



## Problem of the Week

### Problem C and Solution

#### Cookie Shares

#### Problem

Sheetal has some cookies. She gives one-third of her cookies to Gil. She then eats 4 cookies, after which she gives one-half of her remaining cookies to Anna. If Sheetal then has 16 cookies left, how many cookies did she have to begin?

#### Solution

##### Solution 1

We work backwards from the last piece of information given.

Sheetal has 16 cookies left after giving one-half of her remaining cookies to Anna. This means that she had  $2 \times 16 = 32$  cookies immediately before giving cookies to Anna.

Immediately before giving cookies to Anna, she ate 4 cookies, which means that she had  $32 + 4 = 36$  cookies immediately before eating the 4 cookies.

Immediately before eating these cookies, she gave one-third of her cookies to Gil, which would have left her with two-thirds of her original amount.

Since two-thirds of her original amount equals 36 cookies, then one-third equals one half of 36 or  $\frac{36}{2} = 18$  cookies.

Thus, she gave 18 cookies to Gil, and so Sheetal started with  $36 + 18 = 54$  cookies.

##### Solution 2

Suppose Sheetal started with  $x$  cookies.

She gives  $\frac{1}{3}x$  cookies to Gil, leaving her with  $1 - \frac{1}{3}x = \frac{2}{3}x$  cookies.

She then eats 4 cookies, leaving her with  $\frac{2}{3}x - 4$  cookies.

Finally, she gives away one-half of what she has left to Anna, which means that she keeps one-half of what she has left, and so she keeps  $\frac{1}{2}(\frac{2}{3}x - 4)$  cookies.

Simplifying this expression, we obtain  $\frac{2}{6}x - \frac{4}{2} = \frac{1}{3}x - 2$  cookies.

Since she has 16 cookies left, then  $\frac{1}{3}x - 2 = 16$  and so  $\frac{1}{3}x = 18$  or  $x = 54$ .

Therefore, Sheetal began with 54 cookies.

