

1. A tree casts a shadow 75 feet long. In order to figure out its height, we measure the shadow of a one foot ruler (held vertically) and discover it is 10 inches long. How tall is the tree?

2. What is the last digit of 3^{2008} ?

3. What are the missing digits in:

$$11^4 = 14x41$$

and

$$101^4 = 104yz0401.$$

Can you write a formula for $(x + 1)^4$ which “explains” these facts?

4. Each term of the *Fibonacci sequence*

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, . . .

is computed by adding together the two previous terms. What is the greatest common factor of 21 and 34? Of 34 and 55? Can you show the same for every pair of consecutive terms?

5. Triangle $\triangle ABC$ has a right angle at B, and $\overline{AB} = \overline{BC} = 1$. How does this diagram show that $\overline{AC} = \sqrt{2}$?

