

UNIX PROGRAMMER'S MANUAL

Sixth Edition

K. Thompson

D. M. Ritchie

May, 1975

This manual was set by a Graphic Systems phototypesetter driven by the *troff* formatting program operating under the UNIX system. The text of the manual was prepared using the *ed* text editor.

PREFACE
to the Sixth Edition

We are grateful to L. L. Cherry, R. C. Haight, S. C. Johnson, B. W. Kernighan, M. E. Lesk, and E. N. Pison for their contributions to the system software, and to L. E. McMahon for software and for his contributions to this manual. We are particularly appreciative of the invaluable technical, editorial, and administrative efforts of J. F. Ossanna, M. D. McIlroy, and R. Morris. They all contributed greatly to the stock of UNIX software and to this manual. Their inventiveness, thoughtful criticism, and ungrudging support increased immeasurably not only whatever success the UNIX system enjoys, but also our own enjoyment in its creation.

INTRODUCTION TO THIS MANUAL

This manual gives descriptions of the publicly available features of UNIX. It provides neither a general overview – see “The UNIX Time-sharing System” (Comm. ACM **17** 7, July 1974, pp. 365-375) for that – nor details of the implementation of the system, which remain to be disclosed.

Within the area it surveys, this manual attempts to be as complete and timely as possible. A conscious decision was made to describe each program in exactly the state it was in at the time its manual section was prepared. In particular, the desire to describe something as it should be, not as it is, was resisted. Inevitably, this means that many sections will soon be out of date.

This manual is divided into eight sections:

- I. Commands
- II. System calls
- III. Subroutines
- IV. Special files
- V. File formats and conventions
- VI. User-maintained programs
- VII. User-maintained subroutines
- VIII. Maintenance

Commands are programs intended to be invoked directly by the user, in contradistinction to subroutines, which are intended to be called by the user's programs. Commands generally reside in directory */bin* (for *bin*ary programs). Some programs also reside in */usr/bin*, to save space in */bin*. These directories are searched automatically by the command interpreter.

System calls are entries into the UNIX supervisor. In assembly language, they are coded with the use of the opcode *sys*, a synonym for the *trap* instruction. In this edition, the C language interface routines to the system calls have been incorporated in section II.

A small assortment of subroutines is available; they are described in section III. The binary form of most of them is kept in the system library */lib/liba.a*. The subroutines available from C and from Fortran are also included; they reside in */lib/libc.a* and */lib/libf.a* respectively.

The special files section IV discusses the characteristics of each system “file” which actually refers to an I/O device. The names in this section refer to the DEC device names for the hardware, instead of the names of the special files themselves.

The file formats and conventions section V documents the structure of particular kinds of files; for example, the form of the output of the loader and assembler is given. Excluded are files used by only one command, for example the assembler's intermediate files.

User-maintained programs and subroutines (sections VI and VII) are not considered part of the UNIX system, and the principal reason for listing them is to indicate their existence without necessarily giving a complete description. The authors of the individual programs should be consulted for more information.

Section VIII discusses commands which are not intended for use by the ordinary user, in some cases because they disclose information in which he is presumably not interested, and in others because they perform privileged functions.

Each section consists of a number of independent entries of a page or so each. The name of the entry is in the upper corners of its pages, its preparation date in the upper middle. Entries within each section are alphabetized. The page numbers of each entry start at 1. (The earlier hope for frequent, partial updates of the manual is clearly in vain, but in any event it is not feasible to maintain consecutive page numbering in a document like this.)

All entries are based on a common format, not all of whose subsections will always appear.

The *name* section repeats the entry name and gives a very short description of its purpose.

The *synopsis* summarizes the use of the program being described. A few conventions are used, particularly in the Commands section:

Boldface words are considered literals, and are typed just as they appear.

Square brackets ([]) around an argument indicate that the argument is optional. When an argument is given as “name”, it always refers to a file name.

Ellipses “...” are used to show that the previous argument-prototype may be repeated.

A final convention is used by the commands themselves. An argument beginning with a minus sign “_” is often taken to mean some sort of flag argument even if it appears in a position where a file name could appear. Therefore, it is unwise to have files whose names begin with “_”.

The *description* section discusses in detail the subject at hand.

The *files* section gives the names of files which are built into the program.

A *see also* section gives pointers to related information.

A *diagnostics* section discusses the diagnostic indications which may be produced. Messages which are intended to be self-explanatory are not listed.

The *bugs* section gives known bugs and sometimes deficiencies. Occasionally also the suggested fix is described.

At the beginning of this document is a table of contents, organized by section and alphabetically within each section. There is also a permuted index derived from the table of contents. Within each index entry, the title of the writeup to which it refers is followed by the appropriate section number in parentheses. This fact is important because there is considerable name duplication among the sections, arising principally from commands which exist only to exercise a particular system call.

This manual was prepared using the UNIX text editor *ed* and the formatting program *troff*.

HOW TO GET STARTED

This section provides the basic information you need to get started on UNIX: how to log in and log out, how to communicate through your terminal, and how to run a program. See “UNIX for Beginners” by Brian W. Kernighan for a more complete introduction to the system.

Logging in. You must call UNIX from an appropriate terminal. UNIX supports ASCII terminals typified by the TTY 37, the GE Terminus 300, the Dasi 300, and various graphical terminals. You must also have a valid user name, which may be obtained, together with the telephone number, from the system administrators. The same telephone number serves terminals operating at all the standard speeds. After a data connection is established, the login procedure depends on what kind of terminal you are using.

300-baud terminals: Such terminals include the GE Terminus 300, most display terminals, Execuport, TI, GSI, and certain Anderson-Jacobson terminals. These terminals generally have a speed switch which should be set at “300” (or “30” for 30 characters per second) and a half/full duplex switch which should be set at full-duplex. (This switch will often have to be changed since many other systems require half-duplex). When a connection is established, the system types “login:”; you type your user name, followed by the “return” key. If you have a password, the system asks for it and turns off the printer on the terminal so the password will not appear. After you have logged in, the “return”, “new line”, or “linefeed” keys will give exactly the same results.

TTY 37 terminal: When you have established a data connection, the system types out a few garbage characters (the “login:” message at the wrong speed). Depress the “break” (or “interrupt”) key; this is a speed-independent signal to UNIX that a 150-baud terminal is in use. The system then will type “login:,” this time at the correct speed; you respond with your user name. From the TTY 37 terminal, and any other which has the “new-line” function (combined carriage return and linefeed), terminate each line you type with the “new-line” key (*not* the “return” key).

For all these terminals, it is important that you type your name in lower-case if possible; if you type upper-case letters, UNIX will assume that your terminal cannot generate lower-case letters and will translate all subsequent upper-case letters to lower case.

The evidence that you have successfully logged in is that the Shell program will type a “%” to you. (The Shell is described below under “How to run a program.”)

For more information, consult *getty* (VIII), which discusses the login sequence in more detail, and *ty* (IV), which discusses typewriter I/O.

Logging out. There are three ways to log out:

You can simply hang up the phone.

You can log out by typing an end-of-file indication (EOT character, control “d”) to the Shell. The Shell will terminate and the “login:” message will appear again.

You can also log in directly as another user by giving a *login* command (I).

How to communicate through your terminal. When you type to UNIX, a gnome deep in the system is gathering your characters and saving them in a secret place. The characters will not be given to a program until you type a return (or new-line), as described above in *Logging in*.

UNIX typewriter I/O is full-duplex. It has full read-ahead, which means that you can type at any time, even while a program is typing at you. Of course, if you type during output, the output will have the input characters interspersed. However, whatever you type will be saved up and interpreted in correct sequence. There is a limit to the amount of read-ahead, but it is generous and not likely to be exceeded unless the system is in trouble. When the read-ahead limit is exceeded, the system throws away all the saved characters.

On a typewriter input line, the character “@” kills all the characters typed before it, so typing mistakes can be repaired on a single line. Also, the character “#” erases the last character typed. Successive uses of

“#” erase characters back to, but not beyond, the beginning of the line. “@” and “#” can be transmitted to a program by preceding them with “\”. (So, to erase “\”, you need two “#”s).

The ASCII “delete” (a.k.a. “rubout”) character is not passed to programs but instead generates an *interrupt signal*. This signal generally causes whatever program you are running to terminate. It is typically used to stop a long printout that you don’t want. However, programs can arrange either to ignore this signal altogether, or to be notified when it happens (instead of being terminated). The editor, for example, catches interrupts and stops what it is doing, instead of terminating, so that an interrupt can be used to halt an editor printout without losing the file being edited.

The *quit* signal is generated by typing the ASCII FS character. It not only causes a running program to terminate but also generates a file with the core image of the terminated process. Quit is useful for debugging.

Besides adapting to the speed of the terminal, UNIX tries to be intelligent about whether you have a terminal with the new-line function or whether it must be simulated with carriage-return and line-feed. In the latter case, all input carriage returns are turned to new-line characters (the standard line delimiter) and both a carriage return and a line feed are echoed to the terminal. If you get into the wrong mode, the *stty* command (I) will rescue you.

Tab characters are used freely in UNIX source programs. If your terminal does not have the tab function, you can arrange to have them turned into spaces during output, and echoed as spaces during input. The system assumes that tabs are set every eight columns. Again, the *stty* command (I) will set or reset this mode. Also, there is a file which, if printed on TTY 37 or TermiNet 300 terminals, will set the tab stops correctly (*tabs* (V)).

Section *tty* (IV) discusses typewriter I/O more fully.

How to run a program; the Shell. When you have successfully logged into UNIX, a program called the Shell is listening to your terminal. The Shell reads typed-in lines, splits them up into a command name and arguments, and executes the command. A command is simply an executable program. The Shell looks first in your current directory (see next section) for a program with the given name, and if none is there, then in a system directory. There is nothing special about system-provided commands except that they are kept in a directory where the Shell can find them.

The command name is always the first word on an input line; it and its arguments are separated from one another by spaces.

When a program terminates, the Shell will ordinarily regain control and type a “%” at you to indicate that it is ready for another command.

The Shell has many other capabilities, which are described in detail in section *sh* (I).

The current directory. UNIX has a file system arranged in a hierarchy of directories. When the system administrator gave you a user name, he also created a directory for you (ordinarily with the same name as your user name). When you log in, any file name you type is by default in this directory. Since you are the owner of this directory, you have full permissions to read, write, alter, or destroy its contents. Permissions to have your will with other directories and files will have been granted or denied to you by their owners. As a matter of observed fact, few UNIX users protect their files from destruction, let alone perusal, by other users.

To change the current directory (but not the set of permissions you were endowed with at login) use *chdir* (I).

Path names. To refer to files not in the current directory, you must use a path name. Full path names begin with “/”, the name of the root directory of the whole file system. After the slash comes the name of each directory containing the next sub-directory (followed by a “/”) until finally the file name is reached. E.g.: */usr/lem/flex* refers to the file *flex* in the directory *lem*; *lem* is itself a subdirectory of *usr*; *usr* springs directly from the root directory.

If your current directory has subdirectories, the path names of files therein begin with the name of the sub-

directory (no prefixed “/”).

Without important exception, a path name may be used anywhere a file name is required.

Important commands which modify the contents of files are *cp* (I), *mv* (I), and *rm* (I), which respectively copy, move (i.e. rename) and remove files. To find out the status of files or directories, use *ls* (I). See *mkdir* (I) for making directories; *rmdir* (I) for destroying them.

For a fuller discussion of the file system, see “The UNIX Time-Sharing System,” by the present authors. It may also be useful to glance through section II of this manual, which discusses system calls, even if you don’t intend to deal with the system at that level.

Writing a program. To enter the text of a source program into a UNIX file, use *ed* (I). The three principal languages in UNIX are assembly language (see *as* (I)), Fortran (see *fc* (I)), and C (see *cc* (I)). After the program text has been entered through the editor and written on a file, you can give the file to the appropriate language processor as an argument. The output of the language processor will be left on a file in the current directory named “a.out”. (If the output is precious, use *mv* to move it to a less exposed name soon.) If you wrote in assembly language, you will probably need to load the program with library subroutines; see *ld* (I). The other two language processors call the loader automatically.

When you have finally gone through this entire process without provoking any diagnostics, the resulting program can be run by giving its name to the Shell in response to the “%” prompt.

Next, you will need *cdb* (I) or *db* (I) to examine the remains of your program. The former is useful for C programs, the latter for assembly-language. No debugger is much help for Fortran.

Your programs can receive arguments from the command line just as system programs do. See *exec* (II).

Text processing. Almost all text is entered through the editor. The commands most often used to write text on a terminal are: *cat*, *pr*, *roff*, *nroff*, and *troff*, all in section I.

The *cat* command simply dumps ASCII text on the terminal, with no processing at all. The *pr* command paginates the text, supplies headings, and has a facility for multi-column output. *Troff* and *nroff* are elaborate text formatting programs, and require careful forethought in entering both the text and the formatting commands into the input file. *Troff* drives a Graphic Systems phototypesetter; it was used to produce this manual. *Nroff* produces output on a typewriter terminal. *Roff* (I) is a somewhat less elaborate text formatting program, and requires somewhat less forethought.

Surprises. Certain commands provide inter-user communication. Even if you do not plan to use them, it would be well to learn something about them, because someone else may aim them at you.

To communicate with another user currently logged in, *write* (I) is used; *mail* (I) will leave a message whose presence will be announced to another user when he next logs in. The write-ups in the manual also suggest how to respond to the two commands if you are a target.

When you log in, a message-of-the-day may greet you before the first “%”.

TABLE OF CONTENTS

I. COMMANDS

ar	archive and library maintainer
as	assembler
bas	basic
bc	arbitrary precision interactive language
cat	concatenate and print
cc	C compiler
cdb	C debugger
chdir	change working directory
chmod	change mode
cmp	compare two files
comm	print lines common to two files
cp	copy
cref	make cross reference listing
date	print and set the date
db	debug
dc	desk calculator
dd	convert and copy a file
diff	differential file comparator
dsw	delete interactively
du	summarize disk usage
echo	echo arguments
ed	text editor
eqn	typeset mathematics
exit	terminate command file
fc	Fortran compiler
file	determine file type
find	find files
goto	command transfer
grep	search a file for a pattern
if	conditional command
kill	terminate a process
ld	link editor
ln	make a link
login	sign onto UNIX
ls	list contents of directory
mail	send mail to designated users
man	run off section of UNIX manual
mesg	permit or deny messages
mkdir	make a directory
mv	move or rename a file
neqn	typeset mathematics on terminal
newgrp	log in to a new group
nice	run a command at low priority
nm	print name list
nohup	run a command immune to hangups
nroff	format text
od	octal dump
opr	off line print
passwd	change login password

pfe	print floating exception
pr	print file
prof	display profile data
ps	process status
pwd	working directory name
rc	Ratfor compiler
rev	reverse lines of a file
rm	remove (unlink) files
rmdir	remove directory
roff	format text
sh	shell (command interpreter)
shift	adjust Shell arguments
size	size of an object file
sleep	suspend execution for an interval
sort, usort	sort or merge files
spell	find spelling errors
split	split a file into pieces
strip	remove symbols and relocation bits
stty	set typewriter options
tee	pipe fitting
time	time a command
tp	manipulate DECtape and magtape
tr	transliterate
troff	format text
tty	get typewriter name
typo	find possible typos
uniq	report repeated lines in a file
wait	await completion of process
wc	word count
who	who is on the system
write	write to another user
yacc	yet another compiler-compiler

II. SYSTEM CALLS

intro	introduction to system calls
break, brk, sbrk	change core allocation
chdir	change working directory
chmod	change mode of file
chown	change owner and group of a file
close	close a file
creat	create a new file
csw	read console switches
dup	duplicate an open file descriptor
exec, execl, execv	execute a file
exit	terminate process
fork	spawn new process
fstat	get status of open file
getgid	get group identifications
getpid	get process identification
getuid	get user identifications
gtty	get typewriter status
indir	indirect system call

kill	send signal to a process
link	link to a file
mknod	make a directory or a special file
mount	mount file system
nice	set program priority
open	open for reading or writing
pipe	create an interprocess channel
profil	execution time profile
ptrace	process trace
read	read from file
seek	move read/write pointer
setgid	set process group ID
setuid	set process user ID
signal	catch or ignore signals
sleep	stop execution for interval
stat	get file status
stime	set time
stty	set mode of typewriter
sync	update super-block
time	get date and time
times	get process times
umount	dismount file system
unlink	remove directory entry
wait	wait for process to terminate
write	write on a file

III. SUBROUTINES

abort	generate an IOT fault
abs, fabs	absolute value
alloc, free	core allocator
atan, atan2	arc tangent function
atof	convert ASCII to floating
atoi	convert ASCII to integer
crypt	password encoding
ctime, localtime, gmtime	convert date and time to ASCII
ecvt, fcvt	output conversion
end, etext, edata	last locations in program
exp	exponential function
floor, ceil	floor and ceiling functions
fmod	floating modulo function
fptrap	floating point interpreter
gamma	log gamma function
getarg, iargc	get command arguments from Fortran
getc, getw, fopen	buffered input
getchar	read character
getpw	get name from UID
hmul	high-order product
ierror	catch Fortran errors
ldiv, lrem	long division
locv	long output conversion
log	natural logarithm
monitor	prepare execution profile

nargs	argument count
nlist	get entries from name list
perror, syserrlist, sysnerr, errno	system error messages
pow	floating exponentiation
printf	formatted print
putc, putw, fcreat, fflush	buffered output
putchar, flush	write character
qsort	quicker sort
rand, srand	random number generator
reset, setexit	execute non-local goto
setfil	specify Fortran file name
sin, cos	trigonometric functions
sqrt	square root function
ttyn	return name of current typewriter

IV. SPECIAL FILES

cat	phototypesetter interface
dc	DC-11 communications interface
dh	DH-11 communications multiplexer
dn	DN-11 ACU interface
dp	DP-11 201 data-phone interface
hp	RH-11/RP04 moving-head disk
hs	RH11/RS03-RS04 fixed-head disk file
ht	RH-11/TU-16 magtape interface
kl	KL-11 or DL-11 asynchronous interface
lp	line printer
mem, kmem, null	core memory
pc	PC-11 paper tape reader/punch
rf	RF11/RS11 fixed-head disk file
rk	RK-11/RK03 (or RK05) disk
rp	RP-11/RP03 moving-head disk
tc	TC-11/TU56 DECTape
tm	TM-11/TU-10 magtape interface
tty	general typewriter interface

V. FILE FORMATS AND CONVENTIONS

a.out	assembler and link editor output
ar	archive (library) file format
ascii	map of ASCII character set
core	format of core image file
dir	format of directories
dump	incremental dump tape format
fs	format of file system volume
greek	graphics for extended TTY-37 type-box
group	group file
mtab	mounted file system table
passwd	password file
tabs	set tab stops
tp	DEC/mag tape formats
ttys	typewriter initialization data
utmp	user information

wtmp user login history

VI. USER MAINTAINED PROGRAMS

azel satellite predictions
bj the game of black jack
cal print calendar
chess the game of chess
col filter reverse line feeds
cubic three dimensional tic-tac-toe
factor discover prime factors of a number
fed edit form letter memory
form form letter generator
graph draw a graph
gsi interpret extended character set on GSI terminal
m6 general purpose macroprocessor
moo guessing game
plot: tek, gsip, vt0 graphics filters
primes print all primes larger than somewhat
quiz test your knowledge
sky obtain ephemerides
sno Snobol interpreter
speak word to voice translator
spline interpolate smooth curve
tbl format tables for nroff or troff
tmg compiler-compiler
ttt the game of tic-tac-toe
units conversion program
wump the game of hunt-the-wumpus

VII. USER MAINTAINED SUBROUTINES

crfork, crexit, crread, crwrite, crexch, crprior coroutine scheme
ms macros for formatting manuscripts
plot: openpl et al. graphics interface
salloc string allocation and manipulation

VIII. SYSTEM MAINTENANCE

ac login accounting
boot procedures UNIX startup
chgrp change group
chown change owner
clri clear i-node
crash what to do when the system crashes
cron clock daemon
dcheck file system directory consistency check
df disk free
dpd data phone daemon
dump incremental file system dump
getty set typewriter mode
glob generate command arguments
icheck file system storage consistency check

init	. . . . .	process control initialization
lpd	. . . . .	line printer daemon
mkfs	. . . . .	construct a file system
mknod	. . . . .	build special file
mount	. . . . .	mount file system
ncheck	. . . . .	generate names from i-numbers
restor	. . . . .	incremental file system restore
sa	. . . . .	Shell accounting
su	. . . . .	become privileged user
sync	. . . . .	update the super block
umount	. . . . .	dismount file system
update	. . . . .	periodically update the super block
wall	. . . . .	write to all users

PERMUTED INDEX

dp(IV) DP-11 201 data-phone interface
 abort(III) generate an IOT fault
 abs, fabs(III) absolute value
 abs, fabs(III) absolute value
 ac(VIII) login accounting
 sa(VIII) Shell accounting
 dn(IV) DN-11 ACU interface
 ac(VIII) login accounting
 shift(I) adjust Shell arguments
 primes(VI) print all primes larger than somewhat
 wall(VIII) write to all users
 alloc, free(III) core allocator
 salloc(VII) string allocation and manipulation
 break, brk, sbrk(II) change core allocation
 alloc, free(III) core allocator
 plot: openpl et al.(VII) graphics interface
 yacc(I) yet another compiler-compiler
 write(I) write to another user
 a.out(V) assembler and link editor output
 bc(I) arbitrary precision interactive language
 atan, atan2(III) arc tangent function
 ar(I) archive and library maintainer
 ar(V) archive (library) file format
 nargs(III) argument count
 getarg, iargc(III) get command arguments from Fortran
 echo(I) echo arguments
 glob(VIII) generate command arguments
 shift(I) adjust Shell arguments
 ar(I) archive and library maintainer
 ar(V) archive (library) file format
 ascii(V) map of ASCII character set
 atof(III) convert ASCII to floating
 atoi(III) convert ASCII to integer
 gmtime(III) convert date and time to ASCII...ctime, localtime,
 ascii(V) map of ASCII character set
 as(I) assembler
 a.out(V) assembler and link editor output
 as(I) assembler
 kl(IV) KL-11 or DL-11 asynchronous interface
 nice(I) run a command at low priority
 atan, atan2(III) arc tangent function
 atan, atan2(III) arc tangent function
 atof(III) convert ASCII to floating
 atoi(III) convert ASCII to integer
 wait(I) await completion of process
 azel(VI) satellite predictions
 bas(I) basic
 bas(I) basic
 bc(I) arbitrary precision interactive language
 su(VIII) become privileged user
 strip(I) remove symbols and relocation bits

	bj(VI) the game of black jack
bj(VI) the game of	black jack
sync(VIII) update the super	block
update(VIII) periodically update the super	block
	boot procedures(VIII) UNIX startup
	break, brk, sbrk(II) change core allocation
break,	brk, sbrk(II) change core allocation
getc, getw, fopen(III)	buffered input
putc, putw, creat, fflush(III)	buffered output
mknod(VIII)	build special file
cc(I)	C compiler
cdb(I)	C debugger
dc(I) desk	calculator
cal(VI) print	calendar
indir(II) indirect system	call
intro(II) introduction to system	calls
	cal(VI) print calendar
ierror(III)	catch Fortran errors
signal(II)	catch or ignore signals
	cat(I) concatenate and print
	cat(IV) phototypesetter interface
	cc(I) C compiler
	cdb(I) C debugger
floor,	ceil(III) floor and ceiling functions
floor, ceil(III) floor and	ceiling functions
break, brk, sbrk(II)	change core allocation
chgrp(VIII)	change group
passwd(I)	change login password
chmod(II)	change mode of file
chmod(I)	change mode
chown(II)	change owner and group of a file
chown(VIII)	change owner
chdir(I)	change working directory
chdir(II)	change working directory
pipe(II) create an interprocess	channel
gsi(VI) interpret extended	character set on GSI terminal
ascii(V) map of ASCII	character set
getchar(III) read	character
putchar, flush(III) write	character
	chdir(I) change working directory
	chdir(II) change working directory
file system directory consistency	check...dcheck(VIII)
file system storage consistency	check...icheck(VIII)
chess(VI) the game of	chess
	chess(VI) the game of chess
	chgrp(VIII) change group
	chmod(I) change mode
	chmod(II) change mode of file
	chown(II) change owner and group of a file
	chown(VIII) change owner
cli(VIII)	clear i-node
cron(VIII)	clock daemon
close(II)	close a file

	close(II)	close a file
	clri(VIII)	clear i-node
	cmp(I)	compare two files
	col(VI)	filter reverse line feeds
getarg, iargc(III)	get	command arguments from Fortran
glob(VIII)	generate	command arguments
nice(I)	run a	command at low priority
exit(I)	terminate	command file
nohup(I)	run a	command immune to hangups
sh(I)	shell	(command interpreter)
goto(I)		command transfer
if(I)	conditional	command
time(I)	time a	command
	comm(I)	print lines common to two files
comm(I)	print lines	common to two files
dc(IV)	DC-11	communications interface
dh(IV)	DH-11	communications multiplexer
diff(I)	differential file	comparator
	cmp(I)	compare two files
	cc(I)	C compiler
	tmg(VI)	compiler-compiler
yacc(I)	yet another	compiler-compiler
	fc(I)	Fortran compiler
	rc(I)	Ratfor compiler
	wait(I)	await completion of process
	cat(I)	concatenate and print
	if(I)	conditional command
dcheck(VIII)	file system directory	consistency check
icheck(VIII)	file system storage	consistency check
	csw(II)	read console switches
	mkfs(VIII)	construct a file system
	ls(I)	list contents of directory
init(VIII)	process	control initialization
	units(VI)	conversion program
ecvt, fcvt(III)	output	conversion
locv(III)	long output	conversion
	dd(I)	convert and copy a file
	atof(III)	convert ASCII to floating
	atoi(III)	convert ASCII to integer
ctime, localtime, gmtime(III)		convert date and time to ASCII
	dd(I)	convert and copy a file
	cp(I)	copy
break, brk, sbrk(II)	change	core allocation
	alloc, free(III)	core allocator
	core(V)	format of core image file
mem, kmem, null(IV)		core memory
	core(V)	format of core image file
crread, crwrite, crexch, crprior(VII)		coroutine scheme...crfork, crexit,
	sin,	cos(III) trigonometric functions
	nargs(III)	argument count
	wc(I)	word count
	cp(I)	copy
crash(VIII)	what to do when the system	crashes

	crash(VIII) what to do when the system crashes
creat(II)	create a new file
pipe(II)	create an interprocess channel
	creat(II) create a new file
	cref(I) make cross reference listing
crfork, crexit, cread, crwrite,	crexch, crprior(VII) coroutine scheme
scheme...crfork,	crexit, cread, crwrite, crexch, crprior(VII) coroutine
coroutine scheme...	crfork, crexit, cread, crwrite, crexch, crprior(VII)
	cron(VIII) clock daemon
cref(I) make	cross reference listing
crfork, crexit, cread, crwrite, crexch,	crprior(VII) coroutine scheme
crfork, crexit,	cread, crwrite, crexch, crprior(VII) coroutine scheme
crfork, crexit, cread,	crwrite, crexch, crprior(VII) coroutine scheme
	crypt(III) password encoding
	csw(II) read console switches
ASCII...	ctime, localtime, gmtime(III) convert date and time to
	cubic(VI) three dimensional tic-tac-toe
ttyn(III) return name of	current typewriter
spline(VI) interpolate smooth	curve
cron(VIII) clock	daemon
dpd(VIII) data phone	daemon
lpd(VIII) line printer	daemon
dpd(VIII)	data phone daemon
dp(IV) DP-11 201	data-phone interface
prof(I) display profile	data
ttys(V) typewriter initialization	data
ctime, localtime, gmtime(III) convert	date and time to ASCII
time(II) get	date and time
date(I) print and set the	date
	date(I) print and set the date
	db(I) debug
dc(IV)	DC-11 communications interface
	dcheck(VIII) file system directory consistency check
	dc(I) desk calculator
	dc(IV) DC-11 communications interface
	dd(I) convert and copy a file
db(I)	debug
cdb(I) C	debugger
tp(V)	DEC/mag tape formats
tp(I) manipulate	DECTape and magtape
tc(IV) TC-11/TU56	DECTape
dsw(I)	delete interactively
mesg(I) permit or	deny messages
dup(II) duplicate an open file	descriptor
mail(I) send mail to	designated users
dc(I)	desk calculator
file(I)	determine file type
	df(VIII) disk free
dh(IV)	DH-11 communications multiplexer
	dh(IV) DH-11 communications multiplexer
diff(I)	differential file comparator
	diff(I) differential file comparator
cubic(VI) three	dimensional tic-tac-toe

	dir(V) format of	directories
	dcheck(VIII) file system	directory consistency check
	unlink(II) remove	directory entry
	pwd(I) working	directory name
	mknod(II) make a	directory or a special file
	chdir(I) change working	directory
	chdir(II) change working	directory
	ls(I) list contents of	directory
	mkdir(I) make a	directory
	rmdir(I) remove	directory
		dir(V) format of directories
	factor(VI)	discover prime factors of a number
hs(IV) RH11/RS03-RS04	fixed-head	disk file
rf(IV) RF11/RS11	fixed-head	disk file
	df(VIII)	disk free
	du(I) summarize	disk usage
hp(IV) RH-11/RP04	moving-head	disk
rk(IV) RK-11/RK03 (or RK05)		disk
rp(IV) RP-11/RP03	moving-head	disk
	umount(II)	dismount file system
	umount(VIII)	dismount file system
	prof(I)	display profile data
	ldiv, lrem(III) long	division
	kl(IV) KL-11 or	DL-11 asynchronous interface
	dn(IV)	DN-11 ACU interface
		dn(IV) DN-11 ACU interface
	crash(VIII) what to	do when the system crashes
	dp(IV)	DP-11 201 data-phone interface
		dpd(VIII) data phone daemon
		dp(IV) DP-11 201 data-phone interface
	graph(VI)	draw a graph
		dsw(I) delete interactively
		du(I) summarize disk usage
	dump(V) incremental	dump tape format
dump(VIII) incremental file system		dump
	od(I) octal	dump
		dump(V) incremental dump tape format
		dump(VIII) incremental file system dump
		dup(II) duplicate an open file descriptor
	dup(II)	duplicate an open file descriptor
	echo(I)	echo arguments
		echo(I) echo arguments
		ecvt, fcvt(III) output conversion
	end, etext,	edata(III) last locations in program
		ed(I) text editor
	fed(VI)	edit form letter memory
a.out(V) assembler and link		editor output
	ed(I) text	editor
	ld(I) link	editor
	crypt(III) password	encoding
		end, etext, edata(III) last locations in program
	nlist(III) get	entries from name list
unlink(II) remove directory		entry

file(I) determine	file type
chmod(II) change mode of	file
chown(II) change owner and group of a	file
close(II) close a	file
core(V) format of core image	file
creat(II) create a new	file
dd(I) convert and copy a	file
exec, execl, execv(II) execute a	file
exit(I) terminate command	file
fstat(II) get status of open	file
group(V) group	file
hs(IV) RH11/RS03-RS04 fixed-head disk	file
	file(I) determine file type
link(II) link to a	file
mknod(II) make a directory or a special	file
mknod(VIII) build special	file
mv(I) move or rename a	file
passwd(V) password	file
pr(I) print	file
read(II) read from	file
rev(I) reverse lines of a	file
rf(IV) RF11/RS11 fixed-head disk	file
cmp(I) compare two	files
comm(I) print lines common to two	files
find(I) find	files
size(I) size of an object	file
rm(I) remove (unlink)	files
sort, usort(I) sort or merge	files
uniq(I) report repeated lines in a	file
write(II) write on a	file
col(VI)	filter reverse line feeds
plot: tek, gsis, vt0(VI) graphics	filters
find(I)	find files
typo(I)	find possible typos
spell(I)	find spelling errors
find(I)	find files
tee(I) pipe	fitting
hs(IV) RH11/RS03-RS04	fixed-head disk file
rf(IV) RF11/RS11	fixed-head disk file
pfe(I) print	floating exception
pow(III)	floating exponentiation
fmod(III)	floating modulo function
fptrap(III)	floating point interpreter
atof(III) convert ASCII to	floating
floor, ceil(III)	floor and ceiling functions
floor, ceil(III)	floor and ceiling functions
putchar,	flush(III) write character
fmod(III)	floating modulo function
getc, getw,	fopen(III) buffered input
fork(II)	spawn new process
form(VI)	form letter generator
fed(VI) edit	form letter memory
core(V)	format of core image file

	dir(V)	format of directories
	fs(V)	format of file system volume
	tbl(VI)	format tables for nroff or troff
	nroff(I)	format text
	roff(I)	format text
	troff(I)	format text
	ar(V)	archive (library) file
	dump(V)	incremental dump tape
	tp(V)	DEC/mag tape
	printf(III)	formatted print
	ms(VII)	macros for
		form(VI) form letter generator
	fc(I)	Fortran compiler
	ierror(III)	catch Fortran errors
	setfil(III)	specify Fortran file name
iargc(III)	get command arguments from	Fortran...getarg,
	fptrap(III)	floating point interpreter
	df(VIII)	disk free
	alloc,	free(III) core allocator
	read(II)	read from file
getarg, iargc(III)	get command arguments	from Fortran
ncheck(VIII)	generate names	from i-numbers
nlist(III)	get entries	from name list
getpw(III)	get name	from UID
	fstat(II)	get status of open file
	fs(V)	format of file system volume
atan, atan2(III)	arc tangent	function
exp(III)	exponential	function
fmod(III)	floating modulo	function
gamma(III)	log gamma	function
floor, ceil(III)	floor and ceiling	functions
sqrt(III)	square root	function
sin, cos(III)	trigonometric	functions
	bj(VI)	the game of black jack
	chess(VI)	the game of chess
	wump(VI)	the game of hunt-the-wumpus
	ttt(VI)	the game of tic-tac-toe
moo(VI)	guessing	game
	gamma(III)	log gamma function
		gamma(III) log gamma function
	m6(VI)	general purpose macroprocessor
	tty(IV)	general typewriter interface
	abort(III)	generate an IOT fault
	glob(VIII)	generate command arguments
	ncheck(VIII)	generate names from i-numbers
	form(VI)	form letter generator
rand, srand(III)	random number	generator
	getarg, iargc(III)	get command arguments from Fortran
	time(II)	get date and time
	nlist(III)	get entries from name list
	stat(II)	get file status
	getgid(II)	get group identifications
	getpw(III)	get name from UID

getpid(II) get process identification
 times(II) get process times
 fstat(II) get status of open file
 tty(I) get typewriter name
 gtty(II) get typewriter status
 getuid(II) get user identifications
 getarg, iargc(III) get command arguments from Fortran
 getc, getw, fopen(III) buffered input
 getchar(III) read character
 getgid(II) get group identifications
 getpid(II) get process identification
 getpw(III) get name from UID
 getty(VIII) set typewriter mode
 getuid(II) get user identifications
 getc, getw, fopen(III) buffered input
 glob(VIII) generate command arguments
 ctime, localtime, gmtime(III) convert date and time to ASCII
 goto(I) command transfer
 reset, setexit(III) execute non-local
 goto
 graph(VI) draw a graph
 plot: tek, gsip, vt0(VI) graphics filters
 greek(V) graphics for extended TTY-37 type-box
 plot: openpl et al.(VII) graphics interface
 graph(VI) draw a graph
 greek(V) graphics for extended TTY-37 type-box
 grep(I) search a file for a pattern
 group(V) group file
 getgid(II) get group identifications
 setgid(II) set process group ID
 chown(II) change owner and group of a file
 chgrp(VIII) change group
 newgrp(I) log in to a new group
 group(V) group file
 gsi(VI) interpret extended character set on GSI terminal
 plot: tek, gsip, vt0(VI) graphics filters
 gsi(VI) interpret extended character set on GSI terminal
 gtty(II) get typewriter status
 moo(VI) guessing game
 nohup(I) run a command immune to hangups
 hmul(III) high-order product
 wtmp(V) user login history
 hmul(III) high-order product
 hp(IV) RH-11/RP04 moving-head disk
 hs(IV) RH11/RS03-RS04 fixed-head disk file
 ht(IV) RH-11/TU-16 magtape interface
 wump(VI) the game of hunt-the-wumpus
 getarg, iargc(III) get command arguments from Fortran
 icode(VIII) file system storage consistency check
 getpid(II) get process identification
 getgid(II) get group identifications
 getuid(II) get user identifications
 setgid(II) set process group ID
 setuid(II) set process user ID

	ierror(III) catch Fortran errors
	if(I) conditional command
signal(II) catch or	ignore signals
core(V) format of core	image file
nohup(I) run a command	immune to hangups
uniq(I) report repeated lines	in a file
end, etext, edata(III) last locations	in program
newgrp(I) log	in to a new group
dump(V)	incremental dump tape format
dump(VIII)	incremental file system dump
restor(VIII)	incremental file system restore
indir(II)	indirect system call
	indir(II) indirect system call
utmp(V) user	information
ttys(V) typewriter	initialization data
init(VIII) process control	initialization
	init(VIII) process control initialization
clri(VIII) clear	i-node
getc, getw, fopen(III) buffered	input
atoi(III) convert ASCII to	integer
bc(I) arbitrary precision	interactive language
dsw(I) delete	interactively
cat(IV) phototypesetter	interface
dc(IV) DC-11 communications	interface
dn(IV) DN-11 ACU	interface
dp(IV) DP-11 201 data-phone	interface
ht(IV) RH-11/TU-16 magtape	interface
kl(IV) KL-11 or DL-11 asynchronous	interface
plot: openpl et al.(VII) graphics	interface
tm(IV) TM-11/TU-10 magtape	interface
tty(IV) general typewriter	interface
spline(VI)	interpolate smooth curve
gsi(VI)	interpret extended character set on GSI terminal
fptrap(III) floating point	interpreter
sh(I) shell (command	interpreter)
sno(VI) Snobol	interpreter
pipe(II) create an	interprocess channel
sleep(I) suspend execution for an	interval
sleep(II) stop execution for	interval
split(I) split a file	into pieces
intro(II)	introduction to system calls
	intro(II) introduction to system calls
ncheck(VIII) generate names from	i-numbers
abort(III) generate an	IOT fault
bj(VI) the game of black	jack
	kill(I) terminate a process
	kill(II) send signal to a process
kl(IV)	KL-11 or DL-11 asynchronous interface
	kl(IV) KL-11 or DL-11 asynchronous interface
mem,	kmem, null(IV) core memory
quiz(VI) test your	knowledge
bc(I) arbitrary precision interactive	language
primes(VI) print all primes	larger than somewhat

end, etext, edata(III) last locations in program
 ld(I) link editor
 ldiv, lrem(III) long division
 form(VI) form letter generator
 fed(VI) edit form letter memory
 ar(V) archive (library) file format
 ar(I) archive and library maintainer
 col(VI) filter reverse line feeds
 lpd(VIII) line printer daemon
 lp(IV) line printer
 opr(I) off line print
 comm(I) print lines common to two files
 uniq(I) report repeated lines in a file
 rev(I) reverse lines of a file
 a.out(V) assembler and link editor output
 ld(I) link editor
 link(II) link to a file
 link(II) link to a file
 ln(I) make a link
 ls(I) list contents of directory
 cref(I) make cross reference listing
 nlist(III) get entries from name list
 nm(I) print name list
 ln(I) make a link
 ctime, localtime, gmtime(III) convert date and time to ASCII
 end, etext, edata(III) last locations in program
 locv(III) long output conversion
 gamma(III) log gamma function
 newgrp(I) log in to a new group
 log(III) natural logarithm
 log(III) natural logarithm
 ac(VIII) login accounting
 wtmp(V) user login history
 passwd(I) change login password
 login(I) sign onto UNIX
 ldiv, lrem(III) long division
 locv(III) long output conversion
 nice(I) run a command at low priority
 lpd(VIII) line printer daemon
 lp(IV) line printer
 ldiv, lrem(III) long division
 ls(I) list contents of directory
 m6(VI) general purpose macroprocessor
 m6(VI) general purpose macroprocessor
 ms(VII) macros for formatting manuscripts
 ht(IV) RH-11/TU-16 magtape interface
 tm(IV) TM-11/TU-10 magtape interface
 tp(I) manipulate DECTape and magtape
 mail(I) send mail to designated users
 mail(I) send mail to designated users
 ar(I) archive and library maintainer
 mknod(II) make a directory or a special file
 mkdir(I) make a directory

ln(I) make a link
 cref(I) make cross reference listing
 man(I) run off section of UNIX manual
 tp(I) manipulate DECtape and magtape
 salloc(VII) string allocation and manipulation
 man(I) run off section of UNIX manual
 ms(VII) macros for formatting manuscripts
 ascii(V) map of ASCII character set
 neqn(I) typeset mathematics on terminal
 eqn(I) typeset mathematics
 mem, kmem, null(IV) core memory
 fed(VI) edit form letter memory
 mem, kmem, null(IV) core memory
 sort, usort(I) sort or merge files
 mesg(I) permit or deny messages
 messages
 sysnerr, errno(III) system error messages...perror, syserrlist,
 mkdir(I) make a directory
 mkfs(VIII) construct a file system
 mknod(II) make a directory or a special file
 mknod(VIII) build special file
 chmod(II) change mode of file
 stty(II) set mode of typewriter
 chmod(I) change mode
 getty(VIII) set typewriter mode
 fmod(III) floating modulo function
 monitor(III) prepare execution profile
 moo(VI) guessing game
 mount(II) mount file system
 mount(VIII) mount file system
 mtab(V) mounted file system table
 mount(II) mount file system
 mount(VIII) mount file system
 mv(I) move or rename a file
 seek(II) move read/write pointer
 hp(IV) RH-11/RP04 moving-head disk
 rp(IV) RP-11/RP03 moving-head disk
 ms(VII) macros for formatting manuscripts
 mtab(V) mounted file system table
 dh(IV) DH-11 communications multiplexer
 mv(I) move or rename a file
 getpw(III) get name from UID
 nlist(III) get entries from name list
 nm(I) print name list
 ttyn(III) return name of current typewriter
 pwd(I) working directory name
 ncheck(VIII) generate names from i-numbers
 setfil(III) specify Fortran file name
 tty(I) get typewriter name
 nargs(III) argument count
 log(III) natural logarithm
 ncheck(VIII) generate names from i-numbers
 neqn(I) typeset mathematics on terminal

creat(II)	create a	new file
newgrp(I)	log in to a	new group
fork(II)	spawn	new process
		newgrp(I) log in to a new group
		nice(I) run a command at low priority
		nice(II) set program priority
		nlist(III) get entries from name list
		nm(I) print name list
		nohup(I) run a command immune to hangups
reset, setexit(III)	execute	non-local goto
tbl(VI)	format tables for	nrff or troff
		nrff(I) format text
	mem, kmem,	null(IV) core memory
	rand, srand(III)	random number generator
factor(VI)	discover prime factors of a	number
	size(I) size of an	object file
	sky(VI)	obtain ephemerides
	od(I)	octal dump
		od(I) octal dump
	opr(I)	off line print
	man(I) run	off section of UNIX manual
	login(I) sign	onto UNIX
dup(II)	duplicate an	open file descriptor
fstat(II)	get status of	open file
	open(II)	open for reading or writing
		open(II) open for reading or writing
	plot:	openpl et al.(VII) graphics interface
		opr(I) off line print
stty(I)	set typewriter	options
rk(IV)	RK-11/RK03	(or RK05) disk
	ecvt, fcvt(III)	output conversion
	locv(III) long	output conversion
a.out(V)	assembler and link editor	output
putc, putw, creat, fflush(III)	buffered	output
	chown(II) change	owner and group of a file
	chown(VIII) change	owner
	pc(IV) PC-11	paper tape reader/punch
		passwd(I) change login password
		passwd(V) password file
	crypt(III)	password encoding
	passwd(V)	password file
passwd(I)	change login	password
grep(I)	search a file for a	pattern
	pc(IV)	PC-11 paper tape reader/punch
		pc(IV) PC-11 paper tape reader/punch
	update(VIII)	periodically update the super block
	msg(I)	permit or deny messages
	error messages...	error, syserrlist, sysnerr, errno(III) system
		pfe(I) print floating exception
	dpd(VIII) data	phone daemon
	cat(IV)	phototypesetter interface
split(I)	split a file into	pieces
	tee(I)	pipe fitting

	pipe(II) create an interprocess channel
	plot: openpl et al.(VII) graphics interface
	plot: tek, gsip, vt0(VI) graphics filters
fptrap(III) floating	point interpreter
seek(II) move read/write	pointer
typo(I) find	possible typos
	pow(III) floating exponentiation
bc(I) arbitrary	precision interactive language
azel(VI) satellite	predictions
monitor(III)	prepare execution profile
	pr(I) print file
factor(VI) discover	prime factors of a number
primes(VI) print all	primes larger than somewhat
	primes(VI) print all primes larger than somewhat
primes(VI)	print all primes larger than somewhat
date(I)	print and set the date
cal(VI)	print calendar
pr(I)	print file
pfe(I)	print floating exception
comm(I)	print lines common to two files
nm(I)	print name list
cat(I) concatenate and	print
lpd(VIII) line	printer daemon
lp(IV) line	printer
	printf(III) formatted print
opr(I) off line	print
printf(III) formatted	print
nice(I) run a command at low	priority
nice(II) set program	priority
su(VIII) become	privileged user
boot	procedures(VIII) UNIX startup
init(VIII)	process control initialization
setgid(II) set	process group ID
getpid(II) get	process identification
ps(I)	process status
times(II) get	process times
wait(II) wait for	process to terminate
ptrace(II)	process trace
setuid(II) set	process user ID
exit(II) terminate	process
fork(II) spawn new	process
kill(I) terminate a	process
kill(II) send signal to a	process
wait(I) await completion of	process
hmul(III) high-order	product
	prof(I) display profile data
prof(I) display	profile data
monitor(III) prepare execution	profile
profil(II) execution time	profile
	profil(II) execution time profile
nice(II) set	program priority
end, etext, edata(III) last locations in	program
units(VI) conversion	program

ps(I) process status
 ptrace(II) process trace
 m6(VI) general purpose macroprocessor
 putc, putw, fcreat, fflush(III) buffered output
 putchar, flush(III) write character
 putc, putw, fcreat, fflush(III) buffered output
 pwd(I) working directory name
 qsort(III) quicker sort
 qsort(III) quicker sort
 quiz(VI) test your knowledge
 rand, srand(III) random number generator
 rand, srand(III) random number generator
 rc(I) Ratfor compiler
 rc(I) Ratfor compiler
 getchar(III) read character
 csw(II) read console switches
 read(II) read from file
 pc(IV) PC-11 paper tape reader/punch
 read(II) read from file
 open(II) open for reading or writing
 seek(II) move read/write pointer
 cref(I) make cross reference listing
 strip(I) remove symbols and relocation bits
 unlink(II) remove directory entry
 rmdir(I) remove directory
 strip(I) remove symbols and relocation bits
 rm(I) remove (unlink) files
 mv(I) move or rename a file
 uniq(I) report repeated lines in a file
 uniq(I) report repeated lines in a file
 reset, setexit(III) execute non-local goto
 restor(VIII) incremental file system restore
 restor(VIII) incremental file system restore
 ttyn(III) return name of current typewriter
 col(VI) filter reverse line feeds
 rev(I) reverse lines of a file
 rev(I) reverse lines of a file
 rf(IV) RF11/RS11 fixed-head disk file
 rf(IV) RF11/RS11 fixed-head disk file
 hp(IV) RH-11/RP04 moving-head disk
 hs(IV) RH11/RS03-RS04 fixed-head disk file
 ht(IV) RH-11/TU-16 magtape interface
 rk(IV) RK-11/RK03 (or RK05) disk
 rk(IV) RK-11/RK03 (or RK05) disk
 rk(IV) RK-11/RK03 (or RK05) disk
 rmdir(I) remove directory
 rm(I) remove (unlink) files
 roff(I) format text
 sqrt(III) square root function
 rp(IV) RP-11/RP03 moving-head disk
 rp(IV) RP-11/RP03 moving-head disk
 nice(I) run a command at low priority
 nohup(I) run a command immune to hangups

	man(I)	run off section of UNIX manual
	salloc(VII)	string allocation and manipulation
	azel(VI)	satellite predictions
	sa(VIII)	Shell accounting
	break, brk,	sbrk(II) change core allocation
crwrite, crexch, crprior(VII)	coroutine	scheme...crfork, crexit, cread,
	grep(I)	search a file for a pattern
	man(I) run off	section of UNIX manual
	seek(II)	move read/write pointer
	mail(I)	send mail to designated users
	kill(II)	send signal to a process
	stty(II)	set mode of typewriter
gsi(VI) interpret extended character		set on GSI terminal
	setgid(II)	set process group ID
	setuid(II)	set process user ID
	nice(II)	set program priority
	tabs(V)	set tab stops
date(I) print and		set the date
	stime(II)	set time
	getty(VIII)	set typewriter mode
	stty(I)	set typewriter options
ascii(V) map of ASCII character		set
	reset,	setexit(III) execute non-local goto
		setfil(III) specify Fortran file name
		setgid(II) set process group ID
		setuid(II) set process user ID
	sa(VIII)	Shell accounting
shift(I) adjust		Shell arguments
	sh(I)	shell (command interpreter)
		sh(I) shell (command interpreter)
		shift(I) adjust Shell arguments
	login(I)	sign onto UNIX
	kill(II) send	signal to a process
		signal(II) catch or ignore signals
signal(II) catch or ignore		signals
		sin, cos(III) trigonometric functions
	size(I)	size of an object file
		size(I) size of an object file
		sky(VI) obtain ephemerides
		sleep(I) suspend execution for an interval
		sleep(II) stop execution for interval
spline(VI) interpolate		smooth curve
	sno(VI)	Snobol interpreter
		sno(VI) Snobol interpreter
primes(VI) print all primes larger than		somewhat
	sort, usort(I)	sort or merge files
		sort, usort(I) sort or merge files
qsort(III) quicker		sort
	fork(II)	spawn new process
		speak(VI) word to voice translator
mknod(II) make a directory or a		special file
mknod(VIII) build		special file
	setfil(III)	specify Fortran file name

	spell(I) find spelling errors
spell(I) find	spelling errors
	spline(VI) interpolate smooth curve
split(I)	split a file into pieces
	split(I) split a file into pieces
	sqrt(III) square root function
sqrt(III)	square root function
rand,	rand(III) random number generator
boot procedures(VIII) UNIX	startup
	stat(II) get file status
fstat(II) get	status of open file
gtty(II) get typewriter	status
ps(I) process	status
stat(II) get file	status
	stime(II) set time
sleep(II)	stop execution for interval
tabs(V) set tab	stops
ichk(VIII) file system	storage consistency check
salloc(VII)	string allocation and manipulation
	strip(I) remove symbols and relocation bits
	stty(I) set typewriter options
	stty(II) set mode of typewriter
du(I)	summarize disk usage
sync(VIII) update the	super block
update(VIII) periodically update the	super block
sync(II) update	super-block
sleep(I)	suspend execution for an interval
	su(VIII) become privileged user
csw(II) read console	switches
strip(I) remove	symbols and relocation bits
	sync(II) update super-block
	sync(VIII) update the super block
messages...perror,	syserrlist, sysnerr, errno(III) system error
perror, syserrlist,	sysnerr, errno(III) system error messages
indir(II) indirect	system call
intro(II) introduction to	system calls
crash(VIII) what to do when the	system crashes
dcheck(VIII) file	system directory consistency check
dump(VIII) incremental file	system dump
syserrlist, sysnerr, errno(III)	system error messages...perror,
restor(VIII) incremental file	system restore
ichk(VIII) file	system storage consistency check
mtab(V) mounted file	system table
fs(V) format of file	system volume
mkfs(VIII) construct a file	system
mount(II) mount file	system
mount(VIII) mount file	system
umount(II) dismount file	system
umount(VIII) dismount file	system
who(I) who is on the	system
tabs(V) set	tab stops
mtab(V) mounted file system	table
tbl(VI) format	tables for nroff or troff

	atan, atan2(III) arc	atan(V) set tab stops
	atan, atan2(III) arc	tangent function
	dump(V) incremental dump	tape format
	tp(V) DEC/mag	tape formats
	pc(IV) PC-11 paper	tape reader/punch
		tbl(VI) format tables for nroff or troff
	tc(IV)	TC-11/TU56 DECTape
		tc(IV) TC-11/TU56 DECTape
		tee(I) pipe fitting
	plot:	tek, gsis, vt0(VI) graphics filters
interpret	extended character set on GSI	terminal...gsi(VI)
	neqn(I) typeset mathematics on	terminal
		kill(I) terminate a process
		exit(I) terminate command file
		exit(II) terminate process
	wait(II) wait for process to	terminate
	quiz(VI)	test your knowledge
	ed(I)	text editor
	nroff(I) format	text
	roff(I) format	text
	troff(I) format	text
primes(VI)	print all primes larger	than somewhat
	cubic(VI)	three dimensional tic-tac-toe
cubic(VI)	three dimensional	tic-tac-toe
	ttt(VI) the game of	tic-tac-toe
	time(I)	time a command
	profil(II) execution	time profile
localtime, gmtime(III)	convert date and	time to ASCII...ctime,
		time(I) time a command
		time(II) get date and time
		times(II) get process times
	stime(II) set	time
	times(II) get process	times
	time(II) get date and	time
	tm(IV)	TM-11/TU-10 magtape interface
		tmg(VI) compiler-compiler
		tm(IV) TM-11/TU-10 magtape interface
		tp(I) manipulate DECTape and magtape
		tp(V) DEC/mag tape formats
	ptrace(II) process	trace
	goto(I) command	transfer
	speak(VI) word to voice	translator
	tr(I)	transliterate
		tr(I) transliterate
	sin, cos(III)	trigonometric functions
		troff(I) format text
tbl(VI)	format tables for nroff or	troff
		ttt(VI) the game of tic-tac-toe
greek(V)	graphics for extended	TTY-37 type-box
		tty(I) get typewriter name
		tty(IV) general typewriter interface
		ttyn(III) return name of current typewriter
		ttys(V) typewriter initialization data

cmp(I) compare	two files
comm(I) print lines common to	two files
greek(V) graphics for extended TTY-37	type-box
file(I) determine file	type
neqn(I)	typeset mathematics on terminal
eqn(I)	typeset mathematics
ttyps(V)	typewriter initialization data
tty(IV) general	typewriter interface
getty(VIII) set	typewriter mode
tty(I) get	typewriter name
stty(I) set	typewriter options
gtty(II) get	typewriter status
stty(II) set mode of	typewriter
ttyn(III) return name of current	typewriter
typo(I) find possible	typo(I) find possible typos
typos	typos
getpw(III) get name from	UID
umount(II) dismount file system	umount(II) dismount file system
umount(VIII) dismount file system	umount(VIII) dismount file system
uniq(I) report repeated lines in a file	uniq(I) report repeated lines in a file
units(VI) conversion program	units(VI) conversion program
man(I) run off section of	UNIX manual
boot procedures(VIII)	UNIX startup
login(I) sign onto	UNIX
rm(I) remove	(unlink) files
sync(II)	unlink(II) remove directory entry
sync(VIII)	update super-block
update(VIII) periodically	update the super block
update(VIII) periodically	update the super block
update(VIII) periodically	update the super block
update(VIII) periodically	update the super block
du(I) summarize disk	usage
getuid(II) get	user identifications
setuid(II) set process	user ID
utmp(V)	user information
wtmp(V)	user login history
mail(I) send mail to designated	users
su(VIII) become privileged	user
wall(VIII) write to all	users
write(I) write to another	user
sort,	usort(I) sort or merge files
utmp(V)	utmp(V) user information
abs, fabs(III) absolute	value
speak(VI) word to	voice translator
fs(V) format of file system	volume
plot: tek, gsip,	vt0(VI) graphics filters
wait(II)	wait for process to terminate
wait(I) await completion of process	wait(I) await completion of process
wait(II) wait for process to terminate	wait(II) wait for process to terminate
wall(VIII) write to all users	wall(VIII) write to all users
wc(I) word count	wc(I) word count
crash(VIII) what to do when the system crashes	crash(VIII) what to do when the system crashes
crash(VIII) what to do	when the system crashes
who(I)	who is on the system

who(I) who is on the system
 wc(I) word count
 speak(VI) word to voice translator
 pwd(I) working directory name
 chdir(I) change working directory
 chdir(II) change working directory
 putchar, flush(III) write character
 write(II) write on a file
 wall(VIII) write to all users
 write(I) write to another user
 write(I) write to another user
 write(II) write on a file
 open(II) open for reading or writing
 wtmp(V) user login history
 wump(VI) the game of hunt-the-wumpus
 yacc(I) yet another compiler-compiler
 yacc(I) yet another compiler-compiler
 quiz(VI) test your knowledge