

# chmod Quick Reference

File permissions, numeric & symbolic modes, special bits, umask

## Numeric Mode

### Octal Permission Digits

<b>4</b>	Read (r)
<b>2</b>	Write (w)
<b>1</b>	Execute (x)
<b>0</b>	No permission

### Three-Digit Format

```
chmod 755 file # rwxr-xr-x
chmod 644 file # rw-r--r--
chmod 700 file # rwx-----
chmod 600 file # rw-----
```

### Digit Calculation

<b>7 (4+2+1)</b>	rwx	—	read, write, execute
<b>6 (4+2)</b>	rw-	—	read, write
<b>5 (4+1)</b>	r-x	—	read, execute
<b>4</b>	r--	—	read only
<b>3 (2+1)</b>	-wx	—	write, execute
<b>2</b>	-w-	—	write only
<b>1</b>	--x	—	execute only
<b>0</b>	---	—	no permissions

## Symbolic Mode

Syntax: [u<sub>g</sub>oa][+|=][rwxXst]

<b>u</b>	User (owner)
<b>g</b>	Group
<b>o</b>	Others
<b>a</b>	All (u + g + o)
<b>+</b>	Add permission
<b>-</b>	Remove permission
<b>=</b>	Set exact permission

### Symbolic Examples

```
chmod u+x file # owner: add execute
chmod g-w file # group: remove write
chmod o=r file # others: set read only
chmod a+r file # all: add read
chmod u+x,g-w,o= file # combined operations
```

## Common Permissions

### File Permission Presets

<b>644</b>	<b>rwx-r--r--</b>	Default file — owner rw, others read
<b>755</b>	<b>rwxr-xr-x</b>	Script / binary — owner rwx, others rx
<b>600</b>	<b>rwx-----</b>	Private file — owner only
<b>400</b>	<b>r-----</b>	Read-only private (SSH keys)
<b>666</b>	<b>rwx-rwx-rwx</b>	World-writable file (avoid)
<b>777</b>	<b>rwxrwxrwx</b>	Full access for all (avoid)

### Quick Reference

```
chmod 644 *.html # web files: owner rw, world r
chmod 755 *.sh # scripts: owner rwx, world rx
chmod 600 ~/.ssh/id_* # SSH keys: owner only
chmod 400 secret.pem # certificate: read-only
```

## Directory Permissions

### What Permissions Mean for Directories

<b>r (4)</b>	List directory contents ( <b>ls</b> )
<b>w (2)</b>	Create / delete files in directory
<b>x (1)</b>	Access (cd into) the directory
<b>rx (5)</b>	List + access (typical for read)
<b>rwx (7)</b>	Full control

## Common Directory Permissions

```
chmod 755 dir/ # standard: owner rwx, others rx
chmod 700 dir/ # private: owner only
chmod 750 dir/ # group access: owner rwx, group rx
chmod 1777 /tmp # sticky bit: only owner can delete
```

## Special Bits

### Setuid, Setgid, Sticky

<b>Setuid (4xxx)</b>	Run as file owner (e.g., <b>passwd</b> )
<b>Setgid (2xxx)</b>	Run as file group / inherit dir group
<b>Sticky (1xxx)</b>	Only owner can delete files (e.g., <b>/tmp</b> )

### Setting Special Bits

```
chmod 4755 program # setuid: -rwsr-xr-x
chmod 2755 dir/ # setgid: drwxr-sr-x
chmod 1755 dir/ # sticky: drwxr-xr-t
chmod u+s program # symbolic setuid
chmod g+s dir/ # symbolic setgid
chmod +t dir/ # symbolic sticky bit
```

## Recursive

### Recursive Permission Changes

```
chmod -R 755 dir/ # set all to 755 recursively
chmod -R u+rwx dir/ # owner rw, +x on dirs only
chmod -R go-w dir/ # remove group/other write
```

### Files vs Directories with find

```
# set directories to 755, files to 644
find /path -type d -exec chmod 755 {} +
find /path -type f -exec chmod 644 {} +
```

## Capital X — Conditional Execute

<b>x (lowercase)</b>	Add execute to all files and dirs
<b>X (uppercase)</b>	Add execute only to dirs and already-executable files

## umask

### How umask Works

<b>umask</b>	Display current umask
<b>umask 022</b>	Files: 644, Dirs: 755
<b>umask 077</b>	Files: 600, Dirs: 700
<b>umask 002</b>	Files: 664, Dirs: 775

### umask Calculation

```
# default permission minus umask = effective
# Files: 666 - 022 = 644 (rw-r--r--)
# Dirs: 777 - 022 = 755 (rwxr-xr-x)
umask # display current umask
umask 022 # typical default
umask -S # show in symbolic notation
```

## Common Patterns

### Everyday Use Cases

<b>Web root</b>	<b>chmod -R 755 /var/www/html</b>
<b>Config file</b>	<b>chmod 600 app.conf</b>
<b>SSH directory</b>	<b>chmod 700 ~/.ssh</b>
<b>SSH authorized_keys</b>	<b>chmod 600 ~/.ssh/authorized_keys</b>
<b>Shared directory</b>	<b>chmod 2775 /shared (setgid)</b>
<b>Log files</b>	<b>chmod 640 /var/log/app.log</b>
<b>Cron scripts</b>	<b>chmod 755 /etc/cron.daily/myjob</b>
<b>Temp directory</b>	<b>chmod 1777 /tmp (sticky)</b>

## Viewing Permissions

```
ls -l file.txt # show permissions
ls -ld dir/ # show directory permissions
stat -c '%A %a %n' * # symbolic + numeric + name
getfacl file.txt # show ACLs (if in use)
```