Python - Regex

Regular expressions

- Regular expressions, also called regex is implemented in pretty much every computer language.
- Regex is used to find a pattern in specific pattern search.
- Globally regex supports two operations
    1. Match operation
    2. Substitute operation
- Regex patterns are generic text,numbers or specialcharacter,space etc.,

- It is widely used in natural language processing, web applications that require validating string input (like email address) and pretty much more data science projects that involve text mining.

import re

- In python, it is implemented in the standard module 're'.
- **>>> import re**
- To get information about regex use help()
- **>>> help(re)**
- Before going to discuss about the regex pattern,1st understand about following metacharacters.
- Here's a complete list of the metacharacters.
- **. ^ $ * + ? { } [ ] \ | ( )**

. (dot) Matches any single character except newline character.

^ Matches the pattern at the beginning of line.

$ Matches the pattern at the end of the line.

[...] Matches any single character in brackets.

[^...] Matches any single character not in brackets

***** Matches 0 or more occurrences of preceding expression.

+ Matches 1 or more occurrence of preceding expression.

? Matches 0 or 1 occurrence of preceding expression

{n} Matches exactly n number of occurrences of preceding expression.

{ n,} Matches n or more occurrences of preceding expression.

{ n, m} Matches at least n and at most m occurrences of preceding expression.

pattern1|pattern2 Matches either pattern1 or pattern2

(pattern) Groups regular expressions and remembers matched text.

Special Character Classes

\d Match a digit same as **[0-9]**

\D Match a nondigit same as **[^0-9]**

\s Match a whitespace character same as **[\t\r\n\f]**

\S Match nonwhitespace same as **[^ \t\r\n\f]**

\w Match a single word character **[A-Za-z0-9_]**

\W Match a nonword character **[^A-Za-z0-9_]**

\APattern Match "Pattern" at the start of a string

Pattern\Z Match "Pattern" at the end of a string

re module

- The **re** module provides an interface to the regular expression engine, allowing you to compile REs into objects and then perform matches with them.

Regex Functions

- The **re** module offers a set of functions that allows us to search a string for a match

Function	Description
compile	Regular expressions are compiled into pattern objects
search	Returns a Match object if there is a match anywhere in the string
findall	Returns a list containing all matches
split	Returns a list where the string has been split at each match
sub	Replaces one or many matches with a string
finditer	Find all substrings where the RE matches, and returns them as an iterator.
group	Return the string matched by the RE
start	Return the starting position of the match
end	Return the ending position of the match
span	Return a tuple containing the (start, end) positions of the match

Compiling Regular Expressions

- Regular expressions are compiled into pattern objects.

- Which have methods for various operations such as searching for pattern matches or performing string substitutions.

```
>>> import re
>>> pobj = re.compile('sales')
>>> pobj
<_sre.SRE_Pattern object at 0x...>
```

re.compile() also accepts an optional flags argument (re.I) **re.IGNORECASE**

```
>>> pobj=re.compile('sales',re.IGNORECASE)
```

raw string notation

- To use Python's raw string notation for regular expressions; backslashes are not handled.
- In any special way in a string literal prefixed with **'r'**, so r**"\n"** is a two-character string containing **'\'** and 'n'.
- while "\n" is a one-character string containing a newline.
- Regular expressions will often be written in Python code using this raw string notation.
- **search()** searches for the pattern in a given input string.
- returns a particular match object that contains the starting and ending positions of the first occurrence of the pattern.

```
>>> pobj=re.compile("sales")
>>> pobj.search("ram,sales,pune")
<re.Match object; span=(4, 9), match='sales'>
>>>
>>> pobj.search("ram,prod,bangalore")
                                # Pattern is not matched from input string

>>>  # search() return will be None
...
>>> pobj.search("ram,prod,bangalore") == None
True
```

We can write it in another way

Syntax :-

re.search("pattern","inputstring",flag=re.I)

- **>>> re.search("sales","ram,sales,pune")**
- <re.Match object; span=(4, 9), match='sales'>

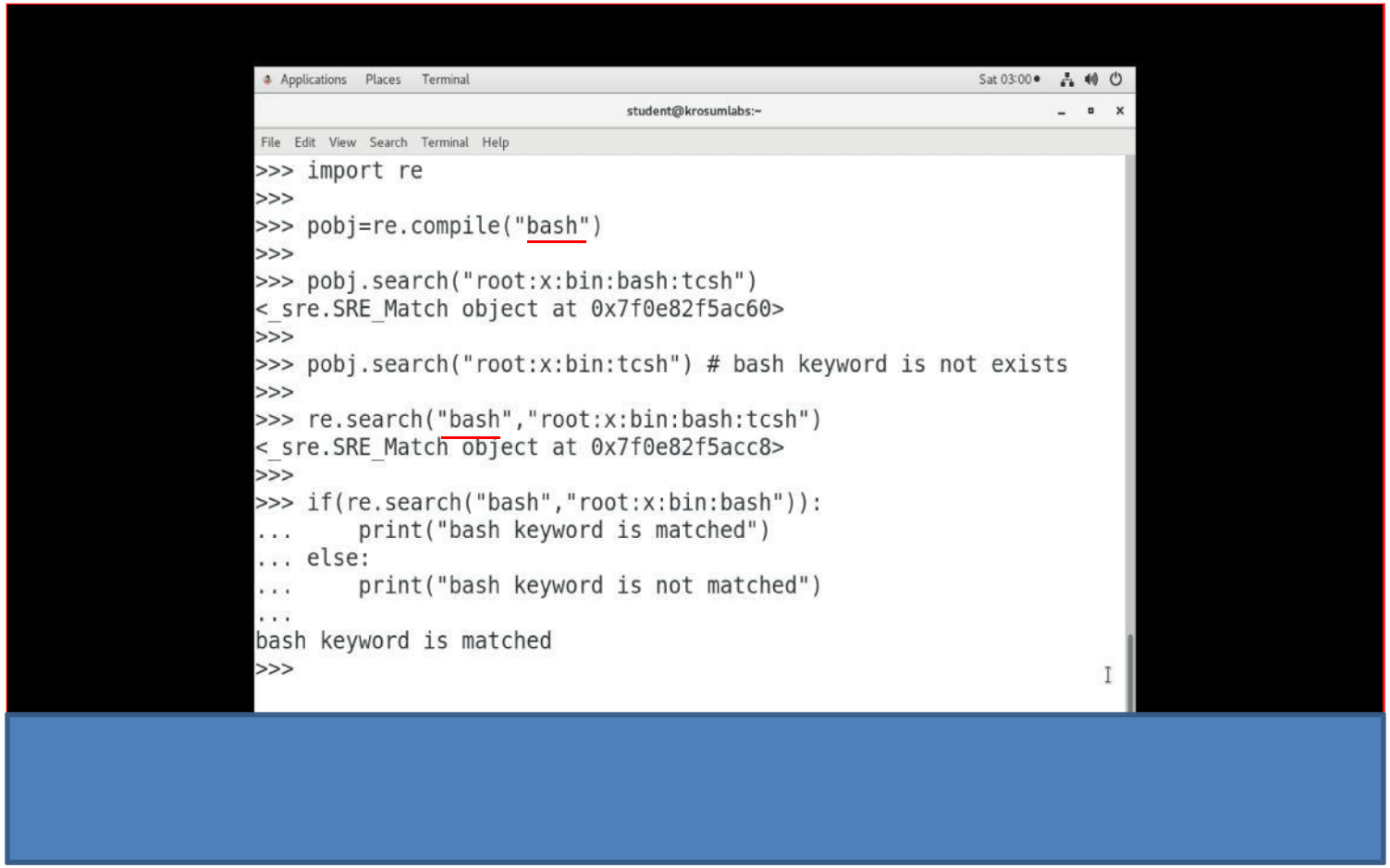
- **>>> re.search("sales","ram,HR,pune")**

using conditional statement

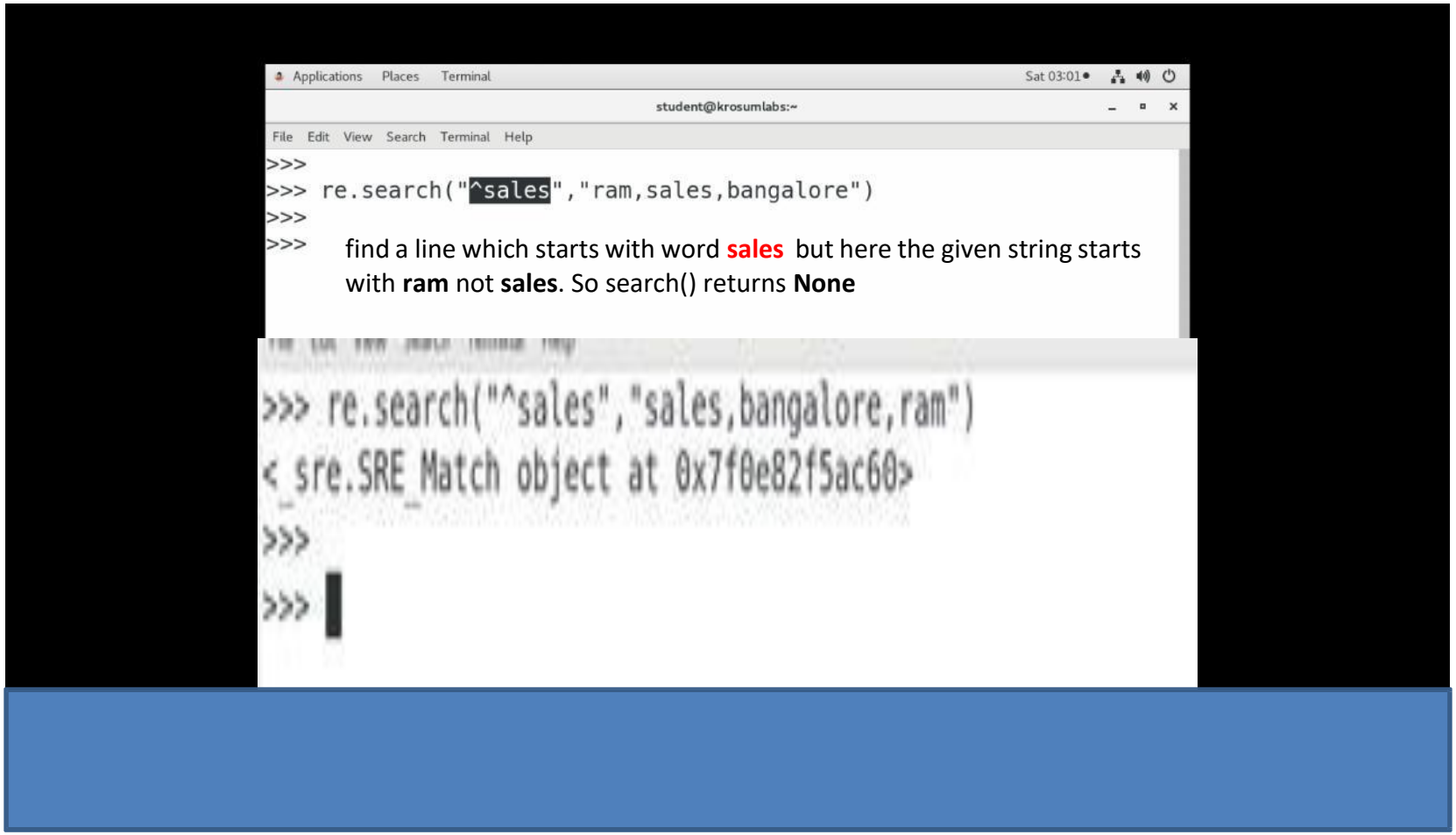
```
>>> if(re.search("sales","ram,sales,pune")):
...     print("Pattern is matched")
... else:
...     print("Pattern is NOT Matched")
```

Pattern is matched

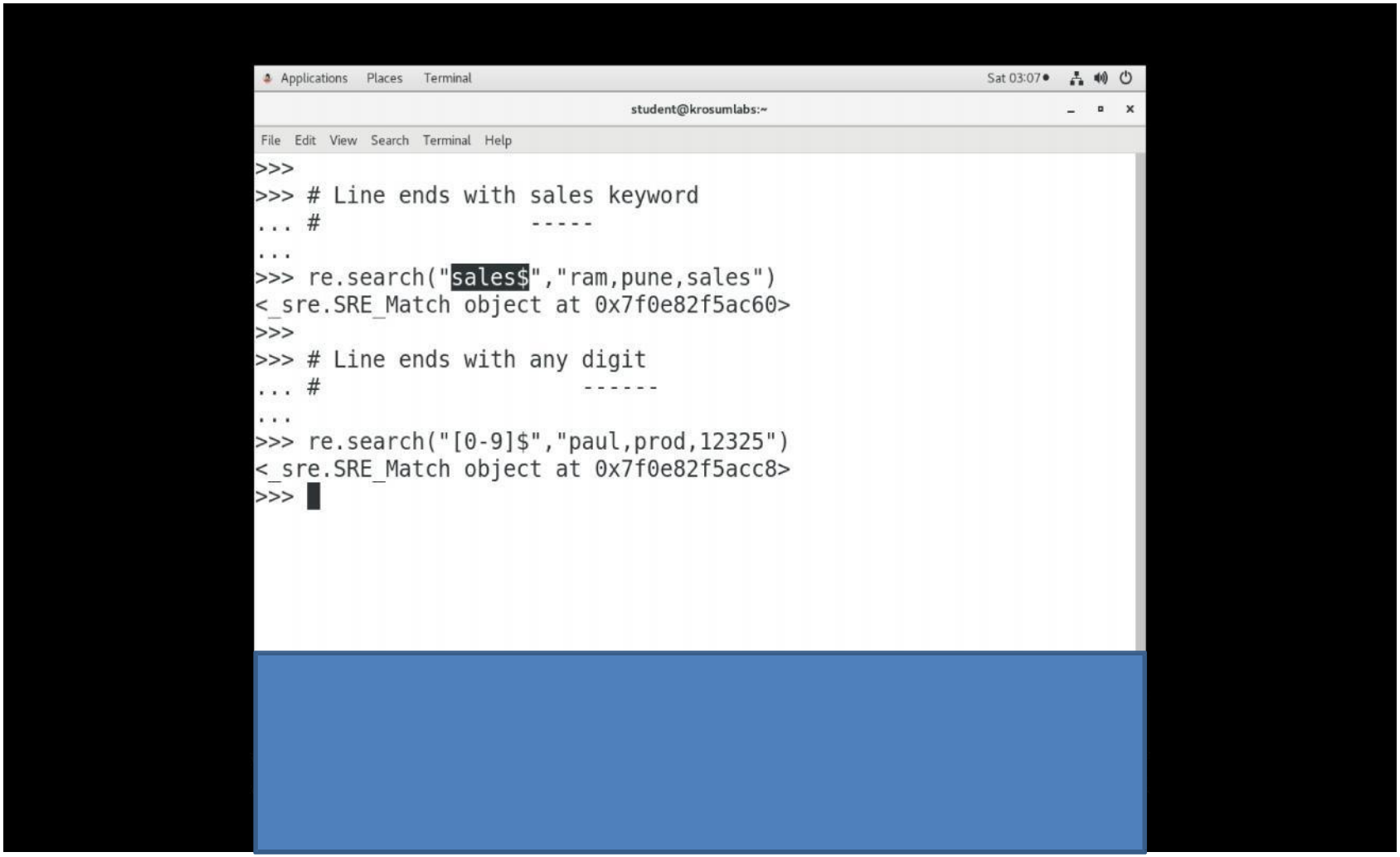
Search a **bash** word from input string



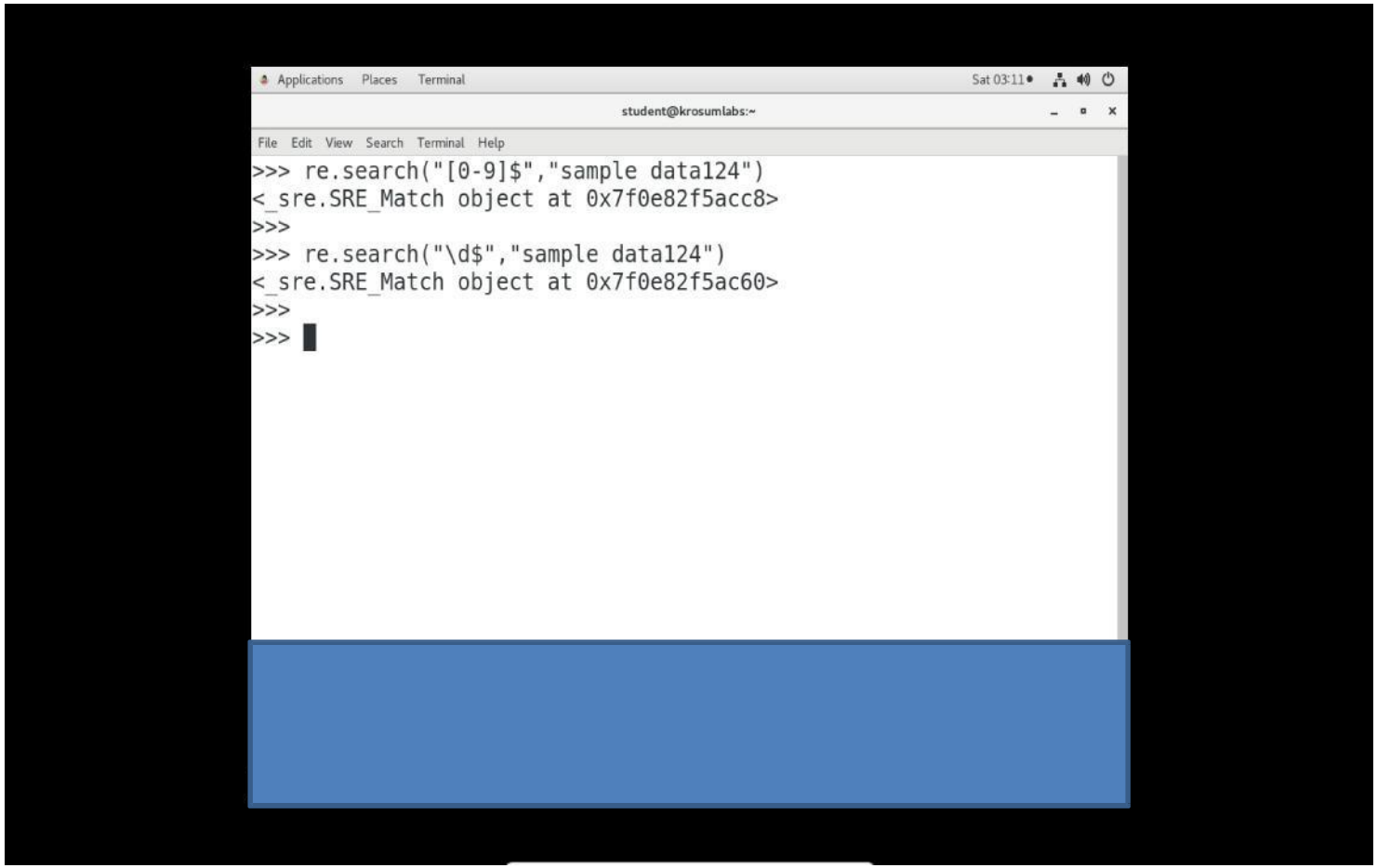
Find a line starts with a pattern

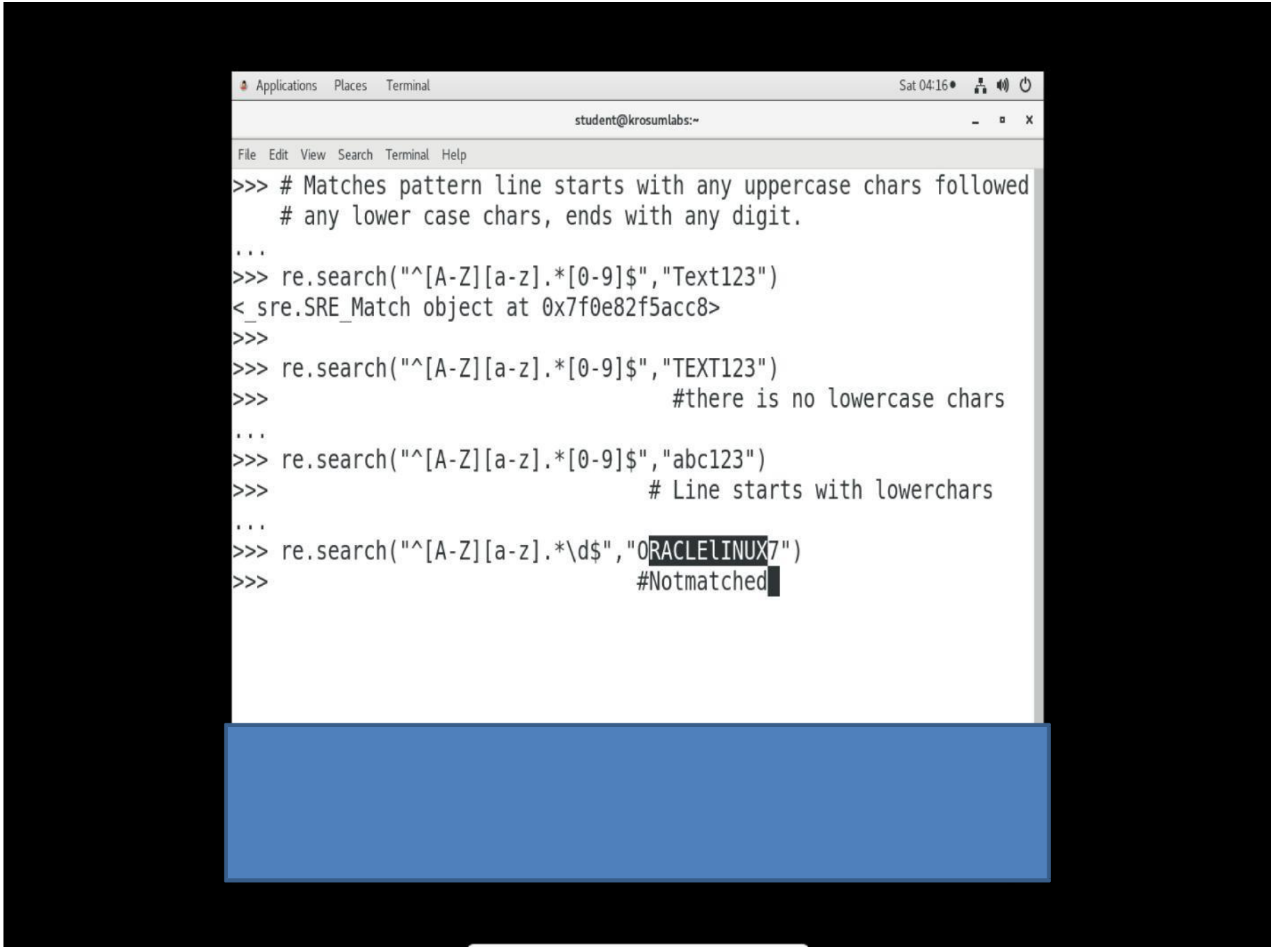


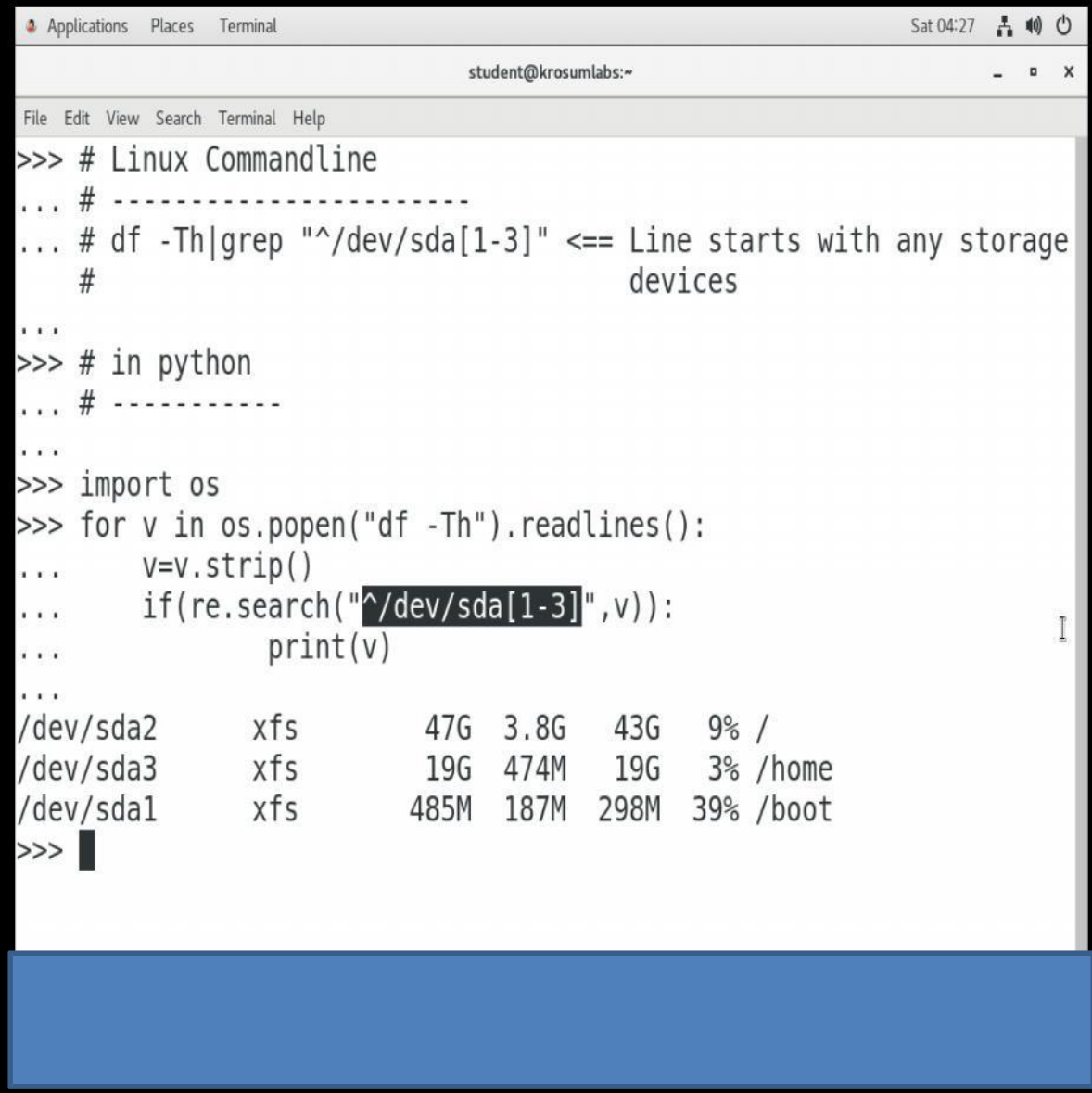
Find a line that ends with a pattern

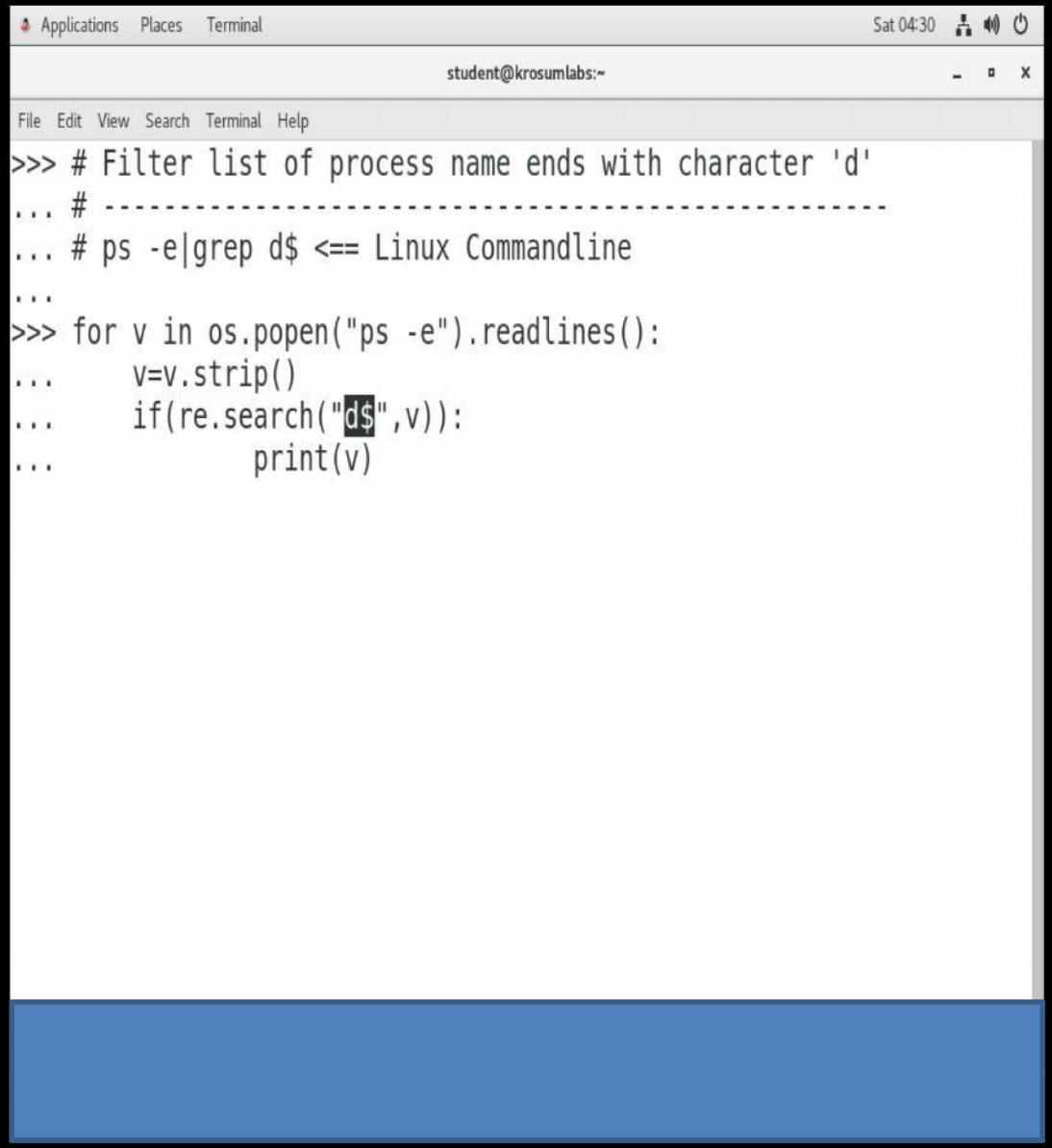


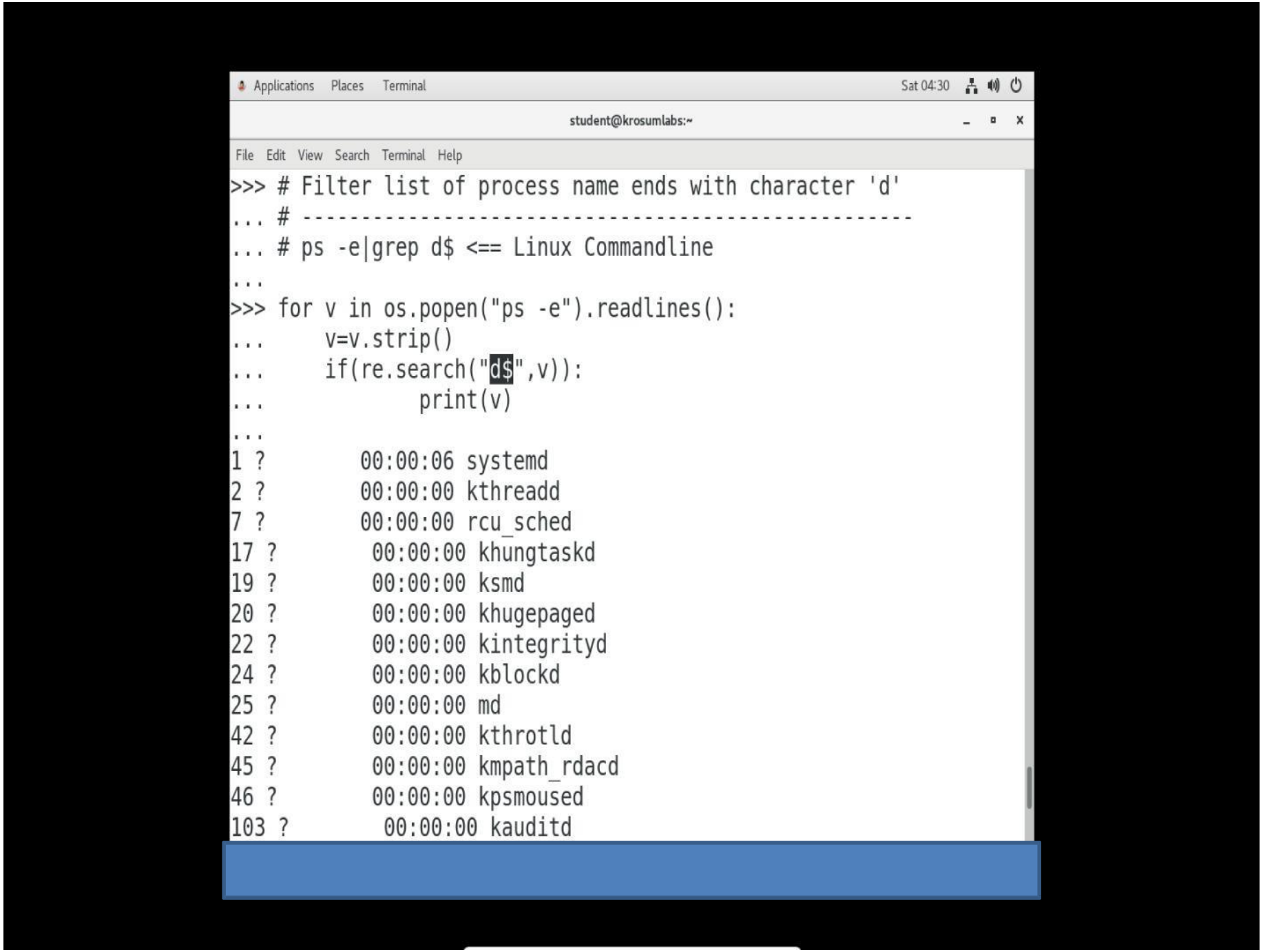
Find a line that ends with a digit

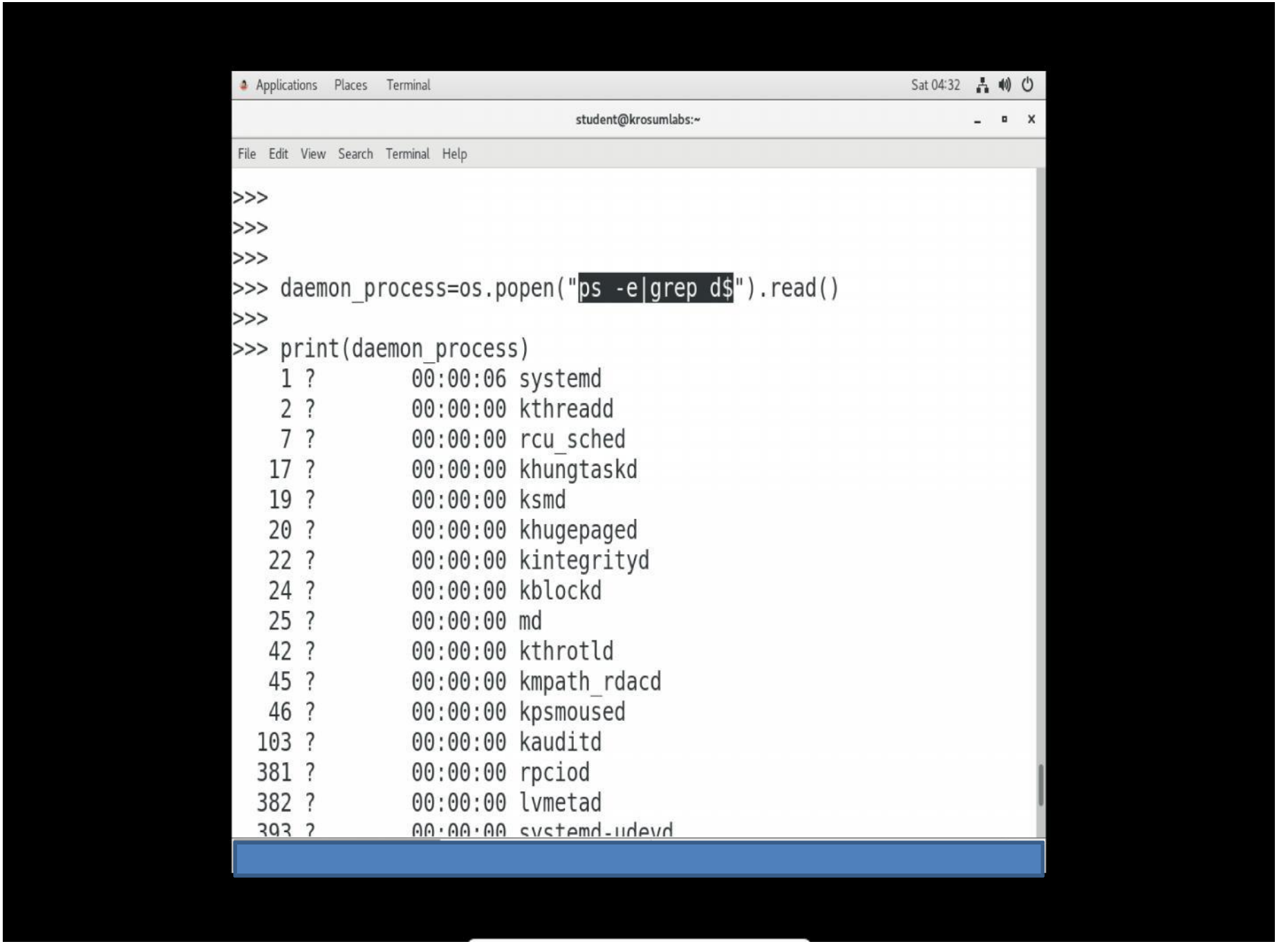


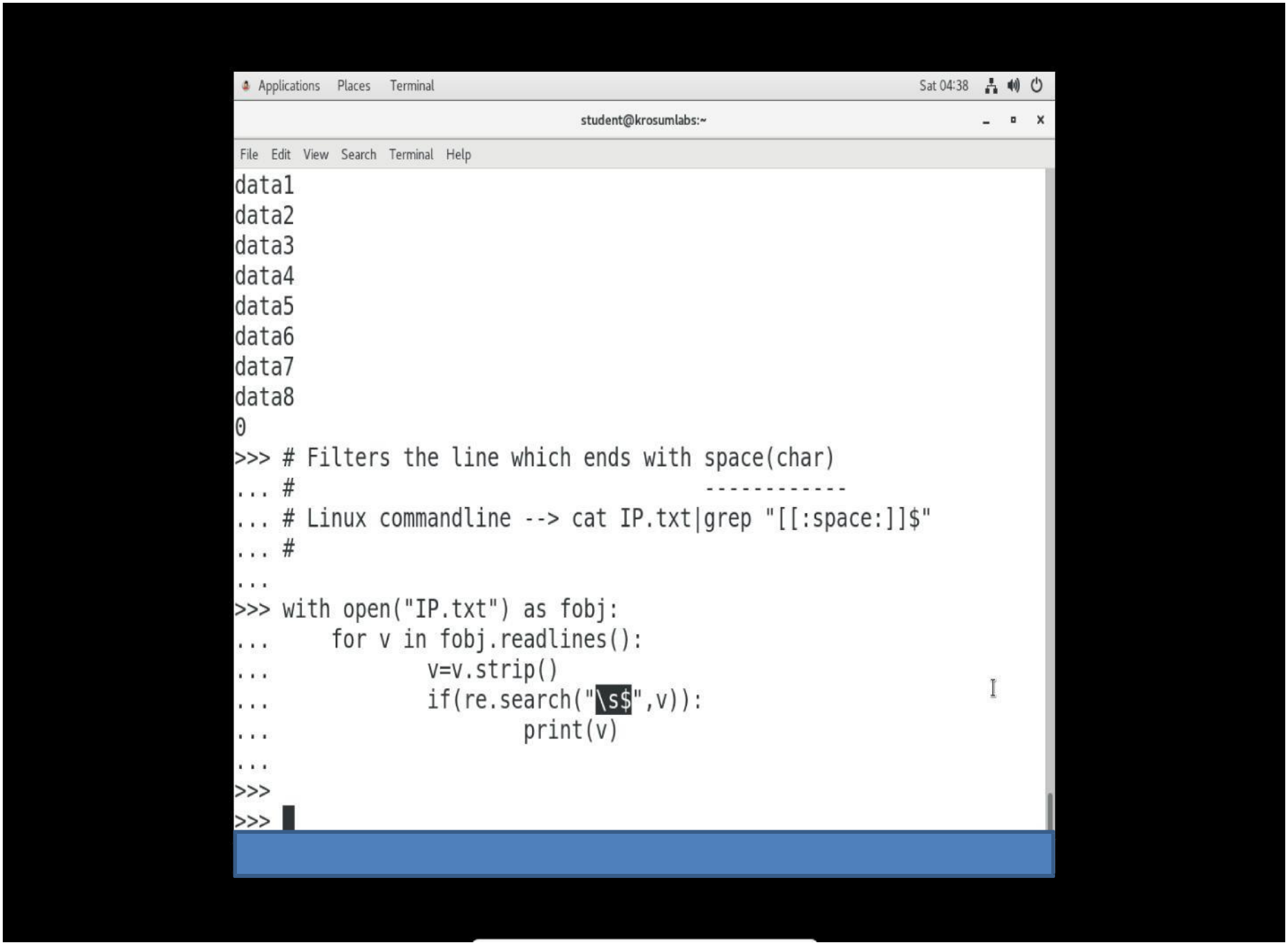

Applications Places Terminal
Sat 04:16
student@krosumlabs:~
File Edit View Search Terminal Help
>>> # Matches pattern line starts with any uppercase chars followed
# any lower case chars, ends with any digit.
...
>>> re.search("^[A-Z][a-z].*[0-9]$","Text123")
<_sre.SRE_Match object at 0x7f0e82f5acc8>
>>>
>>> re.search("^[A-Z][a-z].*[0-9]$","TEXT123")
>>> #there is no lowercase chars
...
>>> re.search("^[A-Z][a-z].*[0-9]$","abc123")
>>> # Line starts with lowerchars
...
>>> re.search("^[A-Z][a-z].*\d$","ORACLElINUX7")
>>> #Notmatched

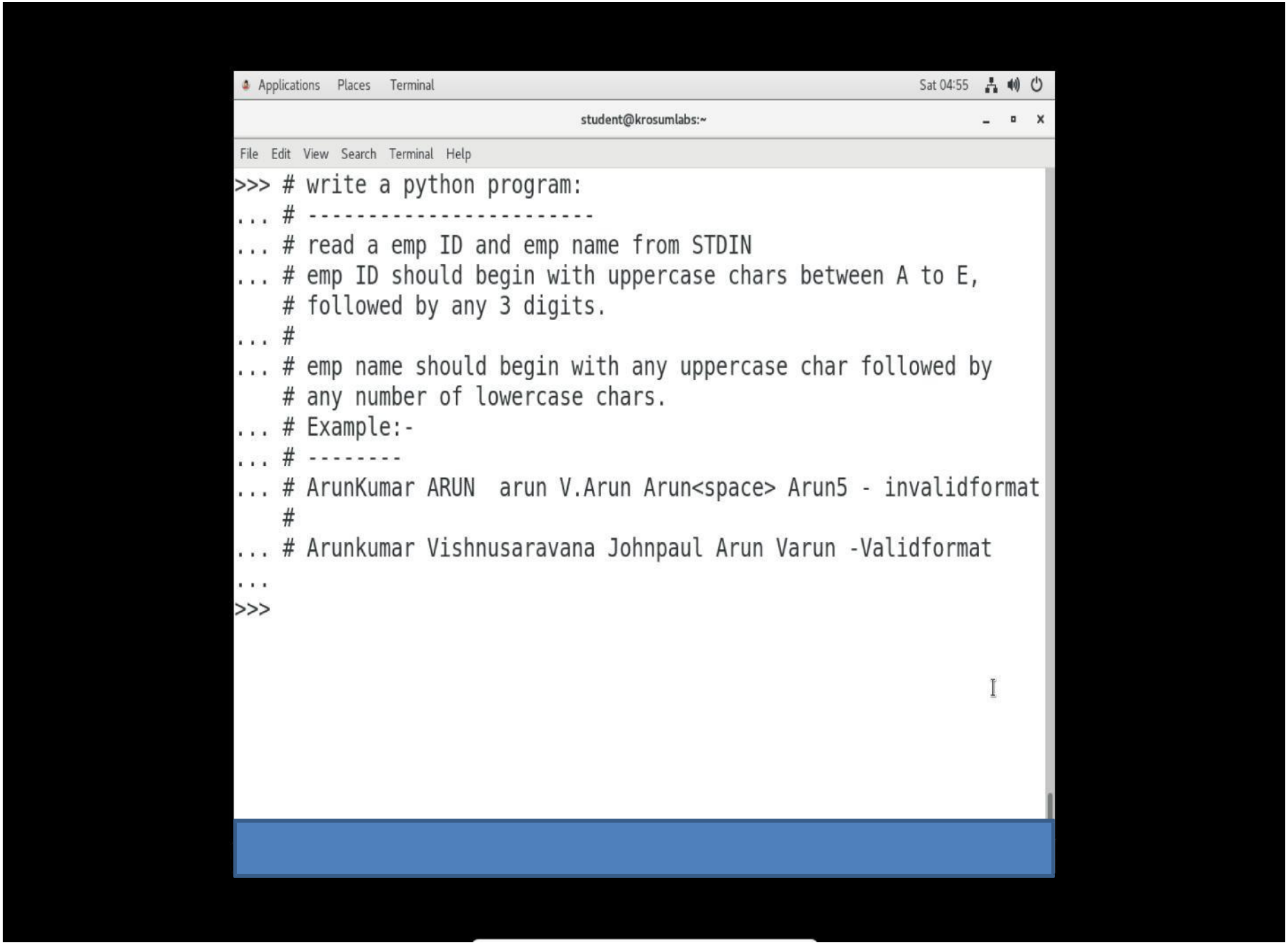

Applications Places Terminal
Sat 04:27
student@krosumlabs:~
File Edit View Search Terminal Help
>>> # Linux Commandline
... # ----------------------
... # df -Th|grep "^/dev/sda[1-3]" <== Line starts with any storage
devices
...
>>> # in python
... # ----------
...
>>> import os
>>> for v in os.popen("df -Th").readlines():
... v=v.strip()
... if(re.search("^/dev/sda[1-3]",v)):
... print(v)
...
/dev/sda2 xfs 47G 3.8G 43G 9% /
/dev/sda3 xfs 19G 474M 19G 3% /home
/dev/sda1 xfs 485M 187M 298M 39% /boot
>>>

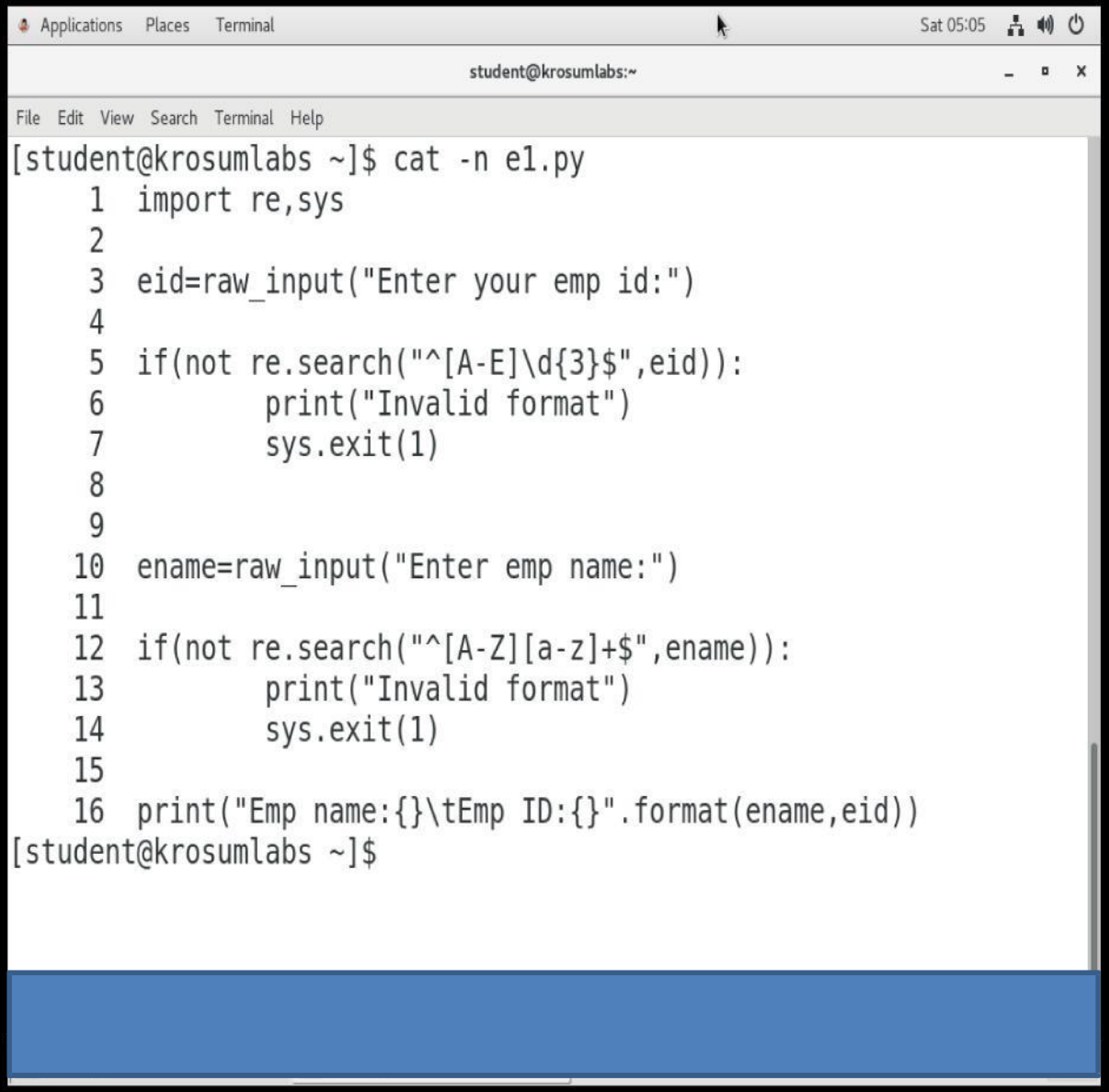

Applications Places Terminal
Sat 04:30
student@krosumlabs:~
File Edit View Search Terminal Help
>>> # Filter list of process name ends with character 'd'
... # --
... # ps -e|grep d$ <== Linux Commandline
...
>>> for v in os.popen("ps -e").readlines():
...   v=v.strip()
...   if(re.search("d$",v)):
...   print(v)

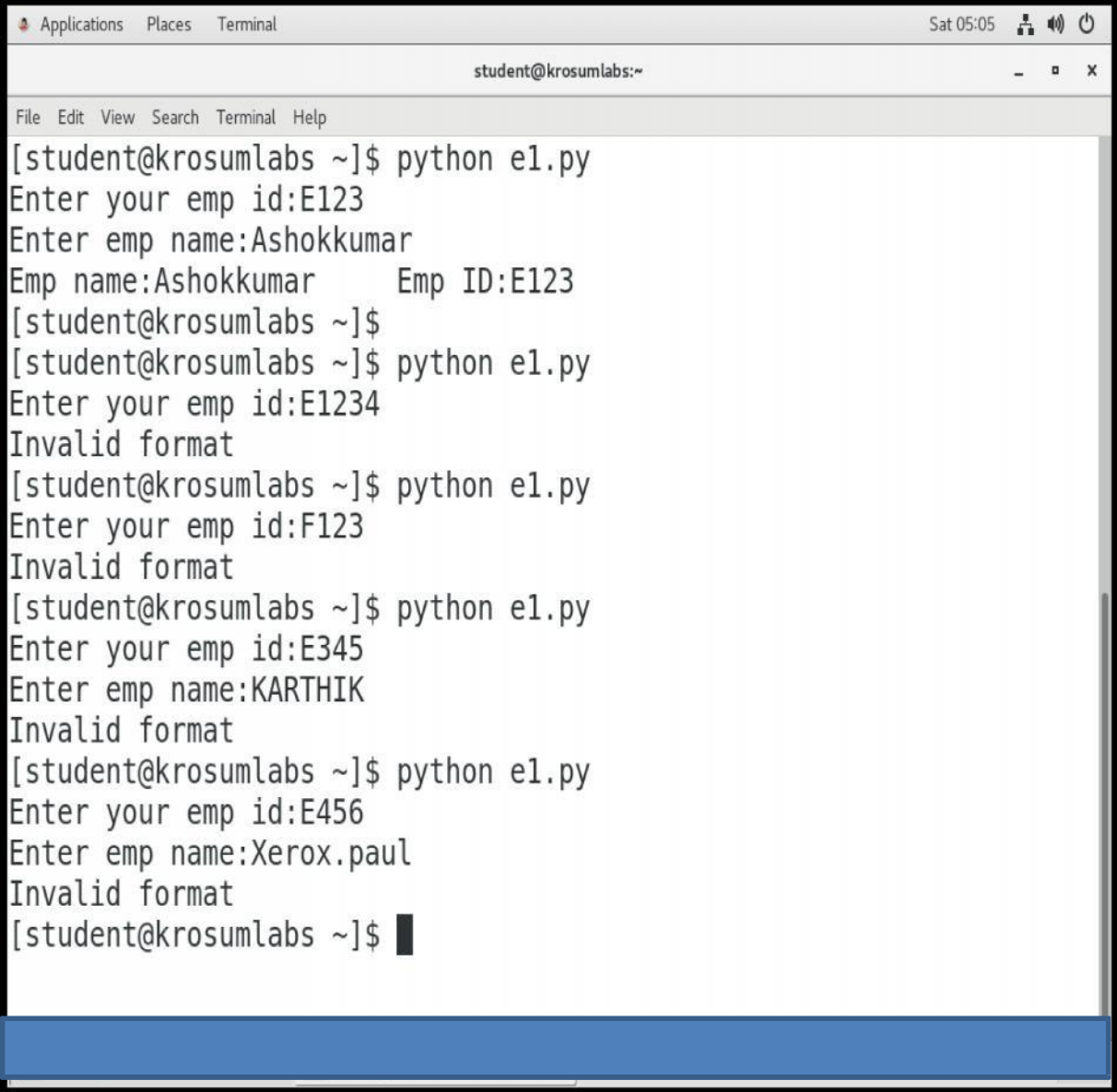

Applications Places Terminal
Sat 04:30
student@krosumlabs:~
File Edit View Search Terminal Help
>>> # Filter list of process name ends with character 'd'
... # --
... # ps -e|grep d$ <== Linux Commandline
...
>>> for v in os.popen("ps -e").readlines():
...   v=v.strip()
...   if(re.search("d$",v)):
...   print(v)
...
1 ?   00:00:06 systemd
2 ?   00:00:00 kthreadd
7 ?   00:00:00 rcu_sched
17 ?   00:00:00 khungtaskd
19 ?   00:00:00 ksmd
20 ?   00:00:00 khugepaged
22 ?   00:00:00 kintegrityd
24 ?   00:00:00 kblockd
25 ?   00:00:00 md
42 ?   00:00:00 kthrotld
45 ?   00:00:00 kmpath_rdacd
46 ?   00:00:00 kpsmoused
103 ?   00:00:00 kauditd

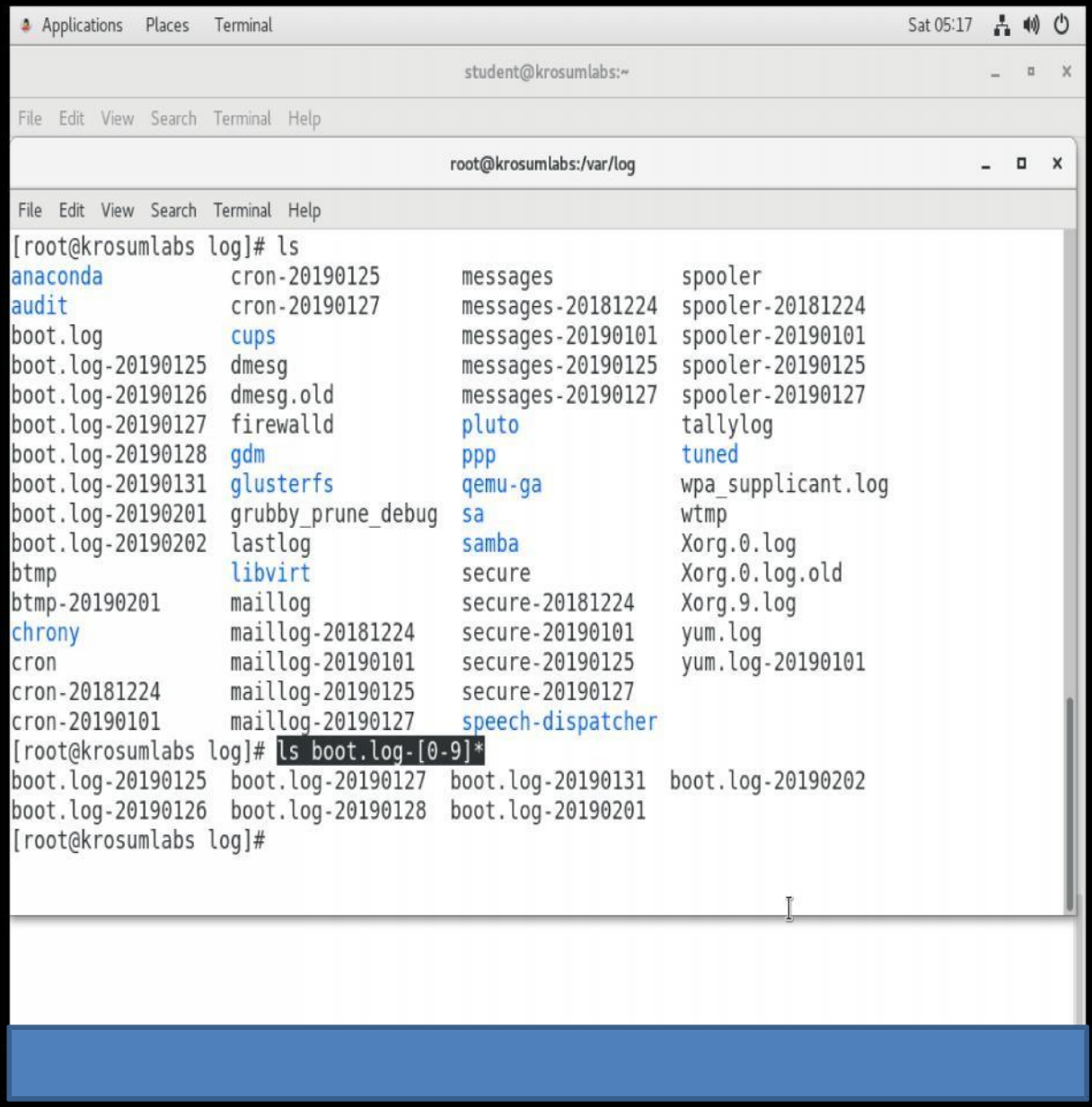

Applications Places Terminal
Sat 04:32
student@krosumlabs:~
File Edit View Search Terminal Help
>>>
>>>
>>>
>>> daemon_process=os.popen("ps -e|grep d$").read()
>>>
>>> print(daemon_process)
1 ? 00:00:06 systemd
2 ? 00:00:00 kthreadd
7 ? 00:00:00 rcu_sched
17 ? 00:00:00 khungtaskd
19 ? 00:00:00 ksmd
20 ? 00:00:00 khugepaged
22 ? 00:00:00 kintegrityd
24 ? 00:00:00 kblockd
25 ? 00:00:00 md
42 ? 00:00:00 kthrotld
45 ? 00:00:00 kmpath_rdacd
46 ? 00:00:00 kpsmoused
103 ? 00:00:00 kauditd
381 ? 00:00:00 rpciod
382 ? 00:00:00 lvmetad
393 ? 00:00:00 systemd-udevd


Applications Places Terminal
Sat 04:38
student@krosumlabs:~
File Edit View Search Terminal Help
data1
data2
data3
data4
data5
data6
data7
data8
0
>>> # Filters the line which ends with space(char)
... #   ------------
... # Linux commandline --> cat IP.txt|grep "[[:space:]]$"
... #
...
>>> with open("IP.txt") as fobj:
...   for v in fobj.readlines():
...   v=v.strip()
...   if(re.search("\s$",v)):
...   print(v)
...
>>>
>>>

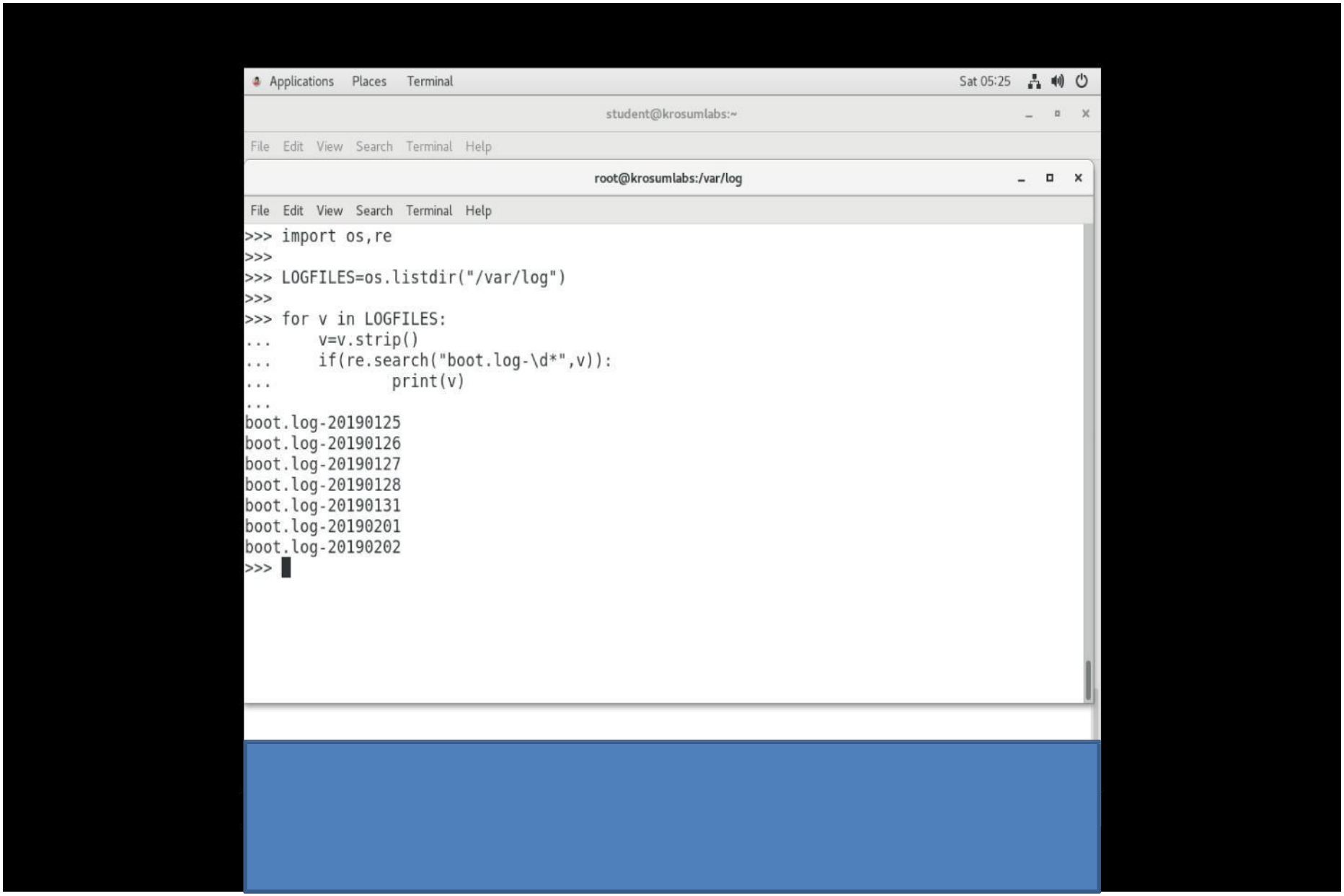

Applications Places Terminal
Sat 04:55
student@krosumlabs:~
File Edit View Search Terminal Help
>>> # write a python program:
... # ------------------------
... # read a emp ID and emp name from STDIN
... # emp ID should begin with uppercase chars between A to E,
followed by any 3 digits.
... #
... # emp name should begin with any uppercase char followed by
any number of lowercase chars.
... # Example:-
... # --------
... # ArunKumar ARUN arun V.Arun Arun<space> Arun5 - invalidformat
#
... # Arunkumar Vishnusaravana Johnpaul Arun Varun -Validformat
...
>>>


Applications Places Terminal
Sat 05:05
student@krosumlabs:~
File Edit View Search Terminal Help
[student@krosumlabs ~]$ cat -n e1.py
1 import re,sys
2
3 eid=raw_input("Enter your emp id:")
4
5 if(not re.search("^[A-E]\d{3}$",eid)):
6 print("Invalid format")
7 sys.exit(1)
8
9
10 ename=raw_input("Enter emp name:")
11
12 if(not re.search("^[A-Z][a-z]+$",ename)):
13 print("Invalid format")
14 sys.exit(1)
15
16 print("Emp name:{}\tEmp ID:{}".format(ename,eid))
[student@krosumlabs ~]$


Applications Places Terminal
Sat 05:05
student@krosumlabs:~
File Edit View Search Terminal Help
[student@krosumlabs ~]$ python e1.py
Enter your emp id:E123
Enter emp name:Ashokkumar
Emp name:Ashokkumar Emp ID:E123
[student@krosumlabs ~]$
[student@krosumlabs ~]$ python e1.py
Enter your emp id:E1234
Invalid format
[student@krosumlabs ~]$ python e1.py
Enter your emp id:F123
Invalid format
[student@krosumlabs ~]$ python e1.py
Enter your emp id:E345
Enter emp name:KARTHIK
Invalid format
[student@krosumlabs ~]$ python e1.py
Enter your emp id:E456
Enter emp name:Xerox.paul
Invalid format
[student@krosumlabs ~]$


Applications Places Terminal
Sat 05:17
student@krosumlabs:~
File Edit View Search Terminal Help
root@krosumlabs:/var/log
File Edit View Search Terminal Help
[root@krosumlabs log]# ls
anaconda cron-20190125 messages spooler
audit cron-20190127 messages-20181224 spooler-20181224
boot.log cups messages-20190101 spooler-20190101
boot.log-20190125 dmesg messages-20190125 spooler-20190125
boot.log-20190126 dmesg.old messages-20190127 spooler-20190127
boot.log-20190127 firewalld pluto tallylog
boot.log-20190128 gdm ppp tuned
boot.log-20190131 glusterfs qemu-ga wpa_supplicant.log
boot.log-20190201 grubby_prune_debug sa wtmp
boot.log-20190202 lastlog samba Xorg.0.log
btmp libvirt secure Xorg.0.log.old
btmp-20190201 maillog secure-20181224 Xorg.9.log
chrony maillog-20181224 secure-20190101 yum.log
cron maillog-20190101 secure-20190125 yum.log-20190101
cron-20181224 maillog-20190125 secure-20190127
cron-20190101 maillog-20190127 speech-dispatcher
[root@krosumlabs log]# ls boot.log-[0-9]*
boot.log-20190125 boot.log-20190127 boot.log-20190131 boot.log-20190202
boot.log-20190126 boot.log-20190128 boot.log-20190201
[root@krosumlabs log]#

Linux ls /var/boot/boot.log-[0-9]*



Extract **year,month** and **date** from given url string.

```
>>> import re
>>>
>>> url="https://www.krosum.com/news/latest-beckhams/2018/02/09/odell-fame-author"
>>>
>>> # Extract year,month and date from an URL
... #        ------------------
...
>>> re.findall("\d{4}/\d{2}/\d{2}",url)
['2018/02/09']
>>>
>>>
```

re.split()

```
>>>
>>> import re
>>>
>>> "root:x:bin:bash:tcsh".split(":")
['root', 'x', 'bin', 'bash', 'tcsh']
>>>
>>> "root-x:bin,bash-tcsh".split(":")
['root-x', 'bin,bash-tcsh']
>>>
>>> "root-x:bin,bash-tcsh".split("-")
['root', 'x:bin,bash-tcsh']
>>>
>>> "root-x:bin,bash-tcsh".split("~")
['root-x:bin,bash', 'tcsh']
>>>
>>> # re.split("[:,~-]","root-x:bin,bash-tcsh")
... #           --------
... #          character class
...
>>>
>>> re.split("[:,~-]","root-x:bin,bash-tcsh")
['root', 'x', 'bin', 'bash', 'tcsh']
>>>
>>>
```

Split the text around 1 or more space chars

```
>>> Given="""
... This is sample
... text line
... multiple line text
... data from line by line"""
>>>
>>> # re.split("regx",Inputstring)  <== Syntax
...
>>> # split the text around 1 or more space characters
... #                          --  -----
...




>>>
>>> re.split("\s+",Given)
['', 'This', 'is', 'sample', 'text', 'line', 'multiple', 'line', 'text', 'dat
a', 'from', 'line', 'by', 'line']
>>>
```

re.match()

```
>>> re.search("^root","root:x:bin:bash")
<re.Match object; span=(0, 4), match='root'>
>>>
>>>
>>> help(re.match)
Help on function match in module re:

match(pattern, string, flags=0)
    Try to apply the pattern at the start of the string, returning
    a Match object, or None if no match was found.

>>>
>>> # re.match(pattern,inputstring)
... #           -------
... #              |__pattern matches at the beginning of the inputstring
... #
... # re.search("^pattern",input) same as re.match("pattern",input)
... #              -------                          --------
... #
...
>>> re.match("root","root:x:bin:bash")
<re.Match object; span=(0, 4), match='root'>
>>>
```

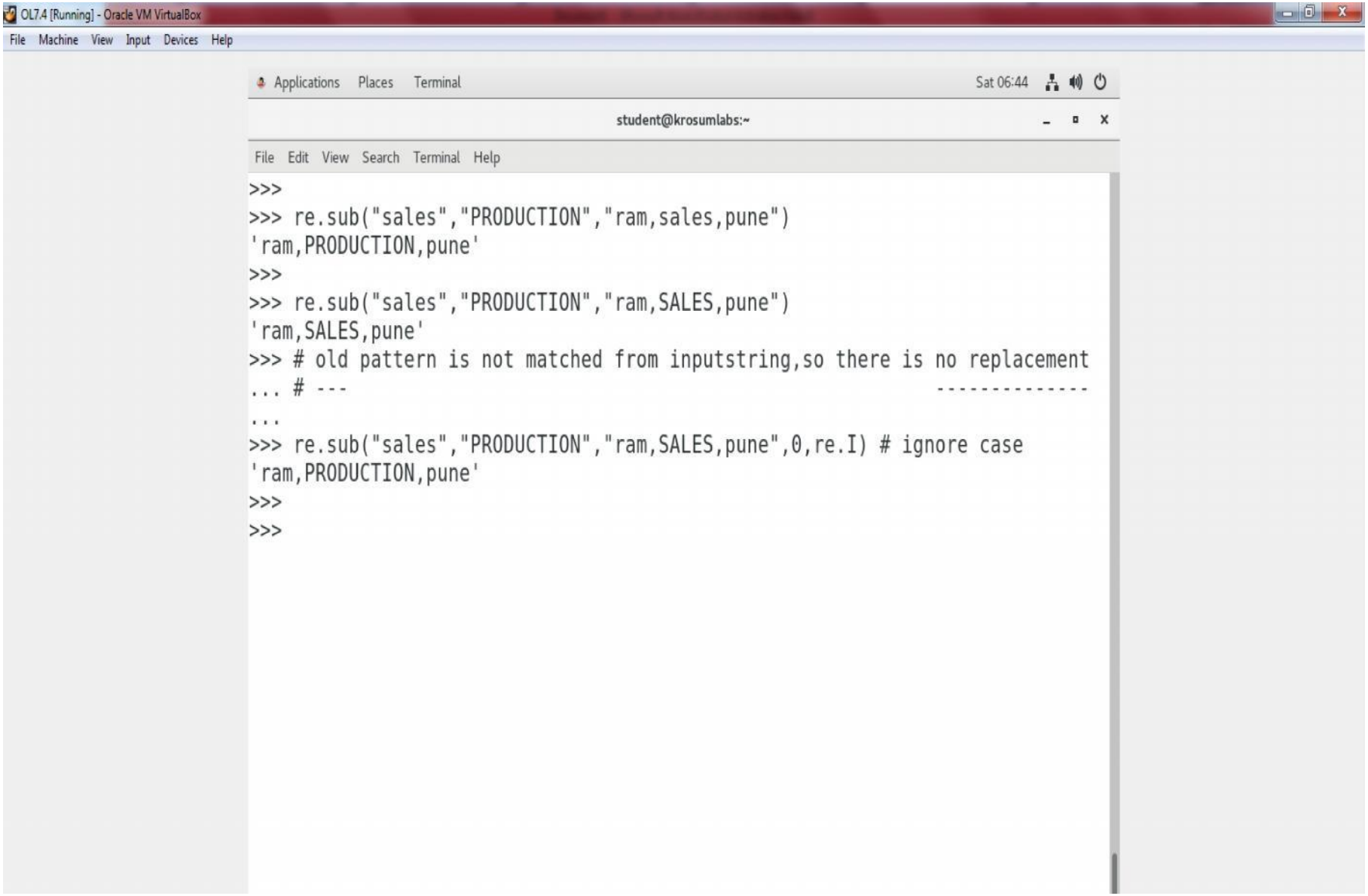
group() vs groups()

re.sub()

re.sub() - replace old pattern with a new pattern in the given string.

>>> **help(re.sub)**
Help on function sub in module re:

sub(pattern, repl, string, count=0, flags=0)
    Return the string obtained by replacing the leftmost
    non-overlapping occurrences of the pattern in string by the
    replacement repl. repl can be either a string or a callable;
    if a string, backslash escapes in it are processed. If it is
    a callable, it's passed the Match object and must return
    a replacement string to be used.

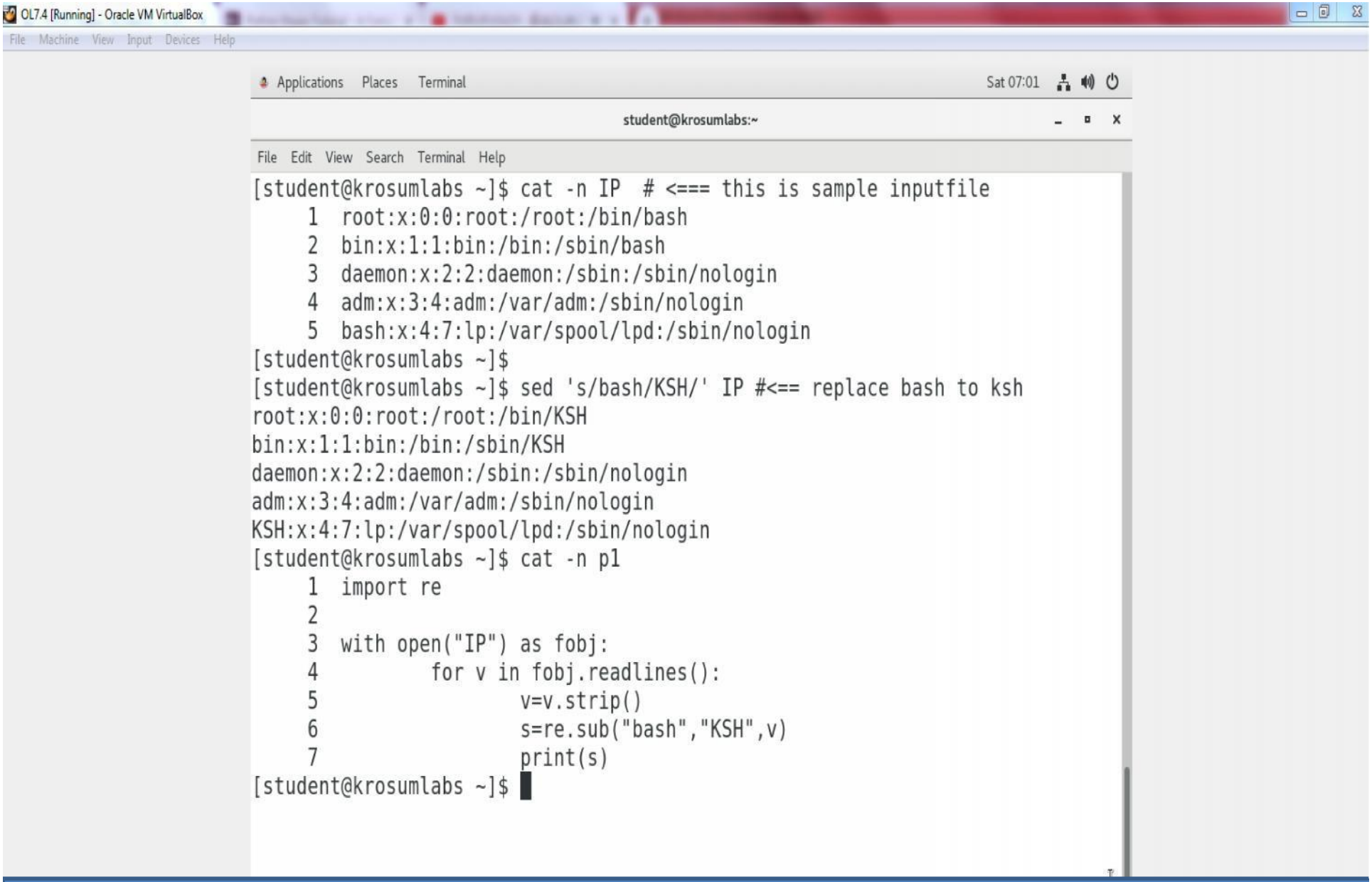

OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 06:44
student@krosumlabs:~
File Edit View Search Terminal Help
>>>
>>> re.sub("sales","PRODUCTION","ram,sales,pune")
'ram,PRODUCTION,pune'
>>>
>>> re.sub("sales","PRODUCTION","ram,SALES,pune")
'ram,SALES,pune'
>>> # old pattern is not matched from inputstring,so there is no replacement
... # ---
...
>>> re.sub("sales","PRODUCTION","ram,SALES,pune",0,re.I) # ignore case
'ram,PRODUCTION,pune'
>>>
>>>

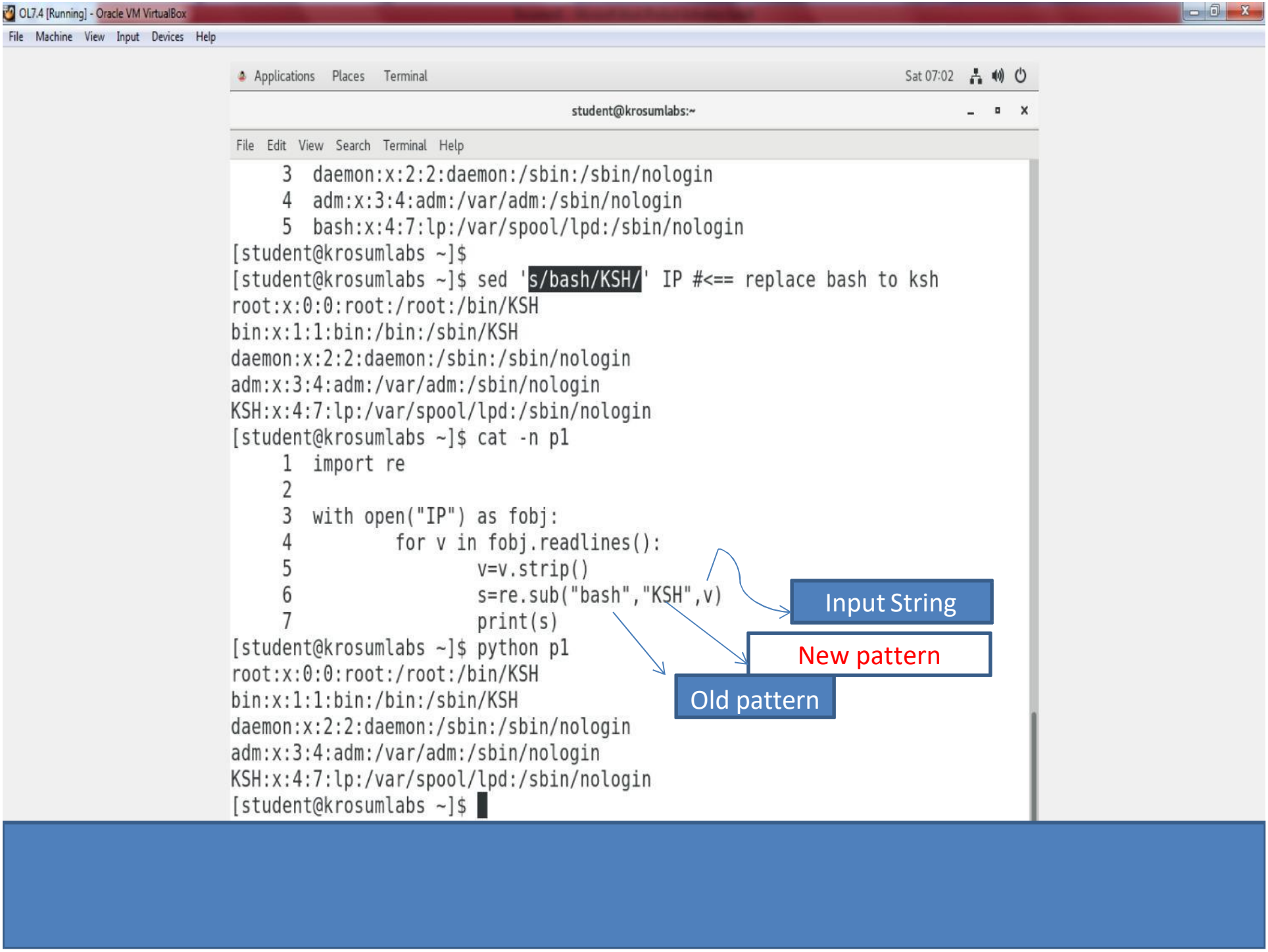
```
# substitute all the digits with *
# - - - - - - - - - - - - - - - - - - - - - - - - - -

>>> re.sub("\d+","*","DATE:6th-March-2013 file INFO details:459KB")

'DATE:*th-March-* file INFO details:*KB'


>>> # delete all the digits[0-9]
...    # - - - - - - - - - - - - - - - - - - - - -

>>> re.sub("\d+","","DATE:6th-March-2013 file INFO details:459KB")

'DATE:th-March- file INFO details:KB'
```

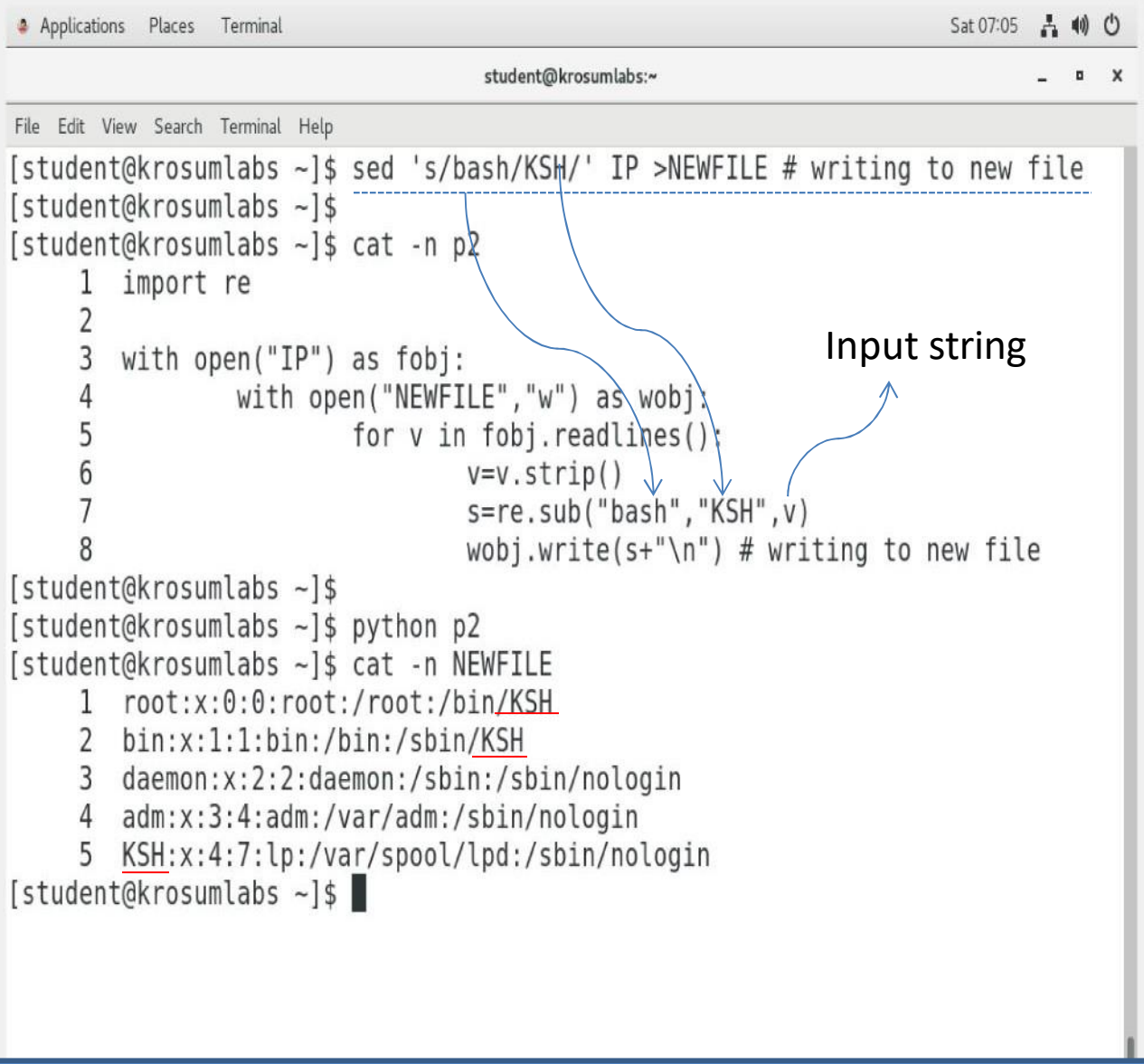
```
>>> re.sub("sales","PROD","data1,sales,sales,sales,SALES,Sales")
'data1,PROD,PROD,PROD,SALES,Sales‘

>>> re.sub("sales","PROD","data1,sales,sales,sales,SALES,Sales",0,re.I) # ignore case case
'data1,PROD,PROD,PROD,PROD,PROD‘

>>> re.sub("sales","PROD","data1,sales,sales,sales,SALES,Sales",1,re.I)
 'data1,PROD,sales,sales,SALES,Sales‘
```

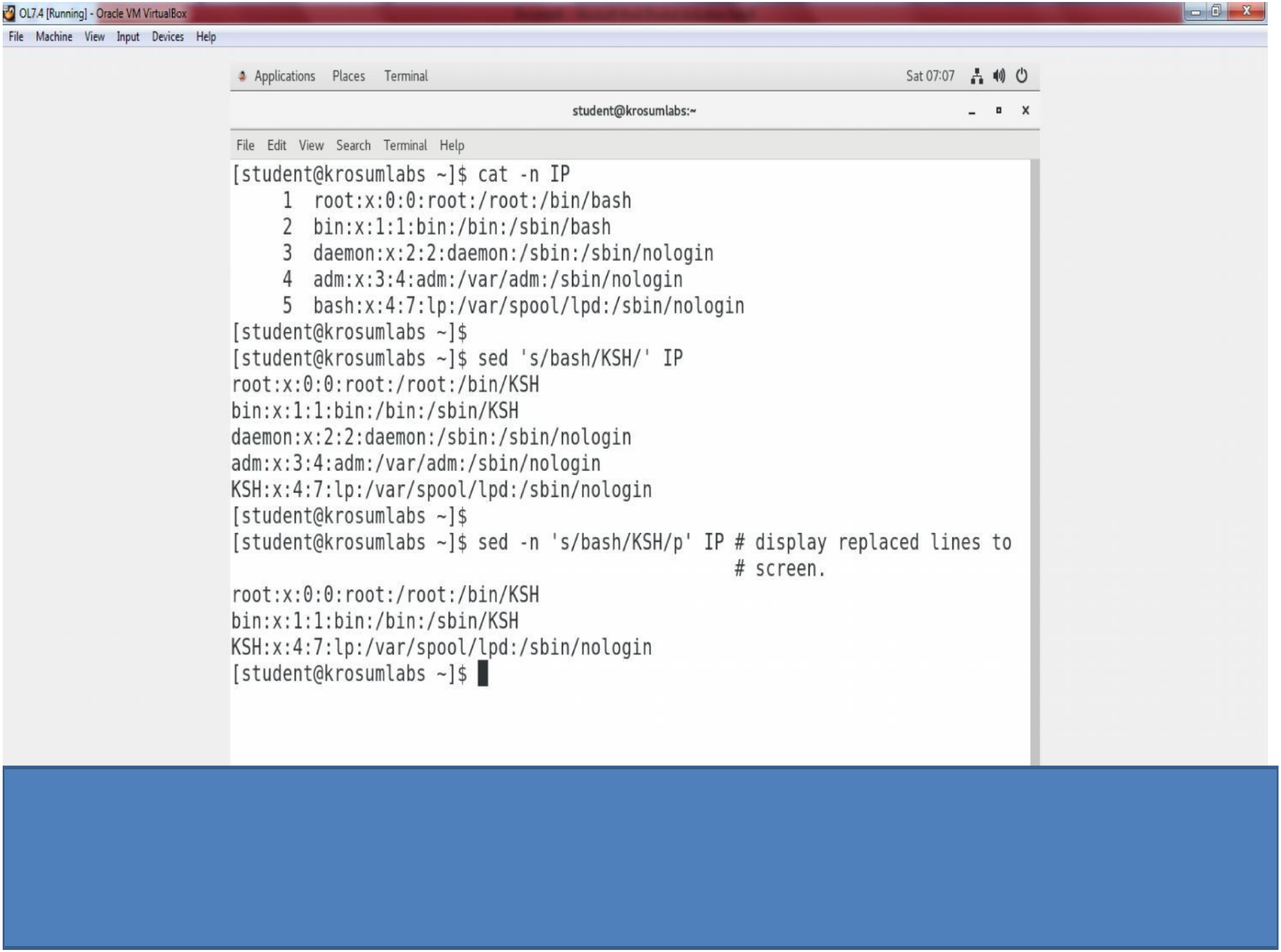
ignore the case

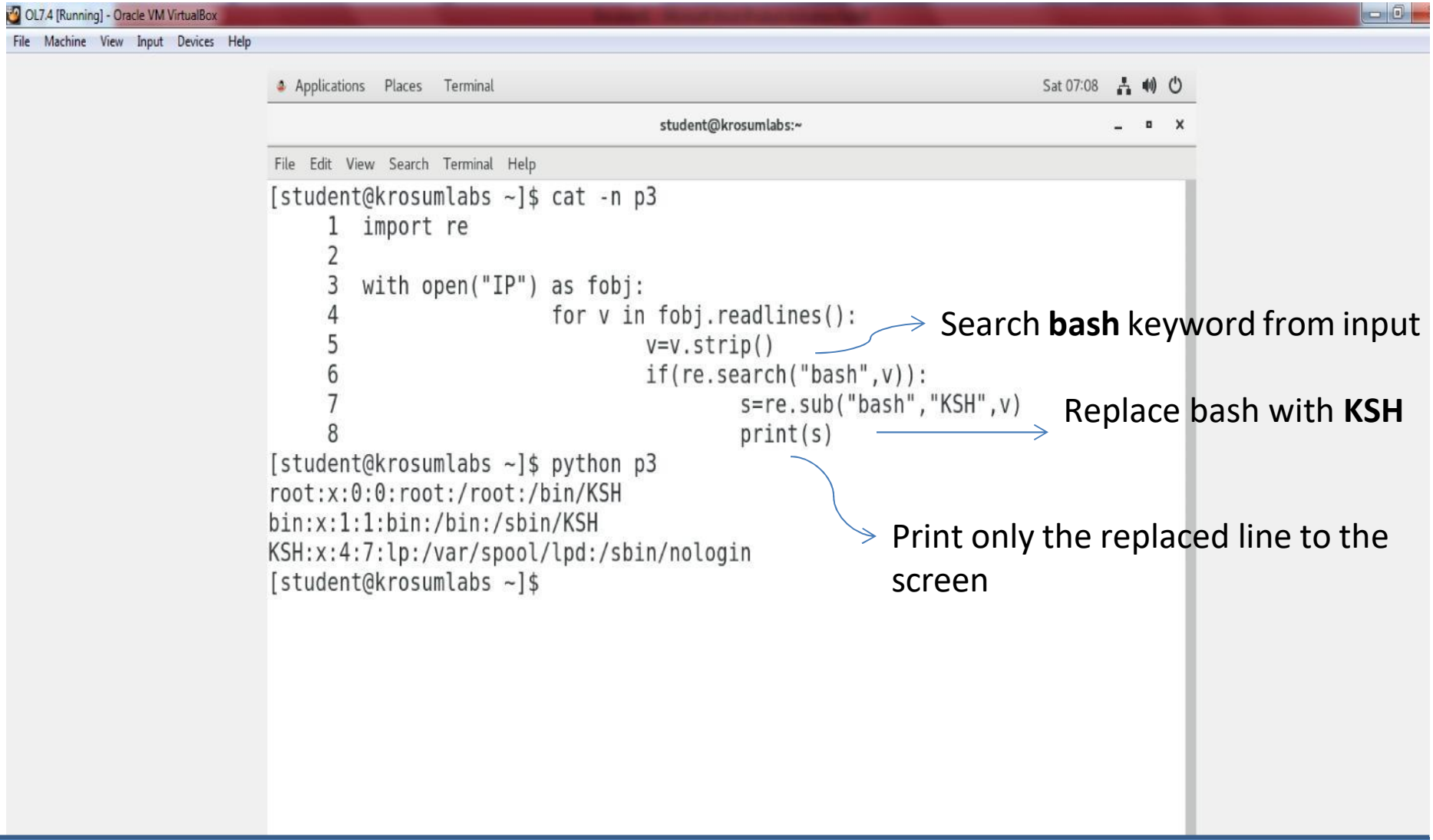
replace 1st matched occurrence

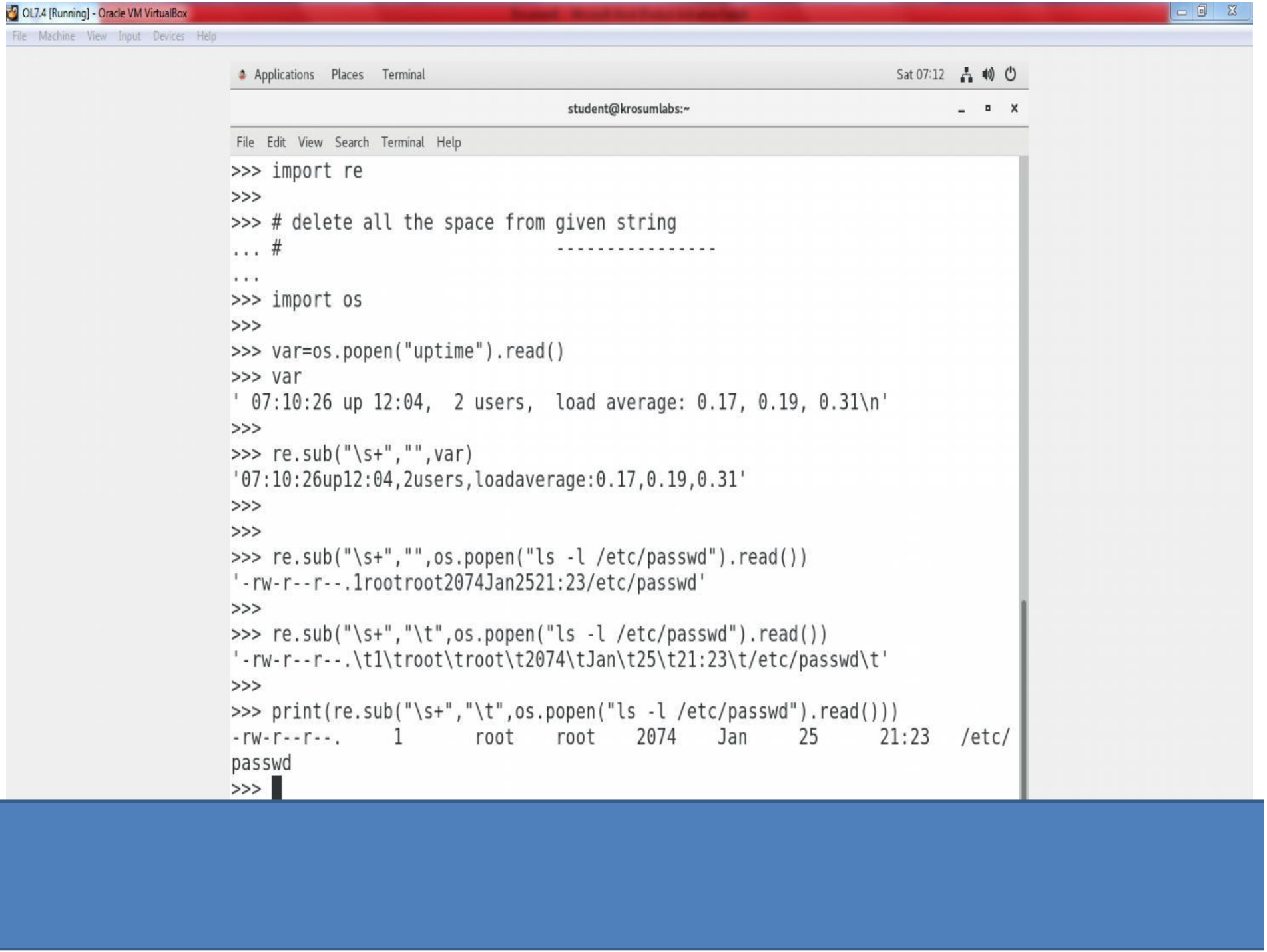

OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:01
student@krosumlabs:~
File Edit View Search Terminal Help
[student@krosumlabs ~]$ cat -n IP # <=== this is sample inputfile
1 root:x:0:0:root:/root:/bin/bash
2 bin:x:1:1:bin:/bin:/sbin/bash
3 daemon:x:2:2:daemon:/sbin:/sbin/nologin
4 adm:x:3:4:adm:/var/adm:/sbin/nologin
5 bash:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
[student@krosumlabs ~]$ sed 's/bash/KSH/' IP #<== replace bash to ksh
root:x:0:0:root:/root:/bin/KSH
bin:x:1:1:bin:/bin:/sbin/KSH
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$ cat -n p1
1 import re
2
3 with open("IP") as fobj:
4 for v in fobj.readlines():
5 v=v.strip()
6 s=re.sub("bash","KSH",v)
7 print(s)
[student@krosumlabs ~]$

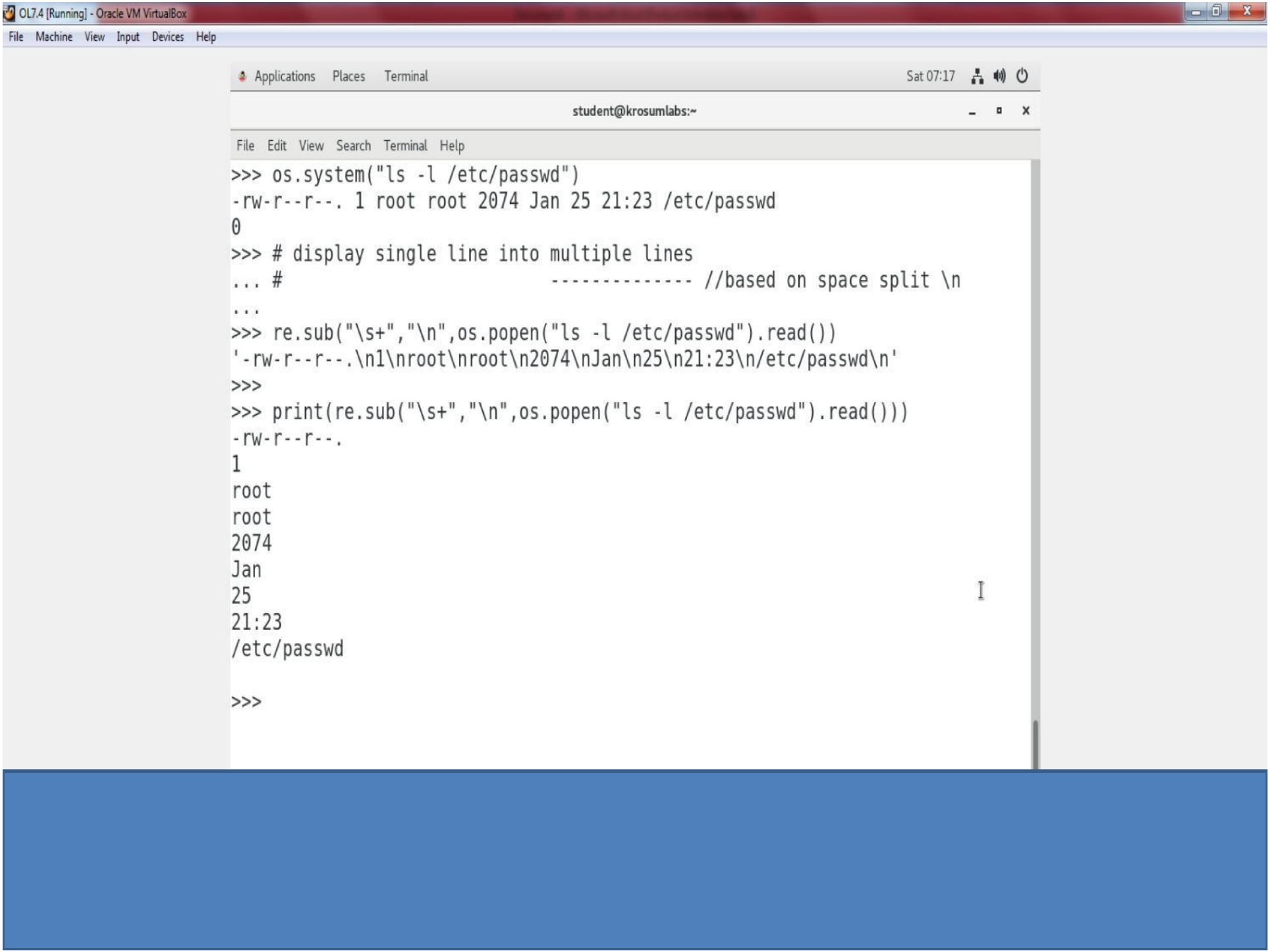

OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:02
student@krosumlabs:~
File Edit View Search Terminal Help
3 daemon:x:2:2:daemon:/sbin:/sbin/nologin
4 adm:x:3:4:adm:/var/adm:/sbin/nologin
5 bash:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
[student@krosumlabs ~]$ sed 's/bash/KSH/' IP #<== replace bash to ksh
root:x:0:0:root:/root:/bin/KSH
bin:x:1:1:bin:/bin:/sbin/KSH
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$ cat -n p1
1 import re
2
3 with open("IP") as fobj:
4 for v in fobj.readlines():
5 v=v.strip()
6 s=re.sub("bash","KSH",v)
7 print(s)
[student@krosumlabs ~]$ python p1
root:x:0:0:root:/root:/bin/KSH
bin:x:1:1:bin:/bin:/sbin/KSH
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
Input String
New pattern
Old pattern

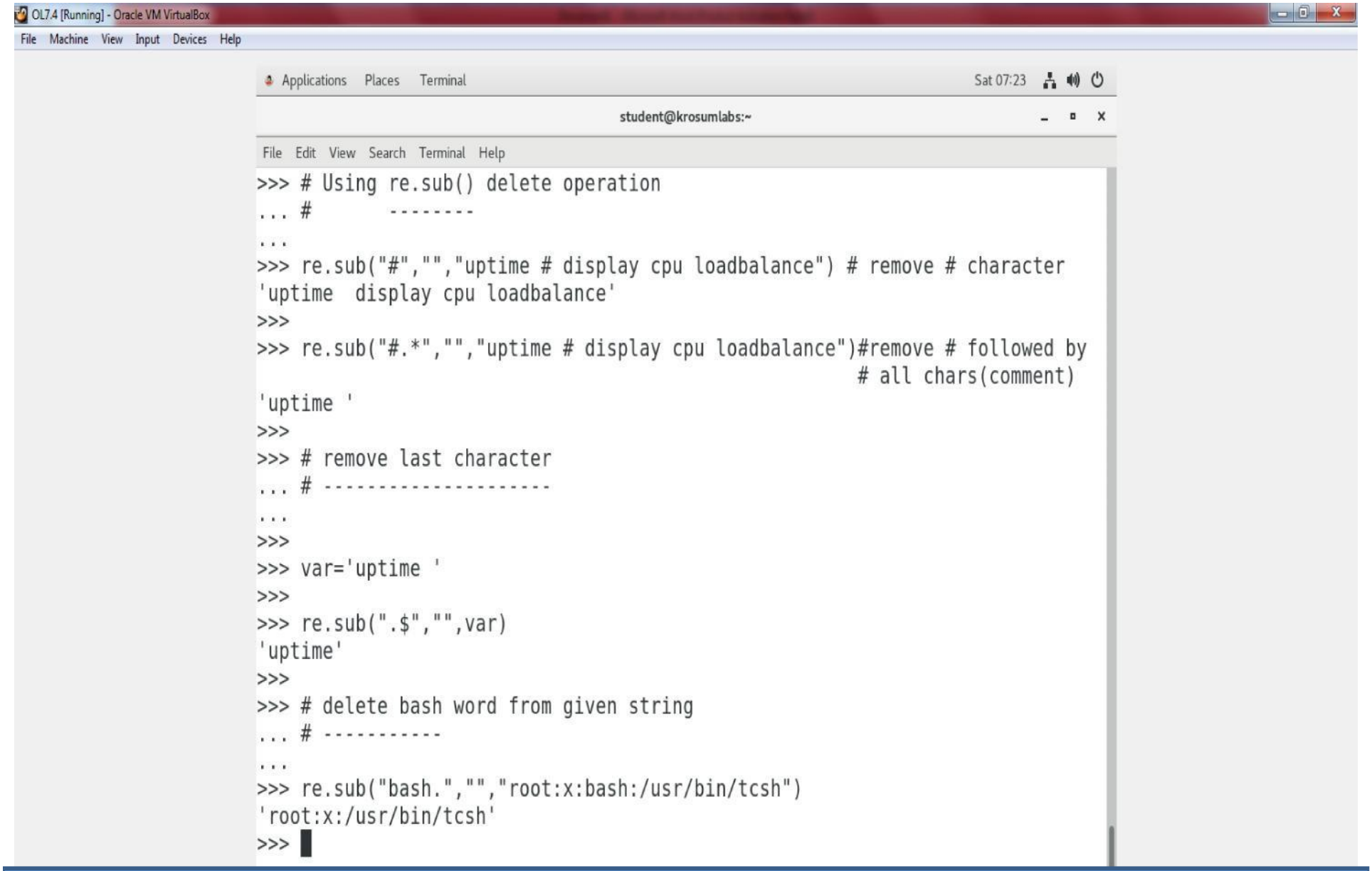

Applications Places Terminal
Sat 07:05
student@krosumlabs:~
File Edit View Search Terminal Help
[student@krosumlabs ~]$ sed 's/bash/KSH/' IP >NEWFILE # writing to new file
[student@krosumlabs ~]$
[student@krosumlabs ~]$ cat -n p2
1 import re
2
3 with open("IP") as fobj:
4 with open("NEWFILE","w") as wobj:
5 for v in fobj.readlines():
6 v=v.strip()
7 s=re.sub("bash","KSH",v)
8 wobj.write(s+"\n") # writing to new file
[student@krosumlabs ~]$
[student@krosumlabs ~]$ python p2
[student@krosumlabs ~]$ cat -n NEWFILE
1 root:x:0:0:root:/root:/bin/KSH
2 bin:x:1:1:bin:/bin:/sbin/KSH
3 daemon:x:2:2:daemon:/sbin:/sbin/nologin
4 adm:x:3:4:adm:/var/adm:/sbin/nologin
5 KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
Input string


OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:07
student@krosumlabs:~
File Edit View Search Terminal Help
[student@krosumlabs ~]$ cat -n IP
1 root:x:0:0:root:/root:/bin/bash
2 bin:x:1:1:bin:/bin:/sbin/bash
3 daemon:x:2:2:daemon:/sbin:/sbin/nologin
4 adm:x:3:4:adm:/var/adm:/sbin/nologin
5 bash:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
[student@krosumlabs ~]$ sed 's/bash/KSH/' IP
root:x:0:0:root:/root:/bin/KSH
bin:x:1:1:bin:/bin:/sbin/KSH
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
[student@krosumlabs ~]$ sed -n 's/bash/KSH/p' IP # display replaced lines to
screen.
root:x:0:0:root:/root:/bin/KSH
bin:x:1:1:bin:/bin:/sbin/KSH
KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$


OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:08
student@krosumlabs:~
File Edit View Search Terminal Help
[student@krosumlabs ~]$ cat -n p3
1 import re
2
3 with open("IP") as fobj:
4 for v in fobj.readlines():
5 v=v.strip()
6 if(re.search("bash",v)):
7 s=re.sub("bash","KSH",v)
8 print(s)
[student@krosumlabs ~]$ python p3
root:x:0:0:root:/root:/bin/KSH
bin:x:1:1:bin:/bin:/sbin/KSH
KSH:x:4:7:lp:/var/spool/lpd:/sbin/nologin
[student@krosumlabs ~]$
Search bash keyword from input
Replace bash with KSH
Print only the replaced line to the screen


OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:12
student@krosumlabs:~
File Edit View Search Terminal Help
>>> import re
>>>
>>> # delete all the space from given string
... #   ---------------
...
>>> import os
>>>
>>> var=os.popen("uptime").read()
>>> var
' 07:10:26 up 12:04, 2 users, load average: 0.17, 0.19, 0.31\n'
>>>
>>> re.sub("\s+","",var)
'07:10:26up12:04,2users,loadaverage:0.17,0.19,0.31'
>>>
>>>
>>> re.sub("\s+","",os.popen("ls -l /etc/passwd").read())
'-rw-r--r--.1rootroot2074Jan2521:23/etc/passwd'
>>>
>>> re.sub("\s+","\t",os.popen("ls -l /etc/passwd").read())
'-rw-r--r--.\t1\troot\troot\t2074\tJan\t25\t21:23\t/etc/passwd\t'
>>>
>>> print(re.sub("\s+","\t",os.popen("ls -l /etc/passwd").read()))
-rw-r--r--.	1	root	root	2074	Jan	25	21:23	/etc/
passwd
>>>


OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:17
student@krosumlabs:~
File Edit View Search Terminal Help
>>> os.system("ls -l /etc/passwd")
-rw-r--r--. 1 root root 2074 Jan 25 21:23 /etc/passwd
0
>>> # display single line into multiple lines
... #   ------------- //based on space split \n
...
>>> re.sub("\s+","\n",os.popen("ls -l /etc/passwd").read())
'-rw-r--r--.\n1\nroot\nroot\n2074\nJan\n25\n21:23\n/etc/passwd\n'
>>>
>>> print(re.sub("\s+","\n",os.popen("ls -l /etc/passwd").read()))
-rw-r--r--.
1
root
root
2074
Jan
25
21:23
/etc/passwd
>>>


OL7.4 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Sat 07:23
student@krosumlabs:~
File Edit View Search Terminal Help
>>> # Using re.sub() delete operation
... #   --------
...
>>> re.sub("#","","uptime # display cpu loadbalance") # remove # character
'uptime display cpu loadbalance'
>>>
>>> re.sub("#.*","","uptime # display cpu loadbalance")#remove # followed by
                                                        # all chars(comment)
'uptime '
>>>
>>> # remove last character
... # --------------------
...
>>>
>>> var='uptime '
>>>
>>> re.sub(".$","",var)
'uptime'
>>>
>>> # delete bash word from given string
... # ----------
...
>>> re.sub("bash.","","root:x:bash:/usr/bin/tcsh")
'root:x:/usr/bin/tcsh'
>>>

```
>>> process="""
... python
... sh
... oracle
... bash"""
>>>
>>> re.findall("^\w",process)
[]
>>>
>>> re.findall("^\w",process,re.MULTILINE)
['p', 's', 'o', 'b']
```

MULTILINE the code will check each line in the string for object