twice the original number **Multiply by 13:** Multiply by 3 and add 10 times original number **Multiply by 14:** Multiply by 7 and then multiply by 2 **Multiply by 15:** Multiply by 10 and add 5 times the original number **Multiply by 16:** You can double four times or multiply by 8 and then by 2 **Multiply by 17:** Multiply by 7 and add 10 times original number **Multiply by 18:** Multiply by 20 and subtract twice the original number **Multiply by 19:** Multiply by 20 and subtract the original number **Multiply by 24:** Multiply by 8 and then multiply by 3 **Multiply by 27:** Multiply by 30 and

subtract 3 times the original number
Multiply by 45: Multiply by 50 and subtract 5 times the original number **Multiply by 90:** Multiply by 9 and put a zero on the right **Multiply by 98:** Multiply by 100 and subtract twice the original number **Multiply by 99:** Multiply by 100 and subtract the original number.

Multiply any large number by 12 mentally in seconds

To multiply any number by 12 just double last digit and thereafter double each digit and add it to its neighbour.

For example **21314 * 12 = 255768** Lets break it into simple steps:

Step 1: 021314 * 12 = ____8 (Double of Last Digit 4= 8)

Step 2: 021314 * 12 = ___68 (Now Double 1= 2, and add it to 4, 2+4=6)
Step 3: 021314 * 12= __768 (Now Double 3=6, and add it to 1, 6+1=7)

Step 4: 021314 * 12= _5768 (Now Double 1=2, and add it to 3, 2+3=5)

Step 5: 021314 * 12= _55768 (Now Double 2=4, and add it to 1, 4+1=5)

Step 6: 021314 * 12= 255768 (Now Double 0=0, and add it to 2, 0+2=2)

So your final answer of **21314 * 12 = 255768**

Calculating Square of numbers quickly...

Lets **calculate the square of 54**

So **(54)^2** = 5^2 +4 -- 4^2 = 25 +4 ----16 =29-------16= **2916**

Similarly **(55)^2** = 5^2 +5 --5^2=25+5------25=30---------25= **3025** Similarly **(56)^2** = 5^2 + 6--6^2=25+6------36= 31--------36= **3136** etc..

Squaring two digit numbers

You should memorize the first 25 squares

If you forgot an entry.
Say, you want a square of 13. Do this: add 3 (the last digit) to 13 (the number to be squared) to get 16 = 13 + 3. Square the last digit: 3^2 = 9. *Append* the result to the sum: 169.
As another example, find 14^2. First, as before, add the last digit (4) to the number itself (14) to get 18 = 14 + 4. Next, again as before, square the last digit: 4^2 = 16. You'd like to append the result (16) to the sum (18) getting 1816 which is clearly too large, for, say, 14 < 20 so that $14^2 < 20^2$ = 400. What you have to do is append 6 and carry 1 to the previous digit (8) making 14^2 = 196.
Any Square

Assume you want to find 87^2. Find a simple number nearby - a number whose

square could be found relatively easy. In the case of 87 we take 90. To obtain 90, we need to add 3 to 87; so now let's subtract 3 from 87. We are getting 84. Finally, $87^2 = 90 \times 84 + 3^2 = 7200 + 360 + 9 = 7569$. digit (8) making $14^2 = 196$.

Faster subtraction

Subtraction is often faster in two steps instead of one.
For example, 427 - 38 = (427 - 27) - (38 - 27) = 400 - 11 = 389. A generic advice might be given as "First remove what's easy, next whatever remains". Another example: 1049 - 187 = 1000 - (187 - 49) = 900 - 38 = 862.

Faster addition

Addition is often faster in two steps instead of one.

For example, 487 + 38 = (487 + 13) + (38 - 13) = 500 + 25 = 525. A generic advice might be given as "First add what's easy, next whatever remains". Another example: 1049 + 187 = 1100 + (187 - 51) = 1200 + 36 = 1236.

Mental Calculations - Getting the result fast

Addition of 5
When adding 5 to a digit greater than 5, it is easier to first subtract 5 and then add 10.
For example,

7 + 5 = 12.
Also 7 - 5 = 2; 2 + 10 = 12.

Subtraction of 5
When subtracting 5 from a number ending with a a digit smaller than 5, it is easier to first add 5 and then subtract 10.
For example,

23 - 5 = 18.
Also 23 + 5 = 28; 28 - 10 = 18.

Division by 5
Similarly, it's often more convenient instead to multiply first by 2 and then divide by 10.
For example,

1375/5 = 2750/10 = 275.

More examples and explanation

Multiplication by 5
It's often more convenient instead of multiplying by 5 to multiply first by 10 and then divide by 2.
For example,

137×5 = 1370/2 = 685.

Division by 5

Similarly, it's often more convenient instead to multiply first by 2 and then divide by 10.

For example,

1375/5 = 2750/10 = 275.

Division/multiplication by 4

Replace either with a repeated operation by
For example,

124/4 = 62/2 = 31. Also,
124×4 = 248×2 = 496.

Division/multiplication by 25

Use operations with 4 instead.
For example,

37×25 = 3700/4 = 1850/2 = 925.]

operation by 2.
For example,

124×8 = 248×4 = 496×2 = 992.

Division/multiplication by 125

Use operations with 8 instead.
For example,

37×125 = 37000/8 = 18500/4 = 9250/2 = 4625.

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More examples and explanation

Division/multiplication by 8

Replace either with a repeated