

What is the first number for in a 4-number chmod argument (such as `chmc

When I install a program, it recommends me to do `chmod 4555`. Okay, I know about values if I just use three nu
For example

```
chmod 555 test-file
```

will give

```
-r-xr-xr-x
```

4 for write, 2 for read and 1 for execute. But, when I do this:


```
chmod 4555 test-file
```

it gives me

```
-r-sr-xr-x
```

So, `x` changed to `s`. What's that mean?

☒ command-line ☐ chmod

1 also explained here: askubuntu.com/a/550947/72216 ("about the s- flag") – Jacob Vlijm Feb 3 '15 at 17:14 

@JacobVlijm also explained more in depth with the other "special" bits, below – Thomas Ward ♦ Feb 3 '15 at 17:28

There's actually 4 attribute sets you can work with via `chmod`.

`Special`, `User/Owner`, `Group`, and `Others` in that order, when working with the four-number
chmods, with that first number being special bits that can be set.

`chmod 4555` equates to the following:

- `Set UID` bit - Run the file as the owner regardless of which user is running it
- `User/Owner`: `Read`, `Execute`
- `Group`: `Read`, `Execute`
- `Others`: `Read`, `Execute`

The `s` in your 'human readable' string for permissions indicates that the `SetUID` bit (explained below) is set.

Effectively, we can break down the four-number `chmod` permissions argument into specific descriptors as follows, and doing the math to determine what a `4` in the first section would be, a `5` in the next section, and so on.

Keep in mind that `####` is `Special` `User/Owner` `Group` and `Others` in that order.

For `Special` attributes (the first number in a four-number `chmod` argument):

- `Set UID` - Run file as owner regardless of the user running it (shows as `s` in the human-readable permissions string for `User` section) = $+4$ (`--s` under `User/Owner`)

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- **Set GID** - Run file as group regardless of the user/group running it (shows as `s` in the human-readable permissions string for `Group` section) = +2 (`--s` under `Group`)
- **Sticky Bit** - EFFECTIVE ON DIRECTORIES ONLY - If set, only the directory's owner user and `root` can delete the directory, and only the file owner or `root` can delete files inside it. (shows as `t` in the human-readable permissions string for `others` section) = +1 (`--t` under `Others`)

For `User/Owner` , `Group` and `Others` attributes (the last three numbers in a four-number `chmod` argument):

- **Read** = +4 (`r--`)
 - **Write** = +2 (`-w-`)
 - **Execute** (for files), or 'Enter Into / List Items' = +1 (`--x`)
-

It is called the `SETUID` bit. if it is set by `chmod 4555 test-file` (in your case), then the `test-file` can be executed by any user as if the user is the owner of the file.

When the `SETUID` bit is set then the Effective User ID (`EUID`) of the user who does not have permission to execute the file otherwise (by normal permissions, e.g. `0744`), takes the EUID of the file owner and can execute the file.
