Maths Week/ Wiki Pāngarau 2025

MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

NZAMT
Te Rōpū Kaiako Pāngarau o Aotearoa
New Zealand Association of Mathematics Teachers

Survivor Series/Kia Mōrehurehu

Day 1 Set E

For students

WHAT TO DO FOR STUDENTS

1 **You can work with one or two others. Teams can be different each day.**

2 **Do the tasks and write any working you did, along with your answers, in your maths book.**

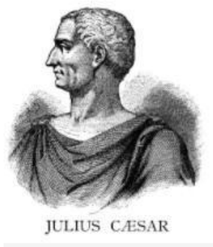
3 **Your teacher will tell you how you can get the answers to the questions and/or have your work checked.**

4 **When you have finished each day, your teacher will give you a word or words from a proverb.**

5 **At the end of the week, put the words together in the right order and you will be able to find the complete proverb! Your teacher may ask you to explain what the proverb means.**

6 **Good luck.**

NUMBER QUEST



Task 1 – Roman Numerals

Unary is the simplest way to represent numbers and has just one character to represent numbers, so 1 = I, 2 = II, 3 = III, and so on so 10 = IIIIIIIIII, zero is represented by no character.

Roman Numerals use letters from the Latin alphabet to represent seven different values. They are still used today; you may have noticed them in television credits, on old buildings, or on clocks. The seven symbols are I, V, X, L, C, D and M and are worth 1, 5, 10, 50, 100, 500, and 1000 respectively.

Romans Numerals are based on the following symbols:

1	5	10	50	100	500	1000
I	V	X	L	C	D	M

Rules Description 1:
The rules for combining letters start from the left-hand side and are if a letter follows one of a higher value you add it and if a letter follows one of a lower value you subtract the lower value.

Thus VI = 6 (5 plus 1) [as the I follows a letter V a letter of a higher value] and IV = 4 (5 minus 1) [as the V follows a letter of a lower value].

In the same way XIV, starting on the right-hand side with IV gives 4 and then looking at XI means that the X is added giving 14.

Rules Description 2:
Start on the left and move towards the right. Add the values for each character UNLESS these specific combinations appear and in which case add their specific value:
IV = 4, IX = 9, XL = 40, XC = 90, CD = 400 and CM = 900

Basic Combinations:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV

What are the following Roman Numerals worth?

1.	XI	2.	IX	3.	LX	4.	CX
5.	XC	6.	LII	7.	DCC	8.	CD

9. The Trevi Fountain in Rome was built in 1732 AD, write this in Roman Numerals.

10. Write 2025 in Roman Numerals.

11. At the end of the film Toy Story, the credits show the Roman Numerals MCMXCVII, what year does this represent?

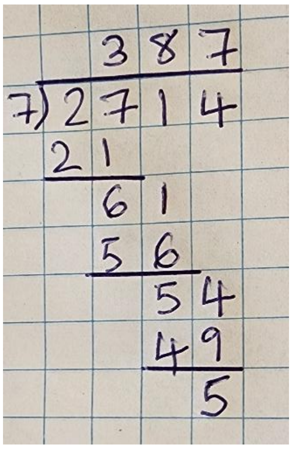
12. Think about places you have seen Roman Numerals or research some places where they are clearly visible to the public for example on buildings.

Task 2

Around fifty years or so ago students did not have calculators (or mobile phones, a computer or the internet) to complete calculations for them in the classroom.

Students either completed the calculations "by hand" or using a structured method such as logarithms, Napier's bones and the like.

Long division was routinely completed by primary age students. You can ask your grandparents, who would have probably been in school without the option to use a calculator during maths classes.



The logic is like "short division", but the calculations are written down in full.

First you think how many sevens there are in twenty-seven, write this digit above the line and above the seven of twenty-seven. Then multiply this digit by seven, in the example 3 x 7 = 21 and write the answer under the twenty-seven and then subtract (27 – 21 = 6) giving six. Move the next number (1 in the example) down, giving a new number (61 in the example). Now think how many sevens there are in this new number (61) and write this as the next digit above the line. Now repeat the process multiply the new digit above the line (8) by seven and write it below the 61 etc.
Note the 5 at the bottom is called the remainder.

If a decimal answer is required, then the calculation can be continued bringing down zeros in subsequent place value positions (those after the decimal point) as many times as necessary to either find an exact answer or an accurate enough answer.

Instead of picking up a calculator, complete the following division sums remembering to use one square for one digit in your maths book and set it out as shown in the example using a ruler where appropriate!

1. 795 divided by 5
2. 47318 divided by 9
3. 8345 divided by 3
4. 72953 divided by 7
5. 298314 divided by 24
6. 478959 divided by 39

Task 3

You are probably so familiar with the decimal number system that you just automatically know that the position of a digit in a number determines how much that digit is worth, and thus what the value of the entire number is.

Base systems like binary and hexadecimal seem a bit strange at first. The key to understanding different counting systems is to know how different systems “tick over” like an odometer on a car when they are full. Base 10, our decimal system, “ticks over” when it gets 10 items, creating a new digit position. We wait 60 seconds before “ticking over” to a new minute. Hex and binary are similar, but tick over every 16 and 2 items, respectively.

Decimal is base 10 and uses powers of ten to write a number, ones, tens, hundreds, thousands etc. ($10^0 = 1$, $10^1 = 10$, $10^2 = 100$, $10^3 = 1000$ etc.)

264 is made up of 2 hundreds, 6 tens and 4 ones, when you see the number 264 you automatically know the number is (2 x 100) + (6 x 10) + 4 x 1).

Binary is base 2 and uses powers of two to write a number, ones, twos, fours, eights, sixteens etc. . ($2^0 = 1$, $2^1 = 2$, $2^2 = 4$, $2^3 = 8$ etc.)

110 in base two is made up of 1 four, 1 two and zero ones so it is equivalent to six in decimal or base 10.

Hexadecimal is base 16 and uses powers of 16 to write a number, ones, sixteens, two hundred and fifty-sixes etc. (. ($16^0 = 1$, $16^1 = 16$, $16^2 = 256$, $16^3 = 4096$ etc.)

892 in base sixteen is made up of 8 two hundred and fifty-sixes, 9 sixteens and 2 ones so is equivalent to two thousand one hundred and ninety-four in decimal

Of course, with hexadecimal, we need more characters to represent single digits than in decimal and the convention is to use the letters A, B, C, D, E and F as a single digit to represent the decimals numbers 10, 11, 12, 13, 14 and 15.

7AF in base sixteen is therefore made up of 7 two hundred and fifty-sixes, 10 sixteens and 15 ones so it is equivalent to one thousand nine hundred and sixty-seven.

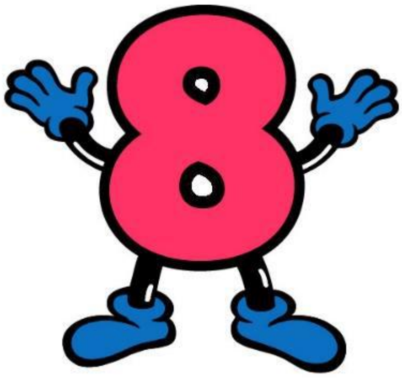
The trick when converting numbers is to write the number out as the sum of the digits multiplied by the appropriate place value. Look at the decimal/binary table below and complete the missing information.

Decimal Number	**$2^5 = 32$**	**$2^4 = 16$**	**$2^3 = 8$**	**$2^2 = 4$**	**$2^1 = 2$**	**$2^0 = 1$**	**Binary Number**
	(sum of powers of 2 required)						
9			1	0	0	1	1001
	9 = 8 + 0 + 0 + 1						
21		1	0	1	0	1	10101
	21 = 16 + 0 + 4 + 0 + 1						
48	1	1	0	0	0	0	110000
	48 = 32 + 16 + 0 + 0 + 0 + 0						
17							
61							
							101011

Look at the decimal/hexadecimal table below and complete the missing information.

Decimal Number	**16^5= 1048576**	**16^4= 65536**	**16^3= 4096**	**16^2= 256**	**16^1= 16**	**16^0= 1**	**Hexadecimal Number**
	(sum of powers of 16 required)						
19					1	3	13
	19 = 16 + 3						
65					4	1	41
	65 = 4x16 + 1						
267				1	0	B	10B
	267 = 256 + 0 + 11						
27							
518							
4099							
							1A7

Create your own conversion table to convert between binary and hexadecimal.



If you look at the place value within binary and hexadecimal you will see that they link together, as the last four digits in binary are equivalent to the last digit in hexadecimal and similarly the preceding four digits in binary are equivalent to the penultimate digit in hexadecimal.

Use your table to convert the following binary numbers to hexadecimal:

1. 110010
2. 100111
3. 001101
4. 111100
5. 101111
6. 101010

Use your table to convert the following hexadecimal numbers to binary:

1. BC
2. 7E
3. AC
4. EE
5. 17
6. D5

Task 4

There are many other techniques people can use for multiplication, other than the standard methods currently taught in school or using a device such as a calculator. These include amongst others the Russian Peasant method, Napier's Bones, the Japanese lines method, and the more traditional logarithms which were used before the invention of electronic calculators and computers. You can find out some more of these by working through the Survivor Series Day 1 Set D.

More recently, in the 1960s a Russian mathematician, Anatoly Karatsuba, proposed a more efficient way to multiply large numbers.

The traditional way to multiple two two-digit numbers together requires four single digit multiplications and some additions, whilst the Karatsuba Method requires three single digit multiplications plus some additions and subtractions. As numbers increase in size, this method can be used repeatedly, saving an increasing number of single digit multiplications.

Research this method, try completing some long multiplications using it and see if you can write a clear and concise explanation how to use the method.

Can you explain how/why it works?