

Fibonacci, phi and magic reciprocals

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Resources

**This Power Point presentation
pdf files for the content of this
presentation**

**Spreadsheets in excel for the material
in this presentation**

FOR MORE INFO...

<http://Ellerbruch.nmu.edu/fibetc/maazonal.html>

Exercises

**Develop a spreadsheet showing the
Fibonacci sequence and phi**

Derive phi algebraically

**Extend phi properties to other magic
reciprocals**

**Develop a spreadsheet for magic
reciprocals**

**Modify and extend the Fibonacci
sequence**

Numerical Generation of Fibonacci sequence and phi

This is done easily using a spreadsheet:

<http://Ellerbruch.nmu.edu/fibetc/Fibonacci1.xls>

Algebraic derivation of phi

$$x = \phi$$

$$1/x = x - 1$$

$$x^2 - x - 1 = 0$$

$$x = (1 + \sqrt{5})/2$$

thus $x = 1.61803398875\dot{E}$ or $x = -.61803398875\dot{E}$

and we can associate $\phi = 1.61803398875\dot{E}$

$$1/\phi = .61803398875\dot{E}$$

Algebraic Extension 1

$$1/x = x - 2$$

$$x^2 - 2x - 1 = 0$$

$$x = (2 + \sqrt{8})/2$$

thus $x = 2.41421356237\dot{E}$

and $1/x = .41421356237\dot{E}$

Algebraic Extension 2

$$1/x = x - 3$$

$$x^2 - 3x - 1 = 0$$

$$x = (3 + \sqrt{13})/2$$

$$\text{thus } x = 3.30277563773$$

$$\text{and } 1/x = .30277563773$$

Algebraic Generalization

$$1/x = x - b$$

$$x^2 - bx - 1 = 0$$

$$x = (b + \sqrt{b^2 + 4})/2$$

Now a table in a spreadsheet will be useful.

To see the spreadsheet

<http://Ellerbruch.nmu.edu/fibetc/magic.xls>

Fibonacci Extension 1

Start the Fibonacci sequence with numbers other than 1

Download this excel spreadsheet and change the beginning values.
Watch the ratio.

<http://Ellerbruch.nmu.edu/fibetc/Fibonacci1.xls>

Fibonacci Extension 2

Sum more than two numbers in a Fibonacci like sequence.

Download this spreadsheet and vary the first three values.

<http://Ellerbruch.nmu.edu/fibetc/Fibonacci2.xls>

Fibonacci Extension 3

Sum four numbers in a Fibonacci like sequence.

Download this spreadsheet and vary the first four values.

<http://Ellerbruch.nmu.edu/fibetc/Fibonacci3.xls>