(G) Magik Yup’ik (1/2)

There is only one possible type of 3-by-3 magic square, although there are 8 distinct configurations that stems from the one type due to rotation and reflection. These permutations are avoided due to the presence of the Yup’ik cross-number puzzle clues.

Since there are 9 digits, the numbers can be arranged via this formula:

[1] n-1	[2] n+4	[3] n-3
[2] n-2	n	n+2
[3] n+3	n-4	n+1

This formula takes into consideration 9 consecutive numbers, as well as the fact that the sum of every row, columns, and diagonals is the same – 3n. Since the sum of each column is 3n, the sum of three columns is 9n. The sum from 1 to 9 is 45. Hence 9n = 45, leaving us with n=5.

G1.

[1] 4	[2] 9	[3] 2
[2] 3	5	7
[3] 8	1	6

The answer to Task 1 is as above. Candidates may in the process arrive at the other 7 possible combinations. These permutations will be eliminated when checked against the Yup’ik hints.

Since the question provided 2D as a 3-digit number that starts with 9, and that all numbers in the clues are 3-digit, and that all Yup'ik numbers begin with Yuinaat, candidates have to consider that Yup’ik may be using a base larger than 10. The most common, in fact, is the Vigesimal system, which is base 20. This is also practical based on the background provided in the question – Yup’ik people based their concept of counting on body parts (20 fingers + toes).

(G) Magik Yup'ik (2/2)

Despite the various permutations, candidates should be able to arrive at 2D, which is 951. Further attempts at solving the spelling will reveal that 951 = (20 x 20 x 2) + (20 x 7) + (10 + 1). This is true to the base 20 system. Arriving at this conclusion will reveal:

- Suffix –k: multiply by 2/double/to do with two (a dual number)
- Suffix –t: multiply by more than 2 (a plural number)
- Suffix –q: the root suffix.

If the word ends in suffix –q, it signifies to the candidate that the subsequent number should be an addition and not a multiplication.

Candidates can then work on 3A, which is the next biggest number with 20 x 20 x 2. Hence, the number, which is the second biggest after one starting with "9", should start with "8". This will lead to 3A being 816. Candidates can then associate *akimiaq atauciq* to 16. From the 2D, *atauciq* = 1, hence *akimiaq* is 15. This is a reasonable and valid guess since Yup'ik people pay attentions to numbers based on the hands and feet.

Next, refer to 3D where candidates can make out (20 x (10+?)) + 16. Given that diagonal also sum up to 15, we can gather 2 and then 7 from it being the remaining cell in 3D. Hence 3D is 276 and that it is (20 x (10+3)) + 16.

Knowing that *qula* = 10, *akimiaq* = 15, and that *malruk* = 2, *pingayun* = 3, we will be able to solve most of the magic square. The other number not mentioned is *cetaman* =4.

G2. Yuinaat yuinaq malruk akimiaq atauciq.

1Diagonal is 456 and can be expressed in Yup'ik spelling as (20 x 20) + (20 x 2) + 16. However, notice from other clues that numbers below 800 are not spelled in this manner but more of (20 x 22) + 16. Hence the number will be spelled according to (20 x (20 + 2)) + 16.