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得分：29/30

1. More Linux Commands

In this exercise, we will learn a few more Linux commands. For each command, please use `man` to learn what it does and how to use it correctly. First, change your directory to `~`.

1.1 [2 points] Make a link called `data_demo_link` to `data_demo` folder using `ln`.

```
[ese-zhouyq@login01 ~]$ ln -s data_demo data_demo_link
[ese-zhouyq@login01 ~]$ ls
data_demo  data_demo_link  exam  t1.py  test
[ese-zhouyq@login01 ~]$ ls -s
total 3
1 data_demo  1 data_demo_link  1 exam  1 t1.py  1 test
```

1.2 [2 points] Print your home directory using `echo`.

```
[ese-zhouyq@login01 ~]$ echo "$(ls)"
data_demo
data_demo_link
exam
t1.py
test
```

echo $HOME,-1

1.3 [2 points] Go to `data_demo/molecules/`, make an empty file `test.pdb` with `touch`.

```
[ese-zhouyq@login01 ~]$ cd data_demo
[ese-zhouyq@login01 data_demo]$ cd molecules
[ese-zhouyq@login01 molecules]$ touch test.pdb
[ese-zhouyq@login01 molecules]$ ls
cubane.pdb  ethane.pdb  methane.pdb  octane.pdb  pentane.pdb  propane.pdb  test.pdb
```

1.4 [3 points] Find how many files in `data_demo/data/elements/` using `find`.

```
[ese-zhouyq@login01 molecules]$ cd ~
[ese-zhouyq@login01 ~]$ cd data_demo/data/elements/
[ese-zhouyq@login01 elements]$ find . -type f -print | wc -l
103
```

1.5 [2 points] Compare `data_demo/data/pdb/ethane.pdb` and `data_demo/data/pdb/ethanol.pdb` with `diff`.

```
[ese-zhouyq@login01 ~]$ cd data_demo
[ese-zhouyq@login01 data_demo]$ cd data
[ese-zhouyq@login01 data]$ cd pdb
```

```
[ese-zhouyq@login01 pdb]$ diff ethane.pdb ethanol.pdb -y -W 50
COMPND      ETHANE     | COMPND      ETHANOL
AUTHOR      DAVE WOOD  | AUTHOR      DAVE WOOD
ATOM      1  C         | ATOM      1  C
ATOM      2  C         | ATOM      2  O
ATOM      3  H         | ATOM      3  H
ATOM      4  H         | ATOM      4  H
ATOM      5  H         | ATOM      5  H
ATOM      6  H         | ATOM      6  C
ATOM      7  H         | ATOM      7  H
ATOM      8  H         | ATOM      8  H
TER       9            | ATOM      9  H
                       > TER      10
END                    END
```

1.6 [3 points] Count how many `But she` string appears in `data_demo/writing/data/LittleWomen.txt` with `grep`.

```
[ese-zhouyq@login01 ~]$ cd data_demo
[ese-zhouyq@login01 data_demo]$ ls
creatures  data  molecules  north-pacific-gyre  notes  pizza.cfg  solar.pdf  writing
[ese-zhouyq@login01 data_demo]$ cd writing
[ese-zhouyq@login01 writing]$ ls
data  haiku.txt  thesis  tools
[ese-zhouyq@login01 writing]$ cd data
[ese-zhouyq@login01 data]$ ls
LittleWomen.txt  one.txt  two.txt
```

```
[ese-zhouyq@login01 data]$ grep -r "But she" LittleWomen.txt | wc -l
15
```

1.7 [2 points] Check the total file size of the `data_demo/data/` folder using `du`.

```
[ese-zhouyq@login01 data]$ cd ~
[ese-zhouyq@login01 ~]$ ls
data_demo  data_demo_link  exam  t1.py  test  test.pdb
[ese-zhouyq@login01 ~]$ cd data_demo
[ese-zhouyq@login01 data_demo]$ cd data
[ese-zhouyq@login01 data]$ ls
amino-acids.txt  animals.txt  morse.txt  planets.txt  sunspot.txt
animal-counts    elements     pdb        salmon.txt
[ese-zhouyq@login01 data]$ du
407     ./pdb
52      ./elements
1       ./animal-counts
719     .
```

1.8 [3 points] Copy the `data_demo/writing/` folder to `data_demo/writing_new/`, compress `data_demo/writing_new/` using `zip`, and decompress the `.zip` file with `unzip`.

```
[ese-zhouyq@login01 data_demo]$ cp -r writing/ writing_new
[ese-zhouyq@login01 data_demo]$ zip -r writing_new.zip writing_new
  adding: writing_new/ (stored 0%)
  adding: writing_new/haiku.txt (deflated 29%)
  adding: writing_new/tools/ (stored 0%)
  adding: writing_new/tools/stats (stored 0%)
  adding: writing_new/tools/old/ (stored 0%)
  adding: writing_new/tools/old/oldtool (stored 0%)
  adding: writing_new/tools/format (deflated 13%)
  adding: writing_new/data/ (stored 0%)
  adding: writing_new/data/one.txt (deflated 53%)
  adding: writing_new/data/LittleWomen.txt (deflated 61%)
  adding: writing_new/data/two.txt (deflated 59%)
  adding: writing_new/thesis/ (stored 0%)
  adding: writing_new/thesis/empty-draft.md (stored 0%)
[ese-zhouyq@login01 data_demo]$ unzip -n writing_new.zip
Archive:  writing_new.zip
[ese-zhouyq@login01 data_demo]$ ls
creatures  data  molecules  north-pacific-gyre  notes  pizza.cfg  solar.pdf  writing  writing_new  writing_new.zip
```

1.9 [3 points] Change the file permissions flags on `writing_new` to `drwxr-x---` using `chmod`.

```
[ese-zhouyq@login01 data_demo]$ chmod 750 writing_new
[ese-zhouyq@login01 data_demo]$ ls
creatures  data  molecules  north-pacific-gyre  notes  pizza.cfg  solar.pdf  writing  writing_new  writing_new.zip
[ese-zhouyq@login01 data_demo]$ ll
total 644
drwxr-xr-x 2 ese-zhouyq ese-ouycc   4096 Nov 24 19:22 creatures
drwxr-xr-x 5 ese-zhouyq ese-ouycc   4096 Nov 24 19:22 data
drwxr-xr-x 2 ese-zhouyq ese-ouycc   4096 Dec  1 20:21 molecules
drwxr-xr-x 3 ese-zhouyq ese-ouycc   4096 Nov 24 19:22 north-pacific-gyre
-rwxr-xr-x 1 ese-zhouyq ese-ouycc     69 Nov 24 19:22 notes
-rwxr-xr-x 1 ese-zhouyq ese-ouycc     32 Nov 24 19:22 pizza.cfg
-rwxr-xr-x 1 ese-zhouyq ese-ouycc  21583 Nov 24 19:22 solar.pdf
drwxr-xr-x 5 ese-zhouyq ese-ouycc   4096 Nov 24 19:22 writing
drwxr-x--- 5 ese-zhouyq ese-ouycc   4096 Dec  2 09:26 writing_new
-rw-r--r-- 1 ese-zhouyq ese-ouycc 422584 Dec  2 09:27 writing_new.zip
```

1.10 [3 points] Print the last `10` commands you made using `history`.

```
[ese-zhouyq@login01 data_demo]$ history 10
  174  ls
  175  cp -r writing_new/ writing
  176  cp -r writing/ writing_new
  177  zip -r writing_new.zip writing_new
  178  unzip -n writing_new.zip
  179  ls
  180  chmod 750 writing_new
  181  ls
  182  ll
  183  history 10
```

2. BASH `for` Loop

The general syntax of a BASH loop goes like:

```
for thing in list_of_things
do
    operation_using $thing
done
```

[5 points] Write a shell script to print file size (in bytes) of each `*.pdb` file in `data_demo/data/pdb/`, line by line.

Firstly, go to *data_demo/data/pdb/* and nano a *.sh* file named practice:

```
[ese-zhouyq@login01 ~]$ cd data_demo/data/pdb/
[ese-zhouyq@login01 pdb]$ pwd
/work/ese-zhouyq/data_demo/data/pdb
[ese-zhouyq@login01 pdb]$ ls
aldrin.pdb          cinnamaldehyde.pdb  cyclopropane.pdb      lactic-acid.pdb  methane.pdb   norethindrone.pdb  quinine.pdb      tnt.pdb
ammonia.pdb         citronellal.pdb     ethane.pdb            lactose.pdb      methanol.pdb  octane.pdb         strychnine.pdb   tuberin.pdb
ascorbic-acid.pdb   codeine.pdb         ethanol.pdb           lanoxin.pdb      mint.pdb      pentane.pdb        styrene.pdb      tyrian-purple.pdb
benzaldehyde.pdb    cubane.pdb          ethylcyclohexane.pdb  lsd.pdb          morphine.pdb  piperine.pdb       sucrose.pdb      vanillin.pdb
camphene.pdb        cyclobutane.pdb     glycol.pdb            maltose.pdb      mustard.pdb   propane.pdb        testosterone.pdb vinyl-chloride.pdb
cholesterol.pdb     cyclohexanol.pdb    heme.pdb              menthol.pdb      nerol.pdb     pyridoxal.pdb      thiamine.pdb     vitamin-a.pdb
[ese-zhouyq@login01 pdb]$ nano practice.sh
```

```
[ese-zhouyq@login01 pdb]$ nano practice.sh
```

Type the following codes in *practice.sh*:

```
for pdb in *.pdb
do
    du -b $pdb
done
```

Then, do these operations:

```
[ese-zhouyq@login01 pdb]$ ls
aldrin.pdb          cinnamaldehyde.pdb  cyclopropane.pdb      lactic-acid.pdb  methane.pdb   norethindrone.pdb  pyridoxal.pdb    thiamine.pdb     vitamin-a.pdb
ammonia.pdb         citronellal.pdb     ethane.pdb            lactose.pdb      methanol.pdb  octane.pdb         quinine.pdb      tnt.pdb
ascorbic-acid.pdb   codeine.pdb         ethanol.pdb           lanoxin.pdb      mint.pdb      pentane.pdb        strychnine.pdb   tuberin.pdb
benzaldehyde.pdb    cubane.pdb          ethylcyclohexane.pdb  lsd.pdb          morphine.pdb  piperine.pdb       styrene.pdb      tyrian-purple.pdb
camphene.pdb        cyclobutane.pdb     glycol.pdb            maltose.pdb      mustard.pdb   practice.sh        sucrose.pdb      vanillin.pdb
cholesterol.pdb     cyclohexanol.pdb    heme.pdb              menthol.pdb      nerol.pdb     propane.pdb        testosterone.pdb vinyl-chloride.pdb
[ese-zhouyq@login01 pdb]$ chmod 750 practice.sh
[ese-zhouyq@login01 pdb]$ ./practice.sh
```

Here are the results:

```
1516    aldrin.pdb
306     ammonia.pdb
1444    ascorbic-acid.pdb
1030    benzaldehyde.pdb
1830    camphene.pdb
5049    cholesterol.pdb
1090    cinnamaldehyde.pdb
1694    citronellal.pdb
2452    codeine.pdb
1158    cubane.pdb
895     cyclobutane.pdb
1384    cyclohexanol.pdb
695     cyclopropane.pdb
622     ethane.pdb
690     ethanol.pdb
2396    ethylcyclohexane.pdb
765     glycol.pdb
4209    heme.pdb
1064    lactic-acid.pdb
2562    lactose.pdb
11193   lanoxin.pdb
3395    lsd.pdb
2562    maltose.pdb
2164    menthol.pdb
422     methane.pdb
490     methanol.pdb
1869    mint.pdb
2288    morphine.pdb
2123    mustard.pdb
1680    nerol.pdb
2729    norethindrone.pdb
1828    octane.pdb
1226    pentane.pdb
2287    piperine.pdb
825     propane.pdb
1256    pyridoxal.pdb
3303    quinine.pdb
2675    strychnine.pdb
1159    styrene.pdb
2562    sucrose.pdb
2787    testosterone.pdb
2196    thiamine.pdb
1508    tnt.pdb
2395    tuberin.pdb
```

```
2103    tyrian-purple.pdb
1361    vanillin.pdb
423     vinyl-chloride.pdb
2894    vitamin-a.pdb
```