Integrate to Find Expected Waste

The assumption of uniformity gives us a factor of $(2^{k-1})^{-1}$.

2^{k-1} N   waste 2^k

Integrating over the interval shown gives us
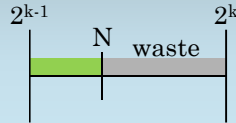
Expected waste $= \frac{1}{2^{k-1}} \int_{2^{k-1}}^{2^k} \left(\frac{2^k}{N} - 1\right) dN$

The -1 averages to **-1**, of course.

The first term averages to **2 ln 2**.

Dynamic Resizing Adds ~38% Extra Space on Average

Putting those two terms together gives

Expected waste = 2 (ln 2 – ½)

which is **about 38%**.

(Probably not too important.)

We Need Dynamic Allocation for Dynamic Resizing

One last thing before we can write the code:

◦ the standard **C** library

◦ dynamic allocation functions

◦ (**#include <stdlib.h>** for these).

malloc Allocates a New Chunk of Memory

The most basic call is

void* malloc (size_t size);

size is the **number of bytes needed**.

malloc returns
◦ **a pointer to a new chunk of memory** (from the heap), or
◦ **NULL on failure** (memory not available).