Hand calculation number e

For most people who do programming and use the extended math package like the one called “GNU Multiple Precision Arithmetic Library” or others which is available with many different programming languages you cannot do the correct decimal calculation with the digits in error, try it and check your results with mine? The problem with the GNU is that it is binary and not decimal like humans use and the calculation extends beyond the required accuracy, you can not set it to say 98 digits you can print a set number of digits from more. For your information I have calculated PI to 100 digits by hand it took 108 pages and that result agreed with the results of my PI program which has the same core program as my “e” program. A good example of the problem can be seen at the web site “mathforum.org/dr.math/faq/faq.e.html. Note when doing hand calculation you do not round up the value as they did in the example 13 times. You just simply truncate the answer as this works to your advantage, if you want to expand your calculation in the future you do not reinvent the wheel and start all over. In the above mentioned example they did a 25 digit calculation and ended up with an answer one unit above than it should be and said it was correct. There were 13 terms that were rounded up by one unit and the extra unit also came in the last calculation which placed the total over the correct value. Their value was "2.7182818284590452353602875" and should have been one unit less at "2.7182818284590452353602874"; by the way the 26th digit is a 7 which would cause a round up only if you know the extra digit. Because the answers were round up by one unit they must have had extra digits beyond the 25 digits before the term was printed which is very common when doing extended math calculation. In the last division they had a value of 16 and it needed to be divide by 25 which should have been a 0 for 25 digits and not the incorrect answer of 1, yes if you do extra digits which allows you to do auto round up the answer would become a 1. The same effect was in the 22 digit answer which was their goal for doing the calculation; it ended up being rounded up by 1 unit in the last digit too. This is what I am talking about in a hand calculation you do not have the next digit to work with so you cannot round up and should never do. If you create a program it needs to have the same results as a hand calculation would do. The following listing is the values they should have produced the +1 at the end of the 13 lines is where the round up should have not occurred. As a justification of my statements, when William Shanks published his 707 digits of his 709 digits calculated value of PI the last two digits that were dropped was 92 and he did not use them to round up. For his 609 digits he also dropped the last two digits which were only 08 which had no effect. In his book he listed all the terms for his 530 digit calculation of PI and he also did not round up the terms. I can think of two methods that may just work correctly if some one with extended math package would like to try it.

I did the following hand calculation for 25 digits in 3 hours; it took seven pages for the total calculation. I have placed the scanned pages on my web site for your viewing at “engert.us/erwin/miscellaneous/Hand calculation number e.pdf”. In a similar location my 20, 40 and 100 hand digits calculation of PI can be found at the more general location “engert.us/erwin/miscellaneous.html”

1/0! = 1.00000 00000 00000 00000 00000

1/1! = 1.00000 00000 00000 00000 00000
1/2! = 0.50000 00000 00000 00000 00000
1/3! = 0.16666 66666 66666 66666 66666 + 1
1/4! = 0.04166 66666 66666 66666 66666 + 1
1/5! = 0.00833 33333 33333 33333 33333
1/6! = 0.00138 88888 88888 88888 88888 + 1
1/7! = 0.00019 84126 98412 69841 26984
1/8! = 0.00002 48015 87301 58730 15873
1/9! = 0.00000 27557 31922 39858 90652 + 1
1/10! = 0.00000 02755 73192 23985 89065
1/11! = 0.00000 00250 52108 38544 17187 + 1
1/12! = 0.00000 00020 87675 69878 68098 + 1
1/13! = 0.00000 00001 60590 43836 82161
1/14! = 0.00000 00000 11470 74559 77297
1/15! = 0.00000 00000 00764 71637 31819 + 1
1/16! = 0.00000 00000 00047 79477 33238 + 1
1/17! = 0.00000 00000 00002 81145 72543
1/18! = 0.00000 00000 00000 15619 20696 + 1
1/19! = 0.00000 00000 00000 00822 06352
1/20! = 0.00000 00000 00000 00041 10317 + 1
1/21! = 0.00000 00000 00000 00001 95729
1/22! = 0.00000 00000 00000 00000 08896 + 1
1/23! = 0.00000 00000 00000 00000 00386 + 1
1/24! = 0.00000 00000 00000 00000 00016
1/25! = 0.00000 00000 00000 00000 00000 + 1

e   = 2.71828 18284 59045 23536 02862

This is the correct sum that they should have produced if they were doing the work correctly and matched these 25 digits with the 12 unit error in the last digit.

See my hand calculation for 25 digits for the number “e”.

Page 1

							16666	
	11222	22222	22222	2222	2222			
						3)	52000	
0	1 00000	00000	000000	00000	000000		3	
1	1 00000	00000	00000	00000	000000		20	
2	50000	0000	00000	00000	00000		18	
3	16666	66666	66666	66666	66666		2	
4	04166	66666	66666	666666	66666		04166	
5	00833	33333	33333	33333	33333	4)	16666	
6	00138	88888	88888	88888	88888		16	
2	71805	55555	55555	55555	55553		6	
							4	
							26	
	19	84126					24	
7)	00138	88888					2	
	7		2	48015	873		0083	
	68		6) 00019	84126	98412	5)	04166	
	63		16				40	
	5	8	3	8			16	
	5	6	3	2			15	
		28		64			1	
		28		64				
		8		12				
		7		8				
		18		46				
		14		40				
		48		69				
		42		64				
		6	8		58			
					56			
					24			
					24			
					12			

		27557	31922	39858	90652				
95	00002	48015	87301	58730	15873				
	1	8				250	52108	38544	17187
		68			45	2755	73192	23985	89065
		63				22			
		60				55			
		45				55			
		51				5	7		
		45				5	5		
		65					23		
		63					22		
		2	8				11		
		2	7				11		
			17				42		
			9				88		
			83				4	2	
			81				3	3	
			20					93	
			18					88	
			21					59	
			18					55	
			3	5				48	
			2	7				44	
				88				45	
				81				44	
				77				1	8
				72				1	1
				53					79
				45					77
				80					20
				72					11
				8	1				96
				8	1				88
					58				86
					54				77
					47				8
					45				

23
18
5

	20	87675	69878	68098		1	60690	43836	82161
125	250	52108	38544	17187	135	20	87675	69878	68098
	24					13			
	10	5				7	8		
	9	6				7	8		
		92					076		
		84					65		
		81					117		
		72					117		
		90					05	6	
		84					5	2	
		68						49	
		60						39	
		8	3					108	
		7	2					104	
		1	18					47	
		1	08					39	
			105					88	
			96					78	
			94					10	6
			84					10	4
			104						28
			96						26
			8	1					20
			7	2					13
				97					79
	X 12	X 13		96					78
1	12	13		118					18
2	24	26		108					13
3	36	39		107					5
4	48	52		96					
5	60	65		11					
6	72	78							
7	84	91							
8	96	104							
9	108	117							
10	120	130							

		11470	74559	77297			264	71637	31819
145	1	60090	43836	82161		150	11470	74559	77297
	1	4					125		
		20					97		
		14					90		
		65					78		
		56					60		
		99					10	7	
		98					10	5	
		10	4					24	
		9	8					15	
			43					95	
			56					90	
			76					55	
			70					45	
			83					109	
			70					105	
			136					4	7
			126					4	5
			10	8					27
			9	8					15
			1	02					122
				98					120
				41					29
				28					15
				136					147
	x 14	x 15		126					135
1	14	15		101					12
2	28	30		98					
3	42	45		3					
4	56	60							
5	70	75							
6	84	90							
7	98	105							
8	112	120							
9	126	135							
10	140	150							

	47	29477	33238		2	81145	72543		
165	764	71637	31819	175	47	79477	33238		
	64				34				
	124				13	7			
	112				13	6			
	11	7				19			
	11	2				17			
	1	51				24			
	1	44				17			
		76				77			
		64				68			
		123				97			
		112				85			
		117				12	3		
		112				11	9		
		5	3				43		
		4	8				34		
			51		15619	20696	92		
			48	185 2	81145	72543	85		
			38	1	8		73		
			32	1	01		68		
			61		90		58		
			48		111		51		
			139		108		7		
			128		34				
			11		18				
					165				
	x16	x17	x18		162				
1	16	17	18		3	7			
2	32	34	36		3	6			
3	48	51	54			125			
4	64	68	72			108			
5	80	85	90			174			
6	96	102	108			162			
7	112	119	126			123			
8	128	136	144			108			
9	144	153	162			15			
10	160	170	180						

205 41 10317

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	822	06352		1	95729			8896	
195	15619	20696	215	41	10317	225	1	95729	
	152			21			1	26	
	41			20	1			197	
	38			18	9			176	
	39			1	20			212	
	38			1	05			198	
	1	20			153			149	
	1	14			147			137	
		66			61			12	
		57			42			386	
		99			197		235	8896	
		95			189			69	
		46			8			199	
		38						184	
		8			16			158	
				245	386			138	
					24			18	
					146				
					144				
					2				
	X 19	X 21	X 22						
1	19	21	22						
2	38	42	44						
3	57	63	66						
4	76	84	88						
5	95	105	110						
6	114	126	132						
7	133	147	154						
8	152	168	176						
9	171	189	198						
10	190	210	220						

	12	22235	35547	89788	8810				
2	71805	55555	55555	55555	55553		First 7	Terms	0-6
7	19	84126	98412	69841	26984				
8	2	48015	87301	58730	15873				
9		27557	31922	39858	90652				
10		2755	23192	23985	89065				
11		250	52108	38544	17187				
12		20	87675	69878	68098				
13		1	60590	43836	82161				
14			11470	74559	77297				
15			764	71637	31819				
16			47	79477	33238				
17			2	81145	72543				
18				15619	20696				
19				827	06352				
20				41	10317				
21				1	95739				
22					8896				
23					386				
24					16				
2	71828	18284	59045	23536	02862				