

### Grammar

```

Stmnt_list → Stmnt Stmnt_list
            | .
Stmnt      → id equal Expr
            | print Expr.
Expr       → Term Term_tail.
Term_tail  → xor Term Term_tail
            | .
Term       → Factor Factor_tail.
Factor_tail → or Factor Factor_tail
            | .
Factor     → Atom Atom_tail.
Atom_tail  → and Atom Atom_tail
            | .
Atom       → ( Expr )
            | id
            | number.
        
```

Some sentences generated by the grammar are equal number and id, id equal number and id, id equal number and

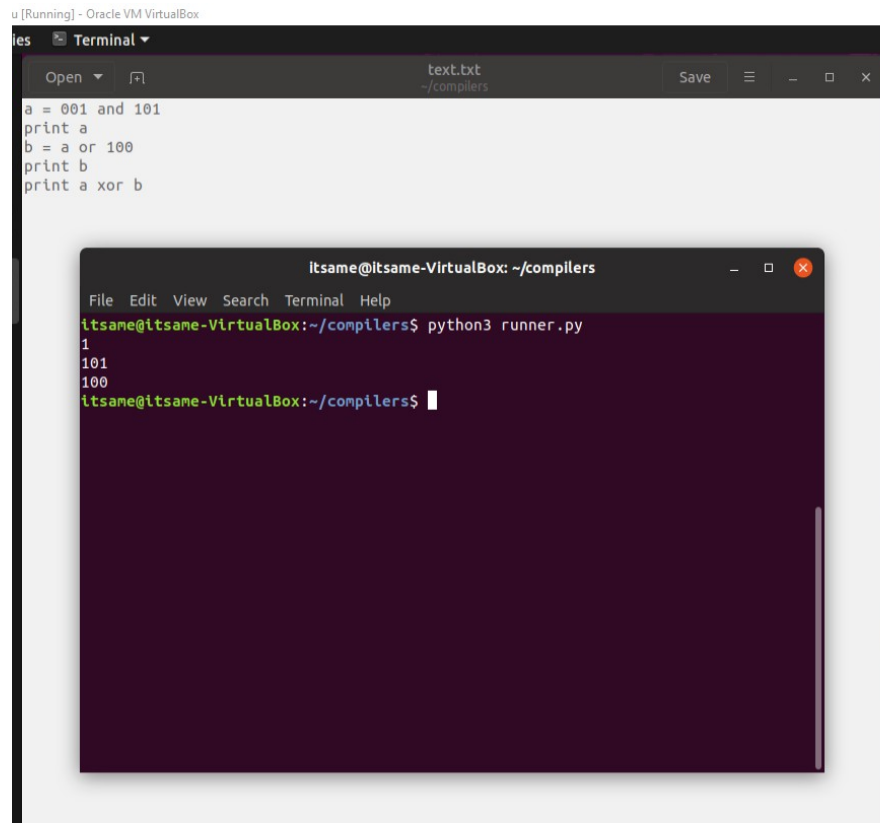
- All nonterminals are reachable and realizable.
- The nullable nonterminals are: Stmnt\_list Term\_tail Factor\_tail Atom
- The endable nonterminals are: Atom\_tail Atom Factor\_tail Factor
- No cycles.

nonterminal	first set	follow set	nullable	endable
Stmnt_list	id print	⊙	yes	yes
Stmnt	id print	id print	no	yes
Term_tail	xor	) id print	yes	yes
Term	( id number	) xor id print	no	yes
Factor_tail	or	) xor id print	yes	yes
Factor	( id number	) or xor id print	no	yes
Atom_tail	and	) or xor id print	yes	yes
Atom	( id number	) and or xor id print	no	yes
Expr	( id number	) id print	no	yes

The grammar is LL(1).

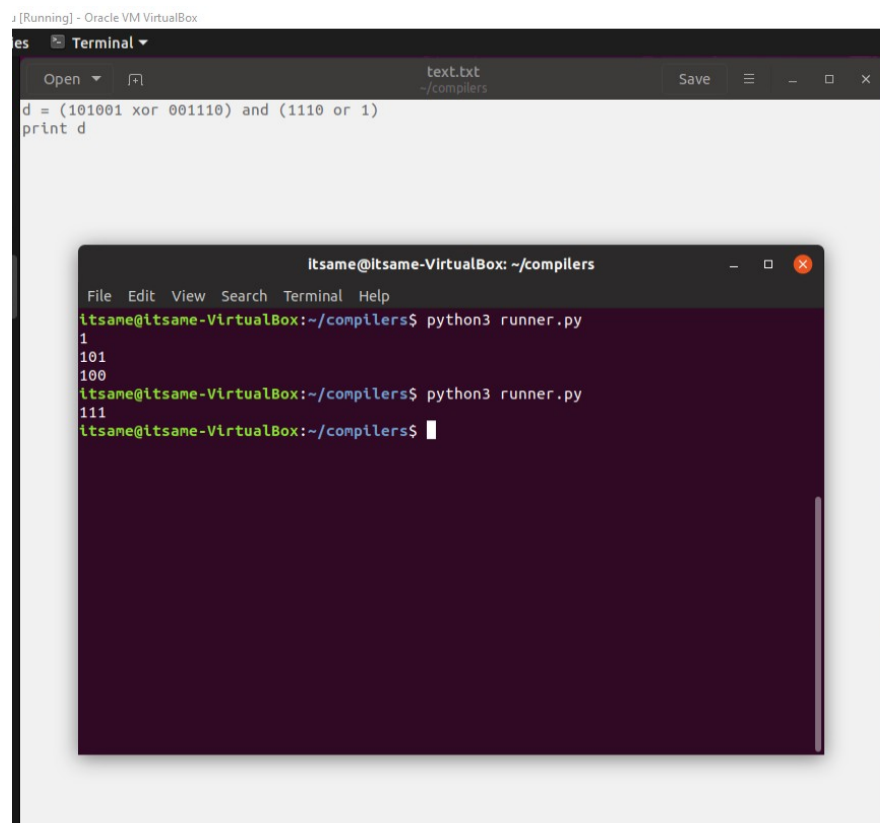
## Αποτελέσματα Εξόδου

### 1. Έγκυρες τιμές



```
u [Running] - Oracle VM VirtualBox
ies Terminal
text.txt
~/compilers
a = 001 and 101
print a
b = a or 100
print b
print a xor b

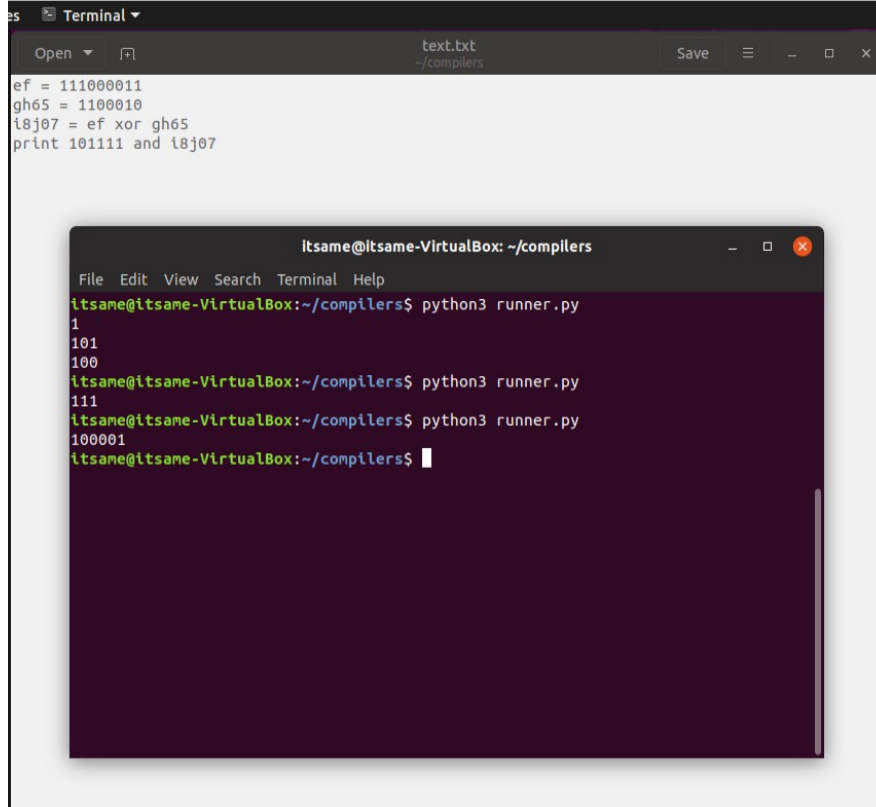
Itsame@Itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
1
101
100
Itsame@Itsame-VirtualBox:~/compilers$
```



```
u [Running] - Oracle VM VirtualBox
ies Terminal
text.txt
~/compilers
d = (101001 xor 001110) and (1110 or 1)
print d

Itsame@Itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
1
101
100
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
111
Itsame@Itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox



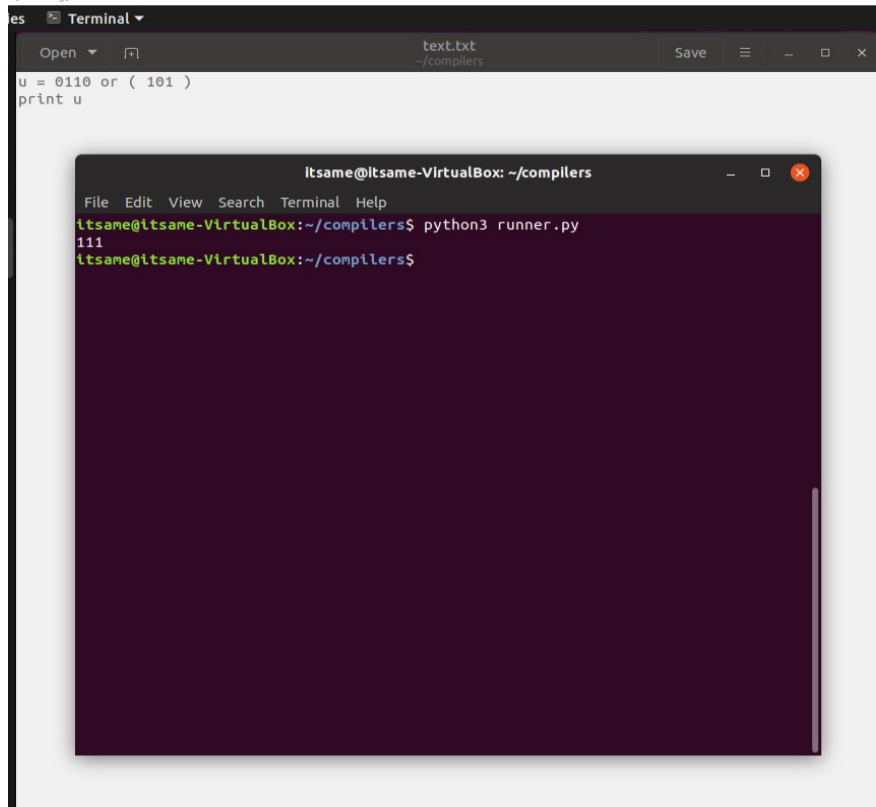
The screenshot shows a VirtualBox terminal window titled "Terminal" with a menu bar (Open, text.txt, Save, etc.). The terminal content is as follows:

```
ef = 111000011
gh65 = 1100010
i8j07 = ef xor gh65
print 101111 and i8j07
```

Below this, a smaller terminal window titled "Itsame@Itsame-VirtualBox: ~/compilers" is shown, displaying the execution of a Python script:

```
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
1
101
100
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
111
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
100001
Itsame@Itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox



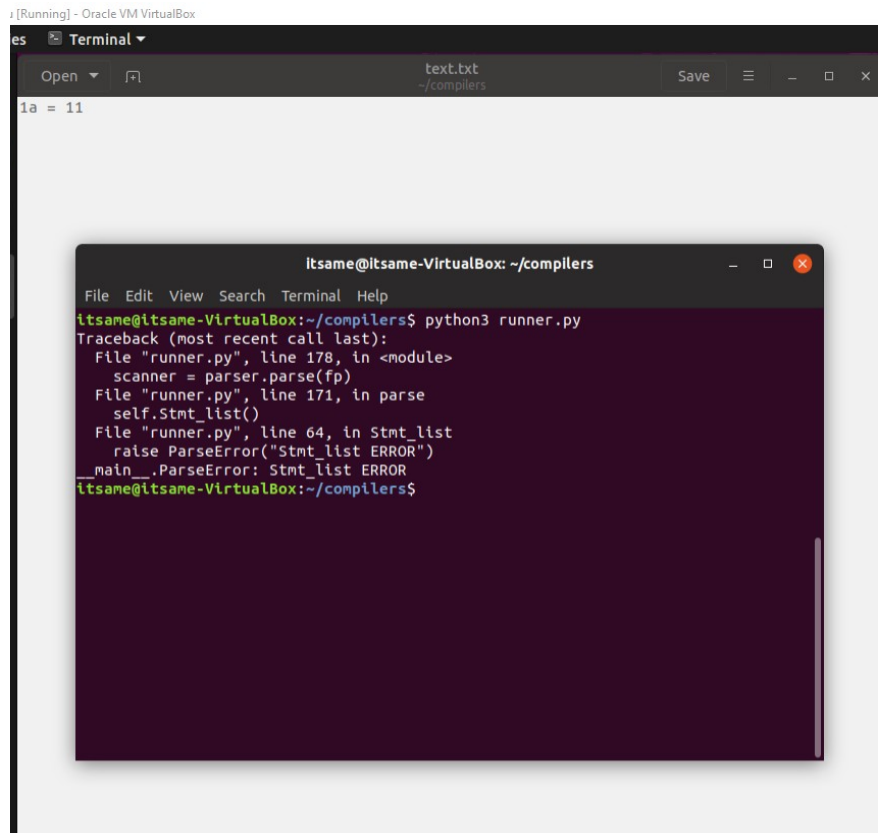
The screenshot shows a VirtualBox terminal window titled "Terminal" with a menu bar (Open, text.txt, Save, etc.). The terminal content is as follows:

```
u = 0110 or ( 101 )
print u
```

Below this, a smaller terminal window titled "Itsame@Itsame-VirtualBox: ~/compilers" is shown, displaying the execution of a Python script:

```
Itsame@Itsame-VirtualBox:~/compilers$ python3 runner.py
111
Itsame@Itsame-VirtualBox:~/compilers$
```

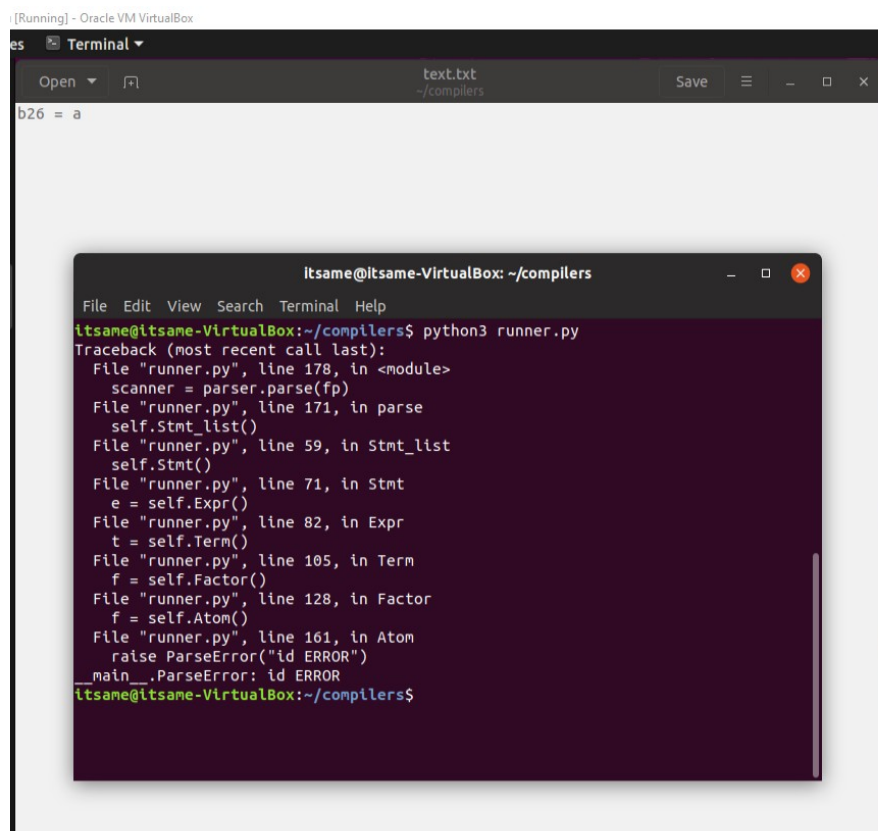
## 2. Μη έγκυρες τιμές



The screenshot shows a terminal window titled "Terminal" with a file named "text.txt" in the directory "~/compilers". The terminal content is as follows:

```
1a = 11

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 64, in Stmt_list
    raise ParseError("Stmt_list ERROR")
  _main_.ParseError: Stmt_list ERROR
itsame@itsame-VirtualBox:~/compilers$
```



The screenshot shows a terminal window titled "Terminal" with a file named "text.txt" in the directory "~/compilers". The terminal content is as follows:

```
b26 = a

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 128, in Factor
    f = self.Atom()
  File "runner.py", line 161, in Atom
    raise ParseError("id ERROR")
  _main_.ParseError: id ERROR
itsame@itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox

```
es Terminal
Open text.txt -/compilers Save
ja = 1002

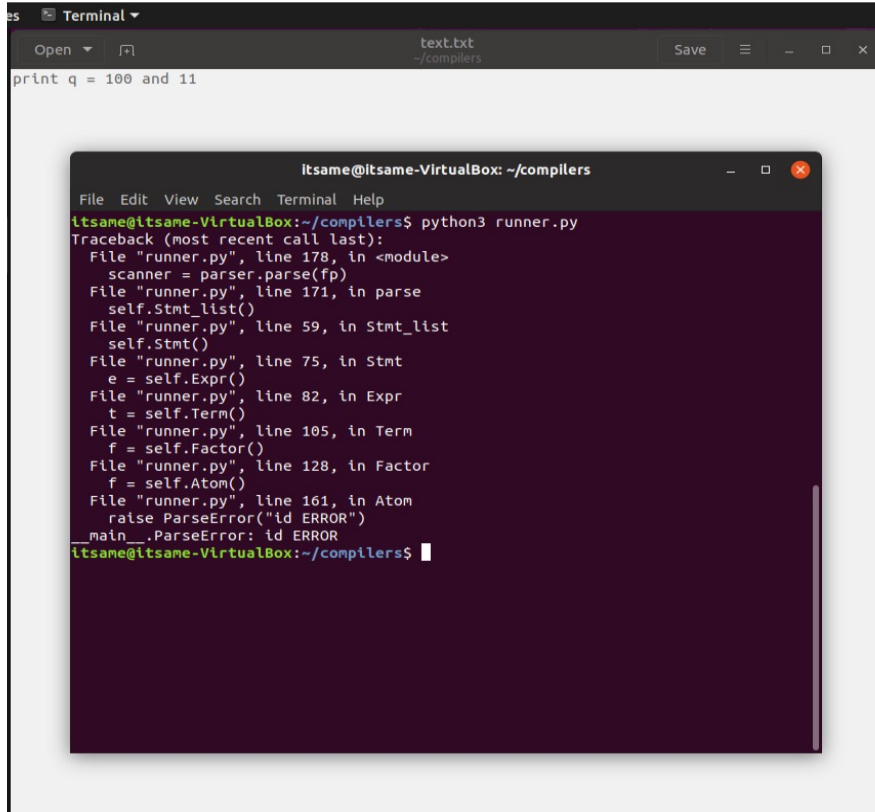
itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 128, in Factor
    f = self.Atom()
  File "runner.py", line 164, in Atom
    self.match('number')
  File "runner.py", line 53, in match
    self.la, self.text = self.next_token()
  File "runner.py", line 49, in next_token
    return self.scanner.read()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
94, in read
    self.text, action = self.scan_a_token()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
138, in scan_a_token
    raise errors.UnrecognizedInput(self, self.state_name)
plex.errors.UnrecognizedInput: ', line 1, char 8: Token not recognised in state
''
itsame@itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox

```
es Terminal
Open text.txt -/compilers Save
b = 11001 + 001

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 128, in Factor
    f = self.Atom()
  File "runner.py", line 164, in Atom
    self.match('number')
  File "runner.py", line 53, in match
    self.la, self.text = self.next_token()
  File "runner.py", line 49, in next_token
    return self.scanner.read()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
94, in read
    self.text, action = self.scan_a_token()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
138, in scan_a_token
    raise errors.UnrecognizedInput(self, self.state_name)
plex.errors.UnrecognizedInput: ', line 1, char 10: Token not recognised in stat
e ''
itsame@itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox

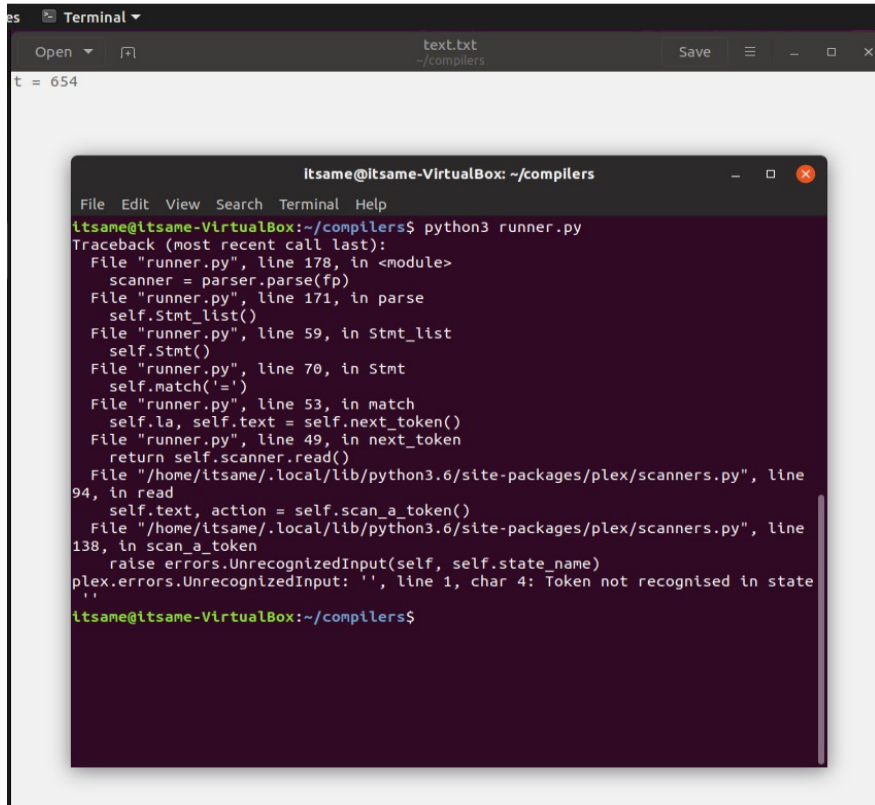


The screenshot shows a terminal window titled "Terminal" with a menu bar (File, Edit, View, Search, Terminal, Help) and a toolbar (Open, Save, etc.). The terminal content shows a Python script execution that has failed with a `ParseError`. The traceback indicates the error occurred in `runner.py` at line 178, in the `<module>` scope, specifically during the `scanner = parser.parse(fp)` call. The error message at the bottom is `_main_.ParseError: id ERROR`.

```
print q = 100 and 11

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 75, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 128, in Factor
    f = self.Atom()
  File "runner.py", line 161, in Atom
    raise ParseError("id ERROR")
_main_.ParseError: id ERROR
itsame@itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox

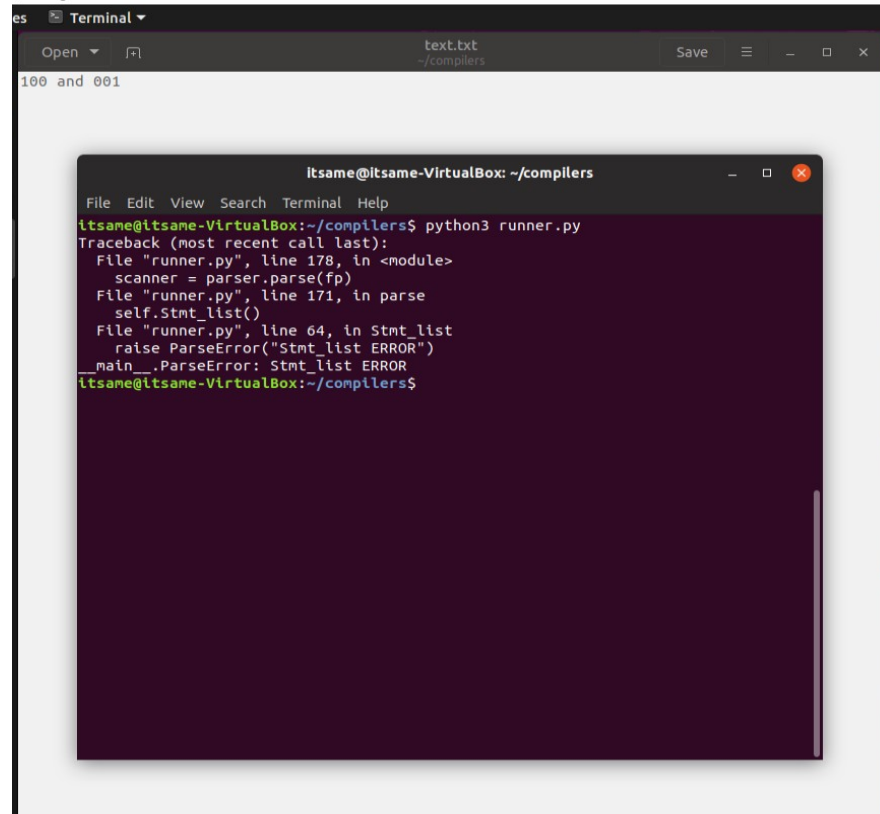


The screenshot shows a terminal window titled "Terminal" with a menu bar (File, Edit, View, Search, Terminal, Help) and a toolbar (Open, Save, etc.). The terminal content shows a Python script execution that has failed with a `plex.errors.UnrecognizedInput` error. The traceback indicates the error occurred in `runner.py` at line 178, in the `<module>` scope, specifically during the `scanner = parser.parse(fp)` call. The error message at the bottom is `plex.errors.UnrecognizedInput: ', line 1, char 4: Token not recognised in state ''`.

```
t = 654

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 70, in Stmt
    self.match('=')
  File "runner.py", line 53, in match
    self.la, self.text = self.next_token()
  File "runner.py", line 49, in next_token
    return self.scanner.read()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
94, in read
    self.text, action = self.scan_a_token()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
138, in scan_a_token
    raise errors.UnrecognizedInput(self, self.state_name)
plex.errors.UnrecognizedInput: ', line 1, char 4: Token not recognised in state
''
itsame@itsame-VirtualBox:~/compilers$
```

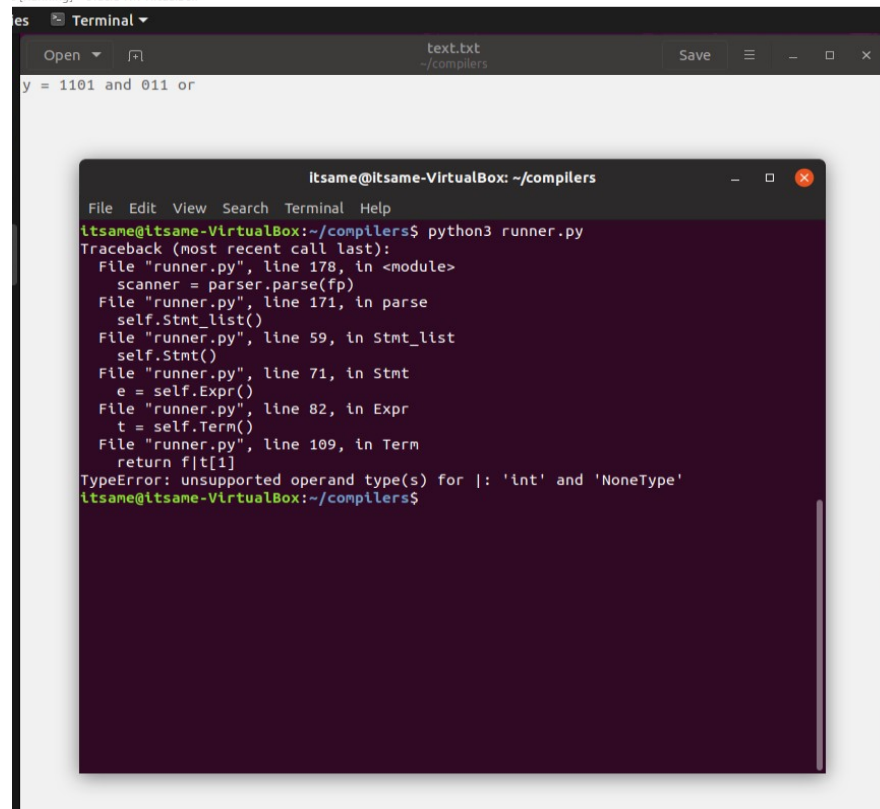
[Running] - Oracle VM VirtualBox



The screenshot shows a terminal window titled "Terminal" with a menu bar (File, Edit, View, Search, Terminal, Help) and a toolbar (Open, Save, and window controls). The terminal content shows a file named "text.txt" at the path "~/compilers" and the text "100 and 001". A secondary terminal window is open, titled "itsame@itsame-VirtualBox: ~/compilers", showing a Python traceback error. The error message is: "Traceback (most recent call last): File 'runner.py', line 178, in <module> scanner = parser.parse(fp) File 'runner.py', line 171, in parse self.Stmt\_list() File 'runner.py', line 64, in Stmt\_list raise ParseError('Stmt\_list ERROR') \_main\_\_.ParseError: Stmt\_list ERROR".

```
itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 64, in Stmt_list
    raise ParseError("Stmt_list ERROR")
_main__.ParseError: Stmt_list ERROR
itsame@itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox



The screenshot shows a terminal window titled "Terminal" with a menu bar (File, Edit, View, Search, Terminal, Help) and a toolbar (Open, Save, and window controls). The terminal content shows a file named "text.txt" at the path "~/compilers" and the text "y = 1101 and 011 or". A secondary terminal window is open, titled "itsame@itsame-VirtualBox: ~/compilers", showing a Python traceback error. The error message is: "Traceback (most recent call last): File 'runner.py', line 178, in <module> scanner = parser.parse(fp) File 'runner.py', line 171, in parse self.Stmt\_list() File 'runner.py', line 59, in Stmt\_list self.Stmt() File 'runner.py', line 71, in Stmt e = self.Expr() File 'runner.py', line 82, in Expr t = self.Term() File 'runner.py', line 109, in Term return f[t[1]] TypeError: unsupported operand type(s) for |: 'int' and 'NoneType'".

```
itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 109, in Term
    return f[t[1]]
TypeError: unsupported operand type(s) for |: 'int' and 'NoneType'
itsame@itsame-VirtualBox:~/compilers$
```



- Oracle VM VirtualBox

```
Terminal
text.txt
~/compilers
Save
01 and 011
or y

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 60, in Stmt_list
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 75, in Stmt
    e = self.Expr()
  File "runner.py", line 88, in Expr
    raise ParseError("Expr ERROR")
_main_.ParseError: Expr ERROR
itsame@itsame-VirtualBox:~/compilers$
```

Ubuntu [Running] - Oracle VM VirtualBox

```
Activities
Terminal
Open
text.txt
~/compilers
Save
y = 1101 and 011
print y xo 101

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
1
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 60, in Stmt_list
    self.Stmt_list()
  File "runner.py", line 60, in Stmt_list
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 70, in Stmt
    self.match('=')
  File "runner.py", line 55, in match
    raise ParseError("match error")
_main_.ParseError: match error
itsame@itsame-VirtualBox:~/compilers$
```



```

Terminal
text.txt
~/compilers
Save
u = 111 ( 10101 and 01)

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
(
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 129, in Factor
    t = self.Atom_tail()
  File "runner.py", line 147, in Atom_tail
    raise ParseError("Atom_tail ERROR")
_main_.ParseError: Atom_tail ERROR
itsame@itsame-VirtualBox:~/compilers$

```

```

Terminal
text.txt
~/compilers
Save
kl = 10011 and ( 010 xor 10110
print kl

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 129, in Factor
    t = self.Atom_tail()
  File "runner.py", line 138, in Atom_tail
    f = self.Atom()
  File "runner.py", line 153, in Atom
    self.match(')')
  File "runner.py", line 55, in match
    raise ParseError("match error")
_main_.ParseError: match error
itsame@itsame-VirtualBox:~/compilers$

```

[Running] - Oracle VM VirtualBox

```
es Terminal
text.txt
~/compilers
Save
fs589f = 101 or and 010

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 71, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 106, in Term
    t = self.Factor_tail()
  File "runner.py", line 117, in Factor_tail
    t = self.Factor_tail()
  File "runner.py", line 124, in Factor_tail
    raise ParseError("Factor_tail ERROR")
_plex_.ParseError: Factor_tail ERROR
itsame@itsame-VirtualBox:~/compilers$
```

[Running] - Oracle VM VirtualBox

```
es Terminal
text.txt
~/compilers
Save
po = 111001
print po - 10

itsame@itsame-VirtualBox: ~/compilers
File Edit View Search Terminal Help
itsame@itsame-VirtualBox:~/compilers$ python3 runner.py
Traceback (most recent call last):
  File "runner.py", line 178, in <module>
    scanner = parser.parse(fp)
  File "runner.py", line 171, in parse
    self.Stmt_list()
  File "runner.py", line 60, in Stmt_list
    self.Stmt_list()
  File "runner.py", line 59, in Stmt_list
    self.Stmt()
  File "runner.py", line 75, in Stmt
    e = self.Expr()
  File "runner.py", line 82, in Expr
    t = self.Term()
  File "runner.py", line 105, in Term
    f = self.Factor()
  File "runner.py", line 128, in Factor
    f = self.Atom()
  File "runner.py", line 157, in Atom
    self.match('id')
  File "runner.py", line 53, in match
    self.la, self.text = self.next_token()
  File "runner.py", line 49, in next_token
    return self.scanner.read()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
94, in read
    self.text, action = self.scan_a_token()
  File "/home/itsame/.local/lib/python3.6/site-packages/plex/scanners.py", line
138, in scan_a_token
    raise errors.UnrecognizedInput(self, self.state_name)
plex.errors.UnrecognizedInput: '', line 2, char 9: Token not recognised in state
itsame@itsame-VirtualBox:~/compilers$
```