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Pattern and Parity in Mathematics

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Abstract

Index terms—

The mathematical form of the evenly even and the oddly even numbers: , where 0, 1,2, 3 ? r .

Table **??**:

1 III. PYTHAGOREAN THEOREM

In a right-triangle, the square of hypotenuse is equal to the sum of the squares of the other sides called the legs. This is known as the theorem of Pythagoras [1]. These three measurements are known as Pythagorean Triplets or Pythagorean Triples.

For the positive real numbers, , , and a b c , which are the measures of three sides of a right triangle the Pythagorean Theorem is 2 2 2 a b c ??, c is the measure of the hypotenuse.

We will discuss the known formulas in terms of evenly even, oddly even and odd numbers to determine the pattern.

Here we discuss some well-known results on Pythagorean triplets (, ,) abc , Proposition 2. Suppose a is an evenly even number, then The following results are Pythagorean Triples (, ,) abc , a is an odd number, Proposition 1. (3,4,5) (? ? ? ? ? ? ? ? ? ? ? ?

We propose a method to find the Pythagorean primes using the magic rule 8 4 12 ?? .

Magic rule 8 -4 -12: Choose a Pythagorean prime, then add 8, 4, or 12 in order to collect the next Pythagorean prime. In this process one needs to observe the output. If the output is not a prime, filter it or mark it and continue with the process. Given below is an elastration step by step. Continuing in this process one may easily find infinitely many Pythagorean primes.

We further check the following: ? ? ? ? ? ? ? ? ? ? ? ?

It is interesting to note that each Pythagorean prime number is the sum of one even squares and one odd squares congruent to 1 mod 4 and this representation is unique.

Following list shows the prime positions of Pythagorean primes. The Pythagorean primes are in row 1, their prime positions are in row 2. x f x x x ? ? ? ? . 3 3 1 '( ) 4 f x x x ??

, then to evaluate the definite integral4 2 2 1 ['( )] L f x dx ?? ? .

It is expected that the readers know how to simplify the integrand.

2 V. PYTHAGOREAN TRIPLES IN FINDING AN ARC LENGTH

It is not too difficult to check that22 33 33 11 1 44 xx xx ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

, which is a Pythagorean.

One has to verify that 21 ? ab or 41 ? ab .

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Definition. Hinges are positions when we split an ordered data set into pieces. John Tukey's upper hinge and lower hinge are the measures of positions, known as third and first quartiles.

Let 0 p ? be a positive integer. Two integers N and r are congruent modulo p, if there is an integer 0, 0 1 k r p ? ? ? ? such that N r kp ?? , and commonly known by the notation mod N r p ? Notice that the condition " N r kp ?? " for some integer k" is equivalent to the condition "p divides Nr".

Suppose we have N discrete ordered data points and to find p segments keeping m data points in each segment. The number of hinges must be 1 p ? .

To determine how many hinges are integer ranked and how many are non-integer ranked.

3 We observe that when

Nr m pp ??, the number of data points in each segment is Nr m p ? ? and there are r integer ranked hinges.

For simplicity we discuss a special case for four equal divisions commonly known as quartiles [4], and the same idea is extended for deciles [2] and further on even order of divisions or segments.

Suppose N is an even number, the middle most hinge will be non-integer ranked.

4 VI. HINGES

Further if N is doubly even, the first and third hinge are non-integer ranked as well. The number of data points N is divisible by 4. This result is confirmed by the remainder rule * , 0; , 4 N m r m r Z ? ? ? , there is no integer ranked hinges.

If N is singly even, then the remainder is 2 when N is divided by 4. The middle most hinge will be non-integer ranked and the other two must be integer ranked. The first hinge therefore is 1) m ? th data point and the third one is () Nr ? th data point, [4], [5].

Corollary 1: If the divisor p is an even number, then there exist midhinge (median) and data set shows symmetry about midhinge.

5 The midhinge 2

H is considered as the median of the ordered data set [4]. If p is odd, midhinge does not exist for the ordered data set and there is no symmetry.

Corollary 2: If the number of data points N is divisible p and ,0 N mp r ?? , then there is no integer ranked hinge. The positions of the hinges would be between each consecutive groups of m observations.

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Note that if N is an odd number and 4 p ? , then the remainder is either 1 or 3. On the other hand if N is an even number then remainder is either 0 or 2. Remainder 1 r ? confirms the middle most hinge (median) as integer ranked and other two non-integer ranked keeping m data points in each segment. Thus we have the following table using average:r 1 H : first quartile 2 H : median 3 H : third quartile 0 1 ( ) / 2 mm dd ? ? /2 /2 1 ( ) / 2 NN dd ? ?(**1**)( ) / 2 N m N m dd ? ? ? ? 1 1 ( ) / 2 mm dd ? ? (1)/2 N d ?(**1**)( ) / 2 N m N m dd ? ? ? ? 2 1 m d ? /2 /2 1 ( ) / 2 NN dd ? ? Nm d ? 3 1 m d ? (1)/2 N d ? Nm d ?

The remainder rule we propose works for hinges when the divisor p is an even number. But the remainder rule still works when p is an odd number. In this case, the number of hinges is even, which shows an interesting behavior. Finding integer ranked hinges we keep as an open question.

For example, we have 22 ordered data points and to find 8 hinges for nine segments.

We have 22, 9 Np ?? , therefore 22 4 mod 9 9 ? , where 4, 2 rm ?? . It is not difficult to verify that there are 4 integer-ranked hinges and remaining 4 hinges are non-integer ranked. The number of data points in each segment is 2 m ? .

7 Table 6:

Following are the possible selections. Suppose there are N elements in an ordered data set, we are interested to find 1 f ? fractiles. In this model f is an even number, [2], [4] .

The ? -th fractile is calculated as follows1 Nd Fi ff ? ? ?? ? ? ? ? ?? ??

, where i and df ? are positive integers.

The following model produces fractiles by the following rounding notion: In this example all the fractiles are non-integer ranked, with 8 ordered data points in each segment.Condition 1. If 2 f r ? , round

8 The average position of the fractiles based on

1 N F f ? ? ? ? Hinge 1 F 2 F 3 F 4 F 5 F 6 F 7 F

Position 8 th -9 th 16 th -17 th 24 th -25 th 32 nd -33 rd 40 th -41 st 48 th -49 th 56 th -57 th In this paper, we proposed several methodologies to solve complex mathematical problems, portraying pattern recognition and parity which could make complex math problems easier. We proposed strategies to determine powers of imaginary roots, calculating Pythagorean t riplets and Pythagorean primes using our "Magic Rule 8-4-12", and finding arc lengths and fractiles. Applying these methods could enhance students' background knowledge and skills to face the challenges in STEM education. These methods would be further studied to determine if students are able to implement these tactics to solve mathematical problems more efficiently. [1] [2]

Figure 1:

1

Figure 2: Proposition 1 :

3

Figure 3: Proposition 3 .

Figure 4:

1

Figure 5: Observation 1 :

{2 1| ? x x Z To evaluate ? ? o S	}											
	Evenly even		n	4, m n S ??						ee	n i ?	1
	Oddly even		n	?	4	m	?	2,	n S ?	oe		1 i ?
		Odd	n	? ?	4 4 m m		?	3,	? m Z m Z ?	* *		n ii
			n				?	1,				??
The general rule:	? nr	mod 4										

London Journal of Research in Science: Natural and Formal On the other hand, the odd numbers are not divisible by 2. The odd numbers set is * * , n in ?? and * mZ ?

Figure 6:

2

The following results are Pythagorean Triples (, ,) abc ,	Proposition 2 and 3.		2 a ? is an even number,
(2,0, 2) Does not form a triangle	(4,3,5)	(6,8,10)	(8,15,17)
(10, 24, 26)	(12,35,37)	(14, 48,50)	(16,63,65)
(18,80,82)	(20,99,101)	(22,120,122)	(24,143,145)
(26,168,170)	(28,195,197)	(30, 224, 226)	(32, 255, 257)

Figure 7: Table 2 :

3

More Pythagorean Triples can be found by using the form

positive real numbers.

Pythagorean Triples are proportional with a scale factor of k , whi
variations.

k ? 1, (3, 4,5) k ? 2, (6,8,10) k ?

k ? 0.1, (0.3,0.4,0.5) k ? 0.2, (0.6,0.8,0.1) k

Another known approach: Two numbers can be selected and then find the third number of the Pythagorean Triples.
We will select two numbers p and q such that a

The relation 2 (p q ? 2 2) (2) (2 pq ? ? 2 p q ? 2 2) follows the Pythagore

Figure 8: Table 3 :

4

2 pq ? 12,q ? 1, p ? 6 2 (12,35,37) pq ? 12, q ? 2, p (12,5,13) ? 3

In the number theory, Fermat's theorem on sums of two squares states that an odd prime P can be expressed as 22 ?? P x y , with * x y Z , set of po

The known such prime numbers are
2 5 1 2 2 2 13 2 3 2 2 17 1 4 2

Pythagorean Triples when pq ? .

Figure 9: Table 4 :

5

12

Box the non-primes, if repeated three times in a row, use the largest non-prime as follows.London Journal of Research in Science: Natural and Formal

Figure 10: Table 5 :

5 13 17 29 37 41 53 61 73 89 97 101 109 113 137 149 157 173
3 6 7 10 12 13 16 18 21 24 25 26 29 30 33 35 37 40
The identity 4 (ab a b ? ? 22) ( ) a b ? ? ? ab ? ab 2 ab

Example 1. Find the arc length of the curve given by the function with the given restricted domain, ( ) 4 48 1 2 , 2

Figure 11:

Let us consider N r ? modf , where r ? 0, 2, 1, f ? 1; f ? 2, 3, 4,
The number of observations in each segment is known by m ? Nr f ?

Figure 12:

Condition 2. If 2 f r ? , round F ? to the nearest integer when d ? 2 f or 3 2 11 d f ? ? ? ? ? . f r
Condition 3. Example 1. Suppose 64, Nf ?? , 64 0 mod 8 8 ? , 0 r ? .

Figure 13:

7

Example 2. Suppose 65, Nf ?? , 65 1 mod 8 8 ? ,
In this example all the fractiles are non-integer ranked except the median
4 F ? 65 1 4 8 th ? ? ? 33 rd , with 8 ordered data points in each se
The average position of the fractiles based on

Hinge	1 F	2 F	3 F	4 F
Position 8 th -9 th 16 th -17 th 24 th -25 th				33 rd

Figure 14: Table 7 :

8

Example 3. Suppose 66, Nf ?? , 66 2 mod 8 8 ? , r ? 2
The average position of hinges based on F ?

Hinge	1 F	2 F	3 F	4 F	5 F	6 F
Position 8 th -9 th 16 th -17 th			25 th	33 rd -34 th	41 th -42 nd	50 th

It is very easy to check that 3 F and 6 F are integer ranked.
The third position is 3 F ? ? ? 1 25 8 25 and the sixth position is 6 F ? ? ? 2 50 8 50

Figure 15: Table 8 :

9

Figure 16: Table 9 :

[Wylie and Calculus] , C R Wylie , Jr Calculus . McGraw-Hill Book Company, University of Utah. p. 533.

[Firozzaman and Joarder ()] 'A refinement over the usual formulae for deciles'. M Firozzaman , A H Joarder . *International Journal of Mathematical Education in Science and Technology* 2001. 32 (5) p. .

[Firozzaman and Firoz ()] 'Efficient Remainder Rule'. Firoz Firozzaman , Fahim Firoz . *International Journal of Mathematical Education in Science and Technology* 2016. 4 (5) p. .

[Tukey ()] 'Exploratory Data Analysis, Addision-Wesley'. J W Tukey . *London Journal of Research in Science: Natural and Formal* 1977.

[Joarder and Firozzaman ()] 'Quartiles for discrete data'. A H Joarder , M Firozzaman . *Teaching Statistics* 2001. 23 p. .