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ANSWERS TO EVEN-NUMBERED EXERCISES

2. What are two ways you can execute a shell script when you do not have execute permission for the file containing the script? Can you execute a shell script if you do not have read permission for the file containing the script?

You can give the name of the file containing the script as an argument to the shell (for example, **bash *scriptfile***, where *scriptfile* is the name of the file containing the script).

Under bash you can give either of the following commands:

```
$ . scriptfile
```

```
$ source scriptfile
```

Because the shell must read the commands from the file containing a shell script before it can execute the commands, you must have read permission for the file to execute a shell script.

4. Assume you have made the following assignment:

```
$ person=zach
```

Give the output of each of the following commands:

- a. **echo \$person**

```
zach
```

- b. **echo ' \$person'**

```
$person
```

- c. **echo "\$person"**

```
zach
```

6. Assume the `/home/zach/grants/biblios` and `/home/zach/biblios` directories exist. Specify Zach's working directory after he executes each sequence of commands. Explain what happens in each case.

a. `$ pwd`
`/home/zach/grants`
`$ CDPATH=$(pwd)`
`$ cd`
`$ cd biblios`

After executing the preceding commands, Zach's working directory is `/home/zach/grants/biblios`. When `CDPATH` is set and the working directory is not specified in `CDPATH`, `cd` searches the working directory only after it searches the directories specified by `CDPATH`.

b. `$ pwd`
`/home/zach/grants`
`$ CDPATH=$(pwd)`
`$ cd $HOME/biblios`

After executing the preceding commands, Zach's working directory is `/home/zach/biblios`. When you give `cd` an absolute pathname as an argument, `cd` does not use `CDPATH`.

8. Enter the following command:

```
$ sleep 30 | cat /etc/services
```

Is there any output from `sleep`? Where does `cat` get its input from? What has to happen before the shell displays a prompt?

There is no output from `sleep` (try giving the command `sleep 30` by itself). The `/etc/services` file provides input for `cat` (when `cat` has an argument, it does not check standard input). The `sleep` command has to run to completion before the shell displays a prompt.

10. Write a shell script that outputs the name of the shell executing it.

There are many ways to solve this problem. The following solutions are all basically the same. These scripts take advantage of the `PPID` shell variable, which holds the PID number of the shell that is the parent of the process using the variable. They also use the fact that `echo` changes multiple sequential `SPACES` to a single `SPACE`. The `cut` utility interprets multiple sequential `SPACES` as multiple delimiters, so the script does not work properly without `echo`.

```
$ cat a
pid=$PPID
line=$(ps | grep $pid)
echo $line | cut --delimiter=" " --fields=4
```

```
$ cat a2
pid=$PPID
```

```
echo $(ps | grep $pid) | cut --delimiter=" " --fields=4
```

```
$ cat a3
echo $(ps | grep $PPID) | cut --delimiter=" " --fields=4
```

The easy solution is to give the following command:

```
$ echo $0
```

The `$0` is the first command-line token, which is usually the name of the script or program that is running (page 1000). In some cases, such as when you call the script with a relative or absolute pathname, this outcome might not be exactly what you want.

12. Add the exit status of the previous command to your prompt so it behaves similarly to the following:

```
$ [0] ls xxx
ls: xxx: No such file or directory
$ [1]
```

The following command sets up the prompt described in the question:

```
PS1='[$?] '
```

14. Implement the `basename` utility, which writes the last component of its pathname argument to standard output, as a `bash` function. For example, given the pathname `a/b/c/d`, `basename` writes `d` to standard output:

```
$ basename a/b/c/d
d
```

The following function is named `bn` to distinguish it from the `basename` utility. It behaves the same way as `basename`.

```
$ function bn () {
> if [ $# = 0 ]; then
>     exit 1
>     elif [ "$1" = "/" ]
>     then
>         echo /
>     else
>         echo $1 | sed 's:.*/::'
> fi
> }
```