NAME

cksum, **sum** - display file checksums and block counts

SYNOPSIS

cksum [**-o** *1* | *2* | *3*] [*file* ...]
sum [*file* ...]

DESCRIPTION

The **cksum** utility writes to the standard output three whitespace separated fields for each input file. These fields are a checksum CRC, the total number of octets in the file and the file name. If no file name is specified, the standard input is used and no file name is written.

The **sum** utility is identical to the **cksum** utility, except that it defaults to using historic algorithm 1, as described below. It is provided for compatibility only.

The options are as follows:

-o Use historic algorithms instead of the (superior) default one.

Algorithm 1 is the algorithm used by historic BSD systems as the sum(1) algorithm and by historic AT&T System V UNIX systems as the sum(1) algorithm when using the **-r** option. This is a 16-bit checksum, with a right rotation before each addition; overflow is discarded.

Algorithm 2 is the algorithm used by historic AT&T System V UNIX systems as the default sum(1) algorithm. This is a 32-bit checksum, and is defined as follows:

```
s = sum of all bytes;
r = s % 2^16 + (s % 2^32) / 2^16;
cksum = (r % 2^16) + r / 2^16;
```

Algorithm 3 is what is commonly called the ‘32bit CRC’ algorithm. This is a 32-bit checksum.

Both algorithm 1 and 2 write to the standard output the same fields as the default algorithm except that the size of the file in bytes is replaced with the size of the file in blocks. For historic reasons, the block size is 1024 for algorithm 1 and 512 for algorithm 2. Partial blocks are rounded up.

The default CRC used is based on the polynomial used for CRC error checking in the networking standard ISO 8802-3: 1989. The CRC checksum encoding is defined by the generating polynomial:

G(x) = x^32 + x^26 + x^23 + x^22 + x^16 + x^12 +
x^11 + x^10 + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1

Mathematically, the CRC value corresponding to a given file is defined by the following procedure:

The *n* bits to be evaluated are considered to be the coefficients of a mod 2 polynomial M(x) of degree *n*-1. These *n* bits are the bits from the file, with the most significant bit being the most significant bit of the first octet of the file and the last bit being the least significant bit of the last octet, padded with zero bits (if necessary) to achieve an integral number of octets, followed by one or more octets representing the length of the file as a binary value, least significant octet first. The smallest number of octets capable of representing this integer are used.

M(x) is multiplied by x^32 (i.e., shifted left 32 bits) and divided by G(x) using mod 2 division, producing a remainder R(x) of degree <= 31.

The coefficients of R(x) are considered to be a 32-bit sequence.

The bit sequence is complemented and the result is the CRC.

EXIT STATUS

The **cksum** and **sum** utilities exit 0 on success, and >0 if an error occurs.

SEE ALSO

md5(1)

The default calculation is identical to that given in pseudo-code in the following ACM article.

Dilip V. Sarwate, "Computation of Cyclic Redundancy Checks Via Table Lookup", *Communications of the Tn ACM*, August 1988.

STANDARDS

The **cksum** utility is expected to conform to IEEE Std 1003.2-1992 ("POSIX.2").

HISTORY

The **cksum** utility appeared in 4.4BSD.