

bc_shell

Testing

Benny Chao
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Features	2
Reading commands	2
Separating commands	2
Parsing commands	2
Executing commands	2
Exiting	2
Test Results	3
Examples	4
Startup	4
newlinepwd	5
cd ..	6
cd ~	7
cd /	7
cd	8
mkdir -p foo/bar	8
cd foo/bar	9
ls -a -l	9
ls -al > a.txt	9
cat a.txt	10
cat < a.txt	11
cat < a.txt > b.txt	11
cat b.txt	12
cat < a.txt >> b.txt	12
ls -al	13
cat b.txt	13
cd b.txt	13
cd ../../	14
rm -rf foo	15
cd foo	15
ls foo 2>err.txt	16
cat err.txt	16
ls > ~/out.txt	17
cat out.txt	17
./a.out	18
gcc hello.c	18
./a.out	19
Unknown command	19
Invalid command	20
Exit	20

Features

Reading commands

Commands should be read from stdin. An empty command (all whitespace) should not report an error.

Separating commands

Any non-empty read should be separated into commands. Only simple commands are supported. A simple command is a single program name with optional arguments and optional I/O redirection.

Some commands are invalid, such as a command that starts with a ;

Parsing commands

Commands should be separated into:

- Program to run
- Arguments to the program
- stdin redirection
- stdout redirection
- stderr redirection

Redirection can include the ~ directory which will be expanded to the user's home directory.

Executing commands

The PATH environment variables shall be searched for executing commands unless the command contains a /.

Exiting

When a command exists it will either display the exit status or if the command cannot be found, an error message.

Test Results

Command	Description	Status	Example
<newline>	Empty command just goes back to read another command	Passed	Example 1
pwd	Print the working directory	Passed	Example 2
cd ..	Go back a directory	Passed	Example 3
cd ~	Go to the home directory	Passed	Example 4
cd /	Go to the root directory	Passed	Example 5
cd	Go to the home directory	Passed	Example 6
mkdir -p foo/bar	Make a directory	Passed	Example 7
cd foo/bar	Go to the new directory	Passed	Example 8
ls -a -l	List all of the files	Passed	Example 9
ls -al > a.txt	List all of the files to a file	Passed	Example 10
cat a.txt	Print the file	Passed	Example 11
cat < a.txt	Print stdin via a redirect	Passed	Example 12
cat < a.txt > b.txt	Print stdin and write it to a file	Passed	Example 13
cat b.txt	Print the file	Passed	Example 14
cat < a.txt >> b.txt	Print stdin and append it to a file	Passed	Example 15
ls -al	List the files to see that one is bigger than the other	Passed	Example 16
cat b.txt	Print the file to ensure that the data is printed twice	Passed	Example 17
cd b.txt	cd into a directory that is a file	Passed	Example 18
cd ../../	Go back 2 directories	Passed	Example 19
rm -rf foo	Remove the directory that was created	Passed	Example 20
cd foo	cd into a directory that does not exist	Passed	Example 21
ls foo 2>err.txt	Print a file that does not exist and redirect stderr to a file	Passed	Example 22

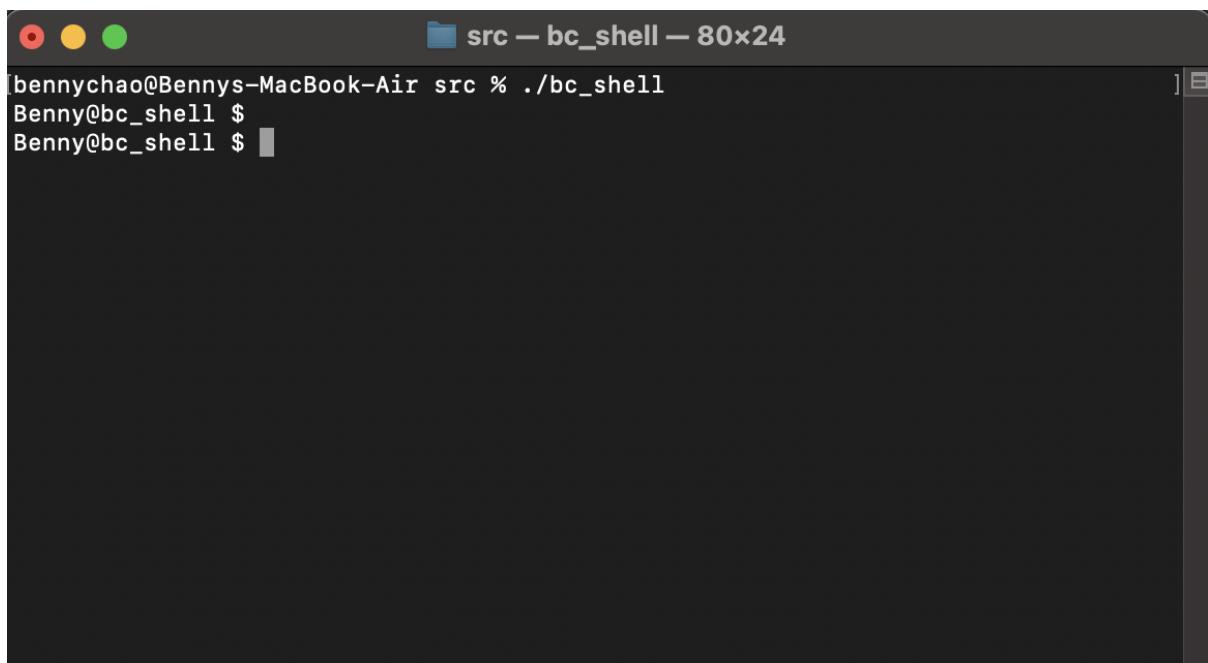
cat err.txt	Print the file	Passed	Example 23
ls > ~/out.txt	Print a file that exists in the users home directory	Passed	Example 24
cat out.txt	Print a file that exists in the users home directory	Passed	Example 25
./a.out	Run a command that does not exist	Passed	Example 26
gcc hello.c	Compile a program	Passed	Example 27
./a.out	Run the program without searching the PATH	Passed	Example 28
vndsnjsamclns	Run a command that does not exist	Passed	Example 29
:s	Enter an invalid command	Passed	Example 30
exit	Exit the shell	Passed	Example 31

Examples

Startup

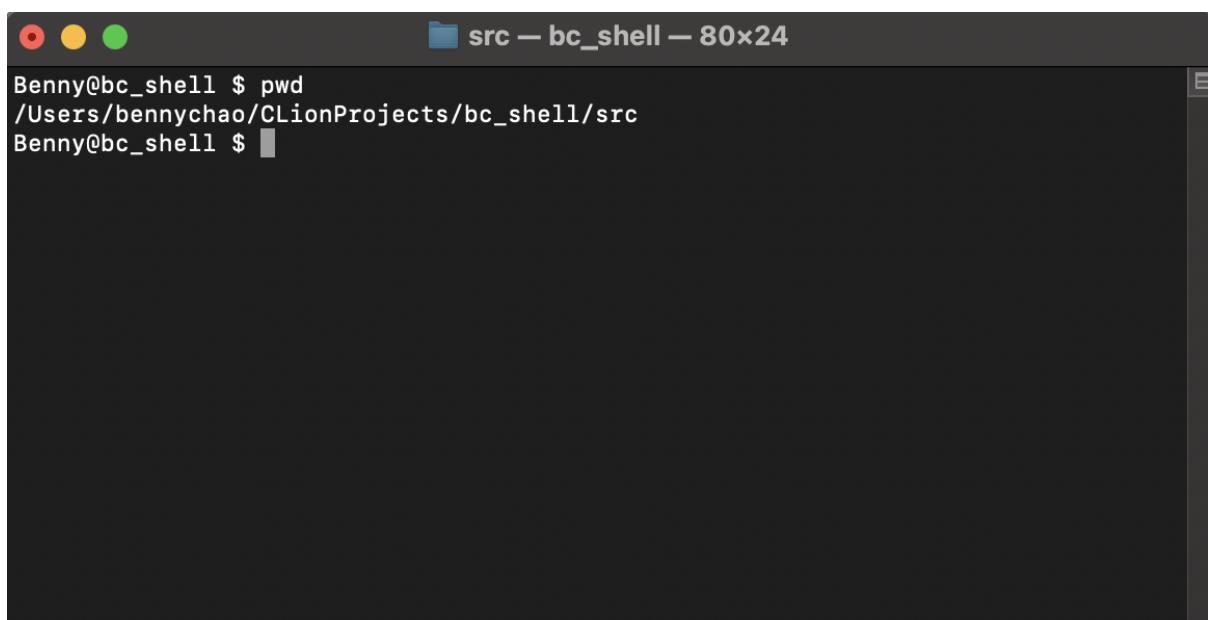
```
bennychao@Bennys-MacBook-Air src % ./bc_shell
Benny@bc_shell $
```

newline



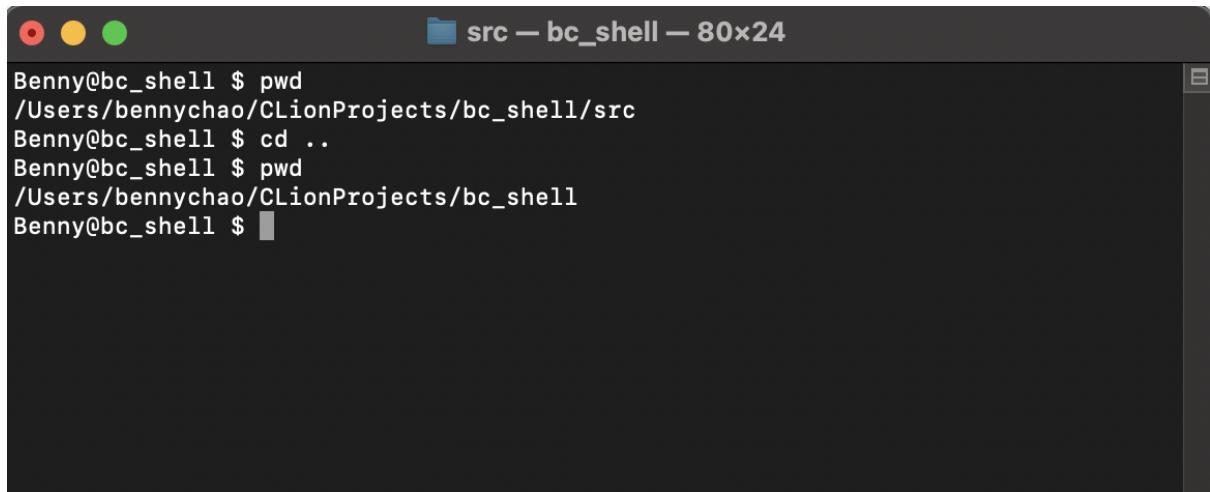
```
bennychao@Bennys-MacBook-Air src % ./bc_shell
Benny@bc_shell $
```

pwd



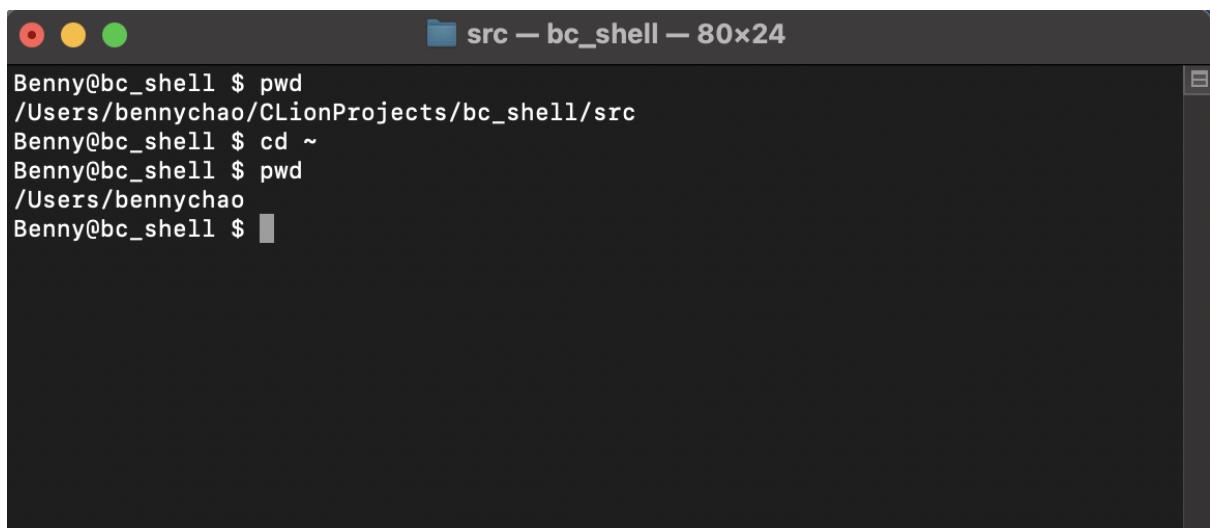
```
Benny@bc_shell $ pwd
/Users/bennychao/CLionProjects/bc_shell/src
Benny@bc_shell $
```

```
cd ..
```



```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ cd ..  
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell  
Benny@bc_shell $
```

```
cd ~
```



```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ cd ~  
Benny@bc_shell $ pwd  
/Users/bennychao  
Benny@bc_shell $
```

```
cd /
```

```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ cd ~  
Benny@bc_shell $ pwd  
/Users/bennychao  
Benny@bc_shell $ cd /  
Benny@bc_shell $ pwd  
/  
Benny@bc_shell $
```

```
cd
```

```
Benny@bc_shell $ pwd  
/  
Benny@bc_shell $ cd  
Benny@bc_shell $ pwd  
/Users/bennychao  
Benny@bc_shell $
```

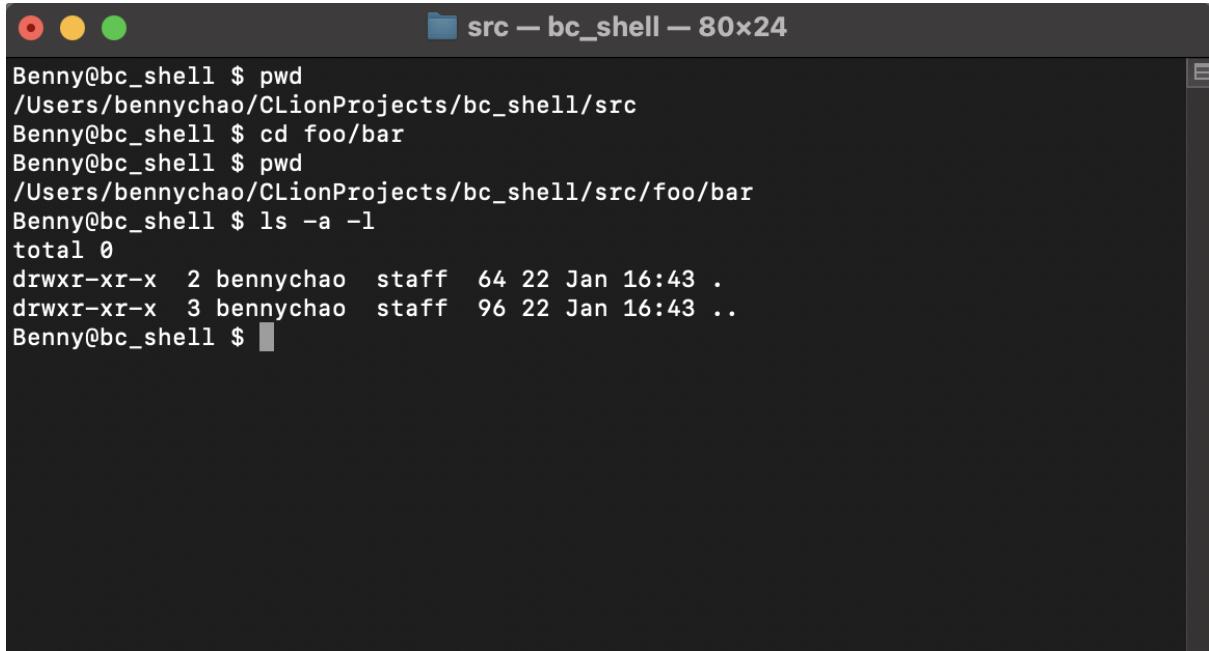
```
mkdir -p foo/bar
```

```
Benny@bc_shell $ ls -al foo
ls: foo: No such file or directory
Benny@bc_shell $ mkdir -p foo/bar
Benny@bc_shell $ ls -al foo
total 0
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 .
drwxr-xr-x 13 bennychao  staff  416 22 Jan 16:43 ..
drwxr-xr-x  2 bennychao  staff   64 22 Jan 16:43 bar
Benny@bc_shell $
```

```
cd foo/bar
```

```
Benny@bc_shell $ pwd
/Users/bennychao/CLionProjects/bc_shell/src
Benny@bc_shell $ cd foo/bar
Benny@bc_shell $ pwd
/Users/bennychao/CLionProjects/bc_shell/src/foo/bar
Benny@bc_shell $
```

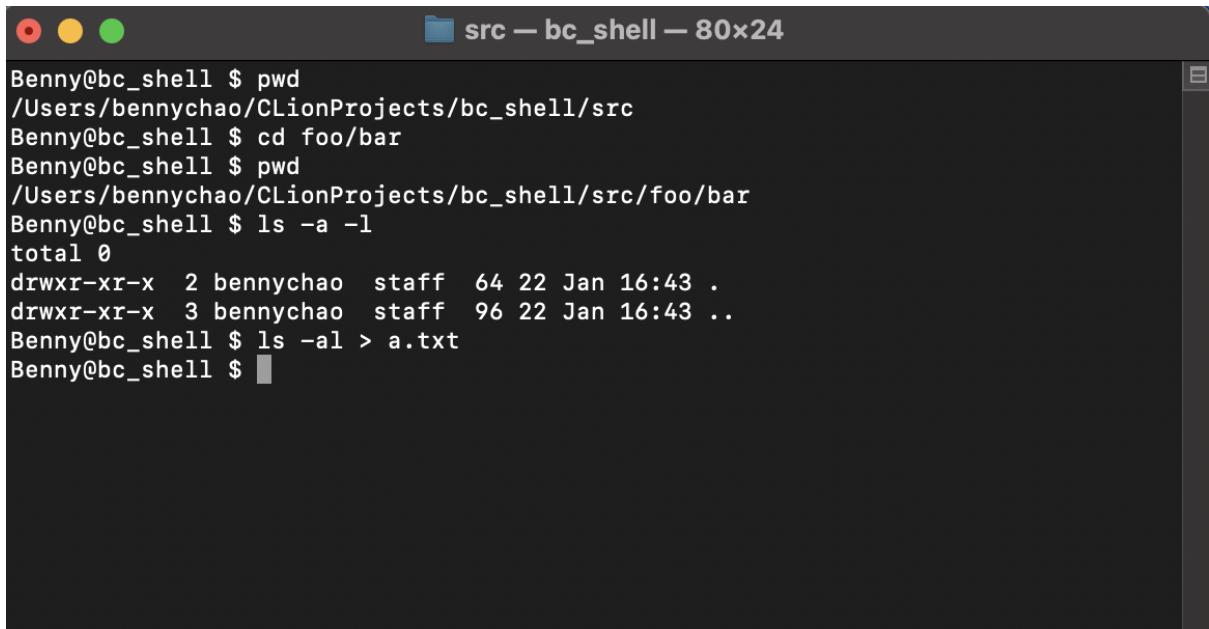
ls -a -l



A terminal window titled "src — bc_shell — 80x24". The window shows the following command history:

```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ cd foo/bar  
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src/foo/bar  
Benny@bc_shell $ ls -a -l  
total 0  
drwxr-xr-x  2 bennychao  staff  64 22 Jan 16:43 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
Benny@bc_shell $
```

ls -al > a.txt



A terminal window titled "src — bc_shell — 80x24". The window shows the following command history:

```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ cd foo/bar  
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src/foo/bar  
Benny@bc_shell $ ls -a -l  
total 0  
drwxr-xr-x  2 bennychao  staff  64 22 Jan 16:43 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
Benny@bc_shell $ ls -al > a.txt  
Benny@bc_shell $
```

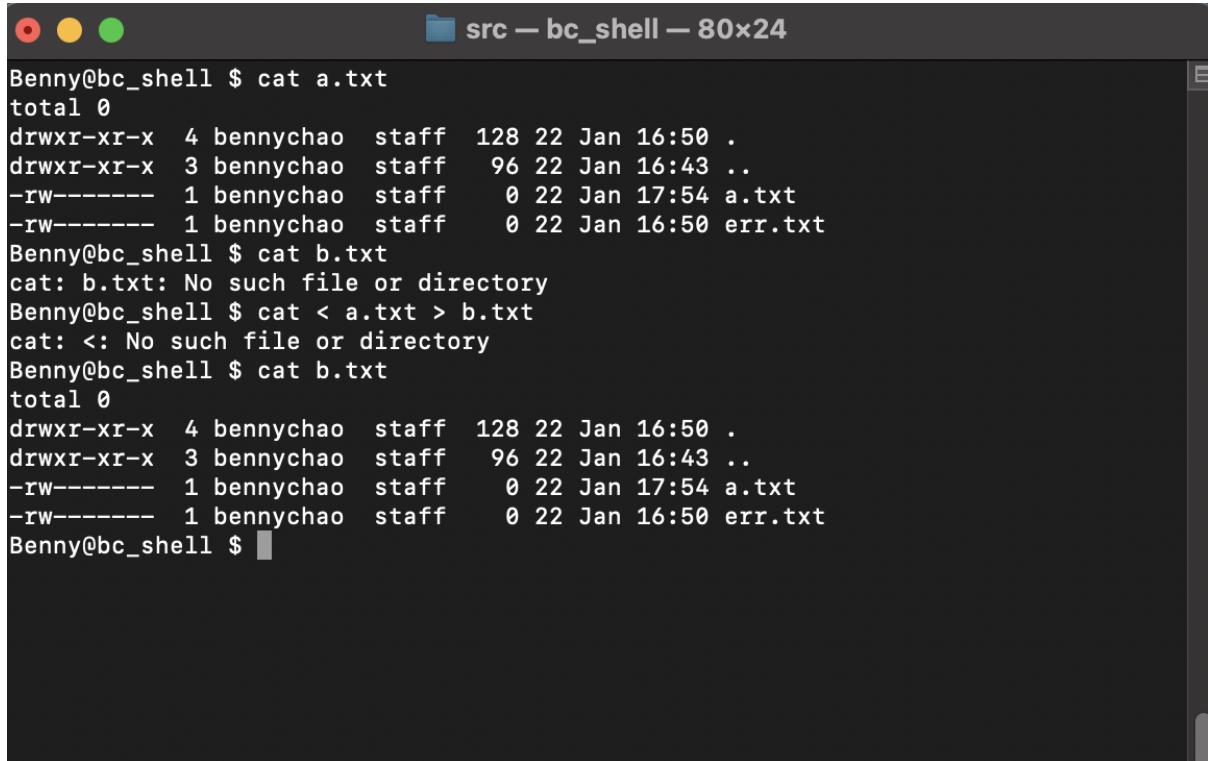
cat a.txt

```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ cd foo/bar  
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src/foo/bar  
Benny@bc_shell $ ls -a -l  
total 0  
drwxr-xr-x  2 bennychao  staff  64 22 Jan 16:43 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
Benny@bc_shell $ ls -al > a.txt  
Benny@bc_shell $ cat a.txt  
total 0  
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:46 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
-rw-----  1 bennychao  staff     0 22 Jan 16:46 a.txt  
-rw-----  1 bennychao  staff     0 22 Jan 16:46 err.txt  
Benny@bc_shell $
```

cat < a.txt

```
Benny@bc_shell $ cd foo/bar  
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src/foo/bar  
Benny@bc_shell $ ls -a -l  
total 8  
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
-rw-----  1 bennychao  staff  223 22 Jan 16:46 a.txt  
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt  
Benny@bc_shell $ ls -al > a.txt  
Benny@bc_shell $ cat a.txt  
total 0  
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
-rw-----  1 bennychao  staff     0 22 Jan 17:54 a.txt  
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt  
Benny@bc_shell $ cat < a.txt  
cat: <: No such file or directory  
total 0  
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .  
drwxr-xr-x  3 bennychao  staff  96 22 Jan 16:43 ..  
-rw-----  1 bennychao  staff     0 22 Jan 17:54 a.txt  
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt  
Benny@bc_shell $
```

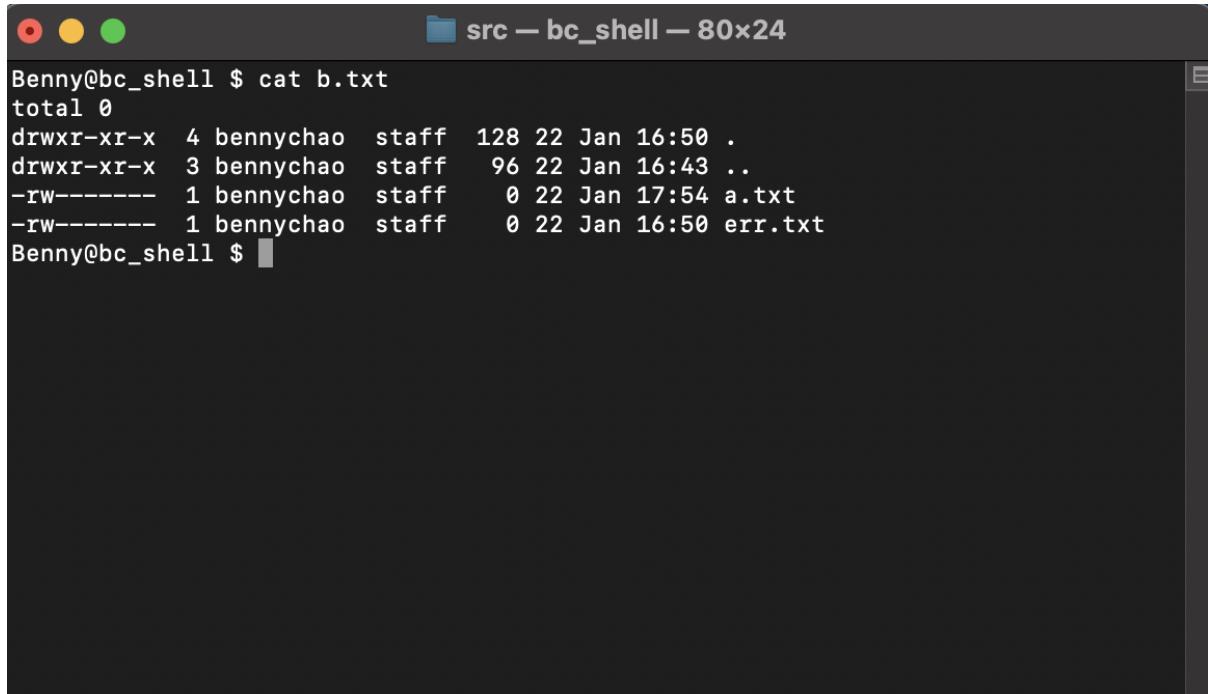
```
cat < a.txt > b.txt
```



A terminal window titled "src — bc_shell — 80x24". The session shows the user attempting to copy the contents of "a.txt" to "b.txt". The user first lists the contents of "a.txt", which contains two files: ".err.txt" and "a.txt". Then, they attempt to copy the contents of "a.txt" to "b.txt", but receive an error message stating "cat: <: No such file or directory". Finally, they list the contents of "b.txt", which also shows the same two files as "a.txt".

```
Benny@bc_shell $ cat a.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-------  1 bennychao  staff     0 22 Jan 17:54 a.txt
-rw-------  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $ cat b.txt
cat: b.txt: No such file or directory
Benny@bc_shell $ cat < a.txt > b.txt
cat: <: No such file or directory
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-------  1 bennychao  staff     0 22 Jan 17:54 a.txt
-rw-------  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $
```

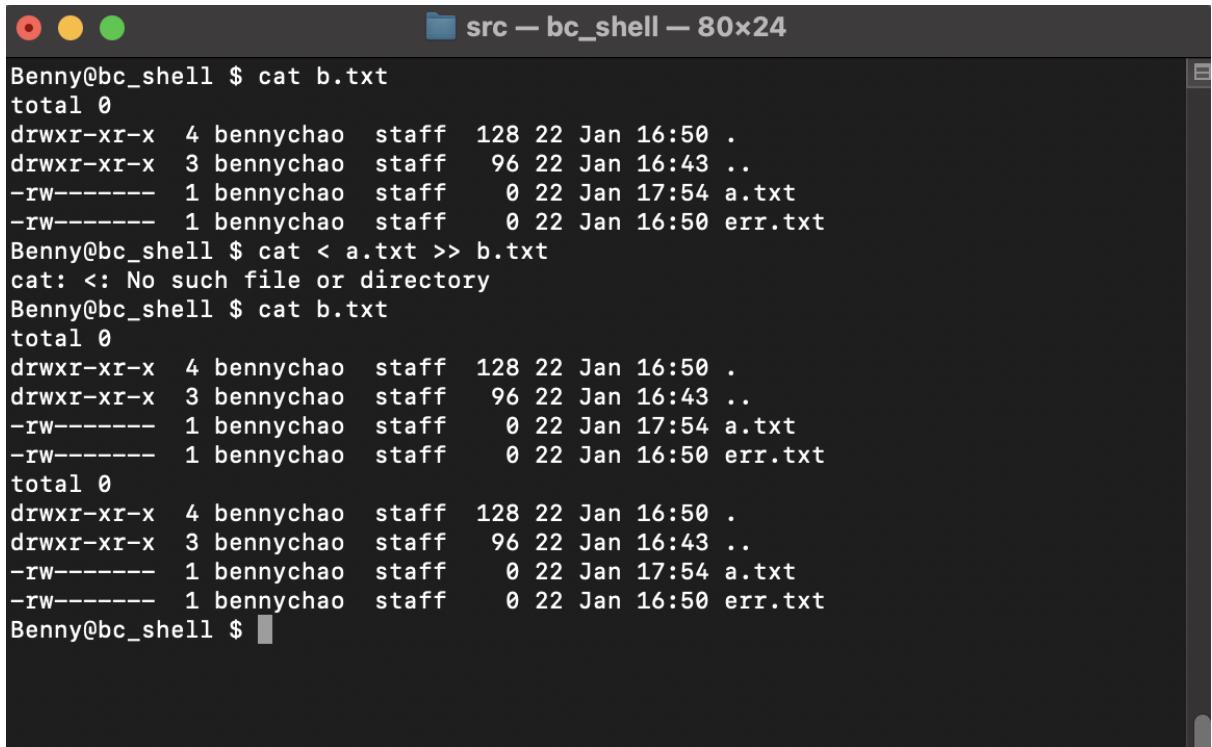
```
cat b.txt
```



A terminal window titled "src — bc_shell — 80x24". The user lists the contents of "b.txt", which shows the same two files as "a.txt": ".err.txt" and "a.txt".

```
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-------  1 bennychao  staff     0 22 Jan 17:54 a.txt
-rw-------  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $
```

```
cat < a.txt >> b.txt
```



```
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff     0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $ cat < a.txt >> b.txt
cat: <: No such file or directory
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff     0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff     0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $
```

ls -al

```
src — bc_shell — 80x24
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $ cat < a.txt >> b.txt
cat: <: No such file or directory
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $ ls -al
total 16
drwxr-xr-x  5 bennychao  staff  160 22 Jan 17:56 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    223 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    446 22 Jan 17:57 b.txt
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $
```

cat b.txt

```
src — bc_shell — 80x24
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $ ls -al
total 16
drwxr-xr-x  5 bennychao  staff  160 22 Jan 17:56 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    223 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    446 22 Jan 17:57 b.txt
-rw-----  1 bennychao  staff     0 22 Jan 16:50 err.txt
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $
```

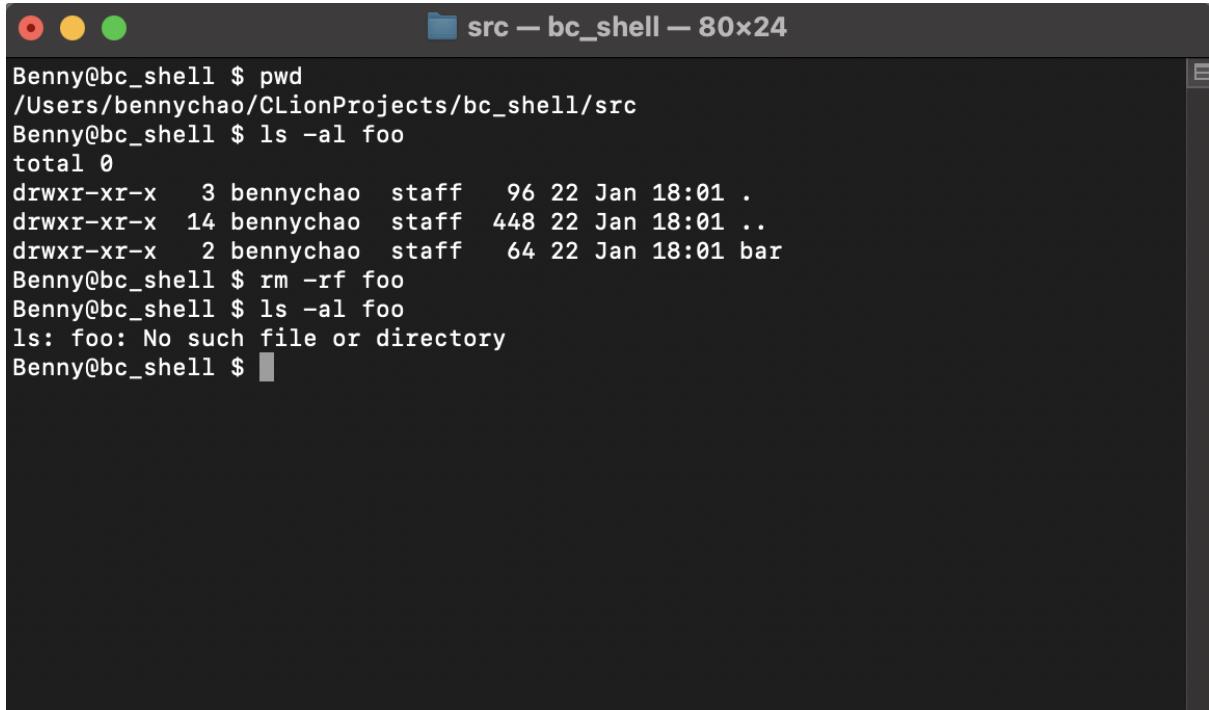
```
cd b.txt
```

```
src — bc_shell — 80x24
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $ ls -al
total 16
drwxr-xr-x  5 bennychao  staff  160 22 Jan 17:56 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff  223 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff  446 22 Jan 17:57 b.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $ cat b.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
total 0
drwxr-xr-x  4 bennychao  staff  128 22 Jan 16:50 .
drwxr-xr-x  3 bennychao  staff   96 22 Jan 16:43 ..
-rw-----  1 bennychao  staff    0 22 Jan 17:54 a.txt
-rw-----  1 bennychao  staff    0 22 Jan 16:50 err.txt
Benny@bc_shell $ cd b.txt
cd: Not a directory: b.txt
Benny@bc_shell $
```

```
cd ../../
```

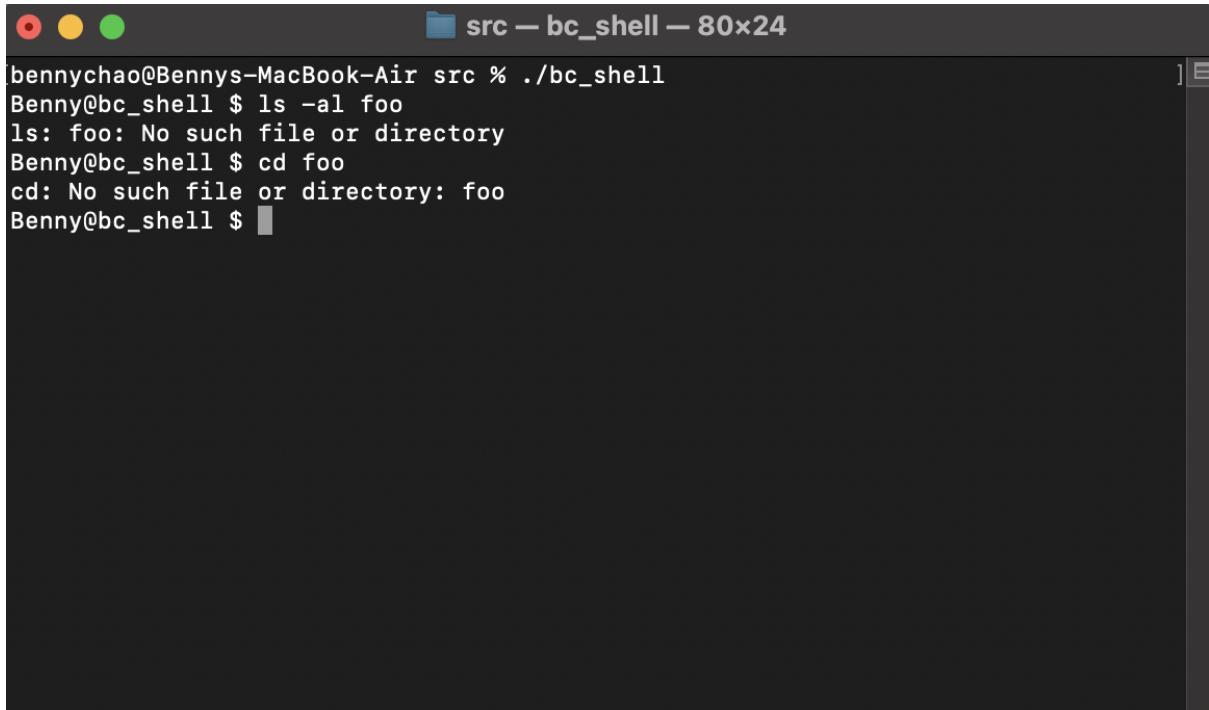
```
src — bc_shell — 80x24
Benny@bc_shell $ pwd
/Users/bennychao/CLionProjects/bc_shell/src/foo/bar
Benny@bc_shell $ cd ../..
Benny@bc_shell $ pwd
/Users/bennychao/CLionProjects/bc_shell/src
Benny@bc_shell $
```

```
rm -rf foo
```



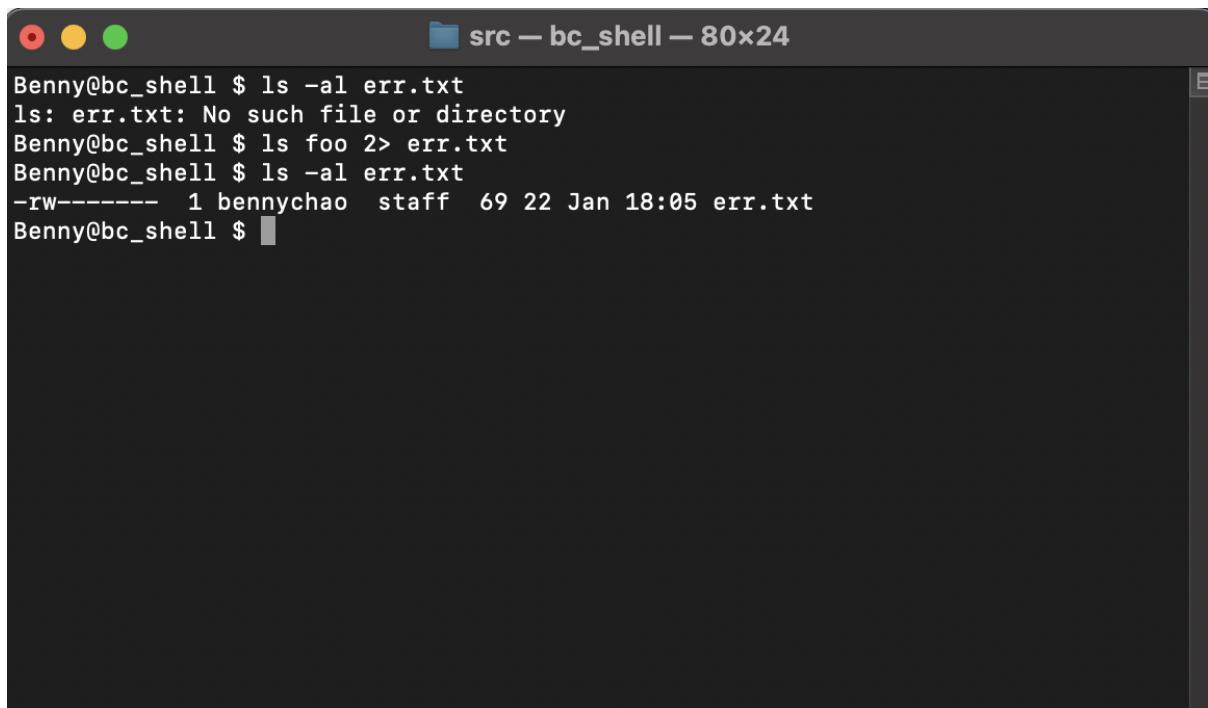
```
Benny@bc_shell $ pwd  
/Users/bennychao/CLionProjects/bc_shell/src  
Benny@bc_shell $ ls -al foo  
total 0  
drwxr-xr-x  3 bennychao  staff   96 22 Jan 18:01 .  
drwxr-xr-x 14 bennychao  staff  448 22 Jan 18:01 ..  
drwxr-xr-x  2 bennychao  staff   64 22 Jan 18:01 bar  
Benny@bc_shell $ rm -rf foo  
Benny@bc_shell $ ls -al foo  
ls: foo: No such file or directory  
Benny@bc_shell $
```

```
cd foo
```



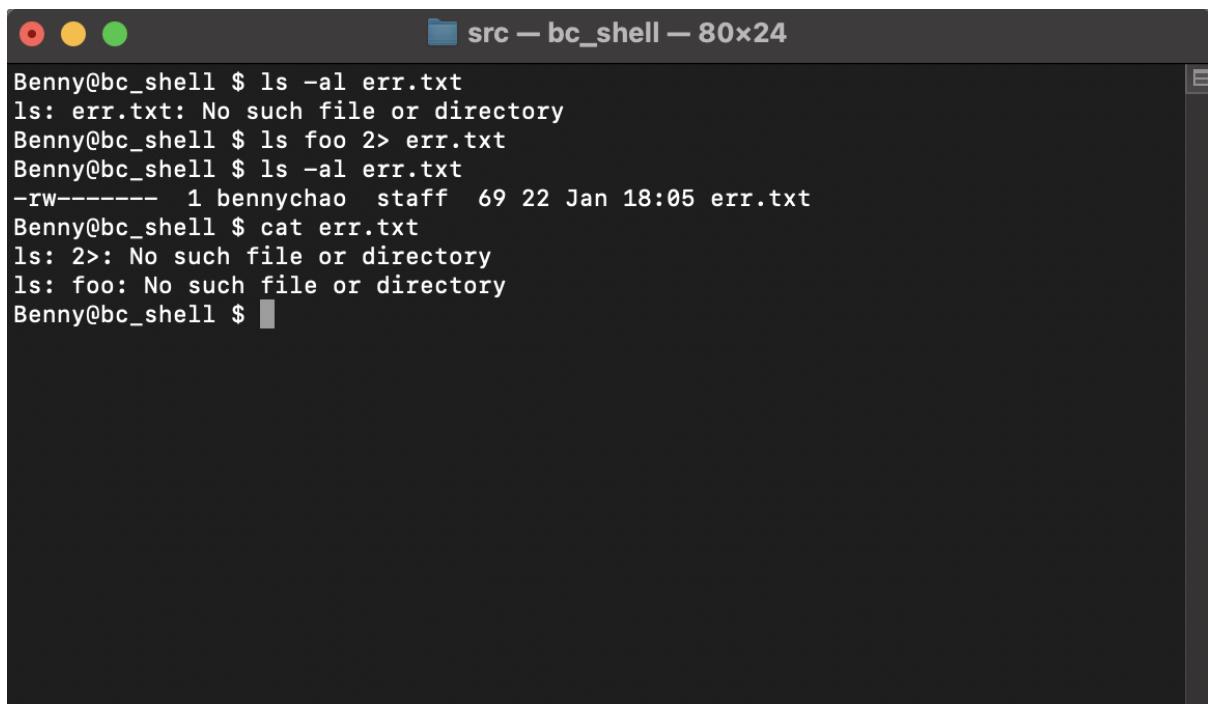
```
bennychao@Bennys-MacBook-Air src % ./bc_shell  
Benny@bc_shell $ ls -al foo  
ls: foo: No such file or directory  
Benny@bc_shell $ cd foo  
cd: No such file or directory: foo  
Benny@bc_shell $
```

```
ls foo 2>err.txt
```



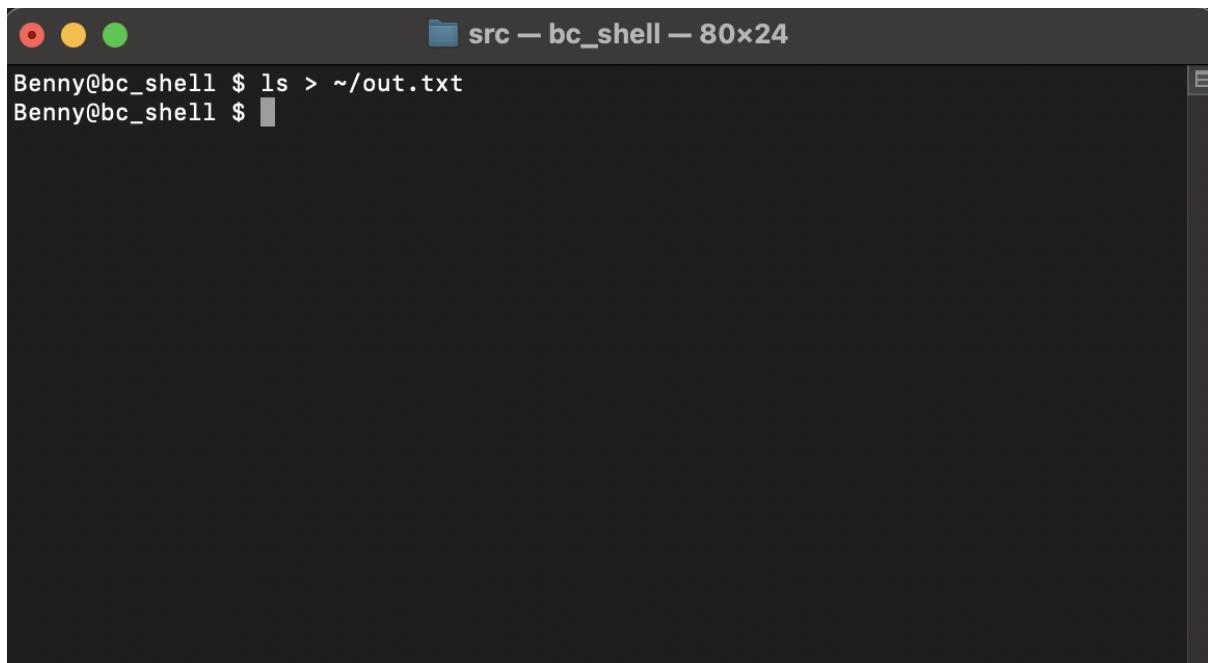
```
Benny@bc_shell $ ls -al err.txt
ls: err.txt: No such file or directory
Benny@bc_shell $ ls foo 2> err.txt
Benny@bc_shell $ ls -al err.txt
-rw----- 1 bennychao staff 69 22 Jan 18:05 err.txt
Benny@bc_shell $
```

```
cat err.txt
```



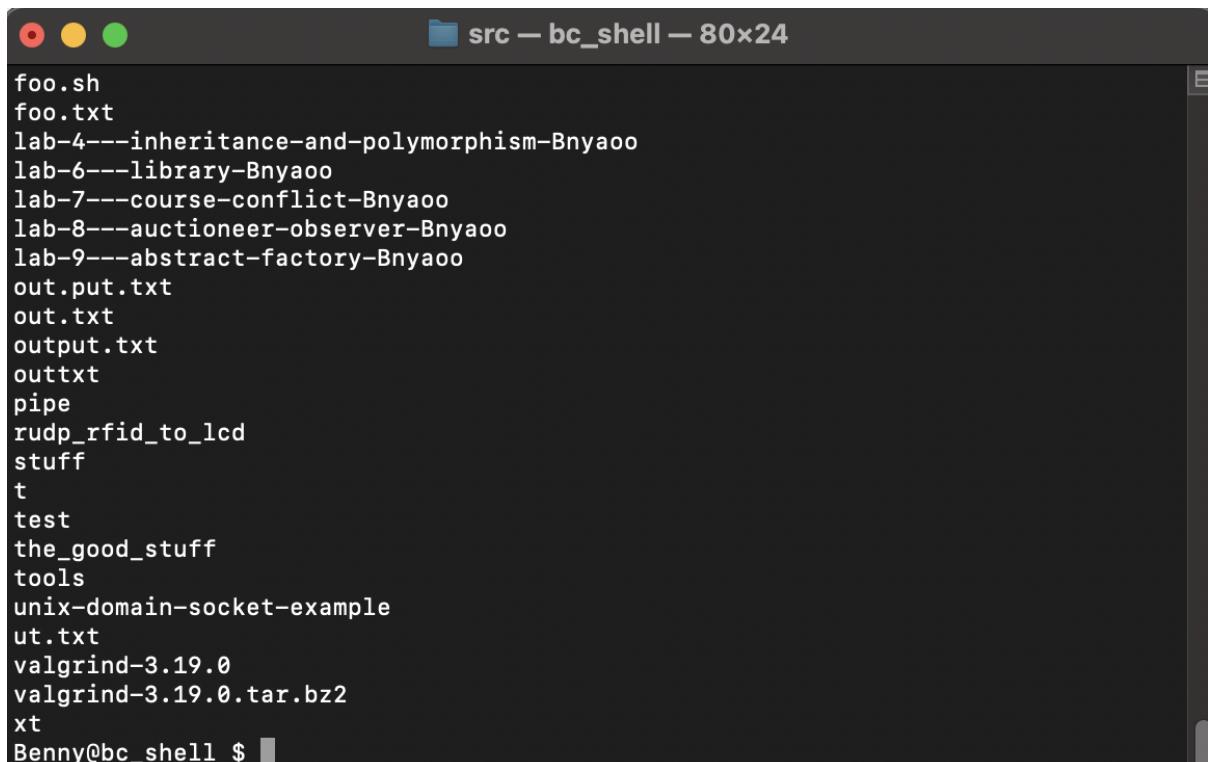
```
Benny@bc_shell $ ls -al err.txt
ls: err.txt: No such file or directory
Benny@bc_shell $ ls foo 2> err.txt
Benny@bc_shell $ ls -al err.txt
-rw----- 1 bennychao staff 69 22 Jan 18:05 err.txt
Benny@bc_shell $ cat err.txt
ls: 2>: No such file or directory
ls: foo: No such file or directory
Benny@bc_shell $
```

```
ls > ~/out.txt
```



A terminal window titled "src — bc_shell — 80x24". The window has three colored window control buttons (red, yellow, green) at the top left. The title bar also displays the window name. The terminal prompt is "Benny@bc_shell \$". The user has typed the command "ls > ~/out.txt" and is awaiting the output.

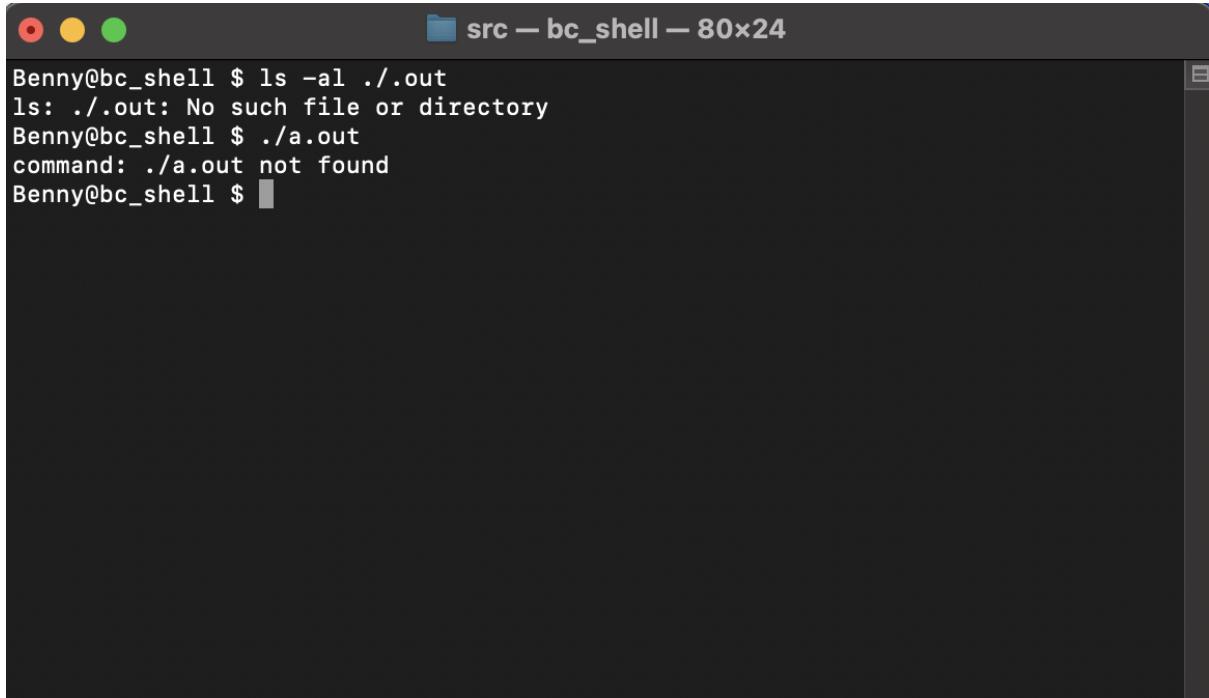
```
cat out.txt
```



A terminal window titled "src — bc_shell — 80x24". The window has three colored window control buttons (red, yellow, green) at the top left. The title bar also displays the window name. The terminal prompt is "Benny@bc_shell \$". The output shows the contents of the file "out.txt", which lists various files and directories from the current directory.

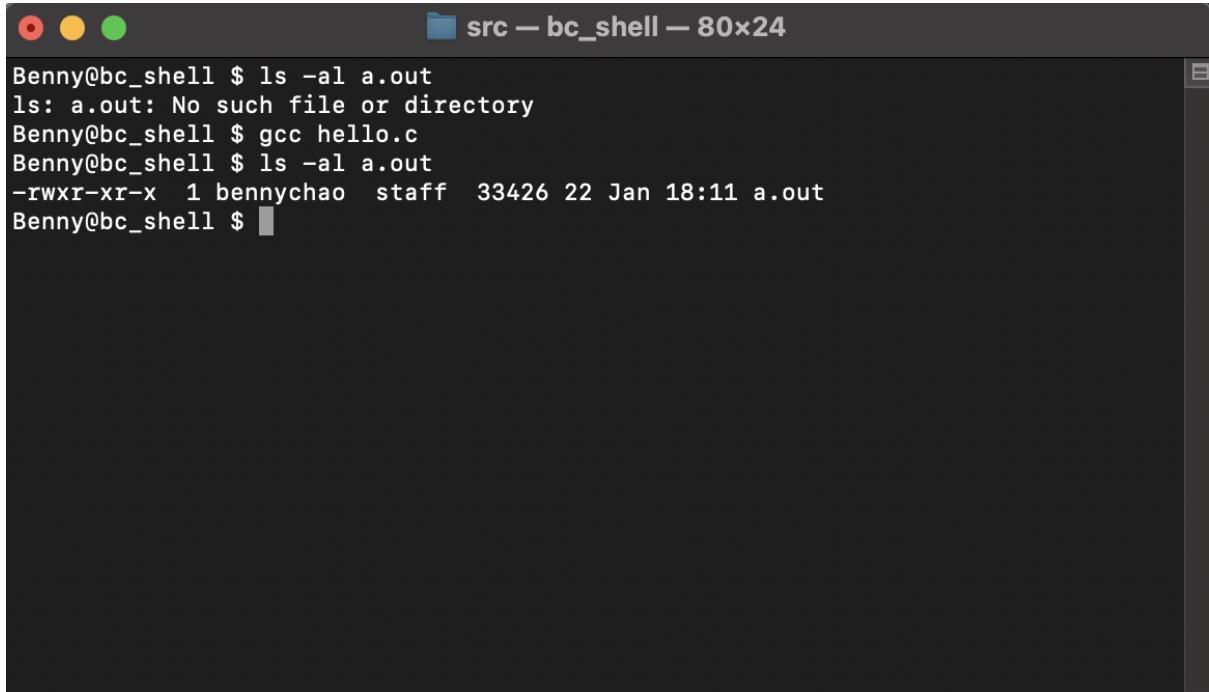
```
foo.sh
foo.txt
lab-4---inheritance-and-polymorphism-Bnyao
lab-6---library-Bnyao
lab-7---course-conflict-Bnyao
lab-8---auctioneer-observer-Bnyao
lab-9---abstract-factory-Bnyao
out.put.txt
out.txt
output.txt
outtxt
pipe
rudp_rfid_to_lcd
stuff
t
test
the_good_stuff
tools
unix-domain-socket-example
ut.txt
valgrind-3.19.0
valgrind-3.19.0.tar.bz2
xt
Benny@bc_shell $
```

`./a.out`



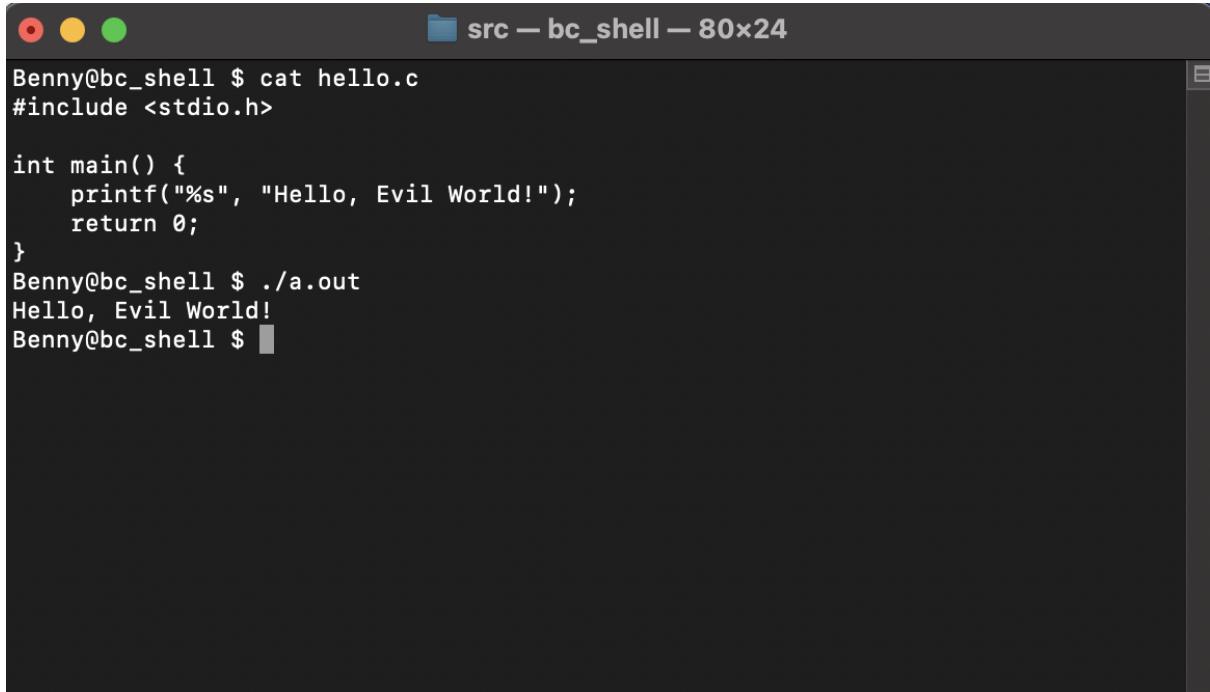
```
Benny@bc_shell $ ls -al ./out
ls: ./out: No such file or directory
Benny@bc_shell $ ./a.out
command: ./a.out not found
Benny@bc_shell $
```

`gcc hello.c`



```
Benny@bc_shell $ ls -al a.out
ls: a.out: No such file or directory
Benny@bc_shell $ gcc hello.c
Benny@bc_shell $ ls -al a.out
-rwxr-xr-x 1 bennychao staff 33426 22 Jan 18:11 a.out
Benny@bc_shell $
```

`./a.out`

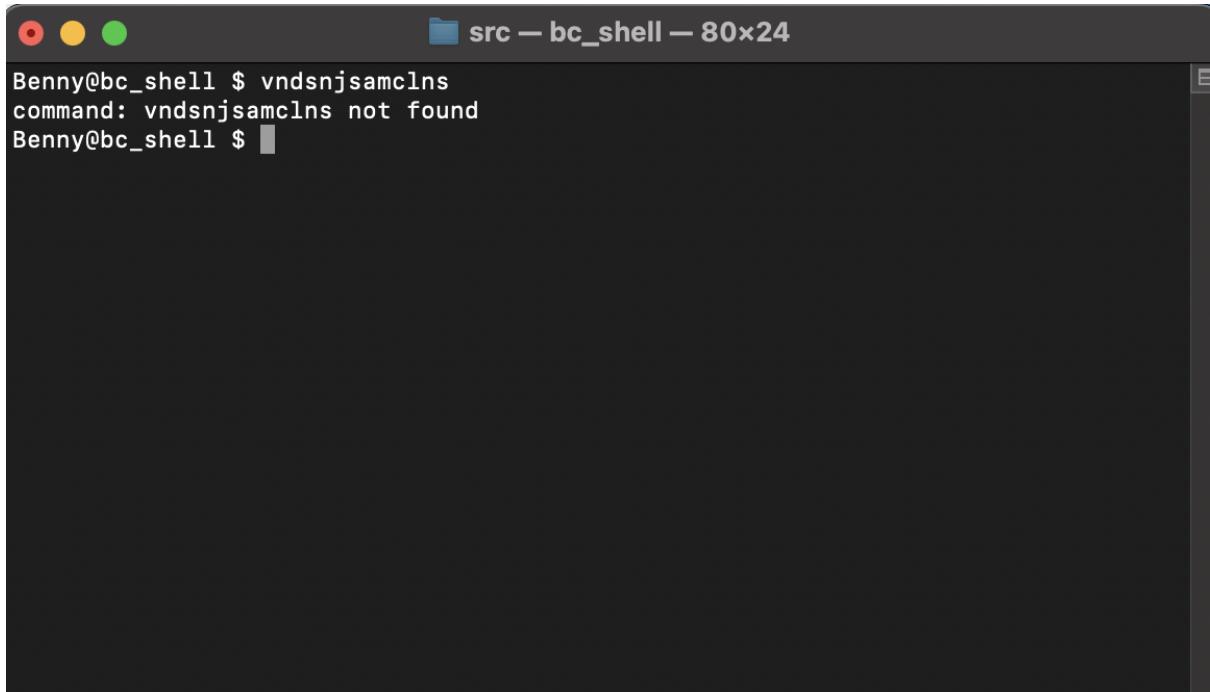


A terminal window titled "src — bc_shell — 80x24". The window shows the command `cat hello.c` being run, displaying its source code. Then, the command `./a.out` is run, outputting "Hello, Evil World!".

```
Benny@bc_shell $ cat hello.c
#include <stdio.h>

int main() {
    printf("%s", "Hello, Evil World!");
    return 0;
}
Benny@bc_shell $ ./a.out
Hello, Evil World!
Benny@bc_shell $
```

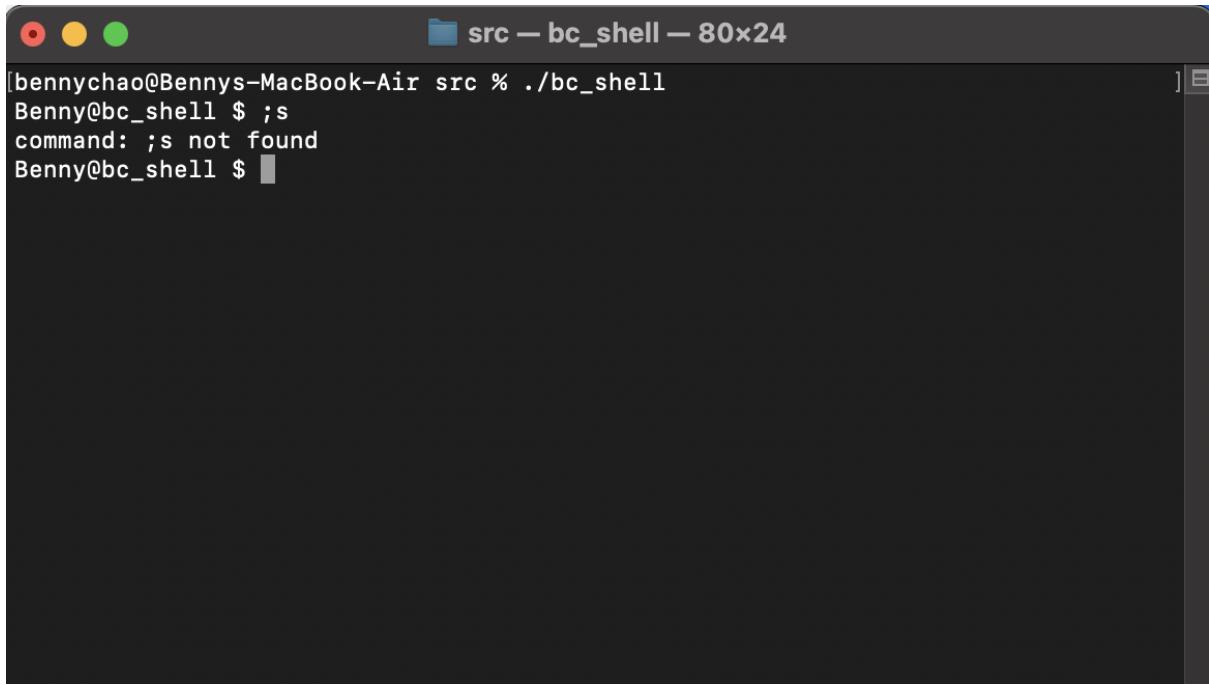
Unknown command



A terminal window titled "src — bc_shell — 80x24". The window shows the command `vndsnjsamclns` being run, resulting in an error message: "command: vndsnjsamclns not found".

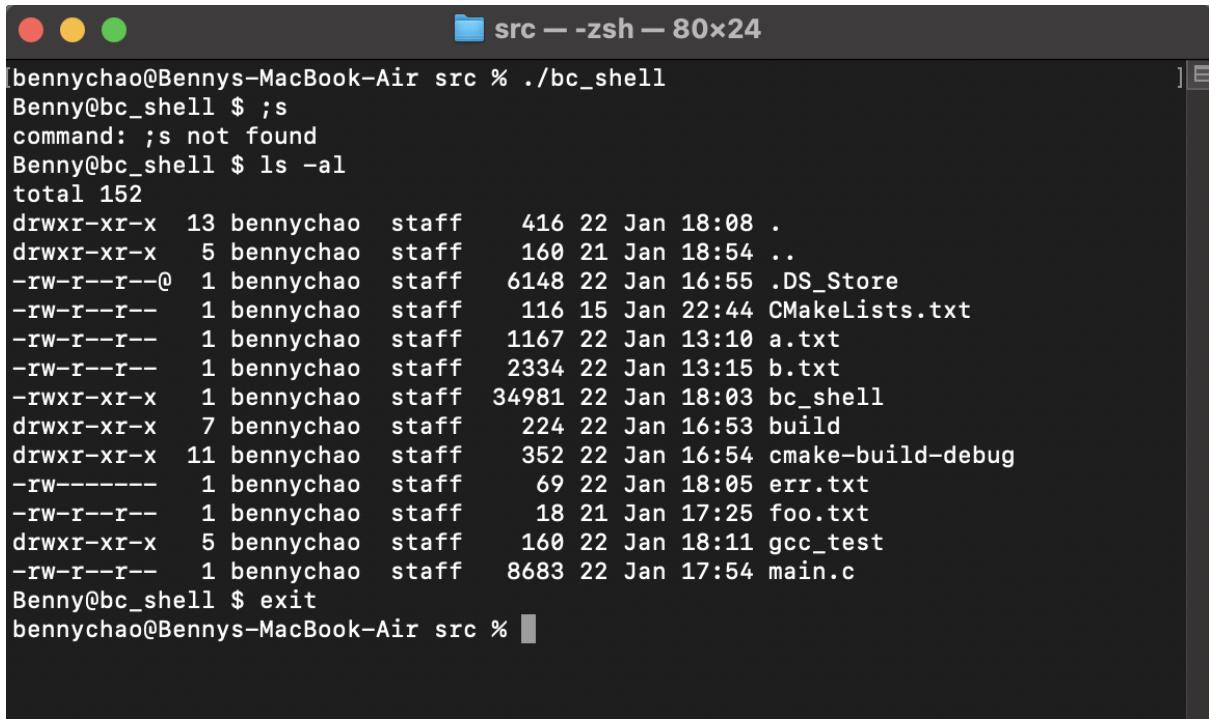
```
Benny@bc_shell $ vndsnjsamclns
command: vndsnjsamclns not found
Benny@bc_shell $
```

Invalid command



```
[bennychao@Bennys-MacBook-Air src % ./bc_shell
Benny@bc_shell $ ;s
command: ;s not found
Benny@bc_shell $ ]
```

Exit



```
[bennychao@Bennys-MacBook-Air src % ./bc_shell
Benny@bc_shell $ ;s
command: ;s not found
Benny@bc_shell $ ls -al
total 152
drwxr-xr-x  13 bennychao  staff   416 22 Jan 18:08 .
drwxr-xr-x   5 bennychao  staff   160 21 Jan 18:54 ..
-rw-r--r--@  1 bennychao  staff  6148 22 Jan 16:55 .DS_Store
-rw-r--r--   1 bennychao  staff   116 15 Jan 22:44 CMakeLists.txt
-rw-r--r--   1 bennychao  staff  1167 22 Jan 13:10 a.txt
-rw-r--r--   1 bennychao  staff  2334 22 Jan 13:15 b.txt
-rwxr-xr-x   1 bennychao  staff 34981 22 Jan 18:03 bc_shell
drwxr-xr-x   7 bennychao  staff   224 22 Jan 16:53 build
drwxr-xr-x  11 bennychao  staff  352 22 Jan 16:54 cmake-build-debug
-rw-----   1 bennychao  staff    69 22 Jan 18:05 err.txt
-rw-r--r--   1 bennychao  staff    18 21 Jan 17:25 foo.txt
drwxr-xr-x   5 bennychao  staff   160 22 Jan 18:11 gcc_test
-rw-r--r--   1 bennychao  staff  8683 22 Jan 17:54 main.c
Benny@bc_shell $ exit
bennychao@Bennys-MacBook-Air src % ]
```