

Spreadsheets

This edition of fxNews contains two spreadsheets in file **SS07V4.g1m**.

The first spreadsheet **PTSEARCH** serves as both a great introduction to creating a simple spreadsheet and secondly for investigating Pythagorean triples.

The second spreadsheet is called **PI** and shows how a spreadsheet can be used to estimate a value for π to a given number of decimal places using a series.

Below is a more detailed description of both of the included spreadsheets.

PTSEARCH This spreadsheet generates column C based on the two coefficients entered in cells A1 and B1.

PTSB	A	B	C	D
1	5	9	10.295	
2	5	10	11.18	
3	5	11	12.083	
4	5	12	13	
5	5	13	13.928	

=√(A1²+B1²)

Column A copies the value in A1 to all cells below.

Column B increments the value in B1 by 1 as it fills down.

Column C is calculated using $\sqrt{A1^2 + B1^2}$ and filled down.

PTSB	A	B	C	D
14	7	21	22.135	
15	7	22	23.086	
16	7	23	24.041	
17	7	24	25	
18	7	25	25.961	

=B16+1

By trying various initial coefficients in cells A1 and B1 and examining the rest of the table, Pythagorean triples can be observed and students may then start to form conjectures to test and justify.

Some typical results are shown below:

3	4	5
5	12	13
7	24	25
9	40	41
11	?	?

PI This spreadsheet uses a series to find an approximation for pi.

PI	A	B	C	D
1	1	2n-1	1/n	1
2	2	3	0.111	0.8888
3	3	5	0.2222	0.9111
4	4	7	-5E-3	0.9058
=1+B3*1÷(-3)^(A3-1)				
[CUT] [COPY] [CELL] [JUMP] [SEC] [D]				

PI	C	D	E	F
1	1/n	1/n	243Sn	π-E
2	1	1	3.4641	-0.322
3	0.111	0.8888	3.0792	0.0623
4	0.2222	0.9111	3.1561	-0.014
5	-5E-3	0.9058	3.1378	3.7E-3
=π-E2				
[CUT] [COPY] [CELL] [JUMP] [SEC] [D]				

An early formula, sometimes attributed to Leibniz (1646-1716) but seemingly first discovered by James Gregory (1638-1675) uses the series

$$\pi / 4 = 1 - 1/3 + 1/5 - 1/7 + \dots$$

From the point of view of the calculation of pi, to get 4 decimal places correct we need nearly 10000 terms of the above series.

However, from this can be derived the more general result

$$\pi = (2 \cdot \sqrt{3})(1 - 1/(3 \cdot 3) + 1/(5 \cdot 3 \cdot 3) - 1/(7 \cdot 3 \cdot 3 \cdot 3) + \dots)$$

which converges much more quickly. The screens below show that the limit of accuracy for the inbuilt value of pi is exceeded by the sum of the first 23 terms. (Column F displays the difference "pi – Sum of series in Column E").

PI	A	B	C	D
22	21	41	6E-12	0.9068
23	22	43	-2E-12	0.9068
24	23	45	7E-13	0.9068
25	24	47	-2E-13	0.9068
26	25	49	7E-14	0.9068
=A25+1				
[CUT] [COPY] [CELL] [JUMP] [SEC] [D]				

PI	C	D	E	F
22	6E-12	0.9068	3.1415	-5E-12
23	-2E-12	0.9068	3.1415	1E-12
24	7E-13	0.9068	3.1415	0
25	-2E-13	0.9068	3.1415	0
26	7E-14	0.9068	3.1415	0
=π-E26				
[CUT] [COPY] [CELL] [JUMP] [SEC] [D]				

Creating a sheet to find this series is an interesting exercise for developing both mathematical and spreadsheet skills.

There are many other alternatives and students could be encouraged to explore not only other solutions but also research other series from which pi may be obtained.

Remember that with all the spreadsheets supplied by fxNews you always have a backup copy in storage memory.

So if you or your students corrupt the data in them or simply want to start again simply pop into storage memory, select the spreadsheet file and copy back into main memory.

Be careful doing the above if you have made changes to the spreadsheets that you actually want to keep! When this is the case, always save a copy from main memory back into storage memory with a different name.