

Practice Problems for Heptadecagon
by Tom Rike

1. Fermat thought that the converse of his theorem ``If p is a prime number then $a^p - a$ is divisible by p '' is also true. Show that it is false by showing that $2^{341} - 2$ is divisible by 341 and that 341 is not prime. (One approach: Write 341 and 2^{341} in binary, do the long division, and look for a pattern.)
2. Show that $F_5 = 2^{32} + 1$ is not prime by finding one of the factors using only five carefully chosen divisions.
3. Consider a pentagon, hexagon and decagon inscribed in a circle. Prove that the square of a side of the pentagon is equal to the sum of the squares of a side of the hexagon and a side of the decagon.
4. Can you express the side of a 17-gon inscribed in a unit circle using only addition, subtraction, multiplication, division, and square roots?