Short Communication
Volume 12:1, 2023

Journal of Applied & Computational Mathematics

ISSN: 2168-9679

Open Access

A Mathematical Miscellany

Peter Sheehan*

Department of Mathematics, Swinburne University of Technology, Victoria, Australia

Introduction

First, let's express the summation over j of jr from j=1 to j=n in the form

$$s(n,r) = S(n,1)E / 3(r=1)$$

Then,

$$E = 6n^{r-1} + 3(r-1)n^{r-2} + [(r-2E)!(r-4)!\}(n^{r-3} - n^{r-4}) - a(1,r)(n^{r-5} - n^{r-6}) + a(2,r)(n^{r-7} - n^{r-8})$$

Until the term (n2-n) for r odd and (n-1) for r even and where the summation over j, from j=0 to j=2, of the terms

$$(-1)^j\left[3!/j!(3-j)!\right] a(1,r-j) \quad equals\ (r-2)/5\ for\ the\ minimum\ value\ of\ r>6,\ and\ so\ on.$$

The above formula is equals (r-2)/5 for the minimum value of r 6 and so on.

In other words, the summation over j from j=0 to j=2 of the terms

$$\left[(-1)^j 2!/(2-j)!j!\right] a(1,r-j) equals\ 1 + \left[(r-1)(r-2)/2-10\right]/5.$$

For r odd, the summation over j, from j=0 to j=(r+1)/2, of the terms

$$(-1)^j\left\{\left[(r+1)/2\right]!/j!\left[(r+1)/2-j\right]!\right\} a(p,r-j)\ \text{equalszero}$$

About the Study

For the minimum value of r ≥ 5 + 4p, p=1, 2 the summation over j from j=0 to j=(3 + 2p) of the terms (an iterated form)

$$(-1)^j\left\{(3+2p)!/j!\left[(3+2p)-j\right]!\right\} a(p,r-j)\text{equalszero}$$

Where t denotes final, for r even,

$$a(t,r)(r+2)/2 = a(t,r+1).$$

Further, for r odd,

$$(r-2)!/2!(r-4)! - a(1,r) + a(2,r) - \ldots.. = 3(r-3)/2$$

For r even, r from 6 upwards,

$$a(t,r)(r+3)(r+2)/6 = a(t,r+2) + a(t-1,r+2).$$

For the minimum value of r ≥ 4(n+1), the summation over j from j=0 to j=2(n+1) of the terms

$$(-1)^j\left[2(n+1)\right]!/j!\left[(2n+2)-j\right]!\ a(n,r-j)\ equals\ 1/(3+2n).$$

For the minimum value of r≥ 2n-1 and n ≥ 7, the summation over j from j=0 to j=n of the terms

$$(-1)^j n!/j!(n-j)!\ \left[a(n-6,r-j) + a(n-5,r-j)\right] equals\ zero.$$

For r odd, r ≥ 17, the summation over j from 0 to j=(r + 1)/2 of the terms

$$(-1)^j\left\{\left[(r+1)/2\right]!/j!\left[(r+1)/2-j\right]!\right\}\left[a(n,r-j) + a(n+1,r-j) + a(n+2,r-j)\right] equalszero$$

For r odd, the minimum value of r ≥ 7,

$$a(t,r)(r+2)/3 = a(t,r+1) + a(t-1,r+1).$$

For r odd, the minimum value of r ≥ 9,

$$a(t,r-2)r(r+1)/12 = a(t,r) + a(t-1,r).$$

For r even, the minimum value of r ≥ 8,

$$a(t,r-2)r(r+1)/6 = a(t,r) + a(t-1,r).$$

$$Also S(n,1) + S(n-1,1) + \ldots.. + S(1,1) = (n+2)!/(n-1)!3!$$

The first few examples follow, where S means $S(n,1)$,

$$S(n,2) = S(6n+3)/9. S(n,3) = S(6n^2+6n)/12. \quad S(n,4) = S\left[6n^3+9n^2+(n-1)\right]/15.$$

$$S(n,5) = S\left[6n^4+12n^3+3(n^2-n)\right]/18.$$

Or, to speed things along considerably,

Of course, it takes all of five seconds to deduce that S (n, 1)=n (n+1)/2.

It isn't hard to show that, for the minimum r10+5h, where h=1, 2,...., the summation over j, from j=0 to j=(6 + h) of the terms.

$$(-1)^j\left[(6+h)!\ /\ j!\ (6+h-j)!\right]\left[a(2h,r-j) + a(2h-1,r-j)\right]\text{ equalszero}$$

Now, on a distinct subject, it is not evident from texts readily available on the Laplace transform that the following is the case.

For the Laplace transform off (t)=sinn at, the inversion via Argand space leaves a simple result [1].

In particular, for n odd,

$$2^{n-1} sin^n at = 2^{n-1} f(t) equals\ the\ summation\ over\ j\ from\ j = 0\ to\ j = (n-1)/2,\ of\ the\ terms$$

$$(-1)^{(n-1)/2-j}\left[n!/(n-j)!j!\right] sin\left[(n-2j)at\right].$$

For n even,

$$2^{n-1} sin^n at = 2^{n-1} f(t)\ equals\ \left[(-1)n/2\right]\left[n!/(n/2)!(n/2)!\right] plus\ the\ summation\ over\ j\ from$$

$$j = 0\ to\ j = n/2-1,\ of\ the\ terms$$

$$(-1)^{j+n/2}\ [n!/(n-j)!j!]\ cos\ [(n-2j)\ at].$$

***Address for Correspondence:** Peter Sheehan, Department of Mathematics, Swinburne University of Technology, Victoria, Australia; E-mail: sheehanp@y7mail.com*

Received 12 December, 2022, Manuscript No: JACM-23-91183; **Editor assigned:** 15 December, 2022, PreQC No. P-91183 (PQ); **Reviewed:** 29 December, 2022, QC No. Q-91183; **Revised:** 13 February, 2023, Manuscript No. R-91183 (R); **Published:** 13 March, 2023, DOI: 10.37421/2168-9679.2023.12.510

Likewise, the interested reader should find that, for an odd, 2n-1 cosn (at) equals the summation over j from j=0 to j= (n-1)/2 of the terms.

$\left[n!/\, j!(n-j)!\right] cos\, [(n-2j)at],$

While, for n even, 2^{n-1} $\cos^n$ at equals the summation over j from j=0 to j=(n/2) -1 of the terms

$\left[n!/(n-j)!\,j!\right] cos\, \left[(n-2j)at\right] + n!/\,2(n/2)!(n/2!)!.$

That is, all results are trigonometric functions of the first order for which the absolute values of the (half) wavelength coefficients sum to unity [2].

a(1,6)=1							
a(1,7)=4							
a(1,8)=51/5	a(2,8)=9/5						
a(1,9)=21	a(2,9)=9						
a(1,10)=38	a(2,10)=28	a(3,10)=5					
a(1,11)=63	a(2,11)=69	a(3,11)=30					
a(1,12)=98	a(2,12)=1030/7	a(3,12)=3859/35	a(4,12)=691/35				
a(1,13)=726/5	a(2,13)=1419/5	a(3,13)=1584/5	a(4,13)=691/5				
a(1,14)=207	a(2,14)=508	a(3,14)=779	a(4, 14)=596	a(5,14)=105			
a(1,15)=286	a(2,15)=858	a(3,15)=1716	a(4,15)=1924	a(5,15)=840			
a(1,16)=385	a(2,16)=1383	a(3,16)=3479	a(4,16)=5361	a(5,16)=20183/5	a(6,16)=3617/5		
a(1,17)=507	a(2,17)=2145	a(3,17)=33033/5	a(4,17)=66417/5	a(5,17)=74547/5	a(6,17)=32553/5		
a(1,18)=3276/5	a(2,18)=16104/5	a(3,18)=59478/5	a(4,18)=150472/5	a(5,18)=1625012/35	a(6,18)=1223848/35	a(7,18)=43867/7	
a(1,19)=833	a(2,19)=32929/7	a(3,19)=143429/7	a(4,19)=444431/7	a(5,19)=894727/7	a(6,19)=1004513/7	a(7,19)=438670/7	
a(1,20)=1044	a(2,20)=6708	a(3,20)=33990	a(4,20)=1389690/11	a(5,20)=3520556/11	a(6,20)=5433004/11	a(7,20)=20460019/55	a(8,20)=3666831/55
a(1,21)=1292	a(2,21)=9367	a(3,21)=54587	a(4,21)=239343	a(5,21)=3713531/5	a(6,21)=7478419/5	a(7,21)=8396594/5	a(8,21)=3666831/5

Conclusion

Now, finally, on a very often forgotten maxim, regression analysis can never be treated as theory. If one is to consider a set of data, considering all of the sorting processes in the Universe which will may have directly or indirectly contributed to the generation of any one datum in the data set, the only things certainly not responsible for the generation of that datum are the other data in the same set. It has been argued, for example, that the earth may be facing an ice age due to considerations based on regression analysis of ice samples, whereas the functionality for any future ice age lies entirely with the sun. In short, data of a single set do not mutually propagate. Functionality-in the physical sense-exists solely in terms of physical propagation, not history. In any case, the sorting processes in the sun involve convection performed by fundamental particles, in terms of every form of interaction known, given the history of convection in this sense back to before the suns actual formation, rendering the obvious difficulty in attempting any prediction of solar activity, and considering, for example, that what may be termed a sun-spot is 10n events throughout the solar mass by origin.

The same considerations are obvious, even when applied to psychology, where the reaction of an individual to any influence depends on the generation of the reaction within the propagation of the individual's consciousness, and the role of memory of any past events is no less subject to propagation in the same circumstance. Basically, today depends solely on its actual propagation, not yesterday. It is trusted that all of the above reflections may prove to be of use.

References

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How to cite this article: Sheehan, Peter. "A Mathematical Miscellany." *J Appl Computat Math* 12 (2023): 510.