Precious primes, a new category of primes that may be used to represent three different primes: related conjecture and possible applications such as encoding graphs

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Abstract: In this paper we define a novel kind of prime "p" with (m+n) digits whose first "m" digits represent a prime and the next "n" digits also represent a prime in just one possible way. These primes which we call as precious primes relate three different primes and therefore products of precious primes may allow representation of complex structures such as graphs.

Results: Consider a prime p that contains m+n digits. If the first m digits represent a prime number q and the next n digits also represent a prime number r, then p is defined as a precious prime. The second prime represented by the n digits may allow the number zero to be the first digit. The numbers p, q, r can be considered to be related to one another and can potentially represent the edge of the graph and the two nodes that connect it respectively. The smallest precious prime is 23, that is split using our strategy into two primes 2 and 3. Another example of precious prime is the number 37 which can be split into two primes 3 and 7. While 37 may be used to represent the edge of a graph, the numbers 3 and 7 may be used to represent the nodes that are connected by that edge.

Next we conjecture that every prime number may be a constituent of infinite number of precious primes. The truth of this conjecture implies that enough precious primes would be available to label each and every edge of any graph using our strategy using a unique precious prime while ensuring that the splitting of the precious prime would yield the primes representing the nodes connecting that particular edge.

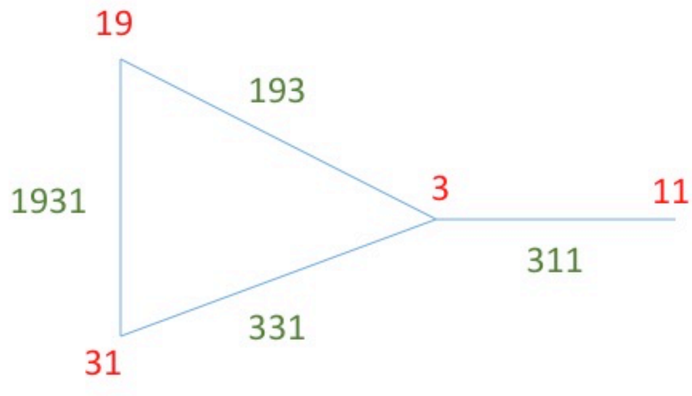
The product of the precious primes (Precious primes product) corresponding to each edge would give us a single number that uniquely represents the given graph. Minimizing this value following precious prime labeling may allow us to test two graphs for isomorphism or may be useful in other graph theory applications.

Zero-split precious prime: Primes such as 307, which may be split as 3 and 07 are known as zero-split precious primes.

Also, to simplify calculations such as finding minimum value for alternate labeling, one can calculate the logarithm for the precious prime product to minimize it.

It may also be possible to reuse the same edge values for distinct edges defined by node pairs away from one another and which would show up as powers of precious primes in the "Precious primes product".

An example of encoding graphs using precious primes is shown in the figure below.



Precious prime product for the above graph = 193 x 311 x 331 x 1931

Figure 1: An example showing labeling of a graph with precious primes