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```
#zsimple.py
languages=z['python','z'perl','z'c','z'java']

forzlangzinzlanguages:
zzzifzlangzinz['python','z'perl']:
zzzzzzzpri ntz"%6szneedzi nterpreter"z%zlang
zzzelifzlangzinz['c','z'java']:
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zzzel se:
zzzzzzzpri ntz"shoul dzn otzreachzhere"
```

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Life is too short, You need python.

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2. GUI (Graphic User Interface) • j Ò

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$tarzxvzfPython-2.7.tgz
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wiki docs.net PDF, page : 18

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Makefile Ž ...→ Ÿ × ˆ Ž 1 configure® ò ° ´´ .

```
$z. /configure
```

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```
$zmake
```

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$zsu  
#zmakeinstall
```

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```
Pythonz2.7z(r27:82525,zJulzz4z2010,z09:01:59)z[MSCzv.1500z32zbitz(Intel)]zonzwin32
Typez"help",z"copyright",z"credits"zorz"license"zforzmorezinformatiön.
>>>
```

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```
>>>importsys
>>>zsys.exit()
```

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```
>>>z1z+z2
3
```

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```
>>>z3z/z2.4
1.25
>>>z3z*z9
27
>>>
```

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```
>>>zaz=z1
>>>zbz=z2
>>>zaz+zb
3
```

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aª © Af• "Python"•ª © Š↯ ÅB° ¨ n print a® ž \ ø a— Š↯ CDž ‡ ¨ .

```
>>>zaz="Python"
>>>zprintza
Python
```

z

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```
>>>zaz=z2z+z3j
>>>zbz=z3
>>>zaz*zb
(6+9j)
```

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```
>>>zaz=z3
>>>zi fza>z1:
...zzzzzprintz"az>z1"
```

```
...
az>z1
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>>>zforzazinz[1,2,3]:
...zzzzzprintza
...
1
2
3
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```
>>>zi=z0
>>>zwhilezi<z3:
...zzzzzi=zı+1
...zzzzzprintzi
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1
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```
>>>defzsum(a,zb):
...zzzzreturnza+b
...
>>>printzsum(3,4)
7
```

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```
#zhello.py
printz"Hellozworld"
```

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```
C:\WINDOWS>zcdz\Python
C:\Python>zpythonzhello.py
Hellozworld
```

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Pythonz2.6.4z(r264:75706,zDecz7z2009,z18:45:15)z[GCcz4.4.1]zonzlinux2
Typez"hel p",z"copyri ght",z"credi ts"zorz"l i cense"zforzmorezi nformati on.
>>>
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Ø" .z• O • Āž¹ ÆĬ • # { ëĬ ÷™S • .z

[1] » ½ (Number)

7•5•' 7•5^>•Å¡¢•45Î> | Ñ•¶ Ĩ © O •". | Ñ° ù ½óž » Ě
 O ñ " ž ÷•. 123 ¢Á „ f, 12.34 ¢Á òf, Å •ª ø -f¿Ĥ > ëĬ Ö 1
 o¹ f(1+2j) ¢Á O ™ Ø¼, ú...{ G•¥ •Ÿ 8¢fÆ 16¢f ¢Á O ™ Ø".

•~ 7• ñ Ž•••¹ © ĵ Å{ Üâ ¼ ¿ ó © • ëĬ ÷•.

```
° Ĩ zzzzzzzzz½óžÖ
```

```
„ f zzzzzzzzz123, z-345, z0
```

```
ò f zzzzzzzzz123.45, z-1234.5, z3.4e10
```

```
o¹ f zzzzzzzz1z+z2j, z-3j
```

```
8¢ f zzzzzzzz034, z025
```

```
16¢ f zzzzzzzz0x2A, z0xFF
```

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z

z

½ (Integer)

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```
>>>zaz=z123
```

```
>>>zaz=z-178
```

```
>>>zaz=z0
```

z

z

• ö€ Ê (Floating-point)

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 ^_¤² •f Üâ¿•". •f Üâ¿Ĥ> Ž•••¹ © 4.24e10 © 4.24E10LV Üâ°". (e,
 E2r ĵ â Oñ ½óž ™ - x ".)

```
>>>zaz=z1.2
```

```
>>>zaz=z-3.45
```

```
>>>zaz=z4.24E10zzz#z4.24z*z10—z10
```

```
>>>zaz=z4.24e-10zz#z4.24z*z10—z€• = " z10
```

z

z

8 í ½ Œ (Octal)

8¢ƒ® Ÿ × ¯ ž¹ © 7• Ñ 0(7• 0)Î > † < Ø ¨ ¨.

```
>>>zaz=z0177
```

z

z

16 í ½ Œ (Hexadecimal)

16¢ƒ® Ÿ × ¯ ž¹ © 7• Ñ 0x> † < Ø ¨ ¨.

```
>>>zaz=z0x8ff
>>>zbz=z0xABC
```

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• Œ (Complex number)

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½ó° ¨ ¨. ³j´ ® Ø™ Ö¼ 'J' ® Ø™ ¨ ¨.

```
>>>zaz=z1+2j
>>>zbz=z3-4j
```

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èNEƒÑ Ø¨. ±O ¬ • ó Ø > ¨ ¨ à° x¿Î > o¹ƒ® ½ó1 ƒ Ø{ ¨ ¨.

¨ n— o¹ƒ ö ¬ ÷•.

o¹ƒ.real Á o¹ƒ— òƒ ÛÛ¬ ¨ á± ¨ ¨.

```
>>>zaz=z1+2j
>>>za.real
1.0
```

z

o¹ƒ.imag© o¹ƒ— ¼ƒ ÛÛ¬ ¨ á± ¨ ¨.

```
>>>zaz=z1+2j
>>>za.i mag
2.0
```

z

$\text{conj}(\text{z}) = \text{z}^*$

```
>>>zaz=z1+2j
>>>za.conj ugate()
(1-2j)
```

z

$\text{abs}(\text{z}) = \sqrt{\text{z} \cdot \text{conj}(\text{z})}$

```
>>>zaz=z1+2j
>>>zabs(a)
2.2360679774997898Z
```

z

z

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Ž•••¹™ †' Ç×Ÿ ∈¾Ñ•> Ĩ K— æÇ•®•ó ä ½f æÇ¬ f °¨¨.

```
>>>zaz=z3
>>>zaz=z4
>>>zaz+zb
7
>>>zaz*zb
12
```

z

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½ó ø¹ f\$ • —•|® - † ¼ „ f 5^ — Š¬ ô¬ á \ { ¨¨. °ª¹ Ĩ K— ö LV
¹ f\$ 5^ —. Š¬ É x ¬ ž¹ © ° — Š¬ ò f 5Ĭ > ø\ ĭ Ö °¨¨.

```
>>>z3z/z4
0
```

```
>>>z3z/z4.0
0.75
>>>z3.0z/z4
0.75
```

z

“ x¿• Ø” . “ n öLV floatª © Ef® ½ó ø ¹7\$ 5^— . §¬ É¬ f Ø” .

```
>>>zaz=z3
>>>zbz=z4
>>>zfloat(a)z/zb
0.75
```

• 3° x¿¬ ³ 5AW´•ª¼ °” . s, float(a)©ªª © Af• ÂB 3•ª © §¬ òf§
3.0Ī > T Uĭ ‡” . Ž•••©”à° 5AW x¿ ••æ ©õ ±O Á 4N•¹ •#ù
” Â™s •.

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“ á ‡” . “ n— ö® ±ž éĭ ÷•.

```
>>>zaz=z3
>>>zbz=z4
>>>zaz**zb
81
```

z

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æÇ• •” . 7¬ 3Ī > Â(ø Â*• © 1• µ O•¼ 3¬ 7> Â(ø Â*• © 3• µ O•” .
“ n— ö> 2fž ÷•.

```
>>>z7z%z3
1
>>>z3z%z7
3
```

[2] 𐌲𐌿 » (String)

• 8• ' N𐌿 Å° " . ö® j " n ꝢÁ O • • 8• " .

```
"Li fezi sztoozshort, zYouzneedzPython"
"a"
"123"
```

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```
ÚHelIozWorl dÜ
'Pythonzi szfun'
""""Li fezi sztoozshort, zYouzneedzpython""""
'''Li fezi sztoozshor, zYouzneedzpython'''
```

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ÉóÛ« (') © • r ÉóÛ«Æ R... ÉóÛ« # ® œÁĬ > G@("''')® àÁĬ >
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ö 1) R... ÉóÛ« (')® É†v¼ Ē𐌿

```
Python' szfavi tezfoodzi szperl
```

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Ø". • Ā © " n ¢• • 8¬ • r £óÛ« (" ")> 23gÖ ° ". • r £óÛ« (" ")• •
i Ø© R... £óÛ« (')© • 8¬ Æ; è× "° x«> £² ô• ë©".

```
>>>zfoodz=z"Python' szfavori tezfoodzi szperl "
```

z

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£² ô_i • 3(Syntax Error)Ñ H O• " .

```
>>>zfoodz=z' Python' szfavori tezfoodzi szperl '
```

z

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```
"Pythonzi szveryzeasy. "zhezsays.
```

z

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```
>>>zsayz=z' "Pythonzi szveryzeasy. "zhezsays. '
```

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ö 3) ³ \´ (ÆK†)> (') (")® • 8• E†v×

```
>>>zfoodz=z' Python\' szfavori tezfoodzi szperl '  
>>>zsayz=z\"Pythonzi szveryzeasy. \"zhezsays. "
```

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L | ž Ö 1 P ?

Li fezi sztoozshort
Youzneedzpython
Pythonzi szpowerful zI language

z

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```
>>>zmultiline=z"Li fezi sztoozshort\nYouzneedzpython\nPythonzi szpowerful zI language"
```

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multiline=ÜÜÜ
Li fezi sztoozshort
Youzneedzpython
Pythonzi szpowerful zI language
ÜÜÜ

z

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ö 1) • 8 † Ô× (Concatenation)

```

>>>zheadz=z"Python"
>>>ztailz=z"ziszfun!"
>>>zprintzheadz+ztail
Pythonziszfun!

```

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 headA f Ÿ " is fun"•ª© tailA f® ° O•´´. . ©³ Python is fun!´´´. s, headŸ
 tailA f Ñ "+"• —ž †: £ O•´´.

ë | ò ž ÷ ¼. §• 6†° O U£• Å%© • 2£ž ÷ •.

ö 2) • 8 © ×

```
>>>zaz="python"
>>>zprintzaz*z2
pythonpython
```

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³ *´ © • 8— š o¬ Ä © —¶> ½óô ¨ ¨ . ` • ö® ý y1 — Ñ ¨ ¬ „™>
ë ¨ ¸ • ¨ ¨ . "print a * 2"ª © ÑÁ a® Ä§ š ož CDª © Ä• ¨ ¨ .

z

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```
#zmultistring.py

printz="z*z50
printz"MyzProgram"
printz="z*z50
```

z

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```
=====
MyzProgram
=====
```

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³ óª Ó¨´ª © —¶• ¨ ¨ . • O ¬ ¨ ¨ ø¹ ¨ ¨ n— ö® °ª ž ÷™s ¨ ¨ .

```
>>>zaz="Li fezi sztoozshort, zYouzneedzPython"z
```

z

```
Li fezi sztoozshort, zYouzneedzPython
0zzzzzzzzz1zzzzzzzzz2zzzzzzzzz3z
```

0123456789012345678901234567890123

" • 8— • €" Š«® — ÷ x". s "Life is too short, You need Python"• ª ©
• 8• 1 'L'Á Š • | ® Á © 7• £ 0¬ T> " n£ 'i'© 1¬ • ² Î > ' Á Š«®
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```
>>>zaz="Li fezi sztoozshort, zYouzneedzPython"  
>>>za[3]  
'e'
```

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w• ª ø a[3]• 1 3• ' 7• © # Š £ ö \ » Š • ® +° " © O£ • —İ 1 O• " .

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ÚŽ• • Á 0Û¤ 7• ® Ö" Û.

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```
a[0]: 'L', a[1]: 'i', a[2]: 'f', a[3]: 'e', a[4]: ' ', a[5]: 'i', a[6]: 's',  
a[7]: ' ',....
```

z

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ö• 1 ÷ Û• a[3]• ' OÁ • 8 è / „ ° Š¬ Øí è© 1¬ ž ‡ " . • 3° O¬
£ ÑÖ(Indexing)• ª ¼ Û " .

MÑ• ® £ ÑÖ¬ ž ÷ ™s • .

```
>>>za[0]  
'L'  
>>>za[12]  
's'  
>>>za[-1]  
'n'
```

€•, — a[-1]• Å © OÁ ÛP? yÔ ¢ w• © • ¶ è • Ÿ T> • 8¬ P•¹ Û ¢ F x
 ~ ž¹ €• = " (-) x ¢ ® Ô• © O• ¢ ¢ . s a[-1]Å P•¹ Û ¢ #¡¹ § Ñ ô© • ®
 + ° ¢ ¢ . a© "Life is too short, You need Python"•ª © N• /> P•¹ Û ¢ § • ©
 ÑN €•, • £ 'n'• µ O• ¢ ¢ .

P•¹ Û ¢ § • ® Û†¹ a[-0]•ª ¼ ž Ö • ë ©Ñ?ª © — • f™
 Ø • Ÿ ó " ž ÷•• 0 -0Á U¢Á O• x • a[-0]•ª © OÁ a[0] U¢Á §¬
 ÷ ä † ¢ ¢ .

```
>>>za[-0]
'L'
```

' Å ž¹ MÑ• ö® ÷•• .

```
>>>za[-2]
'o'
>>>za[-5]
'y'
```

¬ — § ö© P•¹ Û ¢ Å § • ® Ñ¡ v© O• ¼ Å § ö© P•¹ Û ¢ ¢ Û §
 • ® Ñ¡ v© O• ¢ ¢ . z ± w ¢ ¢ "Life is too short, You need Python"•ª © • 8•¹ RØù
 ° • Ÿ¬ Ø¡ è© O• Ĩ ñª 'Life' © 'You'¢Á R¡ ¬ Øĭ m f Ø© x ž Å ¢ ¬ P?
 ¢ n ¢ • ø µ O• ¢ ¢ .

```
>>>zbz=za[0]z+za[1]z+za[2]z+za[3]
>>>zb
'Li fe'
```

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 Æª • Ò(Slicing)•ª © x ž • ¢ ¢ .

¬ — ö© Æª • Ò x ž Ĩ> ¢ n ¢ • QR { L¡¹ f Ø ¢ ¢ . (\ — — • Ĩ P•¹ — ö 6© ' Å
 • ¡ • © O• x • • ¶ £ ¢ ¥¡ ¢ ® Û¼ ¢ ¢ † † < © w•ª Ø >>> a = "Life is too
 short, You need Python"•ª © O¬ ! f f ° P ¢ n — ö 6 ¬ °ª ¢ ¢ .)

```
>>>za[0:4]
'Li fe'
```

a[0:4]Ñ Å © OÁ aª © • 8 s, "Life is too short, You need Python"•ª © N•¹ 0Û ¢
 4P•¹ — • ® Øĭ Ó ¢ © Å• ¢ ¢ . • Ÿ ¢ n ¢ Á — • O• ¢ ¢ .

a[0]Á 'L', a[1]Á 'i', a[2]Á 'f', a[3]Á 'e'• ħP a[0:3]ŸÎ > ™ 'Life'^a © Rj ® Øí m f
 Ø• è¬P?
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```
>>>za[0:3]
'Li f'
```

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a[0:3]¬ f² Î > Æ; èø ∴ n • Φ∴.

```
0 <= a < 3
```

s ∴ — f² ¬ Ÿp © a© a[0], a[1], a[2] ... O• ∴. ° a¹ a[0:3]Á 'Li f'• ¼ a[0:4]©
 'Life'Ñ ö© O• ∴. • ÛÚ• • 8 æÇ•¹ ÑN ÛË x €• ÛÚ• ħ " " > é• æí ž
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```
>>>za[0:5]
'Li fez'
```

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 Ÿ• +™s •. 'Life'Ÿ 'Life'© Þ¾û ∴ • 8• ∴.

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```
>>>za[0:2]
'Li'
>>>za[5:7]
'is'
>>>za[12:17]
'short'
```

a[† < §«: • §«]•¹ • §« ÛÚ¬ ° ø † < §« Û¤ ± • 8— • P• ® Øí è{ ∴.

```
>>>za[19:]
'YouzneedzPython'
```

a[† < § « : • § «] • ' † < § « ® ° ø ± • 8— LnÛ¤ • § « P• Øí è{ " .

```
>>>za[:17]
'Li fezi sztoozshort'
```

a[† < § « : • § «] • ' † < § « Ÿ • § « ® ° ø

```
>>>za[:]
'Li fezi sztoozshort, zYouzneedzPython'
```

a[† < § « : • § «] • ' † < § « Ÿ • § « ® ßÄ ° Œx • • OÁ LnÛ¤ • P• ® + {
ô / > - Ÿ ¢ Ä . ® ÷ ä \ © O• " .

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```
>>>za[19:-7]
'Youzneed'
```

a[19:-7]• Ä © OÁ a[19]• ' Û¤ a[-7]P• ® + ° " . • O † a[-7]Á E • è © " .

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```
>>>zaz="20010331Rainy"
>>>zdatez=za[:8]
>>>zweatherz=za[8:]
>>>zdate
'20010331'
>>>zweather
'Rainy'
```

aª © • 8— Ä Û Ũ † > Æ(© x ¿ • " . Ê...° 7• '8'— x ‡ Î > a[:8], a[8:]LV ½ ó —
" . a[:8]Á a[8]• E • • ô¼ a[8:]Á a[8]— E x • 8— x ‡ Î > ž ' Ä
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'20010331' Hß ® Æ; è © Û Ũ £ 'Rainy' > Æ(© x ¿ — ÷ ä ‡ " .

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Æ; è © Rainy® # Û Ũ † > Æ(á ø " n ¢ • 1 f Ø " .

```
>>>zaz=z"20010331Rainy"
>>>year=z[:4]
>>>zday=z[4:8]
>>>zweather=z[8:]
>>>year
'2001'
>>>zday
'0331'
>>>zweather
'Rai ny'
```

– ö© 4Ÿ 8• ' 7• > "20010331Rainy"ª © • 8¬ # ÛÚŦ > Æ(© x¿¬ ÷ä‡".

• ¢• £ÑÒ Æª • Ò• Ãž¹ ÊÇ ÷x". £ÑÒ Æª • ÒÁ ¥> ±K¬¹
• \ ½óó© x¿• ñ Ã šóž¹ œî¬ž Ä™s ...

z

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/PithonO„. ¿» " /Python"Ÿj 1234?

– öï ¢• "Pithon"• ' • 8¬ "Python"Ŧ > T U á ø j Á{ ž Ò 1P? 6... ! f
à‰© " Á " n ¢¬ O• ".

```
>>>zaz=z"Pithon"
>>>za[1]
'i'
>>>za[1]z=z'y'
```

– ö•¹ ÷Û• „ aª © Af• "Pithon"• ' • 8¬ ÃB ¼ a[1]• ' §• 'i'ñP
a[1]¬ – öLV 'y'> T U j ‡"© "•". •Ÿ. © j Á{ Æj P?

ï œù • 3Ñ Æ¼ òu { µ O• "• • 3Ñ Æ© • ä© • 8– ¹ §Á Tá f Ø© §•
İ ñx • "• \ Tá f "©Ñ?ª©´¬ • © +•. ±8 Tá f "© O• "• •Ÿ
Ã¹ ÊÇ ÷xË Æª • Ò x¿¬ • óž¹ "Pithon"• ' • 8¬ "Python"Ŧ > Tá f Ø© x¿•
Ø".z

" n – ö® ÷•.

```
>>>zaz=z"Pithon"
>>>za[:1]
'p'
>>>za[2:]
'thon'
```



```
>>>za[:1]z+z'y'z+za[2:]
'Python'
```

ˆ — ö• 1 ÷ Û• Æª • Ö¬ • óž 1 ! f 'Pi thon'•ª © • 8¬ 'P'ÛÛ 'thon'ÛÛÎ >
Æâ f Ø× • ± ½•• 'y'ª © • ® " Ñ ä 'Python'•ª © • 8¬ Ý ø " .

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¿ » 56(Formatting)

• 8• 1 éĬ Ö 1 OĬ > © Æ, • 8 ã•ª © O• Ø" . • O¬ Û ×• Å¹
" n ¢Á • 8¬ CD © ¥> ±² ¬ < ÆÖ" ¼ Ñ, ž ÷• .

Úåæ Ö™© 18™Bñ" .Ü

• Ý †Q• • Æ¹ 20™Ñ " ø Ĭ KÝ ¢Á N¬ CD © ¥> ±² .

Úåæ Ö™© 20™Bñ" .Ü

• 3° ¥> ±² ¬ ĩ Á{ Ý f Ø©•• Åž¹ © " • +¼ CDž\© • 8• Ý \Ĭ ž
÷• . CD • 8Á ßÄ ¢Áō 20•ª © 7• Ý 18•ª © 7• Ý• "•" . • w{ • 8 è—
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½óĵ ¬ éĬ ÷• .

ö 1) 7• T> ÅB

```
>>>zprintz"Izeatz%dzapples."z%z3
Izeatz3zapples.
```

ˆ — ö6 . S¬ ÷ø é • Ý ˆ — ö© • 8 è• 3•ª © „ fS¬ ÈB © xĵ ¬
÷ä†" . ÈB1 3•ª © 7• © ÑN P• Ú%Û • " n• G¬" . ±| ¼ • 8 è• 3•ª ©
S¬ ž ¼ ÈÁ • | • "%d"ª © • ® ž ĩ \ " .

• Ý Ā • 8 è• 7• Ý žĬª © ĵ Ā " " . • S• © 7• ĀĀ • 8¬ ž ĩ ÷• .

ö 2) • 8 T> ÅB

```
>>>zprntz"lzeatz%szappl es: "z%z"fi ve"
lzeatzfi vezappl es.
```

- ¨Ý ö•¹ ÷© Ö ¢• •8 è• ¨ ¨ •8¬ ÈB x ¬ º¹ © Å¹ ½óÖÈ %d Ñ
İ Ñ %® ä¬ ê f Ø¨. ±w¨ ø - ¨Ý ¢Å ½ò> w• © ā" 1 f Ø¬ Ö• ¨. 7• ®
ÈB { ¬ º¹ © %® øÖ ¼ •8¬ ÈB x ¬ º¹ © %® øÖ ¨ ¨ © ½ò¬.

3) $7 \cdot A_f \geq \hat{A}B$

```
>>>znumber=z3
>>>zprintrz"lzeatz%dzapplies. "z"znumber
lzeatz3zapplies.
```

ö 1LV 7•® T> ÂB Æ ö 3LV 7•S¬ Æ; è© Af® ÂB Æ ÇÁ . Ñ ÆÔ¨ .
•ÿ ò6 ¥> ±K_•¹ •8 ã¬•ó © ÂÛÚ— Z © Af® ½ó°¨¨ .

±w'' ∅ • 8 • • ° Ñ Ĩ Ñ ä 3 — § ¬ È B ¼ È '' ∅ ; Á { ž Ö 1 P?

ö 4) Ä • — § ¬ ÔW

```
>>>znumber=z10
>>>zday=z"three"
>>>zprintz"lzeatz%dzapplies.zsozlzwaszsi ckzforz%sdays. "z"z(number,zday)
lzeatz10zapplies.zsozlzwaszsi ckzforzthreezdays.
```

ö 4LV Ä • — S- ŌW áø ¯ • 1 ÷ Ū• €• , % ¨ n• () ½•• ä€> pŪ ä
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```
-----
μú z ýy
-----
%s z z • 8 (String)
%c z z • ° (character)
%d z z, f (Integer)
%f z z ÛÈ¹ f (floating-point)
```

```
%o z z8ϕƒ
%x z z16ϕƒ
%% z Li teral % ( • ' %s' • )
-----
```

ä × ¹ æŋ Ø © OÁ %s æ μ ú > • OÁ j 5 ^ > + AW • Ñ ž " . - q + f • ö ® ± ž
2 £ ž ÷ • .

```
>>>zprintz"I zhavez%szappl es"z%z3
I zhavez3zappl es
>>>zprintz"Today szratezi sz%s"z%z3. 234
Today szratezi sz3. 234
```

3 ¬ • 8 è • È B á ø • 8 è • %d Ñ Ø j Ö ¼ 3. 234 ® È B á ø • 8 è • %f Ñ
Ø j Ö • Ÿ %s ® ½ ó ø • ~ O ¬ " • è ĩ ™ " . \ € ø %s © • È ĩ > %d, %f >
T ϕ × • " . ° a 1 ° %s ® ½ ó ø ¥ > ± ² 1 " ® F ¬ ® ĩ Ö Ö ĩ • Ÿ • 3 ©
Æ • è ¬ O • " .

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[8#] æā œÇ • %d Ÿ %® ϕ • ö © %%®

```
>>>zprintz"Errorzi sz%d%. "z%z98
```

ï œù . Š Ĩ > "Error is 98%." Ñ CD μ O • ° ¼ ö • Ÿ Ž • • Á • 3
S † • ® ÷ ä ‡ " . • ā © • 8 æ μ ú f %d Ÿ % Ñ ϕ Á • 8 è •
• æ ø %® Æ ; è × ~ ž ¹ © š ú † %% > ž Ö % > ö © ĵ f • Ø " . • x Ā
x { ž Ä j Ö ° " . • Ÿ • 8 è • %d ϕ Á æā œÇ • Ñ " Ĩ ø % © è >
G ä ™ " . " " .

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```
>>>zprintz"Errorzi sz%d%. "z%z98
Errorzi sz98%.
```

z

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7 ä ¶ ! -9 ¯ :

¯ • 1 ÷ x Û • %d, %s — æµú© • 8 è• j S¬ ÈB x ¯ ž 1 ½óé¬ è f
Ø ¯ ¯ • Ÿ æµú® 7• Ÿ EŸ ½ó ø äó { ½ó1 f Ø ¯ ¯ ¯ n— ö® ÷¼
° a ž ÷™s • .

ö 1) „ È h

```
>>>zprintz"%10s"z%z"hi "  
zzzzzzzhi  
^^^^^^^^^^
```

s "%10s"— ¶ © = • Ñ 10 £ • 8 Q• 1 % ÁĬ > „ È ¼ ± Ā— Æ*• © hĬ >
— Āª © — ¶ • ¯ ¯ ±w ¯ ø šĀĀ£ èĀ „ ĒĀ "%-10s"Ñ µ O• ¯ ¯ . 2£ž ÷• .

```
>>>zprintz"%-10szjane."z%z' hi ' z  
hi zzzzzzzzjane.  
^^^^^^^^^^
```

èĀĬ > „ È ¼ Æ*• © hĬ > èĭ n¬ î f Ø ¯ ¯ .

ö 2) 1 7\$ Üä

```
>>>zprintz"%0.4f"z%z3.42134234  
3.4213  
^^^^
```

s, 3.42134234® 1 f\$ 4\$ P• Ÿ Æ; è¼ È¬ Z • ¯ Ÿ ¢• ¬ ¯ ¯ . s ä x 1 ' . '—
— ¶ © 1 f\$ £9® + ¼ ± P— 7• 4© P• Æj 7• — f® +° ¯ ¯ . ' . 'Ā— 7• ©
• ¾— ö• 1 Ÿ ¢• %₀ Ā © èĀ „ È¬ + © 7• • ¯ ¯ .

z

```
>>>zprintz"%10.4f"z%z3.42134234  
3.4213  
^^^^
```

¯ — ö© 3.42134234ª © 7• ® 10 — • 8 Q• % ÁĬ > „ È ¼ 1 f\$Ā 4\$
• | P• Ÿ Ü† { © ö® ÷ä ‡ ¯ ¯ . ¯ — öŸ— &• \$Ā 7• ® % ÁĬ > „ È Ō ¯ ¯ ©
\$• ¯ ¯ .

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Ø © ... • Å ž 1 Û ž Ö 1 ½ ° • Ĩ è é • – Ĩ Ø ° ° . • ĩ ° ° ø ĩ † Ů ĩ | ¼ ĩ ² ĩ
B ™ S • .

z

z

• ħ » « ħ » ĩ 1 2 ° (upper)

```
>>>zaz=z"hi "  
>>>za.upper()  
'HI'
```

Å 1 o 1 f • 1 o 1 f Ñ • ħ Ĩ > Ñ • ¼ Ø © o 1 f ° ... E f Ñ Ø È O L V • 8 †
• ħ Ĩ > Ñ • ¼ Ø © ° ... E f • M Ø ° ° . ± O ĩ ½ ó × ° ž 1 © • 8 A f • «
P • ' ' ĩ Ñ Ô É ° ° n • ° ... E f • « ĩ ø \ ø ° ° ° . ° – ó – upper() E f © 1 • ® Å • >
T U ĩ † ° ° . Ÿ d • 8 • • ¶ Å • ° ø Ĩ ° ° ° A Å ™ ... ĩ Æ • è ĩ O • ° ° .

z

z

ħ » ; Ö ° ° ° (count)

```
>>>zaz=z"hobby"  
>>>za.count('b')  
2
```

• 8 r • ° b ° – f ® š W ° ° ° .

z

z

³ < 3 Ĩ ° 1 (find)

```
>>>zaz=z"Pythonzi szbestzchoi ce"  
>>>za.find('b')  
10
```

• 8 r • • 'b' Ñ L n Ĩ > Æ Ö ° – Ö ® š W ° ° ° . Ÿ d [© • Æ • 8 • • æ • è © ° ° ø
-1 ĩ š W ° ° ° .

z

z

3 < 31 - 2(index)

```
>>>zaz=z"Li fezi sztoozshort"
>>>za.index('t')
8
```

• 8 r • 't' Ñ Lnî > ÆÔ - Ô® šW° ". Ÿd [© • Æ • 8 • • æ • è © " ø
• 3® †É". - findEƒŸ " \$Á " © • ® [î á¼ ø • 3Ñ ° " ©
\$• " .

z

z

¿ » =A (join)

```
>>>za=z", "  
>>>za.join('abcd')  
'a, b, c, d'
```

"abcd"^a © • 8— " " — • ½• • Aƒ a— § £ ', '¬ ÈB° " .

z

z

¿ » « • ¿ » i 12⁻ (lower)

```
>>>zaz=z"HI "  
>>>za.lower()  
'hi '
```

Ã • ® ¹ • > T U i ‡ " .

z

z

>? < @ Æ - (Istrip)

```
>>>zaz="z"zhi"  
>>>za.lstrip()  
'hi'
```

• 8r ÑN ê Á— œÄ h ñ ßÄ • • " . ä x¹ lstrip• ¹ 'l'• —¶ © OÁ
left• " .

z

z

A9? < @ Œ ⁂ (rstrip)

```
>>>za="z"hi z"  
>>>za.rstrip()  
'hi'
```

• 8r ÑN % Á— œÄ h ñ ßÄ • • " . ä x¹ rstrip• ¹ 'r'• —¶ © OÁ
right• " .

z

z

B? < @ Œ ⁂ (strip)

```
>>>zaz="z"zhi z"  
>>>za.strip()  
'hi'
```

à Á— œÄ h ñ ßÄ • • " .

z

z

¿ » 12⁂ (replace)

```
>>>zaz="Li fezi sztoozshort"  
>>>za.replace("Li fe", z"Yourzleg")  
'Yourzlegzi sztoozshort'
```

replace(Tç{ μ • 8, T á • 8)L V ½óž¹ • 8 è— / „ ° § ñ " § Î > ŒWž
‡ " .

z
z

¿ » Û±⁻ (split)

```
>>>zaz="Li fezi sztoozshort"
>>>za.split()
['Li fe',z'is',z' too',z' short']
>>>zaz="a:b:c:d"
>>>za.split(':')
['a',z'b',z'c',z'd']
```

a.split()LVª«••İ-~§™žj\•ëĬøh¬x‡Ĭ>•8¬Æ(ı‡".
Yd a.split(':')LVª«••/„°S•Ø¬Z•©ª«•—S¬pÚ•>ž¹•8¬
Æ(ı‡".•Æy ŠĀı"9•ÆĬıŃ{".['Li fe', 'is', ' too', ' short']Æ ['a',
'b', 'c', 'd']©ı"9ª©OĖō®ĬŠ••#ùëĬĬO•ñ=-ÄZG•+™s•.

z
z

¿ »C • ¿ »« ıj 12⁻ (swapcase)

```
>>>zaz="Hi zman"
>>>za.swapcase()
'hI zMAN'
```

Ä•Ÿ¹•®¹>TUı‡".
¬•¹¹°•8¬...EfÄ•8Lı•¹½óĬ™Ń?ÁO•¼ăó°
O•".•ı•™MŃ•ŃØ•Ÿ•\½óó©OÄĬñ".

•ĬèëĬ÷xĖ•8¬...Ef®"nΦ•Ü>„ıŒ".
•8a—¬...Ef(äx¹ªª©Af©Æ→ý„°•8Af•")

ō	‡^
a.upper()	•8a®BA A•>TUı‡".
a.count(x)	•8ar xY...O©O—ōf®šW°".
a.find(x)	•8ar•xN Lnl>ÆO"O®šW°".ıĬø-1¬šW°".
a.index(x)	•8ar•xN Lnl>ÆO"O®šW°".ıĬø•3®†É".
a.join(s)	šª©•8—" "—¹•½•••8a®ĖB°".
a.lower()	•8a®BA¹•>TUı‡".

a.lstrip()	• 8 a— êA h¬ ßA • • "" .
a.rstrip()	• 8 a— % A h¬ ßA • • "" .
a.strip()	• 8 a— àA h¬ ßA • • "" .
a.replace(s, r)	• 8 a— s ^a © • 8¬ r • ^a © • 8> ÔW° "" .
a.split([s])	• 8 a® hI > Æ(i " 9S¬ " á ‡ "" .
a.swapcase()	• 8 a— A • © ¹ • > , ¹ • © A • > " " T U _i ‡ "" .

[3] á ĺ í (List)

• ĺ P• ĺ © 7• Ÿ • 8• Åž¹ ě Ĩ ÷ x¨. • Ÿ • 3° O > ¥> ± K_¬ xñ
Ûp° \$• ě¨. ö® ĺ 1Û¤ 10P• — 7• r ěf — ßÆ£ 1, 3, 5, 7, 9ª © • †¬
" ž ÷ •. • O ¬ 7• Æ • 8> Üå x© • Ñ ě¨. Ž•••© • 3° v E¬ ž¹
1 f Ø© • 45• • æ°¨. ± O• T> • Ó•¹ Û { µ ĺ " 9ª © O•¨.
ĺ " 9® • ó ø 1, 3, 5, 7, 9ª © 7• — ßÆ¬¨ n ¢• QR { Üå1 f Ø¨.

```
>>>zoddz=z[1,3,5,7,9]
```

ĺ " 9® Ÿ © ¨•¹ ÷ © O ¢• Åª « ([])> ög\¼•• ĺ Œ § Å òÜ>
pÚž ‡¨.z

ä 3 Ñ• ĺ " 9— ó t® Ê Ç ÷ ø¨¨ n ¢¨.

```
>>>zaz=z[]
>>>z bz=z[1,z2,z3]
>>>zcz=z['Li fe','z' is','z' too','z' short']
>>>zdz=z[1,z2,z'Li fe','z' is']
>>>zez=z[1,z2,z['Li fe','z' is']]
```

a LV ĺ " 9© Ĩ - O™ E • ě © Ĩ ĺ " 9([I])... f™ Ø¼ bLV 7• ® ± ¹ ŠĪ >
Ñ´ f™ Ø¼, cLV • 8¬ ¹ ŠĪ > Ñ´ f Ø¼ dLV 7• Ÿ • 8¬ EŸ ¹ ŠĪ >
Ñ´ f ØĪ) ° eLV ĺ " 9• ® ± ¹ ŠĪ > Ñ´ f™ Ø¨. s, ĺ " 9 ě • ©
ĺ à° • 45™ E† Ç f Ø¨.

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ĺ " 9— Z •™ • 8LV £ÑÒ Æª • Ò• Ñž¨. h • v ä...Ö. +> ýy ©
O÷¨ ě ĺ ö® °ª ž ÷ ø¹ ĺ " 9— x% p®® • ž © O•¨. ÅÅ5 £¤¥ ĺ ¤> ö®
°ª) ě Ĩ ÷ •.

z

ĺ " 9— µ* + ě Ĩ ÷ x
a Af• [1, 2, 3] •ª © §¬ #ã°¨.

```
>>>zaz=z[1,z2,z3]
>>>za
```

```
[1, z2, z3]
```

z

| " 9 † • 8•¹ LV EÑÒ• ĺó " .

```
>>>za[0]
```

```
1
```

a[0]© | " 9 'a'— § ¹ §¬ +° " .

z

ĭ K— ö© | " 9— § ¹ ∈ a[0]Ÿ # § ¹ ∈ a[2]— §¬ ž \ " .

```
>>>za[0]z+za[2]
```

```
4
```

• OÁ 1 + 3> ž ý ôĭ ¹ 4ª © §¬ CDž ‡ " .

z

• 8¬ Û1 • ¶ ě ĭ ÷ x• Ÿ ^_ ¨ © 7• ® 0Û ¨ # x • a[1]• | " 9 a—
§ ¹ Ñ ĭ ñª a[0]Ñ | " 9 a— § ¹ Æ¬ y¾ ™s • . a[-1]Á • 8•¹ Ÿ
€¾Ñ•> | " 9 a— €• , ¹ ® +° " .

```
>>>za[-1]
```

```
3
```

z

• §• © ĭ K— ö LV | " 9 a® 7• 1, 2, 3 " | " 9 ∈ ['a', 'b', 'c']® E ™s
Ÿ ĭ ÷ • .

```
>>>zaz=z[1, z2, z3, z['a', z' b', z' c']]
```

z

" n— ö® °ª ž ÷ • .

```
>>>za[0]
```

```
1
```

```
>>>za[-1]
['a',z'b',z'c']
>>>za[3]
['a',z'b',z'c']
```

Ö ° Ä> a[-1]Ä €•, ¹ §£ ['a', 'b', 'c']® Æ; Ó¨. a[3]© | " 9 a— » §
¹ ® Æ; è x • €•, ¹ ® Æ; è © a[-1] È...° . §¬ ÷ ä ‡¨.

± w¨ Ø ä x¹ | " 9 a• £ ['a', 'b', 'c']ª © | " 9— 'a'ª © §¬ £ÑÖ¬ • ó ä
ô• j m f Ø© x¿ Ä¨ ¬ P?
¨ n— ö® ÷™s •.

```
>>>za[-1][0]
'a'
```

¬ LV Ø 'a'® ô• j m f Ñ Ø¨. a[-1]Ä ['a', 'b', 'c']•¼¨ † • O— § ¹ ®
v 3‰x ¬ ž¹ [0]¬ Öä ‡ O¨.

z

İ K— ö™ † €¾Ñ• Z • /> • ž Ñ µ O¨.

```
>>>za[-1][1]
'b'
>>>za[-1][2]
'c'
```

®ĭ Á o • Ÿ¨ n— ö® °ª ž ÷•

```
>>>zaz=z[1,z2,z['a',z'b',z['Li fe',z'is']]
```

| " 9 a• • | " 9 ['a', 'b', ['Li fe', 'is']]ª © | " 9 Ñ £ ô j Ø¼ ± | " 9 •• †
| " 9 ['Li fe', 'is']ª © | " 9 Ñ £ ô j Ø¨. Är | " 9 p®•¨.

z

'Li fe'ª © • 8Ÿ¬ ô• j è x ¬ ž¹ ©¨ n ¢• ž Ö °¨.

```
>>>za[2][2][0]
'Li fe'
```

$$\begin{aligned} & \frac{1}{2} \cdot 9 - \frac{1}{2} \cdot 1 + \frac{1}{2} \cdot 1 \div x \\ & \cdot 8 \cdot 1 \cdot \dot{Y} \in \mathbb{N} \cdot \dot{\gamma} \mid \cdot 9 \cdot 1 \cdot \text{TM} \cdot \mathcal{A}^a \cdot \dot{\mathcal{O}} \times \mathcal{Z} \cdot \mathcal{Z} \cdot \mathcal{O} \cdot \cdot \cdot \mathcal{A}^a \cdot \dot{\mathcal{O}} \cdot \cdot^a \cdot \mathcal{O} \cdot \mathcal{O} \cdot \mathcal{A} \\ & \dot{U} \mathcal{A} \gamma \cdot \cdot \dot{U}^a \cdot \mathcal{O} \cdot \mathcal{A} \cdot \cdot^a \cdot \frac{1}{4} \cdot \dot{\mathcal{O}} \cdot \cdot \cdot \\ & \cdot \cdot \cdot \pm V \mid \cdot 9 - \mathcal{A}^a \cdot \dot{\mathcal{O}} \cdot \mathcal{A} \cdot \dot{\mathcal{Z}} \cdot \cdot \dot{\mathcal{E}} \cdot \mathcal{Q} \cdot \div \text{TM} \cdot \mathcal{S} \cdot \cdot \cdot \end{aligned}$$
$$\begin{aligned} & \cdot \text{O} \neg \quad \cdot 8 \cdot ^1 \tilde{\text{O}} \ddot{\text{E}} \times \text{C} \quad \check{\text{Z}}^1 \quad " \quad \check{\text{Z}} \div \cdot . \end{aligned}$$

Ä Ñ• Ñ Þ¼û È... { ½óé¬ w• © • ¶ yÖ ±¬ Ö• " . • 8• ¹ ÖÈ Ö ½óç • Þ¼û È... " .

$$M\tilde{N} \cdot \ddot{O}^{\oplus} \quad i \quad \div^{\text{TM}} S \quad \cdot \quad .$$
[illegible]

wiki docs.net PDF, page : 53

```
>>>zaz=z[1,z2,z3,z['a',z'b',z'c'],z4,z5]
>>>za[2:5]
[3,z['a',z'b',z'c'],z4]
>>>za[3][:2]
['a',z'b']
```

˘ — ö•¹ a[3]Á ['a', 'b', 'c']® Æ; è× • a[3][:2]© ['a', 'b', 'c']— a[0]•¹
a[2]P• — § z s, ['a', 'b']® Æ; è© | " 9Ñ " .

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ál í « ø#(+) D ø⁻ (*)

| " 9 † + x«® • óž¹ 1 fÑ Ø¼ * x«® • óž¹ š o¬ 1 fÑ Ø" .
• 8 €¾Ñ• > | " 9•¹ ™ ô©• ° § è| 2fž ÷ ™ s • .

ö 1) | " 9 † Ö×

```
>>>zaz=z[1,z2,z3]
>>>zbz=z[4,z5,z6]
>>>zaz+zb
[1,z2,z3,z4,z5,z6]
```

Ä — | " 9® ³+´ x«® • óž † Ö© x¿•" . | " 9 ½••¹ ³+´ x«© Ä —
| " 9® † Ö© xž¬ °" . • 8•¹ "abc" + "def" = "abcdef"Ñ ô© O ¢Ä • Ö•" .

z

ö 2) | " 9 š o

```
>>>zaz=z[1,z2,z3]
>>>zaz*z3
[1,z2,z3,z1,z2,z3,z1,z2,z3]
```

˘ •¹ ÷ Û• [1, 2, 3]•´ | " 9Ñ # § š o ôj t>• | " 9® Ÿ j è© O¬ î f
Ø" . • 8•¹ "abc" * 3 = "abcbcabcb" Ñ ô© O ¢Ä • Ö•" .

z

z

ál í ¶ ð ÝE¾ F"

>¼ - ¨ n— ö Å ¹ > æ̃ ò| ØÎ /> ° > ° > ò ž ÷• +¼ ö 1Û¤
ö 4P• &- Å> ¢ ž ÆÑÖ ° ¨ .

ö 1) | " 9 f, 1

```
>>>zaz=z[1,z2,z3]
>>>za[2]z=z4
>>>za
[1,z2,z4]
```

a[2]— ¹ § '3'¬ '4'> T U ¨ ¨ .

z

ö 2) | " 9 f, 2

```
>>>za[1:2]
[2]
>>>za[1:2]z=z['a','b','c']
>>>za
[1,z'a',z'b',z'c',z4]
```

a[1:2] © a[1]Û¤ a[2]P• ® + © Ö a[2]® E • è © ¨ ¼ ŒÎ /> a = [1, 2, 4]• ¹
2§ Ÿ¬ + ° ¨ ¨ . s, a[1:2]® ['a', 'b', 'c']> T U Î /> a | " 9• ¹ 2ª © § ÅÃ• ['a',
'b', 'c']ª © §¬ ÅB { ö © O• ¨ ¨ .

z

8# - ä × ¹ a[1] = ['a', 'b', 'c']ª ¼ © O © ¾¼ ¨ ¨ . §¬ ¶ {
Ö /> \ — ™s • . a[1] = ['a', 'b', 'c']© | " 9 a— Å § ¹ ®
['a', 'b', 'c']> T Ö ¨ © + • ¼ a[1:2]© a[1]• ¹ a[2]½• — | " 9® ['a',
'b', 'c']> T Ö ¨ © + • ¨ ¨ . °ª ¹ a[1] = ['a', 'b', 'c']LV ø ¬ Ÿ © I |
| " 9 aÑ [1, ['a', 'b', 'c'], 4]ª © § Î > A { ¨ ¨ .

z

ö 3) | " 9 ¹ ÷ 61

```
>>>za[1:3]z=z[]
>>>za
[1,z'c',z4]
```

• l P• — | " 9 a— SÄ [1, 'a', 'b', 'c', 4]¬". ä × 1 a[1:3]Ä a[1]Ü¤ a[3]P• ®
 Æ; è / > a[1:3] Ä ['a', 'b']• ". ± ¯ ö ¯ — ö • 1 ÷ Û • a[1:3]¬ []Î > T U j \ ×
 • a © a • 1 ['a', 'b']Ñ ½ª ¢ [1, 'c', 4]Ñ ö © O • " .

z

ö 4) | " 9 1 ÷ 6 2

```
>>>za
[1,z'c',z4]
>>>zdel za[1]
>>>za
[1,z4]
```

del a[x]© x\$ 1 S¬ ÷ 6° ". del Ef© Ž•••• • ħ Î > Ñ• ¼ Ø© è N Ef>
 " n ¢ • ½ö ö j ¢ " .

del ½

(> ¼ - ½ ' Ž•••• 1 ½ö ö © B+ • 45¬ +° " .)

del a[x:y]© x\$ Ü¤ y\$ 1 ½• — S¬ ÷ 6° ". ö 4• 1 © a[1]¬ ÷ 6 © x ħ ¬
 ÷ ð ‡ " .

z

[8#] Æ ÷ Ñ l × € • | " 9 œ Ç %
 „ " n ¢ Ä ö ® ! f Ÿ j ÷ • .

```
>>>zaz=z[1,z2,z3]
>>>za[2]z+z"hi "
Tracebackz(innermostzlast):
Filez"",zlinez1,zinz?
a[2]z+z"hi "
TypeError:znumberzcoercionzfailed
```

TypeError • 3Ñ Ö" . • 3— > £Ä -P?a[2]© 3•ª © „ f £ ö
 "hi"© • 8• " . Ä S(„ f Ÿ • 8)¬ ° " © OÄ ² ħ Î > O• è ©
 x ħ • " . z ± K¹ Type • 3Ñ © O• " . z7• Ÿ • 8¬ 1 f © " " .

Ÿd 7•Ÿ •8↵ ž 1 '3hi'LV Ÿ ¼ È" ø 7• 3↵ • '3'Î >
TU_i _i Ö ° " .

± x¿ • © Ä Ñ• Ñ Ø" .

```
>>>zstr(a[2])z+z"hi"  
>>>z`a[2]`z+z"hi"
```

§ x¿ Ä str Ef> „ f® • 8> TU_i \© x¿ • ¼ Ä § x¿ Ä
(^ˆ) Back Quote • ® • ó° OEö, ^ˆ• 1 Back Quote • (^ˆ)© str Ef®
½ó° O Þ¾ü È...° . §↵ ^ˆá‡" .

z

z

áĭ í GH ö®

• 8 €¾Ñ•> | " 9 Afy P• '.'↵ Öä 1 ä 3 Ñ• | " 9— ^ˆ... Ef ↵ • ó 1
fÑ Ø" . äó { G• © | " 9 ^ˆ... Ef M Ñ•• Äž 1 Ÿ èĭ ÷x> • .

z

z

áĭ í £ ©• > š (append)

append— Ä• - . £• • " ø ĭ K— öÑ ĭ x • ž Ñ µ O• " . append(x)© | " 9— ø
€• , • x® " Ñ†v© Ef• " .

```
>>>zaz=z[1,z2,z3]z  
>>>za.append(4)  
>>>za  
[1,z2,z3,z4]
```

z

| " 9è• © ĭ • 45™ " Ñ†Ç fÑ Ø" . ĭ K— ö© | " 9• " † | " 9® " Ñ†É
• ® ÷ä‡" .

```
>>>za.append([5,6])  
>>>za
```

```
[1, z2, z3, z4, z[5, z6]]
```

álí (sort)

sort E f © | " 9 — ¹ ® Ø¹ Å> „ Ě ä „ Ě Š ħ ⁀ á ‡ ⁀ .

```
>>>zaz=z[1, z4, z3, z2]
>>>za.sort()
>>>za
[1, z2, z3, z4]
```

z

• † €¾Ñ•> êŽ⁀ Ø¹> „ Ě• Ñž ⁀ .

```
>>>zaz=z['a', z'c', z'b']
>>>za.sort()
>>>za
['a', z'b', z'c']
```

z

• 8 7• Ñ ùäØ© Z • ™ Ø¹ Å> „ ĚEħ ÷ä ‡ ⁀ .

```
>>>zaz=z['abc', z123, z'youzneedzpython']
>>>za.sort()
>>>za
[123, z'abc', z'youzneedzpython']
```

7• Ñ ÑN Ã• %o{ ó¼ • 8— Z © • 8L| " " — § • Û¤ ž¹ < Á
Oħ Ã• %o{ ° ⁀ . ⁀ — Z • ¹ © 123• 7• • ñP ÑN ! f %o¼ ⁀ n• 'abc'Ÿ 'you need
python'• ' • 8— § • £ 'a' Ÿ 'y'® ! f ä 'a'Ñ 'y' ÷ ⁀ < Á §• x •
'abc'ª © • 8ħ 7• ⁀ n• ú© O• ⁀ .

3.1.1 reverse()

reverse() returns a new list that is a reverse of the original list. It does not modify the original list.

```
>>>zaz=z['a','z','c','z','b']
>>>za.reverse()
>>>za
['b','z','c','z','a']
```

3.1.2 index()

index() returns the index of the first occurrence of the specified value.

```
>>>zaz=z[1,2,3]
>>>za.index(3)
2
>>>za.index(1)
0
```

index() raises a ValueError if the specified value is not found in the list.

z

index() returns the index of the first occurrence of the specified value.

```
>>>za.index(0)z
Traceback (innermost last):
File "<stdin>", line 1, in <module>
a.index(0)
ValueError: 0 is not in list
```

Traceback (innermost last):

z

3.1.3 insert()

insert() inserts an element at the specified index.

```
>>>zaz=z[1, 2, 3]
>>>za.insert(0, z4)
[4, z1, z2, z3]
```

– Ö•¹©0\$ •|s \$ •|•4ª©\$¬ÈBª©Ä•".

z

İK—Ö©| " 9 a— a[3], s » \$ •|•5ª©\$¬ÈBª©Ä•".

```
>>>za.insert(3, z5)
[4, z1, z2, z5, z3]
```

z

ál í ©• " M (remove)

remove(x)© \$ Æ%© x ® ÷ 6 © E f•". İK—Ö© aŃ3ª©\$¬Ä Ń•¼
 Ø¬Z \$ 3Ÿ¬6? © O¬÷ä‡".

```
>>>zaz=z[1, 2, 3, 1, 2, 3]
>>>za.remove(3)
[1, z2, z1, z2, z3]
```

ˆ† 3¬÷6°".

```
>>>za.remove(3)
[1, z2, z1, z2]
```

z

ál í ©• NK! ¬ (pop)

pop() E f©| " 9—ø€•, ¹®¬á\¼± ¹©÷6°".

```
>>>zaz=z[1, 2, 3]
>>>za.pop()
3
>>>za
[1, z2]
```

– Ö•¹ ÷ Û• a | " 9 [1,2,3]•¹ 3¬ô•| è|¹ | E¿İ> [1, 2]Ÿ—© O¬î f
 Ø".

z

pop(x) @ | " 9 — xS 1 ® ¯ á \ ¼ ± 1 © ÷ 6 ° ¨ .

```
>>>zaz=z[1,2,3]
>>>za.pop(1)
2
>>>za
[1,z3]
```

¯ — ö • 1 ÷ Û • a.pop(1) © a[1] — S ¯ ö • ¡ ö ¨ .

z

; ö ¨ ¨ (count)

count(x) © | " 9 r • 1 xÑ M Ø © • ® ® ½ ä ± ö f ® ¯ á \ © E f • ¨ .

```
>>>zaz=z[1,2,3,1]
>>>za.count(1)
2
```

¯ — ö • 1 © 1 • ª © S • | " 9 a • Ä Ñ ¡ Ø Í / > 2 ® ¯ á ‡ ¨ .

z

á ĩ í OP(extend)

extend(x) • 1 x • © | " 9 Ÿ j f Ø ¨ . > K — a | " 9 • x | " 9 ® { ¨ ¨ .

```
>>>zaz=z[1,2,3]
>>>za.extend([4,5])
>>>za
[1,z2,z3,z4,z5]
```

a.extend([4,5]) © a + [4,5] Ÿ È ... ¨ ¨ .

û ¨ ¨ nÄ ¯ • 1 ê ĩ % ¨ | " 9 • ¯ ... ° E f ¯ Û > Ÿ ¡ % ¨ O • ¨ ¨ .
| " 9 a — ¯ ... E f (ä × 1 aª © A f © Æ → ý ¨ ° | " 9 A f • ¨ ¨ .)

ö	‡ ^
a.append(x)	" 9 a — € • , • x" N
a.sort()	" 9 a ® ¨ E
a.reverse()	" 9 a — Ø¹ ® ? U > Y + ¨ ¨ .
a.index(x)	" 9 a • 1 x ® [1 ± ¯ Ö Š W

a.insert(i, x)	$i \in [0, n-1] \wedge x \in E$
a.remove(x)	$x \in E \wedge \exists i \in [0, n-1] : a[i] = x$
a.pop()	$n > 0 \wedge \exists i \in [0, n-1] : a[i] = x$ $\wedge x \in E$
a.count(x)	$x \in E \wedge \exists i \in [0, n-1] : a[i] = x$
a.extend(x)	$x \in E \wedge \exists i \in [0, n-1] : a[i] = x$

[4] ™Q (tuple)

α: © ù: •ª¼ Û ¨.

α: •' | " 9Ý M Ñ• \$¬ 6ì & ß+ O• È... ¨. ± ¨ \$Á ¨ n ¢¨.

< | " 9© '[' ']' Î > 23g•Ý α: Á '(' '')Î > 23Ã¨.

< | " 9© ± §¬ (E, ÷6, f„ • Ñž •Ý α: Á ± §¬ AÄ†Ç f ¨¨.

z

α: Á ¨ n ¢Á ßî • ¨.

```
>>>zt1z=z()
>>>zt2z=z(1,)
>>>zt3z=z(1,2,3)
>>>zt4z=z1,2,3
>>>zt5z=z('a',z'b',z('ab',z'cd'))
```

| " 9Ý ótÑ?— ý •Ý, /•1 Ý° \$•ªø R• ° — ¹Ý¬ ¶© α: Á t2 = (1,)LV ° — ¹Ý ± P• ä€('')® žĭ Ö ° ¨ © \$ » § ÷x t4 = 1, 2, 3 LVª « ()® ° ž™ - x ¨ © \$• ¨.

Yþ ÷ø α: | " 9© ý° 1¬ ° ¨. •Ý ¥> ±K¬ 1 α: | " 9© þÚž¹ ½ó ©O• āĭ ¨. α: | " 9— ÑNĭ &• © §¬ AÄ†Ç f Ø© • ¨ © • — &ª¼ Ö¨. | " 9— ° ĭ ŠÁ AÄÑ Ñž ¼ α: — ° ĭ ŠÁ AÄÑ vÑž ¨. °ª¹ ¥> ±²• ¢ ©© È• ± §• ° A • ëx® T' ¨ø © TÿP „ ¼ È• ë¨ø \f • +¼ α: ¬ ½óžÖ 1 O• ¨. •Ý© šÄ> f†> ± §¬ AÄ†ÄÖ 1 Zªø | " 9® ½óžÖ ° ¨. ò6 ¥> ±²• ¹ © R ĴÎ > α: ÷¨ © | " 9® Š< é• G{ ¨.

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z

™Q¶ μ*+, , „ +, ø⁻ c D

§¬ AÄ†Ç f ¨¨ © \$Ý 6ì ø | " 9Ý Þ¼û È... /> QR { Ý ÈÇ ÷x> •.

Ĭ K— ö6© ¹> æ⁻ ôĭ ØĬ /> ö1Û α &- Ä> f ž ÷x® T' ¨.

z

ö 1) EÑÖ

```
>>>zt1z=z(1,z2,z'a',z'b')
>>>zt1[0]
1
>>>zt1[3]
```

'b'

• 8, | " 9Ý €¾Ñ• > t1[0], t1[3]LV EÑÖ• Ñž " .

z

ö 2) Æ^a • Öz

```
>>>zt1z=z(1,z2,z'a',z'b')
>>>zt1[1:]
(2,z'a',z'b')
```

Æ^a • Ö— ö • " .

z

ö 3) ¨: ×(†)z

```
>>>zt2z=z(3,z4)
>>>zt1z+zt2
(1,z2,z'a',z'b',z3,z4)
```

¨: ¬ † © x¿ ¬ ÷ ä ‡ " .

z

ö 4) ¨: ©(š o)z

```
>>>zt2z*z3
(3,z4,z3,z4,z3,z4)
```

¨: — ©(š o)¬ ÷ ä ‡ " .

z

¨: — ¹ Š Á AZ†Ç f " " ¨: — ¹ Š Á ° Š „ ø • ?Æ AZ1 f " " . " n•
¹ © Ä — ö® Ê Ç÷ø > • ž Ñ €ö O• " .

ö 1) ¨: ¹ • á¼ 1 — • 3

```
>>>zdel zt1[0]
Traceback(z(innermostzlast):
Filez"",zlinez1,zinz?del zt1[0]
```



```
TypeError: zobjectzdoesn' tzsupportzi temzdel etion
```

```
α: — ¹ ® | “ 9LV del Ef> • á¼ ° Ö• ” .  
α: Ä ¹ ® • © - Ñ • > Ö• ë©” © St• ® 2£ 1 f Ø” .
```

z

ö 2) α: ¹ § AZ† • 3

```
>>>z1[0]z=z'c'  
Tracebackz(innermostzlast):  
Filez"",zlinez1,zinz?t1[0]z=z'c'  
TypeError: zobjectzdoesn' tzsupportzi temzassignment
```

```
α: — ¹ § ↯ AZ á¼ ž™ €¼Ñ• > • 3Ñ © O↯ 2£1 f Ø” .
```

[5] RST á (Dictionary)

3 ½@´¬ ö> ø (þ+• Ü•«Ü = Ü =ËÜ, Ü ...Ü = ÜM ^ M ...Ü Î > þÜ1
f Ø¨. Ž•• Å e| {™ • 3° Å}¨' ® • 45Î > Ý¨¨. • OÁ æ Æ%© ÅÜÜ—
Šj¨™ ¶¼ Ø© • 45Î > Associative array, Hashª ¼™ √¨¨.

; <=|´ Rj ±Å> žý ø ½¾•´ Å¨¨. s, people •´ Rj • ¾½@´, baseball
•ª © Rj • ¾ Öþ´ª © Å• Ü†öÜ• ; <=| © KeyÝ Valueª © Ö¬ ° Î > ¶©
• 45¨¨¨.¨ — ö•¹ ÷ø KeyŃ 'baseball'•ª ø Value© 'Öþ'Ń µ Ö¨¨.

; <=| © |¨ 9Æ ¢: LV Ø&¿Î > (sequential) žÿ¨¹ Š¬ þ • ë¼ key® ±ž
value® É©¨¨. ; <=| — ŃŃ Ĩ /Öªª ø key> value® Éj Ö¨ © \$¨¨. baseball•´
Rj — Å¬ [×¨ž¹ ½¾— èó¬ Ø&¿Î > BÄ¨¨ © Ö• Ĩ Ńª baseball•ª ©
Rj Ń Ø© ÖÝ¬¨ : ÷© Ö¨¨.

z

z

RST áß | Uó VW¨ X?

¨ nÁ ×%¿É ; <=| — BÎ¨¨¨.

```
{Key1: Value1, zKey2: Val ue2, zKey3: Val ue3, , , }
```

s, KeyÝ Value¨¨ • ä 3 Ń¨'{'¨' }Î > 23g•¼¨¨ — ¯¹ © Key : Value5^ >
• Åj â Ø¼ öÜ('¨')> þÜöj â Øn¬ ĩ f¨¨¨.

z

¨ n— ; <=| ö® ÷™s¨¨.

```
>>>zdi cz=z{' name': 'pey', z' phone': '0119993323', z' bi rth': z' 1118' }
```

¨ •¹ key©¨¨¨ ¾ name´, ¾ phone´, ¾ birth´ • ¼ ±• žÿ¨¨ © value© ¾ pey´,
¾ 0119993323´, ¾ 1118´¨¨¨.z

z

• Ö¬ ÷ × f{¨¨• ĩ > Ýj ÷ ×¨¨.

<; <=| dic— ¨ ÷>

key	value
name	pey
phone	01199993323
birth	1118

z

```
>>>zaz=z{1:z'hi'}
```

˘ — ö© Key> „ f§ 1¬ Value> 'hi'' • 8¬ ½ó° ö•˘˘.

z

```
>>>zaz=z{z'a':z[1,2,3]}
```

° ˘ — öLV Value• | " 9™ ž¬ f Ø˘˘.

z

z

RSTá • èØ˘

; <=| © \> j O¬ Üâ © ö ö f Ø¬P?ª© — • O•˘˘. 4y— ½©• Ø©ö
" " — ½©— /x® Üâ1 f Ø© fÁ x¿• Âž¹ " ž ÷•˘. | " 9Æ • 8> ©
Üâ xŃ ĩ ũ P˘> ö O•˘˘. • Ÿ ž••—; <=| ® ½ó°˘˘ Ø˘ — ¬ Üâ ©
OÁ „ + ˘˘.

z

˘˘ n— ö® ÷•˘.

```
{Ü =ËÜ:Ü gÿÜ,zÜÆ „ Ü:Ü\ ´Ü,zÜóÄ° Ü:Ü =´Ü,zÜ˘™Ü:Üž••Ü}
```

½©• « /x® ° Ĩ> ©; <=| •˘˘. „ + Q • ëÄŃ?• ĩ è | ©; <=| ®
Ÿú© x¿• Âž¹ Ÿ ÊÇ ÷x©ö • O ¬ 6Ä> Fó x˘˘ ž¹ ëĭ Ö 1 O • Ø˘˘.
±O • Âž¹ ëĭ ÷™S •˘˘.

z

z

Key„ èØ& ValueY˘

˘˘ n— ö® °ª ž ÷™S •˘˘.

```
>>>zgradez=z{'pey':z10,z'juliet':z99}  
>>>zgrade['pey']  
10  
>>>zgrade['juliet']  
99
```

| " 9Æ ¨: •Æ • 8Ä ¹ §¬ Éj èx˘˘ ž¹ £ŃÖ•ÆÆª•Ö•ª© x¿¬ ½óÖ•Ÿ
<=| © R ° Ń• — x¿Ÿ• Ø¬ ö•˘˘. T> Key® • óž¹ Value® Éj è© x¿•˘˘.

┌ ─ ¨• ¹ L V Value® É × ┌ ¨ ž ¹ © " ; <=┘ A f [Key]"Ÿ ¢ • ¨ ä Value® É ┌ f Ø" .

z

MÑ• ¨® ÷™S • .

```
>>>zaz=z{1:'a',z2:'b' }
>>>za[1]
'a'
>>>za[2]
'b'
```

! f aª © A f• {1:'a', 2:'b'}ª © ; <=┘ ® ÄB ┌" . ┌ ─ ¨• ¹ ÷ Û• a[1]Ä 'a'ª ©
S ┌ ┌ á þ" . ä × ¹ a[1]• ─¶ © OÄ ┘ " 9Æ ¢: ─ a[1] © Ÿ \ " O• " . ä × ¹ [
] • ─ 7• 1Ä MS ┌ ¹ ® Ä © O• Ÿ ñª Key• ž Ÿ © 1┌ Æ; Ó" . ; <=┘ ©
┘ " 9Æ ¢: ─ ÉÑÒ x ¨• ' O• • æ • ë ©" . °ª ¹ a[1]Ä ; <=┘ {1:'a', 2:'b'}• ¹
KeyÑ 1ÉO┌ ValueÉ 'a'® ┌ á \ { " . a[2] ┘ €¾Ñ• • " .

z

```
>>>zaz=z{'a':1,z'b':2}
>>>za['a']
1
>>>za['b']
2z
```

• S• © aª © A f• ┌• ¹ ½óÖÉ ; <=┘ ─ KeyŸ Value® P• ┘ úÄ ; <=┘ ® ÄBž
÷ × " . ┘ a['a'], a['b']LV Key® • óž ¹ Value® É ┌ f Ø" . • " ┘ ž ÷ Ø ; <=┘
a © a[Key] LV ž ¹ Key• ž Ÿ © Value® É ┌ f Ø" .

z

" nÄ ┌• ¹ ° S S ÖÉ ; <=┘ Éō Key® • ó ¨ä Value® É © x ¨ ┌ ó ÷ ä \ ¼ Ø" .

```
>>>zdi cz=z{'name': 'pey',z'phone': '0119993323',z'birth':z'1118' }
>>>zdi c['name']
'pey'
>>>zdi c['phone']
'0119993323'
>>>zdi c['birth']
'1118'z
```

z

•

RSTá Z > š, F" Ø⁻

; <=| → " Ñ © x ž Ā Key® • ó ž Value® « CÖĚ OLV t > • Key• Value®
ý „ Ø T> ; <=| • " Ñ " . ö 1Ü¤ ö 3P• © ; <=| ® " Ñ © ö® ÷ ä ‡ " .
; <=| © Ø¹ ® ° • • ë © " . ö • ¹ è f ØÛ • " Ñö© Ø¹ © > f • " " . r ° OĀ
Ú- . • " Ñö © ÑÛ • " .

z

" n— ö® EŸ ° a ž ÷ • .

ö 1) ; <=| → " Ñ1

```
>>>zaz=z{1:z'a' }  
>>>za[2]z=z'b'  
>>>za  
{2:z'b',z1:z'a' }
```

{1: 'a' }^a © ; <=| • a[2] = 'b'Ÿ © • ½óž¹ 2 : 'b' ^a © ; <=| → " Ñ → " .

z

ö 2) ; <=| → " Ñ2

```
>>>za['name' ]z=z'pey'  
{'name': 'pey',z2:z'b',z1:z'a' }z
```

; <=| a• 'name': 'pey'^a © → " Ñ° ßî • " .

z

ö 3) ; <=| → " Ñ3

```
>>>za[3]z=z[1,2,3]  
{'name':z'pey',z3:z[1,z2,z3],z2:z'b',z1:z'a' }z
```

Key© 3 Value© [1, 2, 3]→ Ñ• © ° → " Ñ → " .

z

ö 4) ; <=| → ¹ ÷ 6 1

```
>>>zdel za[1]  
>>>za  
{'name':z'pey',z3:z[1,z2,z3],z2:z'b' }z
```



```
>>>zaz=z{'name':z'pey',z'phone':z'0119993323',z'birth':z'1118'}
>>>za.keys()
['birth',z' name',z' phone']
```

a.keys() ; <=| a— KeyŸ↦ Bİ 1 | " 9> Ÿ+"" . Ÿ | ¢ | " 9 1 — Ø¹ © ... °
 ~ f • Ø© O• İ ħª • °ª 1 TÇ{ "" . °ª 1 w• — . S — — ö6— . S E
 ['birth', 'name', 'phone']Ø¹ © TŸ f™ Ø"" . ; <=| © Key> value® [x • ± Ø¹ ©
 - • è ©"" .

z

Valueáİ İ Ç®- (values)

```
>>>za.values()
['1118',z'pey',z'0119993323']
```

€¼Ñ• x¿ İ > valueŸ↦ É¼ È"" Ø a.values()LV values Ef® ½ó Ø "" .

.

Key, Value Z Y- (items)

```
>>>za.items()
[('birth',z'1118'),z('name',z'pey'),z('phone',z'011993323')]
```

items Ef© keyŸ value— ↦ ¢: > Á S↦ | " 9> - á ±"" .

.

Key: Value Z ↦[ÇE- (clear)

```
>>>za.clear()
>>>za
{}
```

clear() Ef© ; <=| • — B+ ¹ ® ÷ 6° "" . - • 1 ÷ Ů• İ | " 9Ñ [] İ ¢: • ()E
 O €¼Ñ• > İ ; <=| ™ {} ¢• Üä "" .

.

Keyİ ValueY- (get)

```
>>>zaz=z{' name': 'pey', 'z' phone': '0119993323', 'z' bi rth': z' 1118' }
>>>za.get(' name')
'pey'
>>>za.get(' phone')
'0119993323' z
```

get(x) Ef © xª © key• Å} ô© value® ¯ á ± ¨. Å¹ ÊÇ ÷ x Û• a.get(' name')Å
a[' name']LV ½ó © O Þ¼û Ê...º . Ş ¯ ¯ á © ¨. j O ¯ ½ó ©Ñ© w• —
„ • ¨ ¨.

\ KeyŞ ÖBÆ • (has_key)

```
>>>zaz=z{' name': 'pey', 'z' phone': '0119993323', 'z' bi rth': z' 1118' }
>>>za.has_key(' name')
True
>>>za.has_key(' email')
False
```

a.has_key(x) Ef © ; <=| a• xª © keyÑ • æ ©• — >, ?@ ¯ QR ä • æ ø 1 ¯
• æ • è© ¨ ø 0 ¯ Ş Wº ¨ ¨.

.Z.

¯ • ¹ ÊÇ%º ; <=| ¯ ... Ef® ¨ | ä Ü> Ÿ j ÷ x ¨ ¨.
; <=| ¯ ¯ ... Ef (ä x¹ aª © Af© Æ→ ý ¨ º ; <=| Af• ¨ ¨.)

ø	±*
a.keys()	<= a— Key ¯ ßI ũA " 9® ¯ á ± ¨ ¨.
a.values()	<= a— Value ¯ ßI ũA " 9® ¯ á ± ¨ ¨.
a.items()	<= a— (Key, Value) — ¨: ¯ ßI ũA " 9® ¯ á ± ¨ ¨.
a.clear()	<= a— ß+ Key: Value ¯ ÷ 6º ¨ ¨.
a.get(x)	<= a— KeyN xE O— Value® ¯ á ± ¨ ¨.
a.has_key(x)	<= a• xª © KeyN Ø©• ®½ ä >, ?@ ¯ ¯ á ± ¨ ¨.

Z

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; <=| • Åž¹ êĬ ÷ x ¨ ¨. ä xP• ó ºª Ö w•ª ø Ž••• Åž¹ Åº 50% „™
Ĭ SÖ º¼ ÷ Ĭ™ ¨ ¨. ±Ÿ] ¯ • ¹ Ş º • 45 Å r ¯ x ¨ ¨. Ũ• Ø© ö6 Ÿ
ºª • +¼ èĬ ä3 Ñ• ö ¯ Ÿ j ÷ ¼ ¨ ¨ 9ž Ñ) šoz¹ ¯ — • 45 •
» , ž• x® Ĭ Ũº ¨ ¨. \€ ø • 45Á ¥> ±² — #Q• öx ¨ ¨. 2ò { ž ú• èĬ ø

$$f \dot{A} \propto \pm^2 \propto \ddot{Y} \quad f''' \propto \ddot{X} \quad \bullet \quad \ddot{X}.$$

[6] 8¾ M]

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®l • ° +LV | • Ÿ > ?@Á Úýù Ø“. • OÁ r) • \ G• { “.
• 45— > ?@¬ pÚ@© x‡¬ “n ¢• Ü> „ | Ö“.

» ¼½	8 or M]
"""N N • 8 (ö: "python")	>
"""	? @
[]N N " 9 (ö: [1,2,3])	>
[]	? @
()	? @
{}	? @
0 • N 7• (ö: 1)	>
0	? @
None	? @

z
• 8, | " 9, ¢: , ; <=| — S• | Øí ø(" ", [], (), {}) ? @• “. ĩ œü j
Ø• ëĪ ø >• “. 7• • 1 © ± S• 0... ? @• “. — Ü® ÷ ø None• ' O•
Ø©ö • O• Åž¹ © ĩ ëÄ ÅZG• +™s •. ±f None• ' OÁ ? @¬ Å° “ ¼Ÿ
ëĪ Ä•.

z
“ n— ö® ÷ ¼ > ? @• ¥> ±² • ¹ j Á{ G• ©• • Åž¹ QRù ëĪ ÷ •.

```
>>>zaz=z[1,2,3,4]
>>>whi leza:
...zzzzza.pop()
...
4
3
2
1
```

! f a = [1,2,3,4]^a © | " 9® Æ Ÿ “.

z
while Á P• ¹ • #ù “ Å • Ÿ QRù ëĪ ÷ ø “n ¢“.

```
whilez<®x >:
zzz<f 1z N>
```

```

<@x > >£ Ě•• <f 1 N>¬ ' Å f °". s, - — ö•¹ ÷ø aÑ >£ Z •
a.pop()¬ ' Å ò ª © —¶•". a.pop()•' Ef© | " 9 a— €•, ¹ ® ö•j è©
Ef•/> aÑ >£ Ě•(| " 9 è• ¹ Ñ•æ © °)• €•, ¹ ® ' Åž¹ ö•j m
O•". ç • ö•j m O•" Î ø aÑ Ĩ | " 9([])Ñ öj ?@• µ O•". ° a ¹
while Å ?@• —ž¹ r• ". - •¹ %ö© Ž•• ¥> ±K_•¹ • \ G•© xžr
Æ•".

```

z

```

- — öÑ =- o " ¼ " © w•© " n— ö® ÷ø { •žÑ µ O•".

```

```

>>>zi fz[]:
.z.z.zzzzzprintz"True"
.z.z.zelse:
.z.z.zzzzzprintz"False"
.z.z.
False

```

```

if • Åž¹ ó ß•© w•ª™ - — N¬ " n ¢•žý © ð - | Ñ "¬ O•".
(if • Åž¹ © T> ®ĭ Š•• #ù " Å{ "•.) Ÿd []Ñ >•ø "True"ª © • 8¬
CD ¼ ±w• ëĬ ø "False"ª © • 8¬ CDžª. []© - — " •i •¹ ÷Û• ?@• x
• ÚFalse"• • 8• CD "•.z

```

z

```

>>>zi fz[1,2,3]:
.z.z.zzzzzprintz"True"
.z.z.zelse:
.z.z.zzzzzpri ntz"False"
.z.z.
True

```

```

- µú® žýž ÷ø " n ¢". Ÿd [1,2,3]• >•ø "True"ª © • 8¬ CD ¼ ±w•
ëĬ ø "False"ª © • 8¬ CDžª. [1,2,3]Å ¹ Š• Ø© | " 9• x • >•". ° a ¹
"True"® CD° ".

```

[7] Ýð

| © • ¶ Af ↦ ½óž »". " n öÝ ¢Á a, b, c® Ž•• Af^a ¼ ° ".

```
>>>zaz=z1z
>>>zbz=z"python"
>>>zcz=z[1,2,3]
```

Af® Ý © ¯ — ö• ¹ Ý ¢• '=' (assignment) × « ® ½ó° ".

z

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ë©" ø ±8 x= j ™ - x ". Ž••• Ãž¹ Û " ÷ø •œ" ×{ ê { μ O• ".

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Af© ½ ® Ñ| v© O• ". ½ ' | Ñ • ĩ è ÷ ĩ »Ē • 45↦ E° Ž••• ¹
½óó© ± ß+ O↦ + © +• ".

```
>>>zaz=z3
```

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Sß| • ¤ ". a© Af • «Î > ¹ 3•^a © „ f5 ½ Ñ fN Sß| ¯ Ô® Ñ| v{
". s, a© ù} ~ " (Reference)• ".

z

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```
a --> 3
```

zs, a^a © Af© 3•^a © „ f5 ½ ® Ñ| v ¼ Ø".

z

" n ö® ÷ •.

```
>>>zaz=z3
>>>zbz=z3
>>>zazi=szb
```

True

zāÑ 3¬ Ñ| √¼ b™ 3¬ Ñ| É". s a = 3¬ BD © ØQ 3•ª © „ f 5 ½ Ñ Œô¼
Af a© 3•' ½ — SB| Š•® Ñ| É". " n• Af bÑ È...° ½ £ 3¬ Ñ| É".

s 3•ª © „ f 5 ½ ® Ñ| √¼ Ø© Af© 2 Ñ " . • Ä Af© Ñ| √¼ Ø© Ā •
È... " . °ª 1 È...° ½ ® Ñ| √¼ Ø©• Ĩ Ñ•• Āž¹ QR © Ž•• èNEfE is
Ef® a is bLV ò Ō¬ >(True)¬ | ® { " . 3•ª © ½ ® Ñ| √¼ Ø© Af—
f© 2 • " . • O¬ ®| | á• +> ù} ~ " • 9(Reference Count, >®Øf)Ñ 2ª ¼
° " . Yd c = 3•ª ¼ ° Š BD° " ø ù} ~ " • 9© 3• μ O• " .

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3•ª © ½ ® Ñ| √© Af — f® ù} ~ " • 9ª ¬©ð, • ù} ~ " • 9Ñ 0•
ô© ØQ 3•ª © ½ © • ÈĪ > ½ª Φ". s 3•ª © ½ ® Ñ| √¼ Ø© O• Æ™ " ¬
• 3•ª © ½ © SB| • 1 ½ª • { ô© O• " . • O¬ ° | á• +> Gùx f• - Ñ •
Wd (Garbage collection)•ª ¼™ ° " .

z

" n— ö© / „ ° ½ ® Ñ| √© Af® " K© ö® ÷ä‡".

```
>>>zaz=z3z
>>>zbz=z3
>>>zdel (a)
>>>zdel (b)
```

¬ — ö® ÊÇ÷ø aŸ bÑ 3•' ½ ® Ñ| Ð" Ñ del•' Ž•• èNEf• —ž¹ Ñ| √©
Af a, bÑ ½ª • { ô¼ °ª 1 ù} ~ " • 9Ñ 0• ô| 1 ½ 3™ SB| • 1 ½ª • {
" .

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x¿ 1)

```
>>>za,zbz='python','z'life'
```

x 1LV a, b. S AB1 f Ø. • x Ä Ĩ K 1 x 2Y P¼Û È... ..

z

x 2)

```
>>>z(a,zb)z=z('python','life')
```

zx 1 x 2 ½ ò ¢. : ÛÚ• 1™ § Œ• Ÿ : Áª«® ° ž™ ..

z

x 3)

```
>>>z[a,b]z=z['python','life']
```

x 3LV | " 9> Ÿ f™ Ø.

z

x 4)

```
>>>zaz=zbz=z'python'
```

ä 3 – Af• ¢Á S AB1 f™ Ø.

z

– x ½ • ö ä Ž••• 1 © Ä Af S TU© QR ¼ €• x ½ ò f Ø.

```
>>>zaz=z3
>>>zbz=z5
>>>za,zbz=zb,zaz
>>>za
5z
>>>zb
3
```

L n• a• © 3, b• © 5ª © S• ÄBÔĭ Ø • Ÿ a, b = b, aª © N– f ° P ± S•
1> Tç n– 2£ 1 f Ø.

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ä x¹ © | " 9ª © • 45•¹ ÑÑ ÜÈ x €• ÛÜ¬ ýy á¼ ° ´´. ö® ÷) ëĭ ÷™s
•.

```
>>>zaz=z[1,2,3]
>>>zbz=za
>>>za[1]z=z4
>>>zaz
[1,z4,z3]
>>>zb
[1,z4,z3]
```

¬ — ö® ä¾ü ÊÇ÷ø bª © Af• aÑ Ñ| v© | " 9® ÄB ¬´´. ±~ ´´n, a | " 9—
a[1]¬ 4ª © Šĭ > TU ¬´´, a | " 9Ÿ• TÇ© O• ĭ ñª b | " 9™ UÇ• TÇ{ ´´´.
± • ä© a, b ßÄ ÇÁ | " 9E [1, 2, 3]¬ Ñ| v¼ Ø x ´´´. a, b© • «Ÿ ´´®
ð•• ß¾ü È...° | " 9® Ñ| v¼ Ø© Af• ´´´.

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±w´´ ø b Af® Æ1 aŸ ÇÁ Š¬ Ñ• ø¹ aÑ Ñ| v© | " 9Ÿ© ´´´ | " 9®
Ñ| v{ ´´© x¿ Á ´´¬P? ´´n— Ä Ñ• x¿• Ø´´´.

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x¿ 1) [:] • ó

Š x¿ĭ > © ĭ KY Ç• | " 9¾ ® Ñ| v© [:]¬ • ó © O• ´´´.

```
>>>zaz=z[1,z2,z3]z
>>>zbz=za[: ]
>>>za[1]z=z4
>>>za[1,z4,z3]
>>>zb[1,z2,z3]
```

¬ — ö•¹ ÷Û• a | " 9 Š¬ A5 ª™ b | " 9• © ei¬ LÖ• èn¬ ĭ f Ø´´´.

z

x¿ 2) copy ß • ó

Ä Š x¿Á copy ß ¬ • ó © x¿• ´´´. ´´n— ö6•¹ ÷ø from copy import copyª ©
Ln ÷© 5^ Ñ Æ%©ö • OÁ 2N— ß ÛÜ•¹ • #ù ´´ Ä{ ´´´. ä x¹ © RØù
copyª © Ef® Gx ¬ž¹ ½óö© O•ª ¼Ÿ ëĭ Ä•.

```
>>>zfromzcopyzi mportzcopyz
>>>zbz=zcopy(a)
```

~ — Ö b = copy(a) © b = a[:] Ê... ``.

z

Ä A f Ñ ¢ Å § ¬ Ñ • Ø¹ `` ½ ® 6 Å> Æ Ö © • ® 2 E á Ø `` n ¢ • Ø ``.
s, is E f ® • Ó ° ``. • E f © ¹> Ê...° ½ £ • Ĩ Ñ • • Å° QR¬ ä > ?@¬
~ á ‡ ``.

```
>>>zbzi sza
False
```

~ — Ö • ¹ b is a Ñ False® ~ á \ / > b Ÿ a Ñ `` ½ Æ ¬ ê f Ø ``.

2) " | ء

• 6© if, while, for — " | ء • Åž¹ èĭî O• " .

• 3° O ¬ èĭ ÷ x ¾ • • ¬ @© Z ® " ž ÷ • . Æ- , ¯ , † 9 Å • ¬ @x ¯ °
æ4ñ µ O • ¼ , # ¢ Å O Å • — t ã Ñ µ O • " . • O Å ¥ > ±² — Z Ÿ ý " .
s Æ- , ¯ , † 9 — æ4© T > • 45 • µ O • ¼ • — t ã ® • Å © # • T > | Ñ
• Ó • ¹ èĭî 6j • µ O • " . s , • 45 ¬ ± # Qĭ > ä ± O — « ¬ > F ù
• ħ Ĭ > Ÿ j \ © O , • O • T > • ĩ Û ¢ Û 1 6j • " .

[1] if¿

“ n ¢Á ¯ ž ÷•.

Ú • ØĪ ø †®; ¼ Ñ¼ • “Ī ø ~ĵ Q” .Ü

˘Ÿ ¢Á Á | \A•¹ §ó+• ...ĵ H f Ø© ¯— Æ•” . ¥> ±K_•’ O™
½©• Ÿú© O•ª¹ ˘Ÿ ¢Á NLV ®x¬ QRŽ¹ ± • O{ L| žÖ 1 Z Ñ
x{ ” . • wÜ ®x¬ QR ä žĭ ®x• O© ¯ f ©ö G•© O• T>
if •” .

z

˘Ÿ ¢Á ¯ Ž•••¹ © “ n ¢• Ÿ f Ø” .

```
>>>zmoneyz=z1
>>>zi fzmoney:
...zzzzzprintz" †®z; ¼zÑª "
...zelse:
...zzzzzprintz"~ĵ Ñª "
...
†®z; ¼zÑª
```

z

.

if¿¶ ˘_²

“ n— p®Ñ ifŸ else® • ó° x%¿ £ p®•” .

```
ifz<®x >:
zzz<f 1z N1>
zzz<f 1z N2>
zzz...
else:
zzz<f 1z NA>
zzz<f 1z NB>
zzz...
```

®x ¯ “ ” 9 ž¹ >• ø if T> “ n— N ¯ f ¼ ®x • ?@• ø else “ n—
N ¯ f { ” .

z

z

® & ` ^ (indentation)

if ¬ ÿ © ¨ n LV if <®x >: ¨ n— NÜ¤ if • Å © ß+ N • ä Gx®
ž \ j Ö ° ¨ .

```
ifz<®x >:  
zzz<f 1 z N1>  
zzz<f 1 z N2>  
zzz<f 1 z N3>
```

ˆ • 1 ÷ © O ¢ • ®x • >... Z <f 1 N1>¬ ä Gx ¬¼ <f 1 N2>,
<f 1 N3>™ ä Gx® ž \ ¨ . • OÁ Ž • • ¬ Ln • © ½© • { ÜÈ ¨ 3•
ÜÜ• x™ ñ ä 3§ œî ¬ ž ÷ © O• f ¨ .

z

¨ n LV ø • 3 Ñ * ¨ .

```
ifz<®x >:  
zzz<f 1 z N1>  
<f 1 z N2>  
zzz<f 1 z N3>
```

<f 1 N2>Ñ ä GxÑ ô • ë x ¨ .

©

```
ifz<®x >  
zzz<f 1 z N1>  
zzz<f 1 z N2>  
zzzzz<f 1 z N3>
```

<f 1 N3>• ä Gx© ô • Ÿ <f 1 N1>• Æ <f 1 N2>Ÿ— ä Gx— • Ñ
| ¨ . s ä Gx© § 6Æ ¢ Á • > ž \ j Ö ° ¨ .

± w ¨ ø ä Gx© hÎ > © O• f¬P?İ ñ ø l Î > © O• f¬P?• O• Å°
' Á Ž • • ¬ ½ó © ½© ½• • 1 İ ë™ ' Å ô¼ Ø © OEö l Î > • © Á, hÎ >
• © Á ß Á ¨ ...Ö © è ó Á R Æ, 2¬ Ü ó ž¹ G• +• © O• ¨ . hÎ > 1 ? ø
° hÎ > ¼ l Î > 1 ? ø ° l Î > • © +• ¨ . l • Æ hÁ ¥ > ±² 1 ¨ • 1
yÎ > ÷ • © O• İ ñ x • Ü ó ž¹ Gø • 3— > £• ô x™ ° ¨ . \— ™ s • .

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[8#] ':'" aŒ â»

if(®x) ¨n•© šút ':'•%{ ¨ ¨. •OÁ /- ° —¶ª x÷¨ ©
Ž••— ħ p®•¨. \ —•ø ':'EÑ• Āž' rĭ ¨ø Ž••¬ Ÿ+
Guido• { ě| ¨j ÷Ĭ Ö 1 O•¨. while•Æ for, def, class •™ † ±
N— •• ':'• ° ĩ Q¨. • ':'¬ Ñâ ¨ | © Z Ñ éÁō
 \—™s ¨.

Ž••• ¨ Šj ÷¨ ÷xÑ ¼ 1 " μúÑ Q. ° •āÑ T> ':'¬
½ó ä äGx(indentation)® { â Ÿ x ¨ ¨. •Ÿ ¨...
¥> ±K* • Ž••¬ | 1 ÑN Ů' " 3• ŮŮ•x™ ¨.

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ž. ° ¨.

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if <®x >•¹ ½óó© ®x •' > ?@¬ QR © N¬ +° ¨. •45— > ?@•
Āž¹ © •¶ ěĭ ÷x•Ÿ MÑ•Ÿ ¨† ěĭ ÷ø ¨n ċÁ O • Ø¨.

z

»¼½¶ 8¾ M]

z	8	M]
7•	0 • ĭ Ñ 7•	0
• 8	"abc"	""
" 9	[1,2,3]	[]
⌘:	(1,2,3)	()
; <=	{"a": "b"}	{}

z

° a 1 ¨ — ö • ¹ ÷xĔ

```
>>>zmoney=z1
>>>zi fzmoney:
```

• 1 ®x Ā moneyÑ ò¼ money© 1• x • >• ôĭ if `` n— N¬ f { ô©
O• ``.z

z

z

b »
• Ÿ ®x QR¬ © Z © • 45÷`` © æÇ• (<, >, ==, !=, >=, <=)® G© Z Ñ Š<
é``. `` n— " • i Ā æÇ• ® ó ýyž ‡``.

x < y	xÑ y÷`` < ``
x > y	xÑ y÷`` ``
x == y	xŸ yÑ ¢``
x != y	xŸ yÑ ¢• ë``
x >= y	xÑ y÷`` ?Æ ¢``
x <= y	xÑ y÷`` < ?Æ ¢``

z

ô® ±ž¹ ¬ — æÇ• • Āž¹ ëĬ ÷•.

```
>>>zxz=z3
>>>zyz=z2
>>>zxz>zy
True
>>>
```

x• 3¬ y• 2® ĀB° `` n• x > yª © ®x ¬ f ñP True® ĭ ®° ``.
± • ā© x > yª © ®x • >• x • ``.z

z

```
>>>zxz<zy
False
```

¬ — ®x Ā ?@• x • False® ĭ ®° ``.z

z

```
>>>zxz==zy
False
```

xY y@ ¢• ë". ° a 1 ¯ — ®x Å ?@• "".

z

```
>>>zxz!=zy
True
```

xY y@ ¢• ë". ° a 1 ¯ — ®x Å >• "".

z

Ã— Z ®z "" nLV TU_i ÷•.

ÜYd 3000> • — ¯ Ñ• ¼ ØĬ ø †® ; ¼ ±w• ëĬ ø ~_j Ñ^a Üz

z

¯ — ¯ ¯ "" nLV ¥> ±K_ 1 f Ø¬ O• "".

```
>>>zmoneyz=z2000
>>>zfzmoneyz>=z3000:
...zzzzzprintz" †®z; ¼zÑa "
...else:
...zzzzzprintz"~j Ña "
...
~j Ña
>>>
```

money >= 3000 • ' ®x • ?@• Õx • else "" n— N¬ f { "".

z

z

and, or, not

"" ®x QR• G• © OĬ > and, or, not• ' O• Ø"".

z

" " — æÇ• © "" nLV Ě< ¬ ° "".

-	±~
x or y	xŸ y 2r • ÆŸ >•ø >•"
x and y	xŸ y ßÄ >•j Ö >•"
not x	xÑ ?@•ø >•"

z

" n— ö® ±ž " — ½° ¬ šež ÷™s •.

" • 3000> • Ø?Æª 3o †' Ñ Ø" ø †® ; ¼±w• ëĬ ø
~j Ñª Ů

```
>>>zmoney=z2000
>>>zwatch=z1
>>>if zmoney>=z3000orzwatch:
...zzzzzprintz" †®z; ¼zÑª "
...else:
...zzzzzprintz"~j Ñª "
...
    †®z; ¼zÑª
>>>
```

money© 2000• • Ÿ watchÑ 1• x • money >= 3000 or watchª © ®x • >• ôx •
if " n— N• f " . ä x¹ watch = 1¬ Ú†' Ñ Ø" Ůª © —¶• ¿óŌn•
\\ Ĭ™s • • OÁ ¥> ±K_¬ 1 • \ ½óô© 9 • " . ±w" ø Ú†' Ñ " " Ů©
watch = 0Ĭ > ž ÖEÄ Ä+1 Æ¬ Ñ " ¬ O• " .

z

z

x in s, x not in s

ÆĬ Ñ¹ Ž•••¹ © ®Ĭ æ¶Ø© ®x ¬ 6 ° " . T> " n ¢Á O • " .

< x in Ĭ " 9, x not in Ĭ " 9
< x in ɹ: , x not in ɹ:
< x in • 8, x not in • 8z

z

'in' •ª © ej Rj Ñ '¬••ª © Ä¬ Ñ' n¬ xž ÷ø " n— ö • { • žÑ µ
O• " .

```
>>>z1zi nz[1, z2, z3]
True
>>>z1znotzi nz[1, z2, z3]
Fal se
```

```

- S  öC Ú[1, 2, 3]•ª© | " 9 •• 1• ØÑ?Úª© ®x •·· 1Á [1, 2,
3]•• ØÍ /> >• ö; zTrue® | ®° ··. Ä S  öC "[1, 2, 3]•ª© | " 9 •• 1•
·· ØÑ?Úª© ®x •·· 1Á [1, 2, 3]•• ØÍ /> ?@• ö; False® | ®° ··.

```

$$Z$$

“ nÁ ¤: • 8— ¿ óö® ÷ ä‡ ”.

```
>>>z' a' zi nz(' a' , z' b' , z' c' )
True
>>>z' j ' znotzi nz' python'
True
```

$$Z$$

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```
>>>zpocketz=z['paper',z'handphone',z'money']
>>>zi fz'money' zinzpocket:
...zzzzzprintz" † ®z; ¼zÑª "
...zel se:
...zzzzzprintz"~ j Ñª "
...
† ®z; ¼zÑª
>>>
```

['paper', 'handphone', 'money']^a © | " 9. • • 'money' Ñ ØĪ / > 'money' in pocketÁ > •
ôĭ 1 if " n— N• f ô "

$$Z$$
$$Z$$

```
elif (-c de)
```

ifY elseY ̄ N • ¼ 1 © " ̄ a • ® x QR ̄ x N j Ū " . " n ̄ Á ö Y a TM ifY
elseY I > © ® x QR • j á y ̄ { " .


```
"• £• • ØĬ ø †® ; ¼, • £ñ • "• Ÿ †' Ñ ØĬ ø †® ; ¼,
™ " ¼ †' ™ " Ĭ ø ~ĵ Ñª Ū
```

z

```
ˆ — Nˆ ÷ø ®xˆ QR © ŪŪ• Ä ) öÑ Ø". ! f • £• • Ø©• ® QRž Ö ¼
• £• • " Ĭ ø " † †' Ñ Ø©• ® QR° " .
```

z

```
ifŸ elseŸĬ > ˆ — Nˆ Ūâ áø " n ¢• 1 f Øˆ O• " .
```

```
>>>zpocketz=z['paper',z'handphone']
>>>zwatchz=z1
>>>zi fz' money' zinzpocket:
...zzzzzprintz" †®z; ¼Ñª "
...zel se:
...zzzzzi fzwatch:
...zzzzzzzzzzzzzzzzzzzzprintz" †®z; ¼Ñª "
...zzzzzel se:
...zzzzzzzzzzzzzzzzzzzzprintz"~ĵ Ñª "
...
†®z; ¼Ñª
>>>
```

```
$Ä ÷x•™ • ž xÑ • è¼ ÇŸ° á • +". ˆ Ÿ ¢Á $ˆ ÷p x ˆ ž¹
Ž•••¹ © " r ®x QRˆ Ñž { © elifª © Oˆ ½ó° " .
```

z

```
ˆ — ö® elif® • ó ø " n ¢• 1 f Ø".
```

```
>>>zpocketz=z['paper',z'handphone']
>>>zwatchz=z1
>>>zi fz' money' zinzpocket:
...zzzzzprintz" †®z; ¼Ñª "
...zel i fzwatch:
...zzzzzprintz" †®z; ¼Ñª "
...zel se:
...zzzzzzzzzzzzzzzzzzzzprintz"~ĵ Ñª "
...
†®z; ¼Ñª
```

z

s, elif© if<®x >:•¹ <®x >• ?@... f ö{ ". if, elif, else— x% p®©
" n ¢".

```
lfz<®x >:
zzz<f 1z N1>z
zzz<f 1z N2>
zzz...
elifz<®x >:
zzz<f 1z N1>
zzz<f 1z N2>
zzz...
elifz<®x >:
zzz<f 1z N1>
zzz<f 1z N2>
zzz...
...
else:
zz<f 1z N1>
zz<f 1z N2>
zz...z
```

~•¹ ÷Û• elif© f• 6° "• ½ó1 f Ø". (>¼: • OÁ €Ö Ç§j — swi tch
ý° O• "•.)

z

z

pass¶ • è

Ñâ ®x ¬ QR ¼ > ?@• °ª Ë¬ „ — 1 Ĩ - ~ ...™ • ë{ â ý„ ¬ ¼
Ë¬ Ñ x{ "• " n— ö® ÷•.

"• £• • ØĬ ø ÑŸù Ø¼ • £• • " Ĩ ø †' ® 3ª Úz

z

~ — ö® pass® ¿ óž¹ pãž ÷•.

```
>>>zpocketz=z['paper',z'money',z'handphone']
>>>zi fz' money' zinzpocket:
...zzzzzpass
...zel se:
...zzzzzprintz"†' ®z " "
...
```

```
pocket = {
    'money': 8,
    'pass': None
}

if 'money' in pocket:
    print('You have 8 units of money')
```

z

z

```
if 'money' in pocket:
    print('You have 8 units of money')
else:
    print('You have no money')
```

```
>>> zpocket = {'paper': 1, 'money': 2, 'handphone': 3}
>>> if 'money' in zpocket:
...     print('You have money')
... else:
...     print('You have no money')
```

```
if 'money' in zpocket:
    print('You have money')
else:
    print('You have no money')
```

[2] while

š ož¹ N↦ f ž Ö 1 Z while ↦ ½ó° "".

z

"" nÁ while — x% p®• "".

```
while<®x >:
zzz<f 1 z N1>
zzz<f 1 z N2>
zzz<f 1 z N3>
zzz...
```

®x • >£ Ě• while ĩ K— N ↦ ' Áž¹ f { "".

z

Ú8 § ĩ • 9ĭ Ñ© Æ- "" Üª © Á— ž••• Œó†Á ÷ø "" n • µ O• "".

```
>>>ztreeHi tz=z0
>>>zwhi leztreeHi tz<z10:
.z.z.zzzzztreeHi tz=ztreeHi tz+1
.z.z.zzzzzprintz"Æ- ®z%§z ĩ ñ""."z%ztreeHi t
.z.z.zzzzzi fztreeHi tz==z10:
.z.z.zzzzzzzzzprintz"Æ- z9ĭ £ñ""."
.z.z.
Æ- ®z1§z ĩ ñ""
Æ- ®z2§z ĩ ñ""
Æ- ®z3§z ĩ ñ""
Æ- ®z4§z ĩ ñ""
Æ- ®z5§z ĩ ñ""
Æ- ®z6§z ĩ ñ""
Æ- ®z7§z ĩ ñ""
Æ- ®z8§z ĩ ñ""
Æ- ®z9§z ĩ ñ""
Æ- ®z10§z ĩ ñ""
Æ- z9ĭ £ñ"".
```

— ö•¹ while — ®x Á treeHit < 10 • "" . s treeHitÑ 10÷"" < Á Ě•• while • —
N ↦ ' Á f { "" . whlie • — N↦ ÷ø 6... ! f treeHit = treeHit + 1>
treeHit§ • ' Á 1ĭ • Ñ° "" . ±ĭ ¼ Æ- ® treeHit§ Ý] n↦ ěĭ © N↦ CD ¼
treeHitÑ 10• óø ÚÆ- 9ĭ £ñ"" Üª © N↦ CD ¼ treeHit < 10ª © ®x • ?@•
óĭ while ↦ ¢â ÆÑ{ "".

ä x 1 treeHit = treeHit +1Ä ¥> ±K_¬ 1 • \ G• © x¿Î > treeHit— S¬
 1Y] Í • Ñ†Ç ĩ ¿Î > G• © O• " . • OÄ treeHit += 1LV Gx™ ° " .

z

z

1 ´ f • (Loop)

• S• © - ° Ä¥• Äž 1 èĬ ÷x> • . - ° Ä¥ª EÄ - ° ù Š o° " © —¶• " .
 Ž• • • 1 - ° Ä¥© while Î > þä 1 fÑ Ø" . | Ñ ½ó © ¥> ±² r• 1 •
 - ° Ä¥— Y¬ ½ó • è© ¥> ±² Ä Æ™ "¬ „™> • - ° Ä¥© • \ ½ó " .
 " nÄ - ° Ä¥— x%¿ £ 5^ • " .

```
whilez1:zzzz
zzz<f 1z N1>zzzzz
zzz<f 1z N2>
zzz...
```

while— ®x • "1" /> ®x Ä ° >• " . whileÄ ®x • >£ È• • while• Äž
 Ø© N ¬ ' Äž 1 f /> " — ö© - ° { while è— N ¬ f 1 O• " .

z

" n— ö® ÷• .

```
>>>zwhilez1:
.z.z.zzzzzprintz"Ctrl-C@zâ 3Özwhile ¬z¤â zÆÖzfzØî ñ" .
.z.z.
Ctrl-C@zâ 3Özwhile ¬z¤â zÆÖzfzØî ñ" .
Ctrl-C@zâ 3Özwhile ¬z¤â zÆÖzfzØî ñ" .
Ctrl-C@zâ 3Özwhile ¬z¤â zÆÖzfzØî ñ" .
....
```

¬ — N• e> ù CDµ O• " . Ctrl-C® ä 3¹ ¤â ÆÑ™s • . • Ÿ ¬ LV - ° Ä¥®
 ¬ | © Z © ?— "¬ O• " . ÷" òó¿ £ ö® | ÷• .z

z

" n¬ °ª ž ÷™s • .

```
>>>zpromptz=z""
.z.z.z1.zAdd
.z.z.z2.zDel
.z.z.z3.zList
.z.z.z4.zQuit
```

```
.z.z.
.z.z.zEnterznumber:z""
>>>
```

! f ~ Y¢• ä 3oÊ! • 8~ Y+"".

z

```
>>>znumber=z0
>>>zwhile znumber!=z4:
.z.z.zzzzzprintzprompt
.z.z.zzzzznumber=zint(raw_input())
.z.z.
```

- 1.zAdd
- 2.zDel
- 3.zList
- 4.zQuit

Enterznumber:

.. n• numberª © Af• "0"ªª © §~ ! f ÅB°"" . •w{ ©•ä©"" n•Æj while —
 ®x • number != 4£ö numberª © Af® ! f y„ ž ú• ëĬ ø numberª © AfŊ•æ •
 ë©"" ©•3Ŋ Åx "" . while ~ ÷ø numberŊ 4Ŋ Ĭ Ŋ Ē•• prompt® CD { ¼
 ½ó•> Û¤ BD~ Ĭ £"" . ~ — ö© ½ó•Ŋ 4ª © §~ BD • ëĬ ø - ° ù prompt®
 CD { "" . ä x¹ number = int(raw_input())Å ½ó• — 7• BD~ Ĭ • © O•ª ¼Ÿ
 ëĬ Å• . intÆ raw_inputEf• Å° ½° Å P— èNEf ÛÛ•¹ •# { "" Ð O•"" .

z

z

whilež ŋg üš~ (break)

```
while Å ®x • >£ Ê• ' Åž¹ while • — èó~ f { "" . •Ÿ ~6>
while ~ ¨äÆŊ¼ Ē~ Ŋ x{ "" .
```

pi • Qx® " ž ÷• . pi Ŋ • Qx•• BÚ { Ø~ ©° Ú~ Ĭ ø pi ®
 µª Üª © ®x ~ Ŋ¢ while • f "" . •Ÿ ~ª™ pi Ŋ "" ĩ ä¹ pi ®
 \• ë©"" ø ½© Å • Qx® €p > ĩ p O•"" . • QxŊ Ō¾ á ø pi — à~
 ° > • ½® ž¹ pi Ŋ "" ĩ • ø while ~ " { ¼ ÚQ r•Ü' p® • Qx•
 ÷ ä Ö 1 O•"" . •w{ while ~ ~6> "" { © O~ Ŋž { ž \© O• T>
 break• "" .

z

.. n— ö© ~ — Ŋ„ ~ Ž•• Ĭ > Üäž %o O•"" .

-) break¶ • è

```
>>>zcoffeez=z10
>>>zmoneyz=z300
>>>whilezmoney:
...zzzzzprintz"¬z xî ñzPi ®z ñ".
...zzzzzcoffeez=zcoffeez-1
...zzzzzprintz"— ÁzPi —zà Áz%dzBñ". "z%zcoffee
...zzzzzi fznnotzcoffee:
...zzzzzzzzzprintz"Pi Ñz" z j ' î ñ".zQ ®zr • † ñ".
...zzzzzzzzzbreak
...
```

moneyÑ 300î > ¼„ ôj Øî ñP while money:•¹ ®x £ money© 0• î ñx • °
>•". ° a 1 - ° Á¥® - { ". ±| ¼ while — è ó - ° § f 1 € coffee =
coffee - 1• — z¹ coffee— fÑ ° í oj { ". Ýd coffeeÑ 0• ø if not
coffee: ° © N•¹ not coffeeÑ >• ô /> if " n— N • f • ô ¼ breakÑ
« C ôj while ¬ á ÆÑ{ " .

z

• ÿ ò 6 • Qx© - LV < È • © è¬ O•". " nÁ • Qx— ò 6 „ ý { ÿ j
% ò • ". • ž Ñ • ô a TM „ • +•. Ĩ K— ô © ® ĩ o ñP Å Å 5 £ ¥ ¥ | ¤ ®
• ó • + ¼ • • ¤ ® • ó ž¹ < Ě ž ÷ • .

```
#z-*-zcoding: zeuc-krz-*-z
#zcoffee.py

coffeez=z10
whilez1:
zzzmoneyz=zint(raw_input("¬zžj z\ # :z"))
zzzi fzmoneyz=z300:
zzzzzzzprintz"Pi ®z ñ".
zzzzzzzcoffeez=zcoffeez-1
zzzelifzmoneyz>z300:
zzzzzzzprintz"? " « z%d®z\ ¼zPi ®z ñ". "z%(moneyz-300)
zzzzzzzcoffeez=zcoffeez-1
zzzelse:
zzzzzzzprintz"¬z" † z¬ á \ ¼zPi ®z\ • zé î ñ".
zzzzzzzprintz"— ÁzPi —zà Áz%d zBñ". "z%zcoffee
zzzi fznnotzcoffee:
zzzzzzzprintz"Pi Ñz" z j ' î ñ".zQ ®zr • z† ñ".
zzzzzzzbreak
```

```

- -> ± 1 " @ ° > ýy • © è " . w • Ñ - - O - • ž 1 f Ø" ø • l è è Ĩ Ō
if • Æ while - - € " ¢ Ō" ¼ ÷ ø " . " Ÿ money = int(raw_input(Ů - ž ĩ \ # :
Ů))ª © NÁ ½ ó • > Ů ¢ BD - © Ů Ů • ¼ BD Á 7 • @ moneyª © Af • ÄB ©
O •ª ¼ Ÿ è Ĩ Ä • .

```

```

Ÿd - -> ± 2 1 " @ • • ¢ > < Æ ž 1 ò † v © ĸ - ß " ø 1N - € • , Ů Ů ©
Ůs - • • ¢ ½ ó ĸ - > ¼ ™s • • .

```

z

z

while ĸ) hý ĩ œi æš - (continue)

```

while • - N - f 1 ĩ @ x - ½ ž 1 @ x • O • è © Z while - - ¢ Æ Ñ ©
O • Ĩ ñª " † while - ø L n Ĩ > - Ĩ Ñ { ¼ È - Z Ñ x { " . Ÿd 1 Ů ¢
10P • - f r • 1 è f Ÿ - CD © O - while - • ó ž 1 < Æ ° " ¼ " ž ÷ • . w • © ĩ
x ĸ - ½ ó 1 O Æ Ñ ?

```

z

-) continue ¶ • è

```

>>>zaz=z0
>>>whi lezaz<z10:
...zzzzzaz=za+1
...zzzzzi fzaz%z2z==z0: zcontinue
...zzzzzprintza
...
1
3
5
7
9

```

```

- - ö © 1 Ů ¢ 10P • - f r è f Ÿ - CD © ö • " . a Ñ 10 ÷ " < Á È • a © 1 Ÿ Ĩ í ' Å
• Ñ ° " . if a % 2 == 0 (2> Æ ( - Æ * • Ñ 0 E Z ) • > • ò © Z © a Ñ f ...
• " . s , a Ñ f • ø continue N - f ° " . • continue Á while - ø L n Ĩ >
- Ĩ Ñ { © y f ĩ • " . °ª 1 - - ö • 1 a Ñ f • ø print a © f ò • è - O • " .

```


[3] for

Ž••— /O¬ ÑN ó ÂAž\© O• T> • for •". for Á ä ó ¼ ½ó1 N
p®Ñ ° y• i %) • O¬ óŸ Gø ¥> ±K_• ää xP• " .

z

for ǎŋ ˉ _²
for — x%ǎ ∈ p®© " n Φ" .

```
forzAfzinz! " 9( ©zα: ,z • 8):  
zzz<f 1 z N1>  
zzz<f 1 z N2>  
zzz...
```

! " 9— § ¹ Ûα ∈• , ¹ P• &-> Af• ÂBž¹ <f 1 N1>, <f 1
N2>,,®, f ° " .

z

z

- " « j for <æš ˉ
for Á ö6® ±ž¹ ÷© O• ÑN êx " . ö6® ° a ž ÷™S • .

z

ö 1) ¼5ǎ ∈ for

```
>>>ztest_list=z['one',z'two',z'three']z  
>>>zforzinztest_list:z  
...zzzzzprintz  
...z  
onez  
twoz  
three
```

['one', 'two', 'three']ª © | " 9— § ¹ ∈ 'one'• ! f iAf• ÂB Š print iª ©
N¬ f ° " " n• 'two'ª © Â § ¹ Ñ iAf• ÂB Š print i N¬ f ¼
! " 9— ∈• , ¹ P• • O¬ š o° " .

z

for — GÆt ® êx ˉ ž¹ " n¬ Ñ_ ž ÷• .

Ü 5y— í • † é ¬ ÷ × © Õ † é \$ f Ñ 60\$ • 9 Ī ø † à • ¼ ± w •
ë Ī ø v † à • ° . † à £ • v † à £ • • Å ° . ® ÷ ä † ° . Ü

z

„ 5y— í — † é £ ¬ ÷ | “ 9> Ü å ž ÷ × ° .

```
markz=z[90,z25,z67,z45,z80]
```

1\$ í Å 90\$ • ¼ 5\$ í Å 80\$ • ° .

z

• ° \$ f ® & - > ½ ž ¹ † à Õ © • v † à Õ © • • Å ° ± ÷ ® ž \ © ¥ > ±² ¬ Ÿ ĩ
÷ • . † • • ¨ > Ÿ ĩ ÷ • .

```
#marks1.py
marksz=z[90,z25,z67,z45,z80]z

numberz=z0z
forzmarkzinzmarks:z
zzznumberz=znumberz+1z
zzzi fzmarkz>=z60:z
zzzzzzzprintz"%d$ z í Å z † à B ñ ° ."z%znumberz
zzzelse:z
zzzzzzzprintz"%d$ z í Å z v † à B ñ ° ."z%znumber
```

" " — í • { \$ « ® Õ • × ° ž ¹ numberª © A f ® • ó ¬ ° . \$ f | " 9 E marks • ¹
& - > \$ f ® ¬ è ĩ markª © A f • Å B ¼ for • — N ¬ f { ° . „ for •
° \$ Ī f µ € ° number © 1 Ī • Ñ ¼ mark Ñ 60 • • ø † à S † • ® CD ¼ 60 ¬ 9 •
ë Ī ø v † à S † • ® CD ° ° .

z

z

forC continue

while • ¹ ë Ī ÷ × Ë continue Ñ for • ¹ ™ † È ... { ¿ ó • ° . s, for • — N ¬
f © ™ r • continue ¬ Ÿ Æ ø for — L n Ī > ° Ī Ñ { ° .

z

¬ — ö 6 ® ± Å > • ó ž ¹ 60\$ • £ ½ © • { © X S † • ® ÷ è ¼ Æ * • ½ © • { ©
Ī - ° S † • ™ ¾ • ë © ¥ > ±² ¬ Ÿ ĩ ÷ • .

```
#marks2.pyz
marksz=z[90,z25,z67,z45,z80]z

numberz=z0z
forzmarkzinmarks:z
zzznumberz=znumberz+1z
zzzi fzmarkz<z60: zcontinuez
zzzprintz"%d$zí zX tñ".zt à Bñ".z"z%znumber
```

\$fÑ 60\$ • É í ... Z • © mark < 60• >• Ô; continue • f " . ° a 1 X
S†• ® CD © ÛÛÉ print → f • ë¼ for — ÛÛÎ > " Î Ñ{ " .

z

z

forC range Õ

for Á rangeª © 7• | " 9® • ÈÎ > Ý j \© EfÝ Eÿ ½óó© Z Ñ é". " nÁ
rangeEf— QR° ½ó¿ • " .

```
>>>zaz=zrange(10)z
>>>zaz
[0, z1, z2, z3, z4, z5, z6, z7, z8, z9]zz
```

ˆ • 1 ÷ © O Φ • range(10)Á 0Û¤ 9P• — 7• | " 9® Ý j ‡".

z

† < §«Ý • §«® • „ áø " n Φ • žÖ ° " . • §«© Eô • ë©".

```
>>>zaz=zrange(1,z11)z
>>>zaz
[1, z2, z3, z4, z5, z6, z7, z8, z9, z10]
```

ˆ LV † < 7• ® „ ž o f™ Ø".

z

forÝ range® • ó ø 1Û¤ 10P• © O¬ " n Φ • { þå1 f Ø".

ö) 1Û¤ 10P• — †

```
>>>zsumz=z0z
>>>zforzi zinrange(1,z11):z
```

```
. Z. Z. ZZZZZsumz=zsumz+zi z
.Z. Z. Z
>>>zprintzsumz
55
```

```
range(1, 11)
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
sum = sum + i
f { 0: sum
```

z

```
range(1, 11)
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
sum = sum + i
f { 0: sum
```

```
#marks3.pyz
marksz=z[90, z25, z67, z45, z80]z

forznumberzinzrange(len(marks)): z
zzzi fmarks[number]z<z60: zconti nuez
zzzprintz"%d$ zí zX zñ z. z† à Bñ z. "z%z(number+1)
```

```
len(marks)
range(1, len(marks))
range(5)
marks[number]
90, 25, 67, 45, 80
```

z

z

—B´ for zñ • è

```
>>>zaz=z[(1, 2), z(3, 4), z(5, 6)]z
>>>zforz(first, zlast)zinza: z
.Z. Z. ZZZZZprintzfi rstz+zlastz
.Z. Z. Z
3z
7z
11
```

```
range(1, len(marks))
range(5)
marks[number]
90, 25, 67, 45, 80
```

z

• OÁ • ¶ Ê Ç ÷ × Ë ¨: ¬ • ó ° Af § Å B x ¿ ý ° Z • " .

```
>>>z(first,zlast)z=z(1,z2)
```

z

z

forC range« „ è ´ ² ² e

forÝ rangeEf® • ó ø R 4oÝÎ > þþR¬ CDž î fÑ Ø" .

```
>>>zforzi inzrange(2,10):z
...zzzzzforzj inzrange(1,z10):z
...zzzzzzzzprintzi*j,z
...zzzzzprintz'\n'z
...Z
2z4z6z8z10z12z14z16z18z
3z6z9z12z15z18z21z24z27z
4z8z12z16z20z24z28z32z36
5z10z15z20z25z30z35z40z45
6z12z18z24z30z36z42z48z54z
7z14z21z28z35z42z49z56z63z
8z16z24z32z40z48z56z64z72z
9z18z27z36z45z54z63z72z81
```

¬ — ö® ÷ ø forÑ Å § ½óð " . range(2, 10)Å [2, 3, 4, 5, 6, 7, 8, 9]Ñ ö¼ " " — 7• Ñ &- > i• Å B " . iÑ Ln 2... for ¬ ÝÆ{ " . range(1, 10)Å [1, 2, 3, 4, 5, 6, 7, 8, 9]Ñ ö¼ " " — 7• © j• Å B ö¼ ± " n NE print i*j® f ° " . ° a ¹ iÑ 2... 2*1, 2*2, 2*3, , , , 2*9 P• &- > f ö) ± §¬ CD { " . ± " n• © iÑ 3... † 2... Ý ∈¾Ñ• > f µ O• ¼ iÑ 9... P• ' Å š o ö{ " .

¬ • ¹ print i*j, LV print i*jP• â ∈ (',')® ž i ‡ • ā © ž ĭ . §¬ CD1 " n o> 9i Ñ• è¼ ± o• ' Å ž ¹ CD x ¬ ° O• " . • OÁ ó ½óð• © è• Ý â ∈ œÇ• ª © O• " . ± " n— print '\n'Å 2R, 3R, , ¬ þÚ x ¬ ž ¹ Å § for • • Æø . §¬ " n o Û ¨ CD { ž \ © N• " .

z

• ĩ è | © ¥ > ± ² — «¬ ó j © if, while, for • Å ž ¹ è ĭ ÷ x " . w• © while for® ÷ ø ¹ Å Ñ• Ñ ĭ \ O½ " © â ¬ x¬ O• " . ò 6> for ¬ G© Û Û¬ while> Tá f Ø© Z Ñ é¼ while ¬ • Û Û¬ for Î > T U j ¹ ½ ó 1 f Ø© Z Ñ é " . „ Å w• — • ā • " .

04. ÅÄÃ

•l èz Ù° èó¬ #QÍ > ä •6 Ef, BD CD, Ž...L|x¿ • Åž¹ èĭ ÷x>
•.

z

BCDÁ ¥> ±K_ ý' Ý ¯ ...• Ø¨. ¥> ±K*© ¥> ±²¬ j ²Î> È< {
ÿ j Ö¨ © · •£¬!f {ô©ð ± ÑN r ° ÛÚ• T> BCD—ý' •¨. /„
¥> ±²ÿ ½ó © Ef®ÿ OE• ĩñø ß+ ¥> ±² • ±Ī> ½ó © Ef®
ÿ OE•, Æĭ Ñ %eAPI> ä ß+ ĩ Û ¥> ±² • ½ó1 f Ø{ â ÿ OE••
Ã° ± ß+O • ¾Û •z BCD ¯ ...• Ø¨.

1) ð

Ef® ýy × ¼• ! 1 × ® " ž ÷ • . | © ! 1 × • ... ¬ ž © " . ± | ¼ ! 1 ® • ó ž 1
 ... ¬ Ő ĭ 1 ... " " ® Ÿ ĭ Ó " . • 3° ... Á | — F \ A • 1 § 6 + • [ĭ ĭ f
 Ø © ... • " . | Ñ ! 1 × • ž © ... Á BD • ô ¼ ... " " © ± CD (ĭ ® §) • " .
 ± w " ø ! 1 × © - . £ Ñ ?

z



(by <http://www.wpclipart.com>)

z

T > | Ñ ä x 1 ê ¼ • © Ef • " . BD ¬ Ñ • ¼ ĭ ... ¬ f ° " n • ¬
 è ĭ ú © O , • O • Ef Ñ © ... • " . | © ĭ á 1 Ů æ Ef Ñ - . £ • • Ä ž 1 Ů Ő • Ÿ
 • O • Ä ž 1 ... ¼ 1 ž % ĭ Á - > " " . • Ÿ | © Ef • Ä ž 1 ® ĭ " ž ÷ ©
 † Q ¬ Ñ ä Ő ° " . ¥ > ± K _ • Ø ĭ 1 Ef ' O Á „ + r x " " .

... & Ef y = 2x + 3 • O™ Ef • " . • Ÿ | © • O ¬ f ĭ † Q • • ĭ Ė è „ ± K ¥ > Ÿ ê ¼
 Ø • x • ĭ § ¬ ž ¬ ĭ A Ä • — ž 1 y § • Æ Ő " © " Á Ä Ů Ů ž ÷ • è x ¬
 O • " .

" ¬ ĭ | ¼ ž • • Ef • Ä ž 1 • ĭ Ñ ÷ ™ s • .

z

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$f_{\#} \dots \mathfrak{O}\P^2$
 $\mathbb{Z} \bullet \bullet - Ef - \beta \hat{\imath} \mathbb{A} \text{ `` } n \quad \Phi \text{ `` } .$

```
defzEfy(BDzEf):  
  zzz<f 1z N1>  
  zzz<f 1z N2>  
  zzz...
```

$\text{def} \mathbb{C} \, Ef \mathbb{R} \, \mathbb{Y} \quad \tfrac{1}{2} \mathfrak{O} \text{ `` } . \, Efy \mathbb{A} \, Ef \mathbb{R} \, \mathbb{Y} \acute{u} \mathbb{C} \, \tfrac{1}{2} \mathbb{C} \bullet \, \mathbb{A} \rightarrow \mathbb{Y} \acute{u} \mathbb{C} \, \mathbb{O} \bullet \text{ `` } . \, \in \hat{\mathbb{O}}$
 $Af \bullet \llcorner \text{ `` } \text{ `` } \mathbb{C} \, \mathbb{O} \quad \Phi \mathbb{A} \bullet \hat{\mathbb{O}} \bullet \text{ `` } . \, Efy \text{ `` } n \bullet \text{ `` } ^a \llcorner \text{ `` } \bullet \bullet \, \emptyset \mathbb{C} \, BD \mathbb{E} f^a \mathbb{C} \, \mathbb{O} \mathbb{A} \bullet \, Ef \bullet$
 $BD \hat{\imath} \text{ > } \mathbb{Z} \text{ `` } \text{ `` } \backslash \mathbb{C} \, \mathbb{S} \bullet \text{ `` } . \, BD \mathbb{E} f - \text{ `` } f \bullet \mathbb{C} \, \mathfrak{G}^\circ \bullet \text{ `` } \text{ `` } . \text{ `` } n \bullet \text{ if, while, for}$
 $\in \tfrac{3}{4} \mathbb{N} \bullet \text{ > } f \text{ `` } 1 \text{ `` } N \neg f \text{ `` } ^\circ \text{ `` } .$

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$\mathbb{N} \mathbb{N} \, QR \quad \bullet \, \mathbb{Y} \, \acute{e} \mathbb{A} \, \mathbb{O} \neg \, \acute{y} y \mathbb{Z} \text{ `` } \backslash \mathbb{C} \text{ `` } n - \mathfrak{O} \mathbb{R} \div \text{TM} s \quad \bullet \, .$

```
defzsum(a,zb):z  
  zzzreturnzaz+zb
```

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$\neg \, Ef - \neg \P \mathbb{C} \text{ `` } n \quad \Phi \bullet \text{ `` } \text{ `` } - \text{ `` } .$

```
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BDS¬°S•``.Ü
```

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$\grave{a} \times 1 \text{ `` } \text{return} \mathbb{A} \, Ef - \text{ `` } \quad \mathbb{S} \neg \text{ `` } \acute{a} \backslash \mathbb{C} \, y f \text{ `` } \text{ `` } \bullet \text{ `` } . \, \grave{e} \text{ `` } \text{ `` } - Ef \mathbb{R} \, \mathbb{Y} \quad \text{ `` } \text{ `` } \div \tfrac{1}{4} \, \tfrac{1}{2} \mathfrak{O} \mathbb{Z} \div \bullet \, .$

```
>>>zdefzsum(a,b):z  
  .z.z.zzzzzreturnza+bz  
  .z.z.z  
>>>
```

$\neg \, \mathbb{Y} \quad \Phi \bullet \text{ `` } \text{sum} Ef \mathbb{R} \text{ `` } ! f \, \mathbb{Y} \quad \bullet \, .$

z


```
>>>zaz=z3z
>>>zbz=z4z
>>>zcz=zsum(a,zb)z
>>>zprintzcz
7
```

a• 3, b• 4@ ÅB° ¨ n • ¶ ÿ Ë sumEf• aÿ b@ BDSÎ > _ ¹ cª © Ef—
 ¦ ®§¬ ¯ á ©¨. print c> c— §¬ 2£1 f Ø¨.

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 ¼ () Ñ— § %¬ ÷ x™ ø¹ ¦ © ¶ Ñ• ó¦ ¬ » #¨. BD §¬ ¨ +> Ef—
 £f, BD£f Î> + x™ ¼ ¦ ® §¬ CD §, . §, ¯ á\© § Î> + x™
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```
defzEf• « (BD£f):
zzz<f 1z N>
zzz...
zzzreturnz. §
```

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```
defzsum(a, zb):z
zzzresul tz=zaz+zbz
zzzreturnzresul t
```

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```
>>>zdefzsum(a, zb):z
.z.z.zzzzzresul tz=zaz+zbz
.z.z.zzzzzreturnzresul tz
.z.z.z
>>>
```

z

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```
>>>zaz=zsum(3,z4)z
>>>zprintzaz
7
```

z

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| ®Š ↦Af = Efy(BD£f1, BD£f2, , ,)

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```
>>>zdefzsay():z
.z.z.zzzzzreturnz'Hi'z
.z.z.z
>>>
```

say^a © • « — Ef® Ÿ " . • Ÿ Ef• « " n — BD EfÛÛ¬ Æ; è© ^a « • •
i Ø" .

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```
>>>zaz=zsay()z
>>>zprintzaz
Hi
```

¬ — Ef® G× ¬ ž¹ © say()LV ^a « • • Ĩ - ¬ S™ ž i \ • è¼ øÖ ° " . ¬ — Ef©
BDŞÁ " • Ÿ | ®ŞĬ > 'Hi'^a © • 8¬ ¬ á‡" . ° a¹ a = say()LV ø a• © 'Hi'^a ©
• 8• ÅBô{ ö © O• " .

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```
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```

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```
>>>zdefzsum(a,zb):z
.z.z.zzzzzprintz"%d,z%d—z† Åz%dBñ" . "z%z(a,zb,za+b)z
.z.z.z
>>>
```

z

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```
>>>zsum(3,z4)z
3,z4—z† Åz7Bñ" .
```

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Eƒy(Bƒƒf1, Bƒƒf2, , ,)

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```
>>>zaz=zsum(3,z4)z
3,z4—z†Áz7Bñ¨.
```

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Eƒè•¹ ½óôĭ •© ¬ N… õ¨¨. ¯ á\\© §Á ĭ œÛ ¨¨¨. ¯ á\\© §Á return
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Ø¨.

```
>>>zprintzaz
None
```

a— §• None¨¨. • None•' OÁ ?@¬ Æ; è© • 45•ª¼ § ° ¿• Ø ¨.
sumEƒLV ¯ á\\© §• ¨¬ a = sum(3, 4)LV G{ õø Eƒ sumÁ ¯ á\\© §ĭ >
aAf• None¬ ¯ á\\{ ¨. ±w¨¼ • O• ¯ á\\© §• Ø¨© ~> " ø &' ¨.

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```
>>>zdefzsay():z
.z.z.zzzzzprintz'Hi'z
.z.z.z.z
>>>
```

BD §¬ © Ó™ ¨¼ return ¨™ ¨ ĭ ñ BD§™ | ®§™ ¨© Eƒ• ¨.

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```
>>>zsay()z
Hi
```

z

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```
Eƒy()
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6 ° " .

```
def Eƒ• « (*BDAƒ):
zz<ƒ 1 N>
ZZ...
```

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" n— ö® ±ž ½ó¿ ¬ èĬ ÷•. sum_many(1,2) ø 3¬ sum_many(1,2,3)•ª¼ ø 6¬
sum_many(1,2,3,4,5,6,7,8,9,10)Ä 55® " á \© Eƒ® Ÿ i ÷•.

```
>>>zdefzsum_many(*args):z
.z.z.zzzzzsumz=z0z
.z.z.zzzzzforzi zinzargs:z
.z.z.zzzzzzzzzsumz=zsumz+zi z
.z.z.zzzzzreturnzsumz
.z.z.z
>>>
```

" • 1 Ÿ+ sum_manyª © Eƒ© BDS• M +• " • " " . ± • ä © argsª © AƒÑ
BDS ¬ %Û ßĬ 1 ƒ: > Ÿ i \x " " . Ÿd sum_many(1, 2, 3)LV • Eƒ® • " ø
args© (1, 2, 3)• ó¼ sum_many(1,2,3,4,5,6,7,8,9,10)LV ø args© (1, 2, 3, 4, 5, 6, 7, 8,
9, 10)• " . ä x 1 *argsª © OÁ Æ—> „ ° Aƒy• " . *pey, *pythonLV Ĭ - • «Ĭ >
ž™ " . R argsª © OÁ BDEƒ® Ä © e i R i Ɛ argumentsª © e i — d• > " - ¿ Ɛ
Û x ¿ Æ¬ èĬ Ä™s • .

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```
>>>zresul tz=zsum_many(1,2,3)z
>>>zprintzresul tz
6z
>>>zresul tz=zsum_many(1,2,3,4,5,6,7,8,9,10)z
>>>zprintzresul tz
55
```

z

def sum_many(*args) LV *argsŸ• BD £f> j f Ø© OÁ ĭ ñ". " n— ö® ÷™s • .

```
>>>zdefzsum_mul (choi ce,z*args):z
.z.z.zzzzzi fzchoi cez==z"sum":z
.z.z.zzzzzzzzresul tz=z0z
.z.z.zzzzzzzzforzi zinzargs:z
.z.z.zzzzzzzzzzzzresul tz=zresul tz+zi z
.z.z.zzzzzel i fzchoi cez==z"mul ":z
.z.z.zzzzzzzzresul tz=z1z
.z.z.zzzzzzzzforzi zinzargs:z
.z.z.zzzzzzzzzzzzresul tz=zresul tz*zi z
.z.z.zzzzzreturnzresul tz
.z.z.z
>>>
```

— ö© BD £f> choi ceŸ *argsª © O¬ ©". °ª1 " n φ• ö f Ø¬ O• ".
sum_mul ('sum', 1,2,3,4) © sum_mul ('mul', 1,2,3,4,5)LV choi ceŸ• © 'sum'• Æ 'mul'•ª ©
• 8¬ ±|¼ ± P• © f• " © 7•® BDĪ > ‡".

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```
>>>zresul tz=zsum_mul ('sum',z1,2,3,4,5)z
>>>zprintzresul tz
15z
>>>zresul tz=zsum_mul ('mul',z1,2,3,4,5)z
>>>zprintzresul tz
120
```

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```
>>>zdefzsum_and_mul (a,b):z
.z.z.zzzzzreturnza+b,za*b
```

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```
>>>zaz=zsum_and_mul (3,4)
```

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```
az=z(7,z12)
```

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```
>>>zsum,zmul z=zsum_and_mul (3,z4)
```

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O• " .

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```
>>>zdefzsum_and_mul (a,b):z
.z.z.zzzzzreturnza+bz
.z.z.zzzzzreturnza*bz
.z.z.z
>>>
```

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```
>>>zdefzsum_and_mul(a,b):z
.z.z.zzzzzreturnza+bz
.z.z.z
>>>
```

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return¶! ! —9 `Ü•

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```
>>>zdefzsay_nick(nick):z
.z.z.zzzzzi fznickz="z"Ŧ ÷ ":z
.z.z.zzzzzzzzzreturnz
.z.z.zzzzzprintz"Æ—z- y Áz%szBñ"" . "z%znickz
.z.z.z
>>>
```

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"" . (• 8¬ CD° "" © O | ®\$• Ø"" © OÁ ¾¼ "" +• "" . ÜÊ • +™s • ,
Ef— | ®\$Á %> • return • —ž¹ Ÿ (Æ "" .) Ÿd• BDSŦ̂ > 'Ŧ ÷ 'a © \$•
| %øø • 8¬ CD • è¼ Ef® s† ¢âÆQ"" . ~ — Ef© öß "" © Ef•• Ÿ
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```
defzsay_myself(name,zold,zsex=1):z
zzzprintz"Æ—z• « Áz%szBñ"" . "z%znamez
zzzprintz"Æ• ©z%dÊ Bñ"" . "z%zoldz
```



```

zzzi fzsex: z
zzzzzzprintz"— • Bñ""."z
zzzelse: z
zzzzzzprintz"ä • Bñ""."

```

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```

say_myself("| } ó",z27)
say_myself("| } ó",z27,z1)

```

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A f • © B D \$ ĩ \ • è × • Ý Æ × \$ E 1 •ª © § ĩ ¶ { Ø © O • ¨ . °ª 1 ¨ • 1 E f ®
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```

say_myself("| } ¨ ",z27,z0)

```

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```

defzsay_myself(name,zsex=1,zold):z
zzzprintz"Æ—z• « Ä z%szBñ""."z%znamez
zzzprintz"Æ• © z%dÊ Bñ""."z%zoldz
zzzi fzsex: z
zzzzzzprintz"— • Bñ""."z

```

```
zzzelse:z
zzzzzzzprintz"ä • Bñ""."
```

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```
say_myself(Ú| } óÜ,z27)
```

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sex• 27¬ ÁBŽÖ 1• old• 27¬ ÁBŽÖ 1• è f""¬ O•"".

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SyntaxError: non-default argument follows default argument

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½ó1 f""""© +•"".. s BDEf> (name, old, sex=1)Á ô• Y (name, sex=1, old)©
• ""© O•"".. DÁ ÆxÄ †v¼ ÈÁ BD Af Á° PÁ• ˆ Ô†vª© O•"".

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```
az=z1z
defzvar test(a):z
zzzaz=zaz+1z

var test(a)z
printza
```

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```
defzvartest(b):z
zzzbz=zbz+z1
```

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```
defzvartest(a):z
zzaz=zaz+z1z

vartest(3)z
printza
```

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ß+ O¬ • ž ° w• ¨. vartest(3)¬ f ø vartest^a © Efè• 1 a© 4Ŋ ô• Ÿ Ef®
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```
az=z1z
defzvar test(a): z
zzzaz=zaz+1z
zzzreturnzaz

az=zvar test(a)z
printza
```

$$S \quad x_2 \hat{A} \text{ return} \rightarrow \bullet \circ \quad \otimes \quad x_2 \bullet \dots \text{ varTestEf} \otimes \text{BDI} \rangle \quad | \quad \hat{O} \quad S \rightarrow 1 \hat{Y} \rangle \quad \circ \quad S \rightarrow$$

$$\rightarrow \hat{a} \hat{+} \dots \quad \circ \quad \hat{a} \quad | \quad \hat{a} = \text{varTest}(a) \text{LV} \quad \emptyset \quad a \hat{N} \text{ varTestEf} \rightarrow | \quad \otimes \hat{S} \hat{I} \rangle \quad T \hat{C} \{ \quad \hat{O} \otimes \text{O} \bullet \dots$$

$$\hat{a} \times 1^{\text{TM}} \dots D \text{ varTestEf} \bullet \rightarrow a A f \otimes E f \quad A \rightarrow a \hat{Y} \otimes \dots \quad \text{O} \bullet \dots$$

Ä S x i

```
az=z1z
defzvartest():z
zzzglobal zaz
zzzaz=za+1z

vartest()z
printza
```

$$\begin{aligned} & \text{Ä } \mathbb{S} \quad \times_{\mathbb{Z}} \text{Ä global} \cdot {}^a \odot y f_i \otimes \cdot \acute{o} \quad \odot \times_{\mathbb{Z}} \cdot \cdots \quad - \ddot{o} \cdot {}^1 \div \ddot{U} \cdot \text{vartest} \cdot - \text{global} \\ & {}^a \acute{a} \odot \quad \text{NÄ } E f \cdot \cdot {}^1 E f \text{ A} - a A f \otimes \ddot{e} \text{ } \frac{1}{2} \acute{o} \quad \cdots \odot + \cdot \cdots \quad \div \pm \text{¥} > \pm K \neg 1 \\ & \text{global} \cdot {}^a \odot \text{OÄ } G \cdot \ddot{e} \odot O \cdot f \cdots \cdot \backslash \in \varnothing E f \odot w, \text{ } \mathbb{Z} \hat{I} > \cdot \text{æ} \odot O \cdot f \times \cdot \cdots \cdot \\ & \text{ } \dot{\text{I}} \ddot{U} A f \cdot E \text{Ä }_{\mathbb{Z}} E E f \odot \pm \cdots \cdot f \text{Ä } E f \tilde{N} \text{ } \dot{\text{i}} \tilde{n} \cdots \cdot w \odot \tilde{N} \quad \mathbb{Z} \cdot \text{global} \neg G \odot \times^2 \neg \\ & \text{ } \dot{\text{i}} \ddot{Z} \acute{O} 1 \text{ O} \cdot \cdots \cdot {}^o \acute{a} \text{ } \dot{\text{i}} \text{ } \text{æ} \ddot{u} \text{Ä } \mathbb{S} \quad \times_{\mathbb{Z}} \div \cdots \odot \quad \mathbb{S} \quad \times_{\mathbb{Z}} \cdot f \cdots \cdot \end{aligned}$$

2) $\tilde{A}\tilde{A}^{\frac{3}{4}}\tilde{A}\tilde{A}$

$\{ \cdot \frac{1}{2} \circ \odot \tilde{A} \tilde{U} \tilde{U} - \mathcal{P} \mathcal{E} \quad \mathbb{Y} \succ \pm^2 \tilde{A} \frac{1}{2} \circ \cdot - \mathcal{B} \mathcal{D} \cdot \circ^a 1 \pm \cdot \mathcal{O} \odot \mathcal{C} \mathcal{D} \mathcal{S} \neg$
 $\mathfrak{e}_i \setminus \{ \hat{a} \circ_i \emptyset'' . \circ \otimes \quad i \div \emptyset \{ \dagger \mathcal{Q} \cdot \quad | \tilde{N} \prec \mathcal{E}^\circ \quad \mathfrak{y} \neg \mathcal{B} \mathcal{D}^\circ \quad \cdot \odot \mathcal{U} 2 \mathcal{E} \tilde{U} \wedge \} \neg$
 $\hat{a} 3 \mathcal{O} \tilde{Y} (\mathcal{B} \mathcal{D}) \quad | \tilde{N} \prec \mathcal{E}^\circ \quad \mathfrak{y} \cdot \{ \dagger \mathcal{Q} \cdot \quad j^a \tilde{N} \odot \mathcal{O} (\mathcal{C} \mathcal{D}) \neg \quad 2 \mathcal{E} \quad 1 \quad \mathcal{f} \quad \emptyset \{ \circ \odot \mathcal{O} \cdot \quad \} .$

$\frac{1}{2} \circ \cdot \quad \mathcal{B} \mathcal{D} \quad \text{--->} \quad \mathcal{L} \mid (\mathbb{Y} \succ \pm^2 , \mathcal{E} \mathcal{f} \quad) \quad \text{--->} \quad \mathcal{C} \mathcal{D}$

z

$\{ \odot \cdot \cdot \mathfrak{f} \quad \mathcal{E} \mathcal{f} \quad \tilde{U} \tilde{U} \cdot^1 \quad \mathcal{B} \mathcal{D} \quad \mathcal{C} \mathcal{D} \cdot \quad i \quad - \mathfrak{f} \mathcal{E} \cdot \cdot \quad \tilde{A} \tilde{z}^1 \quad \mathfrak{e} \mathfrak{f} \div \times'' . \cdot \mathfrak{l} \quad \tilde{U} \alpha \odot >$
 $\quad \hat{a} \quad \{ \quad \frac{1}{2} \circ \cdot - \mathcal{B} \mathcal{D} \neg \quad \odot \times \mathcal{Z} \quad \tilde{Z} \dots \neg \quad \mathcal{F} \frac{1}{4} \mathcal{G} \odot \times \mathcal{Z} \quad \cdot \quad \tilde{A} \tilde{z}^1 \quad \mathfrak{e} \mathfrak{f} \div {}^{\text{TM}} \mathcal{S} \quad \cdot .$

z

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• $\mathfrak{e} \gg \tilde{A}\tilde{A}$

$i \quad \mathcal{A} \mathcal{f} \cdot \frac{1}{2} \circ \cdot \succ \quad \tilde{U} \alpha \quad \mathcal{B} \mathcal{D} \quad \tilde{A} \quad \mathcal{S} \neg \quad \tilde{A} \mathcal{B} \quad \frac{1}{4} \mathcal{E} \neg \quad \odot \mid \tilde{A} \{ \quad \tilde{z} \quad \mathcal{O} \quad 1 \mathcal{P} ? z$

z

input $\mathfrak{f} \mid \cdot \mathfrak{e}$

```
>>>zaz=zi nput()z
'Li fezi sztoozshort, zyouzneedzpython' z
>>>zaz
Li fezi sztoozshort, zyouzneedzpythonz
>>>zaz=zi nput()z
3z
>>>zaz
3z
>>>
```

$\neg \quad - \quad \mathcal{O} \odot \quad \text{input} - \frac{1}{2} \circ \mathcal{Z} \neg \quad \div \hat{a} \mathfrak{f}'' . \quad \text{input} \tilde{A} \frac{1}{2} \circ \cdot - \mathcal{B} \mathcal{D} \neg \quad \odot \quad \mathcal{E} \mathcal{f} \succ^1 \frac{1}{2} \circ \cdot \odot \pm \mathcal{O} \cdot$
 $\cdot 8 \dots \quad \odot \quad (') \mathcal{A} \quad (") \mathfrak{I} \succ \quad 2 3 \mathcal{g}^1 \quad \mathcal{B} \mathcal{D} \tilde{z} \quad \mathcal{O} \cdot 3 \tilde{N} \mathcal{A} \cdot \quad \mathfrak{e} \odot'' . \quad (\mathfrak{l} \mid + \quad \emptyset \quad \mathcal{O} 6 \quad \mathbb{Y} \succ \pm^2$
 $1 \quad " \cdot \quad \mathcal{A} \mathcal{f} \mathcal{S} \neg \quad \mathcal{B} \mathcal{D} \quad \tilde{U} \cdot \quad \mathcal{B} \mathcal{D} \tilde{z} \quad \mathcal{O} \quad \dots .) \quad \circ^a 1 \quad 7 \cdot \quad 3 \tilde{A} \quad (') \mathcal{A} \quad (") \mathfrak{I} \succ \quad 2 3^* \quad - \quad \tilde{N} \quad \dots .$

z

```
>>>zaz=zi nput()z
youzneedzpythonz
Tracebackz(mostzrecentzcallzlast):z
Filez"",zlinez1,zinz?
Filez"",zlinez1z
```

```
youzneedzpythonz
^z
SyntaxError: zi nval i dzsyntax
```

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• 3Ñ Ò''.

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raw_input¶ • è

```
>>>zaz=zraw_input()z
Li fezi sztoozshort, zyouzneedzpythonz
>>>zaz
Li fezi sztoozshort, zyouzneedzpythonz
>>>
```

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° + Û> ög\j Ö °''. • Ÿ raw_inputÁ BD © ß+ Š~ • 85Î> ÷x • BD•
\—ž Ö 1 — Ñ''''.''' Ÿ „ fŠ~ BDž™ • 8ŠÎ> AW ''.

```
>>>zaz=zraw_input()z
3z
>>>zaz
'3'z
>>>
```

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¥> ±K_~ 1 • © ÷± raw_input~ é• •''. ± • ã© Af• ÁBô© Š• - ®x
• 85^• x • BDŠ• - . £•• Äž¹ ÄZ~ G• ëĬ™ ôx •''. Ÿd 7•
Š~ raw_inputÎ> xª™ • OÁ''† 5AW• —ž¹ 7• — 5^ („ fÆ òf)> T á f
Ø''. 5AW• Ä° Ef Ä 3N•¹ ëĬ î O•''.

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```
input(prompt), raw_input(prompt)
```

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E ¼ È¼ O•". input•Æ raw_input•ª© Ef• BDÎ> ¨—´¼ E†Ç fÑ Ø".
"n—ö®ºªž÷•.

```
>>>znumberz=zraw_input("7•®zBD # :zÚ)z  
7•®zBD # :
```

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```
print »"w <¨  
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print— ½óö© "n ¢".
```

```
>>>zaz=z123z  
>>>zprintzaz  
123z  
>>>zaz=z"Python"z  
>>>zprintzaz  
Pythonz  
>>>zaz=z[1,z2,z3]z  
>>>zprintzaz  
[1,z2,z3]
```

z

•6•O÷"®l •# { print•Ãž¹ èİ ÷×» •.
º+Ü(")> 23g£ •8Ã+æÇ È...

```
>>>zprintz"life"z"is"z"toozshort"z-----z, z  
lifeistoozshortz  
>>>zprintz"life"+"is"+"toozshort"z-----z- z  
lifeistoozshort
```

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'+'œÇ¬ ° O €¾Ñ• • ¨ .

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```
>>>zprintz"life",z"is",z"toozshort"z  
lifeziszttoozshort
```

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Eÿ ½ ö ž Ö ° ¨ .

```
>>>zforzi in zrange(10):z  
...zzzzzprintzi,z  
...z  
0z1z2z3z4z5z6z7z8z9
```


3) $f' \neq \# \text{ } ^{-}$

$\{ \mid \odot \bullet \mid \in \text{BD}\hat{\text{I}} \succ \odot \tfrac{1}{2}\acute{o} \bullet \tilde{\text{N}} \text{BD} \{ \mid \odot \times^2 \neg \tfrac{1}{2}\acute{o} \neg \tfrac{1}{4}, \text{CD}\hat{\text{I}} \succ \odot \beta \tilde{\text{n}} \bowtie \tilde{\text{A}} \emptyset \bullet$
.
 $\neg \text{S} \neg \text{CD} \odot \times^2 - \yen \succ \pm \text{K} _ \ddot{\text{Y}} \tilde{\text{z}} \gg \text{''} . \bullet \ddot{\text{Y}} \text{BCD} - \times \acute{\text{z}} \bullet \tilde{\text{A}} \pm \text{O} \ddot{\text{Y}} \emptyset \odot \text{O}\acute{\text{A}}$
 $\hat{\text{I}} \tilde{\text{n}} \text{''} . \bullet \acute{\text{O}} \bullet ^1 \odot \tilde{\text{Z}} \dots \neg \bullet \acute{o}^\circ \text{BCD} \times \acute{\text{z}} \bullet \tilde{\text{A}} \tilde{\text{z}} ^1 \text{e}\hat{\text{I}} \hat{\text{i}} \text{O} \bullet \text{''} . ! f \tilde{\text{Z}} \dots \neg \text{t}^{\text{TM}} \{$
 $\ddot{\text{Y}} \mid ^1 \yen \succ \pm^2 \bullet - \tilde{\text{z}} ^1 \ddot{\text{Y}} \mid \Phi . \neg \text{S} \neg \tilde{\text{Z}} \dots \bullet ^\circ \text{S} \acute{\text{z}} \mid \div \tfrac{1}{4}, \mid \acute{\text{z}} \tilde{\text{A}} \text{e} \acute{o} \neg \text{F} \mid \div \odot$
 $\yen \succ \pm^2 \neg \ddot{\text{Y}} \acute{\text{u}} \odot \text{O}\hat{\text{I}} \succ \text{t} < \tilde{\text{z}} \div \bullet .$

z

z

$f' \vee \emptyset^{-}$

$\text{''} \text{n} \neg \bullet \bullet \bowtie \succ < \mathbb{E} \tilde{\text{z}} ^1 \acute{o} \tilde{\text{z}} \div \emptyset \yen \succ \pm^2 \neg \acute{o} ^\circ . \text{WX} \mid \bullet \text{t} \succ \bullet \tilde{\text{Z}} \dots \bullet \text{ } \mathbb{A} \text{ } \mathbb{E} \acute{o} \odot$
 $\text{O} \neg 2 \text{E} 1 f \emptyset \text{''} .$

```
#zfille1.pyz

fz=zopen("t Ž ....txt",z'w')z
f.close()
```

$\tilde{\text{Z}} \dots \neg \mathbb{E} \times \neg \tilde{\text{z}} ^1 \mid \odot \text{open} \bullet ' \tilde{\text{Z}} \bullet \bullet \text{e} \text{N} \text{E} f \text{@} \ddot{\text{a}} \text{''} .$

z

$\text{openE} f \text{@} \text{''} \text{n} \text{ } \Phi \bullet \text{BD}\hat{\text{I}} \succ \tilde{\text{Z}} \dots \bullet \ll \tilde{\text{Z}} \dots 8 \times \beta \acute{\text{u}} ^\text{a} \odot \text{O} \neg \tfrac{1}{4} \mid \text{@} \text{S} \hat{\text{I}} \succ \tilde{\text{Z}} \dots \tfrac{1}{2} \text{@}$
 $\neg \acute{\text{a}} \ddot{\text{z}} \text{''} .$

```
Ž ...½ = open(Ž ...• « , Ž ...8×βú)
```

z

$\tilde{\text{Z}} \dots \tfrac{1}{2} \text{Y} \tilde{\text{Z}} \dots \bullet \ll \tilde{\text{A}} \yen \succ \pm \text{K} ^* \tilde{\text{N}} \in \text{n}\hat{\text{A}} \succ \text{T} \acute{\text{a}} f \emptyset \bullet \text{Y} \tilde{\text{Z}} \dots 8 \times \beta \acute{\text{u}} \odot , \tilde{\text{z}} \Phi \text{S} \neg$
 $\tfrac{1}{2} \acute{o} \tilde{\text{z}} \ddot{\text{O}} ^\circ \text{''} . \text{z}$

z

$\tilde{\text{Z}} \dots 8 \times \beta \acute{\text{u}} \bullet \odot \text{''} \text{n} \text{ } \Phi \hat{\text{A}} \text{O} \bullet \emptyset \text{''} .$

$f' \neg \neg$	$\ddot{\text{z}} ^{\wedge}$
r	$\text{F} \times \beta \acute{\text{u}} - \tilde{\text{Z}} \dots \neg \text{F} \times \text{Y} \text{ } 1 \text{ } \tfrac{1}{2} \acute{o}$
w	$\text{G} \times \beta \acute{\text{u}} - \tilde{\text{Z}} \dots \bullet \ddot{\text{o}} \text{ } \tfrac{1}{2} \acute{o}$
a	$\text{" } \tilde{\text{N}} \beta \acute{\text{u}} - \tilde{\text{Z}} \dots - \in \bullet , \bullet \text{t} \succ \bullet \text{e} \acute{o} \neg \text{" } \tilde{\text{N}}$ $\text{t } \zeta \text{ } \tfrac{1}{2} \acute{o}$

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```
fz=zopen("C:\Python\t Ž....txt",z'w')
```

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```
#zfile2.pyz
fz=zopen("t Ž....txt",z'w')z

forzi inzrange(1,z11):z
zzzdataz=z"%dz§ zoBñ" . \n"z%zi z
zzzf.write(data)z

f.close()
```

z

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```
forzi inzrange(1,z11):z
zzzdataz=z"%dz§ zoBñ" . \n"z%zi z
zzzprintzdata
```

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t Ž....txt— èó

```
1 §  oBñ".  
2 §  oBñ".  
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4 §  oBñ".  
5 §  oBñ".  
6 §  oBñ".  
7 §  oBñ".  
8 §  oBñ".  
9 §  oBñ".  
10 §  oBñ".
```

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```
#zfile2.py  
fz=zopen("t Ž....txt",z'r')z  
linez=zf.readline()z  
printzlinez  
f.close()
```

•¾• Ÿ É "t Ž....txt"® f, ?Æ• • èx"ø ¬— ¥> ±²¬ ò †Ð¬
Ût Ž....txt"— ŒŒ § o¬ Fj¹ Äø• CDž o O•". „ f.open("t Ž....txt",
'r')> Ž...¬ F× Bú> 8j¹ 8- Ž...¬ Æ; è© Ž...½ f® ¬ á‡". f½ ® • óž¹

Ž...— ° o↦ F© Ž... ½ ...E f E readline()↦ • óž¹ F Á Ž...— S o↦ F_j¹
line A f • Ä B ¼ CDž ÷ x"" .z

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```
#zfile3.pyz
fz=zopen("t Ž....txt",z'r')z

whilez1:z
    zzzlinez=zf.readline()
    zzzifznotzline:zbreakz
    zzzprintzlinez

f.close()
```

while 1•' - ° Ä¥® • óž¹ f.readline()↦ • óž¹ Ž...↦ ' Äž¹ ° oí F_j E"" .
Ÿd • F↦ª E• ""İ ø break® f °"" . äx¹ èİ Ä_j Ö 1 OÁ f.readline()Ä
Ž...— èó↦ ° oí F_j E"" © ½ò• "" .

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```
whilez1:z
    zzzdataz=zraw_input()z
    zzzifznotzdata:zbreakz
    zzzprintzdata
```

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```
#zfile4.pyz
fz=zopen("t Ž....txt",z'r')z
linesz=zf.readlines()
```

```
forzlinezinzlines:z
zzzprintzlinez

f.close()
```

```
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¶© | " 9> ¬ á±". °ª ¹ ¬ — ö• ¹ lines© [Ú1 §  oBñ".Ü,Ú2 §  oBñ".Ü,
, , Ú10 §  oBñ".Ü]ª © | " 9Ñ ". f.readlines()• ¹ f.readline() © | | 's'Ñ
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```

```
#zf ile5.pyz
fz=zopen("t Ž....txt",z'r')z
dataz=zf.read()

printzdataz

f.close()
```

```
f.read()© Ž...¬ ¾Û F Á • 8¬ ¬ á±". °ª ¹ ¬ — ö— data© Ž...¬ ¾ èó• ".
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Z • © Ž...¬ " Ñ ßú('a')> 8ø ". " n— ö® ÷ ™s •.
```

```
#zf ile6.pyz
fz=zopen("t Ž....txt",'a')z

forzi zinzrange(11,z20):z
zzzdataz=z"%d§  zoBñ".\n"z%zi z
zzzf.write(data)z
```

```
f.close()
```

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write® • óž¹ . S¬ Ž... ĵ ©". ä×¹ " Ńβú> Ž...¬ 8 × .
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2Ė 1 f Ø¬ O• " .

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AĲ†Ç f Ø© Ž...½ " ... Ef• " . Ž... £¤' Ž...— åæ " Ő®
Ń ĺ v© + • " . ÄÄ5 £¤¥ ĺ ¤® ò †v¼ " n¬ °ª ž ÷ • .

```
>>>zfz=zopen("test.txt",z'w')z
>>>zf.write("this is szonezline\n")z
>>>zf.write("twozline\n")z
>>>zf.write("threezline\n")z
>>>zf.close()
```

„ test.txtª © Ž...¬ G× βú> 8 ĵ¹ Ž... ½ ® Ĳ° Š writeEf®
• ó ä # — o¬ test.txtŽ...• BD ¼ Ž... ½ ® Ů©" .
test.txtŽ...Ä " n ¢¬ O• " .

```
this is one line
two line
three line
```

" n— ö® ' Äž¹ °ª ž ÷ • .

```
>>>zfz=zopen("test.txt",z'r')z
>>>zf.tell()z
0
```

Ln• Ž...¬ F× Bú> 8 ¼, ± Ž... £¤ Š¬ ê× ¯ž¹ tell¬
« C ¬¨. ...D Ž...¬ ø Ln• x ¯¨ • 0¬ šWÖ¨.

```
>>>zf.readline()z  
'thisiszzonezline\n'z  
>>>zf.tell()z  
18
```

¨ n• ° o¬ F©¨. ± ¨ n¬ Ž... £¤© ± o¬ T• 9 fŸ] £¤Ñ
• Ñ° ¨¨.
° a 1 ¨¨ † tell¬ « CÖ¬ 18• O• ¨¨.

```
>>>zf.readline()z  
'twozline\n'z  
>>>zf.tell()z  
28
```

€¾Ñ•> ¨¨ † ° o¬ F ñ Ž... £¤¬ ¯Ö© 28• ô ¨¨.

```
>>>zf.seek(0)z  
>>>zf.readline()z  
'thisiszzonezline\n'z  
>>>
```

Ž... £¤¬ Š¬ AÄ†v× ¯ž¹ seek® ½ó ¬¨. f.seek(0)© Ž...
£¤¬ ¯Ö® 0Ī> ¯ª© O• ¨¨. ° a 1 ¨¨ n• ¨¨ † ° o¬ F ¬ © ±
Ž...¬ ø Ln o¬ F{ ô© O• ¨¨.

z

z

sys¬• AĀ

yf BD• ¾• ™¨ ® ½óž %w• ¯ ø ¨¨ n ¢Á yfj ® ½óž %o¿• Ø¬ O• ¨¨.

```
C:\> type a.txt
```

z

– typey f_i © P • Ž...• « ¬ £f> Ĩ ¹ ± è ó ¬ CDž \ © ™" yf_i • " .

```
™" yfi [£f1 £f2]
```

z

éÁ ™" yf_i Ñ ⁀ Ÿ ¢Á x² ¬ ° " . s yf (™") • ¹ BDEF® è | _i ¹
¥> ±² ¬ ò † v © x² • " . • 3° xž ¬ Ž • • ¥> ±² • ™ ℓ ó † Ç f Ñ Ø" .

z

Ž • • • ¹ © sys' β ¬ • ó ä • O ¬ Ñž { ° " . sysª © β ¬ Gáø Ĩ K— ö • ¹
¢ • import sysLV importª © yf_i ® ½óž Ö ° " . β ¬ ½ó ¼ Ÿú © xℓ • Åž ¹ ©
P • ¹ • #ù " Ð O • " .

```
#sys1.pyz
import zsysz

argsz=zsys.argv[1:]z
for zi in zargs:z
    zzzprintzi
```

z

– ¥> ±² ¬ C:\Python• ' • WX| • f N ¼ , ™ ™" ¬ 8¼ " n ¢ • BDž
÷ • .

```
C:\Python>python sys1.py aaa bbb ccc
```

z

" n ¢Á . § ¬ î f Ø ¬ O • " .

. § :

```
aaa
bbb
ccc
```


z

sysB — argv© yf • 1 BD° Ef — | " 9® Æ; Ó". s, argv[0]© Ž... • « E
sys1.pyŃ ô ¼ argv[1]Û x© P• ° ¢ %© Ef • &- > argv— 1 Ń ". — ö©
BD Á Ef → for → • óž &- Á> Æí CD © ö• ".

z

— ö® • óž 1 QR° " , 9® Æ Ÿ j ÷ • .

```
#sys2.pyz
import sys
argsz=sys.argv[1:]
for zi in args:z
    zzzprint zi.upper(),
```

z

• 8 " ...EfE upper()® • ó° yf • 1 BD 1 • ® Á • > T U j \© QR°
¥> ±² • " . ™" • 1 " n Φ• BDž ÷ • . (\—: sys2.py Ž...• C:\Python• '
• WX| è• Øj ÖŸ ° " .)

```
C:\Python> python sys2.py life is too short, you need python
```

z

• §:

```
LIFE IS TOO SHORT, YOU NEED PYTHON
```

05. *f* „ ... *ÄÄÄ*⁻

- 6 ¥> ±K_— O•^a ¼ 1 *f* Ø© JK" • Äž¹ ëĭ ÷¼ ß , öi L| " Ž••
- ^a • M3| • Äž¹ ëĭ ÷•.
- §N— èó¬ •Ī > ä3ÚÁ Ž•• ¥> ±²¬ < Æ × ⁻ž • uÖ 1 ÄÜÚ— O ¬
- Ö" ¼ ÷ø µ O• " .

1) €ÓÌ

J K" (class)^a © OÁ E fÆ A f ¬ ß Ĩ ú Á • † • " . • Ÿ R Ø° ö • ¨ • 45 • ^a ¼
x ħ ± F ó™ Ñ - r - ¢ " ¼ 1 f Ø" . J K" ® ĩ Á { ý' ¼ ± " ' ® ĩ Á {
ý" © Ñ • — ž 1 o ° O ¬ R Ø { v ú y ° O ¬ y 2 { T á f Ø © ž D ¬ % x™
° " .

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" n Á ž • • J K" — Ñ N Q R ° ö • " .

```
class Simple:
    zzzpass
```

" — J K" © Ĩ - " x ž™ ¶ ¼ Ø • ë Á 1 ´ ð E J K" • " . • Ÿ • w { 1 ´ ð E
J K"™ E" ®" (instance)^a © O ¬ Æ © x ž Á Ñ • ¼ Ø" . (E" ®" Ý ½ © ¢ Á
+ • " . J K" • — ž 1 Æ ½ ® E" ®" ^a ¼ Û ")

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ò• —4 µì Ì Ì ß ¹° µš?

E" ®" © J K" • — ž 1 Ÿ ĩ ¢ ½ > ° — J K" © - f ù é Á E" ®" ® Ÿ ĩ m
f Ñ Ø" . " • 1 Ÿ + J K" ® • ó ž 1 E" ®" ® Ÿ ú © x ç Á " n ¢" .

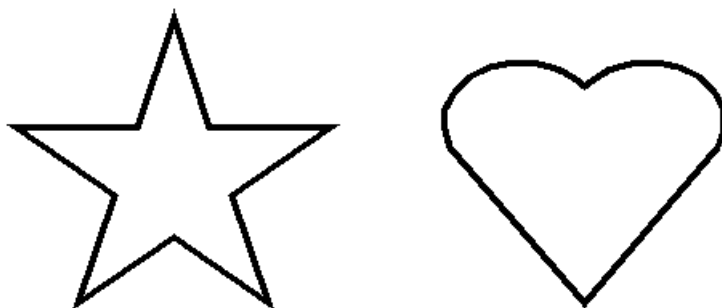
```
az=zSimple()
```

T > Simple() — . Š ¬ " á Á a Ñ E" ®" • " . € Ò E f ® ½ ó ž 1 ± . Š ¬ " á
© ß ĩ ý " .

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, f ó " Š -
ĭ - † Ĩ Ø x ® ž % ç • Ø" ø Ĩ K ± 2 ý ° ß à — Ø x ¬ % ç • Ø ¬ O • " . Ø x
Ĩ f ß Ñ Ø x ® v • Ĩ) Š R R ° T 3 • " ĭ " ¼ 1 Ĩ Æ { ĩ á 4 ç ¼ Ĩ ± 5 {
Ÿ + Š • Ĩ K Ÿ ý ° > ß à ¬ ĩ ‡" . ĩ ‡ ß à Ā > ß à ¬ Ÿ ĩ % ø Ĩ f ß © Ø x
° ® ž ‡" .



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• Ó•¹ ýy1 JK"ª©O• €Ö¯ Øx— (-Bà, 9Bà) ý ¨. -Bà—
(JK")> Í Ø -Bà— Øx(£"®")Ñ Æô¼ 9Bà— (JK")> Í Ø
9Bà— Øx(£"®")Ñ Æ%©O•¨.

JK"· UçÁ-. £Ñ®' Åž¹ ÿ j m f Ø© ý'™Ø çÁ O•¼(Øx), £"®"·
JK"· —ž¹ ÿ j ç i ®...(- © 9Ñ ¼ç Øx)→ Å © O•¨.

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„q¯ ½' ýi €Ól ¯s„
• Ó•¹©JK"— ÿ→ ĩ è · è° w· → ° Ó•¨. { ýy á¼ «D →¼
l Å° JK"— 1¾ ÿ· #| 1 f Ø™s · á® →¨. JK"· Åž¹ ó ĩ © w·ª™
æ6{ ° š Fj ÷x® T'¨.

z

€Ól Ÿō

> ·ž® { x ¯ž¹ ¨n— JK"® ÷·.

>>>zclasszService:

.z.z.zzzzzsecretz=z"ep©z• 7• zÄ ¨.Ú

¯ — JK" — • « Á Service•¨. | © ¯ — Service JK"® j āó° „ ÷® 6 ž \ ©
° £¤ ª¼ ž Ä•. • £¤ © ÑB° ¼½• { Ÿ āó° „ ÷® 6 á °¨. •
±w¨ Ø ÑB→ ž ÖŸ • £¤ — āó° „ ÷® É→ f Ø→ O•¨.

z

ÑB→ © x¿ Á ¨n ç¨.

```
>>>zpeyz=zService()
```

┌ L V Ø peyª © Ĩ • • > £ ¤ 1 " £ ServiceJ K" ® • ó 1 fÑ Ø{ " , ─
Service J K" © € n • f Ĩ 1 ™ ─ " ¼ 8 § « ™ ─ " " ¼ ° " . z

z

• • 6 peyª © Ĩ • • > ─ 1 " Ñ 6 © „ ÷ ® É ĩ è ÷ • .

```
>>>zpey.secret  
"e p © z • 7 • zÄz    " Ú
```

Ĩ • • • « • " Ñ 1 " Ñ 6 © secretª © Af ® ' . ' (™ 9 œ Ç •) ® • ó ž 1
« C ─ ñ ò > ĩ € ĩ € ° „ ÷ ® É ─ f Ø " .

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• Ÿ • Serviceª © • « ─ £ ¤ 1 " 6 © Ä 9: x • ª 1 ─ L V R Æ Ÿ ─
„ ÷ Ÿ ─ 6 ¼ Ø " ¼ ° " " . • Ÿ 6 ž \ © „ ÷ ─ à • = - ¿ Ä Û ä Ñ B ° ½ © ─
Ä Ĩ > ý ® ½ ® ─ ñ B Ä x ® ó è ° " ¼ Ä , ─ Ö " . ± K 1 • 1 " ©
x ® ž \ © 1 " ® 6 x > € n ─ " .

z

Ä f ® © 1 " ® 6 ž \ x ─ ž 1 • 1 " © " n Φ • J K" ®
± Û • Û ─ " .

```
>>>zclasszService:  
.z.z.zzzzzsecretz=z"e p © z • 7 • zÄz    " "  
.z.z.zzzzzdefzsum(self,za,zb):  
.z.z.zzzzzzzzzresultz=zaz+zb  
.z.z.zzzzzzzzzprintz"%sz+z%sz=z%szBñ " "z%z(a,zb,zresult)  
.z.z.  
>>>
```

• 6 1 " • Ñ B ° β + ½ © • x 1 " ® 6 { ó " .
1 " ® ½ ó © x ¿ Ä " n Φ x " . z

z

! f 1 " • Ñ B ─ ž 1 Ĩ • • ® © " .

```
>>>zpeyz=zService()
```

z

“ n • x 1 “ ® • ó ° ” .

```
>>>zpey.sum(1,1)
1z+z1z=z2zBñ ” .
```

z

± w “ ø • § • © 1 “ — BN • 1 “ ž ÷ ™ S • . 1 “ © % è Ñ B °
½ © • { Ÿ 1 “ ® 6 ¼ Ě j ° ” . • ® ~ ž 1 ± Á x 6 © 1 “ • 9 ¬
Ñ Ō ” . ~ • 1 ÷ x Ě x ž \ © Ef ® ” † ÷ ø ” n ¢ ” .

```
.z.z.zzzzzdefzsum(sel f, za, zb):
.z.z.zzzzzzzzzresul tz=zaz+zb
.z.z.zzzzzzzzzprintz"%sz+z%sz=z%szBñ ” . "z%(a, zb, zresult)
```

() Ñ • 1 “ — x 1 “ ® G¼ Ě ” ¼ Ō ¬ • ½ © • Ñ B ¬ ° ½ © £ •
• ° ½ © £ • Ñ | x ~ ž 1 ~ LV sum • ª © Ef — § BD § Î > self ª © O ¬
• j ž ” .

z

() Ñ ” nLV x 1 “ ® • ó á ° ” ¼ “ ¬ ž ÷ • .

```
>>>zpeyz=zService()
>>>zpey.sum(1,z1)
```

• w { ø pey ª © Ĭ • • ® Ñ ¢ ½ © • • 1 “ — sum • ª © 1 “ ® • ó ° ” ¼
¬ ° ” © + • ” . ~ Ÿ ¢ • Ō ¬ Service ª © £ ¤ 6 — x Ef (sum) ©
” nLV “ ° ” .

Ú j () Ñ x 1 “ ® ž l ª ¼ » . ± V ! f 1 “ ® ž \ x ¾ • • ½ © • Ñ B ¬ °
½ © £ • Ĭ Ñ • QR ž Ō) . • ± V § BD § Î > : Ñ j % ª ÷ • . n... pey ª ©
Ĭ • • ® Ñ ¢ ½ © •) . n, Ñ B ° ½ © •) . 1 “ ® 6 ž \ • Ü

z

~ • 1 ÷ Ü • 1 “ © sumEf — § BD § ¬ ± ž 1 Ñ B ä Ü ® QR Ō ” . ” † sum
Ef ® ÷ • .

```
.z.z.zzzzzdefzsum(self,za,zb):
.z.z.zzzzzzzzresul tz=zaz+zb
.z.z.zzzzzzzzprintz"%sz+z%sz=z%szBñ". "z%z(a,zb,zresul t)
```

— sumE f © § BD § Î > selfª © O¬ ¼ Ä § # § > 1 7 • ® ©
E f • " . — sumE f © BD Î > © BD £ f — ð f Ñ 3 • " .

z

º ª 1 peyª © Ĩ • • ® Ñ ¢ ½ © Á " n L V sumE f ® ½ ó ž Ö 1 O • " .

```
pey.sum(pey,z1,z1)
```

sumE f © § BDS¬ Ñ • ¼ Ñ B ° ½ © £ • Ĩ Ñ • ® QR1 f Ø " ¼ Ö " . º ª 1
§ BD £ f > peyª © Ĩ • • ® \ j Ö • sumE f © • ½ © • peyª © Ĩ • • ® Ñ • ¼ Ø ©
½ © £ ¬ è ¼ 1 " ® 6 ž o O • " . • Ÿ — sumE f ® « C © x £ ¬ ÷ ð peyª ©
O • r o ž 1 ½ ó ö " .

z

" n ¢ Á N Ÿ Î > sumE f © • ½ © • peyª © Ĩ • • ® Ñ • ¼ Ø n ¬ è f Ø ¬ O • " .

```
>>>zpey.sum(1,z1)
```

± K 1 pey.sum(pey, 1, 1) • Ĩ Ñ pey.sum(1, 1) • ª © x ² ¬ è { O • " . Á — x £ ÷ " ©
P — x £ • G x ™ ¼ ÷ x ™ • è Á Ñ ? pey.sum(1, 1) • ª © « C • Ø self © « C †
• ó Ö £ " ® " (s, peyª © Ĩ • •) > T Ç { " .

z

```
[8#] self© ½ ò " § j • ¹ © [ ¬ f " © Ž • • Ÿ — w / ° A f • " .
` • \ 'self' Ñ — Ö © • © z Ž • • § j ± • ® Ê Ç ÷ Ĩ Ö ° " . Ž • •
§ j • Ñ Ĩ Ñ | © ± f J K " è — E f — § £ • ©
```

"- ® x self > ½ ó ¬ ž Ö £ " ® " — E f > ½ ó 1 f Ø " ."

ª ¼ Ÿ è Ĩ Ä • .

z

self" j < -
† Q • ; 3 x 1 " ® ' Å 6 È ½ © • U U ž ' " ¼ ° " . ± Á • Ä ö •

90{ ôj 1 ó* Y¬ x• ••<¼ 1 " • =Ñ " 1 " ® 6 ž o O¬
p x• ••<". ± p© ĭ {™ x 1 " ® 6 1 Ů =Ė Ů 1+2=3
Bñ".ÜLV Ů =Ė Ů •ª © • Ā— •«¬ ž ĭ lª © O• ".

£¤ 1 " £ Service© ĒB• — pÑ > " ĭ •Ÿ ±K™ • Ā— 1 " ® • óž
\\ © O• ¼€• €nĬ > ±3° 1 " ® 6 ž \x> €n¬ ".

±K1 " n ¢• Service J K" ® ± Ů• Ů { ô " ". •«¬ BD ĭ 1 sumEf®
6 1 ĀŮŮ• ± •«¬ ž ĭ \x> Ő".

```
>>>zclasszService:
.z.z.zzzzzsecretz="e p ©z• 7• zĂz "
.z.z.zzzzzdefzsetname(sel f,zname):
.z.z.zzzzzzzzzsel f.namez=zname
.z.z.zzzzzdefzsum(sel f,za,zb):
.z.z.zzzzzzzzzresul tz=zaz+zb
.z.z.zzzzzzzzzprintz"%sŮz%sz+z%sz=z%sBñ".z%z(sel f.name,za,zb,zresult)
.z.z.
>>>
```

± ĭ ¼ T' \$ ½óĴ• Āž 1 ĒB° ½© •{ ...3\ " . ±K1 ½© Ā " nLV " —
1 " ® • ó1 f Ø " .z

z

! f 1 " • ĒB¬ ž 1 peyª © ĭ •• ® Ė©".

```
>>>zpeyz=zService()
```

z

" n• peyª © ĭ •• ® Ē¢ ½©— •«• Ů =Ė Ů Ā¬ 1 " • ê á ‡".

```
>>>zpey.setname(Ů =Ė Ů)
```

z

" n• x 1 " ® • ó° " .

```
>>>zpey.sum(1,z1)
=Ė Ů z1z+z1z=z2zBñ".
```

z

• 6 1 " ® 6 ž \ © 1 " — BN• 1 " † ° § " ž ÷™S • . „ • « ¬ BD
© Ef setname¬ ÷ • .

```
.z.z.zzzzzdefzsetname(self,zname):  
.z.z.zzzzzzzzzself.namez=zname
```

z

ĭ KLV peyª © ĭ • • ® Ŭä Å ½©•

```
>>>zpeyz=zService()
```

z

• « ¬ ý„ " © p® " n Φ• ¬ " .

```
>>>zpey.setname(" =Ě Ŭ)
```

z

¬ Ÿ ΦÁ • Ŏ¬ 1 " 6 — setnameEf© " n Φ• " ° " .

Ŭpeyª © ĭ • • ® ŊΦ ½©• • Ā— • « ¬ ' =Ě'Ĭ > ý„ á¼ © pÆ.
±w" ø ĀĬ > peyª © ĭ • • > | # ø • ½©— • « • ' =Ě'•ª © O¬
Ÿ• +ĭ Ŏ " .Ŭ

¬ Ÿ ΦÁ O¬ Ŋž { ž \ © O• T> self• " .

z

...R peyª © ĭ • • ® ŊΦ ½©• " =Ě Ŭ•ª © • « ¬ setnameEf• BDĬ > \ø " n—
N• f " .

```
self.namez=zname
```

z

self© § BD ŠĬ > peyª © ĭ • • ® { ö/> " n Φ• Tŷ O• " .

```
pey.namez=zname
```

z

z

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`__init__` „ „ 1° μš?

• , • 6 „ † Q • ; 3 Ñ B • f Ñ é Ĩ • { ò „ . „ x ž \ © 1 „ © = - Ĩ {
1 „ ® 6 ž \ x „ • „ . ± ã ò Ñ ä • ~ 6 Ñ „ ° „ ¼ ° — ¾ Ä Ñ ? Ô Û
ĭ Ô „ . ± ½ © — + ñ ĭ ÷ ø „ n ¢ Á O • „ .

```
>>>zbaboz=zService()  
>>>zbabo.sum(1,z1)
```

ˆ Ÿ ¢ • ø babo.setName(ŮÆT ÷ Ů)Ÿ ¢ Á „ • ¢' x „ • • 3 Ñ Æ © O • ¢ ¼ @ h §
" x ® • Ÿ ° • ~ ò f ® © ½ © > Û ¢ ° — ¾ Ä Ñ Ÿ 1 1 „ • 1 © ä Q ~ A Ä
{ Ĩ ñ „ . z ± K 1 „ n ¢ Á Ĩ • • ĭ ® à j B „ . • Ĩ P • © ½ © • 1 „ Ñ B † T >
Ĩ • • ® \ © x ² • © ò Ĩ • • ® o ± ½ © — • « ñ B D Ĩ Ö Ÿ Ĩ • • ® \ © x ² Ĩ >
T U ø babo.setName("ÆT ÷ Ů)Ÿ ¢ Á „ ñ ° 1 f Ø ñ ?' „ • „ .

z

ˆ Ÿ ¢ • ž \ x ˆ ° x ž ñ [Ě r 1 „ — ò D • ° ½ © • __init__ • ' E f ®
• ó • ¼ 6 — ® • „ . ± x ž Ä „ n ¢ x „ .

```
>>>zclasszService:  
.z.z.zzzzzsecretz=z"e p © z • 7 • zÄz „ "  
.z.z.zzzzzdefz__init__(self,zname):  
.z.z.zzzzzzzzzself.namez=zname  
.z.z.zzzzzdefzsum(self,za,zb):  
.z.z.zzzzzzzzzresultz=zaz+zb  
.z.z.zzzzzzzzzprintz"%sÜ z%sz+z%sz=z%sB ñ „ . "z%(self.name, za, zb, zresult)  
.z.z.  
>>>
```

ˆ — ServiceJ K " ® • ¾ — J K " Ÿ ž ÷ ø T' Û Ů Ä • ° Ñ • „ . T > setNameE f —
• « E setName• __init__ Ĩ > T' O • „ . J K " • 1 • __init__ • ' E f © / - ° — ¶ ®
¶ © „ . — ¶ © „ n ¢ „ .

Ů E " ® " ® Ÿ „ ò „ . Ů s , Ĩ • • ® Ů ä ñ „ ò „ © + • „ .

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° ¢ 1 • 6 © — 1 „ • Ñ B ñ x ˆ ž 1 „ n L V ž Ö ° „ .

```
>>>zpeyz=zService(Ů = Ě Ů)
```

• ¾ • © pey = Service()Ÿ ħ Ø Ò • Ÿ • 6 © _init_Ef • pey =
Service(Ü = Ê Ü)L V İ • • ® Üä ħ • « ° Ø \ j Ö ° ¨.

z

• ¾ • ÖÊ x² Á ¨ ħ Ç ¨.

```
>>>zpeyz=zService()  
>>>zpey.setname(Ü = Ê Ü)  
>>>zpey.sum(1,z1)
```

z

• O • _init_ Ef® • ó Ø ¨ ħ nLV Q° { ö f Ø{ ¨.

```
>>>zpeyz=zService(Ü = Ê Ü)  
>>>zpey.sum(1,z1)
```

° a 1 ? ÖÊ ° — ¾Ä™ ¨ { ö¼ # § BD Ê O ħ Ä §Ÿ BD Ø òñ BÄ
x C { ö ¨ ¼ ° ¨.

• Ç • E" ®" Ÿ self— ¶® ê x ħ ž 1 • Öx 5² Ĩ > J K" • Äž¹ ê Ĩ ÷ x ¨.
Ħ — è ó Ä J K" • Ä° „ 2° ý y • Ĩ ñ • Ÿ Æ ÷ • Ñ E" ®" Ÿ self— ¶, ± | ¼
_init_Ef— ¶® ÷ ¨ { | # 1 f Ø ħ O ¨. Ħ • 1 ê Ĩ %o pey = Service()> ž 1
Æ pey® Ĩ • • ª ¼ ħ Ñ Ö • O • T > E" ®" ª ¼ v | © OÆ ħ Ÿ • + •.

• 6 Ħ • 1 ê Ĩ ÷ x Ê xÆ E ½° ħ T „ Ĩ > J K" • Äž¹ • # { ê Ĩ ÷ x > •.

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J K" ' EfÆ Af ħ E ¼ Ø © • † • ¨. J K" — Ef© ...šĵ E EfŸ © ¨ • {
¨ ¨ à ° ó™ > G... f™ Ø ¨. J K" © Ÿ > ± K* Ñ ý' ® © O • ¨. €Ö Ef® Ÿ ú ©
O €¾Ñ • > Ÿ > ± K* © J K" ® Ÿ + ¨. J K" ® • ó Ø ¾ Af® ö — Ñ ¨ j 1
f¼ J K" • —ž¹ Ÿ j • © E" ®" (Instance)^a © O ħ r¾Ĭ > Ÿ > ±² ħ < Æ1 f Ø x
• ½ r¾— w, ĵ E Ÿ > ± K_ ħ 1 f Ø{ ¨. z

J K" ' E" ®" (Instance)® Ÿ j è © N ™ Ç ¨. • E" ®" ® j Ä{ ½ó1 f
Ø © • ® é á Ø J K" — p®® ÷ Ø ê f Ø ¨. s, J K" © ž Ĩ E" ®" —
½Ç(Ÿ' ™)^a ¼ 1 f Ø ¨. z½ò • Ĩ è ê Ĩ Ö • 45, 6j , Ef Ÿ Ĩ > ™ | Ñ > ©
Ÿ > ±² ħ < Æ ©ö © 6Ñ ¨ ¨. • Ÿ J K" ® • ó Ø ÷ ¨ Ĩ «, { Ÿ > ±² ħ Ÿ f
Ø{ ¨. z

• 6Ü¤ ½ • Ĩ Ÿ > ± K_— Ñ N r¾ • ö © J K" • Äž¹ • #ù ê Ĩ ÷ x > •. Ĩ ∈™
2N • 1 Ñ N j á • ÜÜ • µ O ¨. ó • ž Ñ • ö ª ™ ¾ • © + •. Ž • • • » „ ž • ¨
÷ Ø š ú † { • ž Ñ µ O ¨.

ä 3 Ñ• J K" ® Ÿ j ÷ø¹ J K" • Åž¹ • #ù èĭ ÷™s •.

z

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€Óĭ ħ²

J K" © ĩ n ¢Á ßî • ĩ.

```
classzJ K" • « [( ÅzJ K" y)]:
zzz<J K" zA,fz1>
zzz<J K" zA,fz2>
ZZZ...
zzzdefzJ K" Ef1(sel f[, zEf1,zEf2,,,]):
zzzzzzz<f 1z Nz1>
zzzzzzz<f 1z Nz2>
zzzzzzz...
zzzdefzJ K" Ef2(sel f[, zEf1,zEf2,,,]):
zzzzzzz<f 1z N1>
zzzzzzz<f 1z N2>
zzzzzzz...
ZZZ...
```

ˆ • ¹ ÷Û• classª © yDÁ J K" ® Ÿ G• © ödĭ • ¼ ± T> P• © J K" • « ¬
ø \ĭ Ö ° ĩ. €Ô Ef• ¹ Ÿ ¢Á x² • ĩ. J K" • « P• Å¹ J K" Ñ Ø ĩ ø Å¹
J K" • « ¬ • ĩ. J K" èÛ• © J K" AfÑ Ø¼ J K" Ef • Ø ĩ.

J K" Ñ - . E• ö• • %₀ª™ „ • +¼ &#&# ĩ n— ö®÷) • žž ÷•.

z

z

• ... Øß €Óĭ ¢®ˆ

½fœÇ¬ { ž\© J K" ® Ÿ j î O• ĩ. • O¬ èĭ ÷© „ ¬ ±ž¹ w• ©
J K" ® Ÿú© xž• Åž¹ è{ µ O• ĩ. „ ½fœÇ• ' OÁ x, /x, Æ(x,
© x® +° ĩ. °ª¹ ĭ Ñ Ÿ J K" © • 3° xž¬ Ñž { Ÿ O• ĩ.

z

FourCal• ' ½fœÇ¬ Ñž { © J K" Ñ ĩ nLV Ė< ° ĩ ¼ Ñ„ •. ! f a =
FourCal()LVž¹ªª© E" ®" ® Ÿ+ ĩ.

```
>>>zaz=zFourCal()
```

z

'''n • a.setdata(4, 2)L Vž 1 4Ÿ 2ª © 7• ® aª © £" ®" • • „ ž \ ¼

```
>>>za.setdata(4,z2)
```

z

a.sum()↯ ∅ Ä f— † ° . (4 + 2)® ¯ á \ ¼

```
>>>zprintza.sum()
6
```

z

za.mul() ∅ Ä f— © ° . (4 * 2)® ¯ á \ ¼

```
>>>zprintza.mul()
```

8

z

za.sub()Ä Ä f® E . (4 - 2)® ¯ á \ ¼

```
>>>zprintza.sub()
2
```

z

a.div()© Ä f® Æy . (4 / 2)® ¯ á ‡ ¨ .

```
>>>zprintza.div()
2
```

z

ˆ Ÿ ¢Á Ê< ↯ { Ÿ+© FourCal• ' J K" ® Ÿú© O• | — ĩ ÜÑ μ O• ¨ . z

z

```
>¼ - ˆ Ÿ ¢Á x² Á J K" ® ! f Ÿú© O• ĩ ñª J K" • —ž¹
Ÿ ĩ ¢ £" ®" ® r¾Î > ĩ ² Î > Ê< { 1 O£• ¶ | þ ↯ ž
÷ © x² • ¨ . ± | ¼ " ŒË O↯ ÆÍ ž. ž ÆÑ∅¹ J K" ® Þ£ {
```

.. - xŁ Ā - • Ñ ā - ½ó © xŁ Ī > J K" • -ž ¹ Œ
£" ®" Ñ Ī Ā{ Ē 1 • ¶ Ī " ° " n ò 6 Ł £ J K" ® Ÿ Ī Ñž
x² • " .

z

• ! ± w" ø - LV Ē < © J K" ® • ĩ Û ✕ Ÿ Ī ÷ • . 6... ! f 1 ...Ā a = FourCal () LV
£" ®" ® Ÿ f Ø{ ž Ö ° " . • OĀ QR " . " n - ° a ž ÷ • .

```
>>>zcl asszFourCal :  
.z.z.zzzzzpass  
.z.z.  
>>>
```

z

„ ĀĀ5 £ ✕ ¶ ĩ ✕ • ¹ - Ÿ Φ • pass' NŸ - E ° FourCal • ' J K" ® Ÿ + " . -
J K" © Ī - ~ A f Æ E f ™ E • è • Ÿ Ī Ñ > © a = FourCal () > £" ®" a ® Ÿ
f Ø © x ž - Ñ • ¼ Ø " . 2 £ ž ÷ • .

```
>>>zaz=zFourCal ()  
>>>ztype(a)  
<typez'instance'>
```

- • ¹ ÷ Û • a = FourCal () LV ž ¹ aª © £" ®" ® ! f Ÿ ¼ ± " n • type(a) > aª ©
A f Ñ Ī Ī 5 ^ £ • è Ī ÷ x " . † LV A f a Ñ £" ®" Æ - ÷ ä ‡ " . z (Ū > ¼ -
type E f © Ž • • • Ł Ī > Ñ • ¼ Ø © è N E f > ½ - E ® ÷ ä ‡ " .)

• Ÿ Ī Ñ Ÿ Ī Ó £" ®" a © Ī - ~ x ž ™ Ñ • ¼ Ø • è " . Ī © x , Æ (x ,
© x , / x - x ž - Ñ Φ £" ®" ® Ÿ Ī Ö ° " . • 3 ° x ž - ¶ 4 £" ®" ® Ÿ x
¾ • „ Ł Ī > ž \ Ī Ö 1 ...Ā aª © £" ®" • x Æ © x ® 1 G... Ā - 7 • ®
! f Û ä ž \ © ... • " .

z

" n Φ • æ Ç - f 1 Ā (4, 2) - • „ 1 f Ø{ Ÿ Ī ÷ • .

```
>>>za.setdata(4,z2)
```

z

- ½ ° • Ñž ™ s x - ž ¹ © " n Φ • ž Ö ° " .

```
>>>zclasszFourCal :
.z.z.zzzzzdefzsetdata(self,zfirst,zsecond):
.z.z.zzzzzzzzzself.firstz=zfirst
.z.z.zzzzzzzzzself.secondz=zsecond
.z.z.
>>>
```

•¾• Ÿ Ę FourCalJK" •¹ pass' OÁ ĩ œû " ĩ â Ö ¼ ± ÃÃ• setdataª © Ef®
Ÿ " . JK" è— Ef® " +> Søúª ¼™ ° " . ĩ á ó ĩ ••Ÿ » ¼Ã™S •.
(S setdataª © Ef© FourCalJK" — Søú• " .) ±w" ø • 6 setdataEf• Ãž¹
• # { èĬ ÷x> •. z

z

÷ ± ĩ Ĭ ...Š ĵ £ Ef® Ÿ © " n Φ• Ÿ+ " .

```
defzsum(a,zb):
zzzreturnza+b
```

z

s BD §• Ø¼ " á\ © ĩ ® §• Ø" . JK" è— Ef™ €¾Ĭ• • " . setdataEf® " †
ĵ ĩ ÷ø Ĭ KŸ Φ" .

```
defzsetdata(self,zfirst,zsecond):z
zzzself.firstz=zfirst
zzzself.secondz=zsecond
```

BD Ef> self, first, second• ' # — BD § ĩ ©" . •Ÿ ...Š ĵ £ EfŸ© ĩ ĩ
JK" è— Ef•¹ § BD Ef© /- ° →¶® ¶¶©" . " •¹ ÷ø T> selfĬ /- °
→¶® ¶¶© Af• " .

z

" n— ö® ÷ø¹ • #û èĬ ÷x> •. .

```
>>>zaz=zFourCal ()
>>>za.setdata(4,z2)
```

" •¹ ÷© OL V aª © £" ®" ® Ÿ+ " n• a.setdata(4,2)L V ø FourCalJK" —
setdataEfĬ « Cö¼ setdataEf— § Ef• © • ĘĬ > aª © £" ®" Ĭ BDĬ >
ĩ Ĭ{ " .

s setdata— BD Ef© self, first, secondLV # ••Ÿ a.setdata(4,2)LV Ä — BD
§Ÿ \j™ aª © E" ®" Ñ setdataEf— § BD¬ © AfE self• ÄBö{ ö©
O• " .

```
self: zE" ®" za, zfirst: z4, zsecond: z2
```

z
Ž•• JK" •¹ ÑÑ ÖÖ! © ÜÜ• T> • ÜÜ• " . setdataª © Ef© BD Ef> 3 ®
©ö \ a.setdata(4,2)LV Ä Ÿ¬ \j™ ö©Ñ?ª © ÜÜ• " . •O• Ä° , A¬
ä3ÚÄ •6 êx¬ O• " .

z
± " nî > r ° " n— ½° ¬ ÷• . z
setdata Ef• © Ä — f 1 N• Ø" .

```
self.firstz=zfirst  
self.secondz=zsecond
```

•O• Ä © T• Äž¹ èĭ ÷• . BDEf> Ä first© 4• ¼ second© 2ª © OÄ • ¶ èĭ
÷x" .

z
±w" ø " n ¢• " — NÄ " n ¢• Tÿ O• " .

```
self.firstz=z4  
self.secondz=z2
```

äx¹ r ° OÄ T> self• " . self© a.setdata(4, 2)LV « CÖ¬ • ÊĬ > § BD
Ef> j %© E" ®" aª ¼ Ö" . ±w" ø self.first— ¶© - . • ©Ñ? ĩ œù
a.firstÑ µ O• " . self.second© ĩ œù a.secondÑ µ O• " .

z
°ª 1 " — Ä N¬ª j¹ Gø " n ¢• µ O• " .

```
a.firstz=z4  
a.secondz=z2
```

z
„ + • " • 2E ž ÷™s • .

```
>>>zaz=zFourCal ()
>>>za.setdata(4,z2)
>>>zprintza.first
4
>>>zprintza.second
2
```

z

• ĩ è ÞĖ Ĵ K" ® " † ø ÷ ø " n ¢ " .

```
>>>zclasszFourCal :
.z.z.zzzzzdefzsetdata(sel f,zfi rst,zsecond):
.z.z.zzzzzzzzzsel f.fir stz=zfi rst
.z.z.zzzzzzzzzsel f.secondz=zsecond
.z.z.
>>>
```

• ĩ P• ° èó• T> ¯ — 4o¬ ýy x ¯ ° O• " . ¯ • 1 ýy° O • • ž Ń ó ó•
 è©" ø " † ° § F ĵ ÷ © O• f" . • ĩ è ŒĖ O¬ • ž • è ø " n• 1 O ™
 • ž x Ń ĵ Ūx " " . z• ! ± V • 6 Ä — 7• §¬ ý„ ž \ Ĩ ñ Ä — 7• ®
 © x ž ¬ ¯ — Ĵ K" • " Ńž ÷ ™ s • . z

z

Ĵ © " n ¢ • x ® 1 f Ø© x ž ¬ ¶ 4 Ĵ K" ® Ÿ ĵ Ö ° " .

```
>>>zaz=zFourCal ()
>>>za.setdata(4,z2)
>>>zprintza.sum()
6
```

z

¯ — O¬ Ńž { x ¯ ž 1 FourCal Ĵ K" ® " n ¢ • Ÿ ĵ Ö ° " .

```
>>>zclasszFourCal :
.z.z.zzzzzdefzsetdata(sel f,zfi rst,zsecond):
.z.z.zzzzzzzzzsel f.fir stz=zfi rst
.z.z.zzzzzzzzzsel f.secondz=zsecond
.z.z.zzzzzdefzsum(sel f):
.z.z.zzzzzzzzzresul tz=zsel f.fir stz+zsel f.second
.z.z.zzzzzzzzzreturnzresul t
```

```
.Z.Z.  
>>>
```

z

" Ñ OÁ sum• ' Ef• " . • Efÿ ° > Fj è¹ " ž ÷™s • .

```
defzsum(sel f):  
    zzzresul tz=zsel f.firstz+zsel f.second  
    zzzreturnzresul t
```

BDĪ > © §Á selfA• " ¼ ¯ á\© §Á resul t• " . a.sum()LV ø sumEf• • ĒĪ >
£" ®" aÑ § BD Ef> j Ñ{ " © O¬ y¾ • . °ª¹ sumEf— § BD
Af self© £" ®" aÑ " .

z

±3ø • §• © ¯ á\© §¬ ÷• .

```
resul tz=zsel f.firstz+zsel f.second
```

z

¯ — èóÁ ĩKŸ ¢• žý µ O• " .

```
resul tz=za.firstz+za.second
```

z

¯ — èóÁ a.setdata(4, 2)• ¹

```
a.firstz=z4  
a.secondz=z2
```

z

ª ¼ • ¶ Ÿ„ ô × • " t " n ¢• žý µ O• " .

```
resul tz=z4z+z2
```

z

o a 1

```
>>>zprintza.sum()
```

ˆ LV ø 6• ‘ § ¬ Äø• CD { ° ¨ .

z

ä x P• ß Ä • ž ° w• ª ø J K" • Ä ° O 80% • ¬ è x ¨ ¼ ÷ Ĩ ™ ¨ . Ž • • —
J K" © ± ¨ • ĵ Ů • è ¨ .
± w ¨ ø • § • © © x, / x, Æ(x ¬ 1 f Ø{ ž ÷ • .

```
>>>zclasszFourCal :  
.Z.z.zzzzzdefzsetdata(sel f,zfi rst,zsecond):  
.Z.z.zzzzzzzzzsel f.fir stz=zfi rst  
.Z.z.zzzzzzzzzsel f.secondz=zsecond  
.Z.z.zzzzzdefzsum(sel f):  
.Z.z.zzzzzzzzzresul tz=zsel f.fir stz+zsel f.second  
.Z.z.zzzzzzzzzreturnzresul t  
.Z.z.zzzzzdefzmul (sel f):  
.Z.z.zzzzzzzzzresul tz=zsel f.fir stz*zsel f.second  
.Z.z.zzzzzzzzzreturnzresul t  
.Z.z.zzzzzdefzsub(sel f):  
.Z.z.zzzzzzzzzresul tz=zsel f.fir stz-zsel f.second  
.Z.z.zzzzzzzzzreturnzresul t  
.Z.z.zzzzzdefzdi v(sel f):  
.Z.z.zzzzzzzzzresul tz=zsel f.fir stz/zsel f.second  
.Z.z.zzzzzzzzzreturnzresul t  
.Z.z.  
>>>
```

z

mul , sub, divß Ä sumE f • ¹ Ö Ě O € ¾ Ñ • x ĵ • ñ ° > ý y ¬ • © è ¨ ¨ . „ + >
ß + O • 6 Ä > Ě < © • 2 Ě ž ÷ • .

```
>>>zaz=zFourCal ()  
>>>za.setdata(4,z2)  
>>>za.sum()  
6  
>>>za.mul ()  
8  
>>>za.sub()  
2
```

```
>>>za.div()
2
```

| Ñ Ĩ Ü> ÖÉ ½f æÇ¬ ž è© JK" ® Ÿ ĭ Ó O• " . z z

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• Š • © ¾¼ " èó— JK" ® ° Š Ÿ ĭ ÷ • . ½f æÇ¬ © JK" ÷ " © ® ĭ
æŋØ{ Ÿ ĭ ÷ • . Ú ĭ ß» • Ü • ª © JK" ® Ÿ ĭ ÷ " . ! f JK" Ñ ĭ ² Ĩ >
Ë < { 1 • " ž ÷ • .

z

JK" • « Á HouseParkĪ > x> • . peyª © £" ®" ® " nLV Ÿ + " .

```
>>>zpeyz=zHousePark()
```

z

pey.lastname¬ CD ø Ú ĭ ß» • Ü • x • " ĭ Ü • ª © £¬ CD { Ÿ x> • .

```
>>>zprintzpey.lastname
|
```

z

• « ¬ Ÿ , ø pey.fullName• £¬ E ° Š ¬ Ñ • { ™s Ÿ • .

```
>>>zpey.setname("{} ó")
>>>zprintzpey.fullName
| } ó
```

z

travel • ' Ef • ä ¬ Ñ¼ ÈÁ Ó¬ BDĪ > \ø " n ¢ • CDž \© travelEf™
Ÿ ĭ ÷ • .

```
>>>zpey.travel("ÜÇÜ)
| } ó,zÜÇä ¬ zÑ " .
```

z

```

    „ ä x P • Ÿ Ÿ j ÷ x >    • . j Ů • ë ¬ O • ¨ . ! f £ " ® " Ÿ R Ø ù    Æ 1 f Ø ©
J K " © ¨ n L V Ÿ    f Ø ¨ .

```

```

>>>zclassHousePark:
    .z.z.zzzzzpass
    .z.z.
>>>

```

z

```

• w{    Ø pey = HousePark() L V ž 1 £ " ® " ® Ÿ j m f Ø {    ¨ . • § • ©
pey.lastname Ø " | " ¬ C D {    x ¬ ž 1 ¨ n L V ž ÷ • .

```

```

>>>zclassHousePark:
    .z.z.zzzzzlastname=z" | "
    .z.z.
>>>

```

z

```

lastnameÁ J K " Af • ¨ . • J K " Af lastnameÁ HouseParkJ K " • —ž 1    Æ Ø ©
£ " ® " B Ä • lastnameÁ " | Ů • ª © § ¬ ¶ {    © x ž ¬ ° ¨ . ¨ n — ö ® ÷ • .

```

```

>>>zpeyz=zHousePark()
>>>zpesz=zHousePark()
>>>zprintzpey.lastname
|
>>>zprintzpes.lastname
|

```

```

¬ • 1 ÷ Ů • HouseParkJ K " • —ž 1    ¥ £ " ® " © B Ä lastname • " | " Î > ý „ ô © O ¬
2 £ 1 f Ø ¨ . z

```

z

```

>¼ - J K " Af ® ö f Ø ©    Æ — x ¿
>>> print HousePark.lastname
|

```

z

```

¨ n • © • « ¬ ý „    ¼ print pey.fullname Ø Æ ¬    E ° • « ¬ C D {    ¨ ¢ s Ÿ j ÷ • .

```

```
>>>zclassHousePark:
.z.z.zzzzzlastname=z" | "
.z.z.zzzzzdefzsetname(self,zname):
.z.z.zzzzzzzzzself.fullname=zself.lastname+zname
.z.z.
>>>
```

„ • « ¬ ý „ × ¯ ž ¹ setname• ' Ef® • ó ¬”.

z

¬ — Ef© ¯ nLV ½óµ O• ”.

```
>>>zpez=zHousePark()
>>>zpey.setname("{} óÚ)
```

¬ — ö• ¹ ÷ Û• setnameEf• " } ó"• ' § ¬ Ef> \ j ¹ . Ç self.fullname• © Ú | Û +
Ú } óÛ• ' § • ÄBô{ ”.

z

• „ ¬ ÊÇ ÷ ø ¯ n Φ”.

```
self.fullname=zself.lastname+zname
```

z

„ Ä § BD § name Á Ú } óÛ • /> ¯ n Φ• Tÿ O• ”.

```
self.fullname=zself.lastname+zÚ } óÛ
```

z

” n• self© setnameEf— § BDÎ > j %© peyª © £” ®” • x • ” n Φ•
” † Tÿ O• ”.

```
pey.fullname=zpey.lastname+z"} óÚ
```

z

pey.lastnameÁ JK” Af> ° “ | Ú• ' § ¬ ¶ x • ” n Φ• Tÿ O• ”.

```
pey.fullname=z"| Úz+zÜ} óÜ
```

z

° ª 1 - Ý • pey.setName(Ú} óÜ)¬ ° ¨ n•© ¨ n • Á . ® î f Ø¬ O• ¨ .

```
>>>zprintzpey.fullname
| } ó
```

z

• 6 | Ñ Ý á¼ ÖË JK" — xž r R ° Ñ•Ý — x¨ .
Ú| } óÜ¬ ä ÷è{ © Ef travel¬ HousePark JK" • pâž ÷• .

```
>>>zclasszHousePark:
.z.z.zzzzzlastname=z"| "
.z.z.zzzzzdefzsetName(self,zname):
.z.z.zzzzzzzzzself.fullname=zself.lastname+zname
.z.z.zzzzzdefztravel(self,zwhere):
.z.z.zzzzzzzzzprintz"%s,z%sä ¬zÑ¨ .Úz%z(self.fullname,zwhere)
.z.z.
>>>
```

travel•' Ef® " Ñ†Ð¨ . BD ŠĪ > £" ®" Ý where® ©¨ . ±| ¼ žĭ Š ¬ • 8
æä æÇ• ®• ó ä • 8• ĚB° Š CD° ¨ .

z

¬ — JK" © ¨ n • ½óöĭ • ¨ .

```
>>>zpeyz=zHousePark()
>>>zpey.setName("} óÜ)
>>>zpey.travel(ÚÛÇÜ)
| } ó,zÛÇä ¬zÑ¨ .
```

z

¬ — „ ¬ travelEf— BN•¹ ĚÇ÷ø ¨ n • ¨ . „ travelEf— BDAf£ selfÝ
whereÁ ¨ n • Ç¬ O• ¨ .

```
self:zpey
wherez:zÚÛÇÜ
```


$\circ^a 1$ self.fullNameÄ pey.fullName• μ O• $\frac{1}{4}$ • pey.fullNameÄ pey.setName(Ü} óÜ)•
 $\rightarrow \dot{z}^1 \ddot{Y} \text{ } _i \Phi \dot{U} | \}$ óÜ• μ O• $\ddot{\cdot}$. $\circ^a 1$ pey.travel(ÜÜÇÜ)LV { $\delta \emptyset^- - \delta LV$
 CDô{ $\delta \odot$ O• $\ddot{\cdot}$.

z

z

s⁻k ‡ Ø⁻

$| \odot^- \cdot 1$ HousePark• $^a \odot JK^{\prime \prime} \text{ } _{\text{R}}$ • óž¹ £[″] $\text{ } _{\text{R}}^{\prime \prime}$ $\text{ } _{\text{R}} \ddot{Y}$ $\odot \delta$ • £[″] $\text{ } _{\text{R}}^{\prime \prime}$ •
 setNameEf[®] • óž¹ • « $\rightarrow \dot{y}_{\#}$ ž \ $\odot x^2 \rightarrow \frac{1}{2} \delta \ddot{O}$ $\ddot{\cdot}$.

z

• $\ddot{Y}^- \cdot 1$ $\ddot{Y} + Ef^{\text{®}}$ $\ddot{\cdot}$ n Φ • δ ž ÷ • .

```

>>>zpeyz=zHousePark()
>>>zpey.travel(ÜÜÇÜ)

```

• 3Ñ Æ{ $\ddot{\cdot}$. • 3— • ä \odot travelEf• ¹ self.fullName• ' Af[®] — > $\odot \delta$
 self.fullName• ' OÄ setName• ' Ef• $\rightarrow \dot{z}^1$ $\text{ } _{\text{E}} \odot \odot$ O• x $\ddot{\cdot}$ • $\ddot{\cdot}$ — Z setName \rightarrow
 $\dot{z} \backslash \odot \ddot{U} \dot{U}$ • $\circ \delta _i 1$ • 3Ñ Æ{ $\delta \odot$ O• $\ddot{\cdot}$. JK[″] $\dot{y}' \uparrow$ • w{ • 3Ñ H f Ø \odot \rightarrow
 $\ddot{Y} \delta f \dot{A} JK^{\prime \prime} \text{ } ^a \frac{1}{4} \div x \text{ } _i \ddot{U} \ddot{\cdot}$. $\circ^a 1$ • $\ddot{\cdot}$ • 3Ñ Æ \odot O \rightarrow x• x $\ddot{\cdot}$ ž¹ pey^a \odot
 £[″] $\text{ } _{\text{R}}^{\prime \prime}$ $\text{ } _{\text{R}} \ddot{Y} \dot{u} \odot \text{ } _{\text{OQ}}$ setNameEfÑ È< { $\circ \ddot{\cdot}$ δ $\ddot{\cdot}$ ì ù | 1 O• $\ddot{\cdot}$. • 3° " Î >
 Æ%o{ O• T> $_init_$ • ' Ef• $\ddot{\cdot}$. z

z

z

$_init_ \delta$, s⁻ « ‡ $\dot{\cdot}$ —.

• $\pm w \ddot{\cdot}$ $\delta^- - JK^{\prime \prime} \text{ } _{\text{R}}$ $\ddot{\cdot}$ n Φ • TU_i ÷ • .

```

>>>zclasszHousePark:
. z. z. zzzzzlastName=z" | "
. z. z. zzzzzdefz__init__(self, zname):
. z. z. zzzzzzzzzself.fullName=zself.lastName+zname
. z. z. zzzzzdefztravel(self, zwhere):
. z. z. zzzzzzzzzprintz"%s, z%sä  $\rightarrow z\ddot{N} \ddot{\cdot}$  . "z%z(self.fullName, zwhere)
. z. z.
>>>

```

setNameEf— • « • $_init_ \hat{\cdot}$ > TÇ x \ddot{Y} $\rightarrow \ddot{\cdot}$.

z

• O• _i &• $\text{ } _{\text{R}} v 3\%$ \odot • è Î ÷ • . $\ddot{\cdot}$ nLV ž ÷ • .

```
>>>zpeyz=zHousePark()
TypeError: z__init__()takessexactly2argumentsz(1zgiven)
```

~ Ÿ ¢Ä • 3 S†•® î f Ø¬ O• ¨ . • 3 S†•—> E¬ ÷ø BD Ef> Ä ® Ĩ Ö
©ö 1 Ÿ x¨ © • 3• ¨ . ä x¹ 1 ® x¨ © OÁ T> peyª © E" ®" • ¨ . •!
• 3— S†•® ÷ø è f Ø¨ . pey = HousePark()•ª ¼ © ØQ _init_EfÑ « C ô{
ô© O• ¨ . °ª¹ _init_(self, name)LV _init_Ef© Ä — BDS¬ — > { ¨ ¨ .
±w¨ ø ĵ Ä{ E" ®" ® Ÿ _init_Ef• Ä — BDS¬ o f Ø¬P?

z

±OÄ ¨ n ¢ ¨ .

```
>>>zpeyz=zHousePark("") óÚ)
```

€Ô •¾• ÷ xË setnameEf® äË O €¾Ñ• xĵ• ¨ ¨ . ¨ Ÿ E" ®" ® Æ © ØQ•
BDSĪ > ") óÚ• ' BDS¬ \© \$• ¨ ¨ . _init_ Ef®•ó ø Ÿ ĵ •©
E" ®" • ÆxS¬ o f Øx • | 1 Ñ é ¨ .

z

¨ n ¢• ø • 3 ¨ • ó ò ô© O¬ 2E 1 f Ø¬ O• ¨ .

```
>>>zpeyz=zHousePark("") óÚ)
>>>zprintzpey.travel(Ú^ Ğ Ū)
| } ó,z^ Ğ ä ¬zÑ ¨ .
```

z

z

__del__ . õ, µ ĩ ĩ š • % % ŠÄ —.

• Š• © E" ®" Ñ ½ª ´ / „ ° È¬ B1 f Ø{ © xĵ• Äž¹ èĬ ÷™s • .
E" ®" Ñ ½ª ¢ ¨ EÄ ¨ n ¢Ä Z ® +° ¨ .

```
>>>zpeyz=zHousePark("") óÚ)
>>>zdel zpey
```

Ž•••• ĵĪ > Ñ•¼ Ø© èN Ef del• —ž¹ peyª © E" ®" ®¹ G†Ç f Ø¨ .
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```
>>>zcl asszHousePark:
.z.z.zzzzzl astname=z" | "
.z.z.zzzzzdefz__ini t__(sel f,zname):
.z.z.zzzzzzzzzsel f. full name=zsel f. l astname+zname
.z.z.zzzzzdefztravel (sel f,zwhere):
.z.z.zzzzzzzzzprintz"%s,z%sä → zÑ". "z%z(sel f. full name,zwhere)
.z.z.zzzzzdefz__del__(sel f):
.z.z.zzzzzzzzzprintz"%szH» Úz%zsel f. full name
.z.z.
>>>
```

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```
>>>zpeyz=zHousePark("{} óÚ)
>>>zdel zpey
| } ózH»
```

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 • Üª © HouseKi m J K" ® Ÿ j ÷ • . Å— Ÿ¬ • ó ø "n Φ• QR { 1 f
 Ø". z HouseParkJ K" © •¶ Ÿ j ú x" ¼ Ñ„ ¬ ° ". "n— ö© HouseKi mª © J K" Ñ
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```
>>>zcl asszHouseKi m(HousePark):
.z.z.zzzzzl astname=z"óÚ
.z.z.
>>>
```

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```
classzHouseKim(HousePark):
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```
>>>zclasszHouseKim:
.z.z.zzzzzlastnamez=z"ó"
.z.z.zzzzzdefz__ini t__(self,zname):
.z.z.zzzzzzzzzself.fullnamez=zfself.lastname+zname
.z.z.zzzzzdefztravel(self,zwhere):
.z.z.zzzzzzzzzprintz"%s,z%sä ¬ zÑ¨ . "z%z(self.fullname,zwhere)
.z.z.zzzzzdefz__del__(self):
.z.z.zzzzzzzzzprintz"%szH» Úz%zself.fullname
.z.z.
>>>
```

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```
>>>zclasszHouseKim(HousePark):
.z.z.zzzzzlastnamez=z"óÚ
.z.z.
>>>
```

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```
>>>zjullietz=zHouseKim("o ĭ ĩ ")
>>>zjulliet.travel("w™Ú)
óo ĭ ĩ ,zw™ä ¬ zÑ¨ .
```

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 JK" Ñ Ú | ß» • ÜJK" ® Ä x©ö ä x¹ Ä Ä travelEf® "• { ý„ © xž¬
 ° § ÷™S • .

```
>>>zjullietz=zHouseKim("o | I Ú)
>>>zjulliet.travel("w™Ú,z3)
ó o | I ,zw™ä z3...zÑ» .
```

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```
>>>zclasszHouseKim(HousePark):
. z. z. zzzzzlastname=z"ó "
. z. z. zzzzzdefztravel(self,zwhere,zday):
. z. z. zzzzzzzzzprintz"%s,z%sä z%d...zÑ» . "z%z(self.fullname,zwhere,zday)
. z. z.
>>>
```

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```
>>>zpeyz=zHousePark("{} ó ")
>>>zjullietz=zHouseKim("o | I Ú)
>>>zpeyz+zjulliet
| } ó,zó o | I z. ÜÖ»
```

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```
#zhouse.py

classHousePark:
    zzzlastname=z" | "
    zzzdefz__init__(self, zname):
        zzzzzzzself.fullname=zzself.lastname+zname
    zzzdefztravel(self, zwhere):
        zzzzzzzprintz"%s, z%sä    → zÑ" . "z%z(self.fullname, zwhere)
    zzzdefzlove(self, zother):
        zzzzzzzprintz"%s, z%s½• • z¼' » "z%z(self.fullname, zother.fullname)
    zzzdefz__add__(self, zother):
        zzzzzzzprintz"%s, z%sz.  ÜÖ» "z%z(self.fullname, zother.fullname)
    zzzdefz__del__(self):
        zzzzzzzprintz"%szH» "z%zself.fullname

classHouseKim(HousePark):
    zzzlastname=z"ó"
    zzzdefztravel(self, zwhere, zday):
        zzzzzzzprintz"%s, z%sä    z%d...zÑ» . "z%z(self.fullname, zwhere, zday)

peyz=zHousePark("{} ó")
jullietz=zHouseKim("ó | I ")
pey.love(julliet)
peyz+zjulliet
```

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```
peyz=zHousePark("{} ó")
jullietz=zHouseKim("ó | I ")
pey.love(julliet)
peyz+zjulliet
```

! f pey = HousePark(Ú} óÜ)Ī > peyª © £" ®" ® Ÿ ¼ julliet•ª © £" ®" † Æ
Ē° "... " n• pey.love(julliet)•' J K" Eƒ loveÑ « C ô "...

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```
zzzdefzllove(sel f,zother):  
zzzzzzzprintz"%s,z%sz½•• zⱱ' » "z%z(sel f.full name,zother.full name)
```

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self• © peyÑ other• © julliet• ĭ Ñ{ ô© O• "... °ª¹ "| } ó, ó o| l ½••
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peyz+zjulliet
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```
zzzzdefz__add__(sel f,zother):zz  
zzzzzzzprintz"%s,z%sz.    ÜŒ» "z%z(sel f.full name,zother.full name)
```

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```
peyz=zHousePark("{} óÚ)  
jullietz=zHouseKim("o| l Ü)  
pey.travel("ÜÇÜ)  
julliet.travel("ÜÇÜ,z3)  
pey.love(julliet)  
peyz+zjulliet  
pey.fight(julliet)  
peyz-zjulliet
```

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```
classzHousePark:  
zzzlastnamez="z"| "  
zzzdefz__init__(self,zname):  
zzzzzzself.fullname=zzself.lastnamez+zname  
zzzdefztravel(self,zwhere):  
zzzzzzprintz"%s,z%sä ¬zÑ" . "z%z(self.fullname,zwhere)  
zzzdefzlove(self,zother):
```



```

zzzzzzprintz"%s,z%sz½••z¼'»"z%z(sel f. full name, zother. full name)
zzzdefzfght(sel f, zother):
zzzzzzprintz"%s,z%szg»"z%z(sel f. full name, zother. full name)
zzzdefz__add__(sel f, zother):
zzzzzzprintz"%s,z%sz. ÜÖ»"z%z(sel f. full name, zother. full name)
zzzdefz__sub__(sel f, zother):
zzzzzzprintz"%s,z%sz•ÜÖ»"z%z(sel f. full name, zother. full name)
zzzdefz__del__(sel f):
zzzzzzprintz"%szH»"z%zsel f. full name

```

```

classzHouseKim(HousePark):
zzzlastnamez="ó"
zzzdefztravel(sel f, zwhere, zday):
zzzzzzprintz"%s,z%sä z%d...zÑ»."z%z(sel f. full name, zwhere, zday)

```

```

peyz=zHousePark("{} ó")
jullietz=zHouseKim("o | l ")
pey.travel("ÜÇ")
julliet.travel("ÜÇ", z3)
pey.love(julliet)
peyz+zjulliet
pey.fight(julliet)
peyz-zjulliet

```

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__init__	£• (Constructor), £" ®" N Ÿ i ´ « C	z
__del__	† G• (Destructor) £" ®" N ½ª ´ « C	z
__add__	œÇ• "+"	X + Y
__or__	œÇ• " "	X Y
__repr__	print	print X
__call__	E f« C X()O¬ « C	z
__getattr__	• à Uä	X.S¹ ú
__getitem__	£NO	X[i]
__setitem__	£N" OW	X[key] = value
__getslice__	Æª • O	X[i:j]
__cmp__		X > Y

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```
#zmod1.py
defzsum(a,zb):
    zzzreturnzaz+zb
```

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mod1.py® f N ° Ó Ĵ > • Ê ° " n • Ä Ä 5 Ε π ¥ Ĵ π ® ò † √ ¼ Ĵ K Ÿ Φ • ° ª ž ÷ • .
Ä mod1.py Ñ f N ° " Ò • Ê ° " n " n ↯ ò ž Ò ° " . ± K Ö Ÿ Ä Ä 5 Ε π ¥ Ĵ π • 1
mod1.py® F ↯ f Ø " . import © ä æ • W X Ĵ • Ø © Ž ... Æ Ž • • ª • M 3 Ĵ Ñ f N ô Ĵ Φ
• W X Ĵ • Ø © Ž • • Β Ÿ ↯ √ 3 ĵ f Ø " . • ½ ° • Ä Ž 1 © î † Œ • ê Î ÷ ™ s • .

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importzΒ • «
```

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```
>>>importzmod1z
>>>zprintzmod1.sum(3,4)z
7
```

ˆ L V mod1.py® √ 3 % × ˆ ž 1 import mod1 Φ • " " . import mod1.py Φ • ½ ó ©
ò f ® • è ™ s \ — • . import © • ¶ Ÿ ĵ Φ Ž • • Β ↯ ½ ó 1 f Ø { ž \ ©

O• " . mod1.pyŽ...• Ø© sumEƒ® • ó × ¯ ž¹ © ¯ — ö• ¹ Ÿ Ꞥ• mod1.sumLV ß • «
P• '.'(™⁹ œÇ•)® Ö• ¼ Eƒ• « ¬ ø¹ ½ó1 ƒ Ø" .

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```
defzsafe_sum(a,zb):z
zzzi fztype(a)z!=ztype(b):z
zzzzzzzprintz" 1 ƒzØ©zO• žĭ L ñ" .z
zzzzzzzreturnz
zzzelse:z
zzzzzzzresul tz=zsum(a,zb)z
zzzreturnzresul t
```

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Rwĭ > ½óôĭ NoneŠ¬ ¯ á\{ " .

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```
>>>importzmod1z
>>>zprintzmod1.safe_sum(3,z4)z
7
```

z

import mod1ĭ > mod1.pyŽ...¬ √ 3Ö" . " n• mod1.safe_sum(3, 4)> safe_numEƒ® « C° " .

```
>>>zprintzmod1.safe_sum(1,z'a')z
1 zƒzØ©zŠ• žĭ L ñ" .z
Nonez
>>>
```

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—ž ¹ None•ª © O¬ ¯ á\{ " .

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```
>>>zprintzmod1.sum(10,z20)z
30
```

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```
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Ø¬ O• '' . • Ā © Úfrom B • « import B EfÜ® ½ó ø '' .
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```
fromzB • « zimportzB Ef
```

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```
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```

```
>>>zfromzmod1zimportzsumz
>>>zsum(3,z4)z
7
```

```
from ~ import ~® • ó ø ~ • ¹ LV B • « ¬ Ô• • è¼ T> ž ĭ B — Ef® ö f
Ø'' . • Ÿ ~ Ÿ Φ• ø mod1.pyŽ ...— sumEfŸ¬ ½ó 1 f Ø{ '' . ±w'' ø sumEfŸ
safe_sumEf® 2'' ½ó ¼ È¬ J ĭ Ā{ Ž Ö 1P? ĀÑ• x¿• Ø'' .
```

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```
fromzmod1zimportzsum, zsafe_sum
```

```
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x¿• '' . ä€> þÚ ä — ° Ef® v3j f Ø© x¿• '' .
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```
fromzmod1zimportz*
```

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Ž• • • ¹ ™ €¾Ñ• • '' . ~ — from mod1 import *Ñ Ä © + Ä mod1.py— B+ Ef® v3¹
G '' © +• '' . mod1.py• © EfÑ 2 Ä• • æ • è× • ~ — ĀÑ• x¿ Ā È... {
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```
if.__name__ == "__main__": ¶ ¶•
• §• © mod1.py Ž ... '' n Φ• " Ñ ä ÷• .
```

```
#zmod1.pyz
defzsum(a,zb):z
zzzreturnza+bz

defzsafe_sum(a,zb):z
zzzi fztype(a)z!=ztype(b):z
zzzzzzzzprintz" 1 f zØ©zO• zİ L ñ "" . "z
zzzzzzzzreturnz
zzzel se: z
zzzzzzzzresul tz=zsum(a,zb)z
zzzreturnzresul tz

printzsafe_sum('a',z1)z
printzsafe_sum(1,z4)z
printzsum(10,z10.4)
```

~ Ÿ ¢Á mod1.py® •• ¨ > < ĲŽ 1 C:\Python• ' • WX| • f N~ Œ" ø " — ¥> ±²
Ž ...~ " nLV ò 1 f Ø" .

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```
C:\Python> python mod1.py
1 f Ø© O• İ L ñ "" .
None
5
20.4
```

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¥" .

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```
C:\WINDOWS> cd \Python
C:\Python> python
Python 2.1 (#15, Apr 16 2001, 18:25:49) [MSC 32 bit (Intel)] on win32
Type "copyright", "credits" or "license" for more information.
>>> import mod1
1 f Ø© O• İ L ñ "" .
None
5
20.4
```

$$\begin{array}{l} \Upsilon \nabla \Phi \Delta \cdot \quad \textcircled{\ast} \hat{\imath} \textit{f} \varnothing \rightarrow \textcircled{\ast} \cdot \cdot \cdot \quad | \textcircled{\ast} \textit{R} \cdot \text{mod}1.\textit{py}\tilde{\text{Z}} \dots \text{---} \text{sum} \quad \text{safe_sum} \textit{E} \textit{f} \tilde{\text{Y}} \rightarrow \text{Gá} \frac{1}{4} \\ \tilde{\text{O}} \circ \tilde{\alpha} \text{---} \text{L} \textit{V} \text{import} \text{mod}1 \rightarrow \quad \textcircled{\ast} \varnothing \textit{Q} \text{mod}1.\textit{py}\tilde{\text{N}} \text{---} \textcircled{\ast} \hat{\imath} \text{---} \cdot \quad \hat{\imath} \text{---} \cdot \quad \S \rightarrow \text{CD}^{\circ} \cdot \cdot \cdot \quad \cdot \text{---} 3^{\circ} \text{---} \text{O} \rightarrow \\ \text{x} \cdot \quad \text{x} \text{---}^{\circ} \quad \text{O} \cdot \quad \varnothing \cdot \cdot \cdot \end{array}$$
$$\text{mod1.py} \quad \dots \quad 1 \in \cdot, \quad \cup \cup \neg \quad \dots \quad n \quad \in \cdot \quad f_{\cdot} \quad \checkmark \quad \div \cdot.$$

```
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"__main__" • > • ô | if "n N • f ô¼ ÅÅ5 £¤¥ | ¤£ " Ž ... • 1 • ß ¬
v3¹ õ © __name__ == "__main__" • ?@ • ô | if ĨK N • f ô • ë™s ° " ©
Å • " •
```

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$$- \dot{Y} \in \frac{1}{4} \pi \cdot n \cdot \mathbb{C} \setminus \tilde{\gamma} \quad , \quad \S \rightarrow \mathbb{C} \mathbb{D} \quad \cdot \quad \ddot{e} \in \mathbb{O} \rightarrow \hat{f} \in \emptyset \quad .$$
$$\begin{aligned} & \cdot \cdot \cdot e i \%_0 \beta \quad \dot{\bar{A}} E f \ddot{Y} \neg \quad E \quad \frac{1}{4} \varnothing \bullet \ddot{Y} J K " \textit{\AE} A f \quad \neg \quad E 1 \textit{\textit{f}}^{\textit{\textit{TM}}} \varnothing'' . \quad \cdot n - \\ & \mathbb{N} \rangle \pm ^2 \neg \langle \mathbb{E} \tilde{Z} \div \cdot . \end{aligned}$$

wiki docs.net PDF, page : 167

```
def zsum(a, zb): z
zzzreturn za+bz

if __name__ == '__main__': z
zzzprintzPlz
zzzaz=zMath()z
zzzprintza.solv(2)z
zzzprintzsum(Plz, z4.4)
```

J K " Ÿ E f , A f ↦ B Ä E ¼ Ø © Ž ... • " . • « ↦ mod2.py > ¼ C:\Python • ' · WX | • f N Ö " ¼ Ñ , ↦ ž ÷ • .

z

" n ¢ • ò 1 f Ø " .

```
C:\Python> python mod2.py
3.141592
12.566368
7.541592
```

z

• § • © Ä Ä 5 £ ¤ ¥ | ¤ ® 8 ¼ " n ¢ • ° ª ž ÷ • .

```
C:\Python> zpython
Pythonz2.1z(#15, zAprz16z2001, z18: 25: 49)z[MSCz32zbi tz(Intel)]zonzwi n32
Type z"copyright", z"credits"zor z"license"zfor zmore zinformation.
>>> zimport zmod2
>>>
```

__name__ == "__main__" • ? @ • ô / > ĩ - ~ § ™ C D ô • ë © " . z

z

```
>>> zprintzmod2.Plz
3.141592
```

mod2.Pl L V mod2.py • Ø © Pl ª © A f § ↦ ½ ó 1 f Ø " .

z


```
>>>zaz=zmod2. Math()z
>>>zprintza. sol v(2)z
12. 566368
```

— ö © mod2.py• Ø© J K" Math® G© x ¿ ¬ ÷ ä ‡ " . ° • 1 ÷ Û • ß è • Ø©
J K" ® • ó × ¯ ž ¹ © ' ' (™ 9 æ Ç •) ® • ó ä J K" • « Å • ß • « ¬ ! f ø \ i Ö
° ..

$$Z$$

```
>>>zprntzmod2.sum(mod2.PI,z4.4)z
7.541592
```

mod2.py • Ø© E f sum † ï œ ù ½ ó 1 f Ø'' .

$$Z$$
$$Z$$
[illegible]

```
#zmodtest.pyz
import zmod2z

result = zmod2.sum(3, z4)z
print result
```

· 1 ÷ Û · Ž ... · 1™ ÄÄ5 £¤¥¦ § · 1 ° Ö €¼Œ · x¿Î > import mod2> mod2
 ß ¬ √ 3Ý¹ Gø "... ä x¹ r ° OÄ modtest.pyª © Ž ... mod2.pyª © Ž ... Ê ...
 · WX| · Ø¡ ÖÝ ° ·· © \$ · · ·

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$$\neg \cdot \check{Z} \text{ AB ! } -9 \text{ i}$$

$$| \text{ @ } \cdot | \text{ è } \check{Y} + \beta \neg \varnothing \times \neg \check{Z}^1 \text{ TM}^{\#} \neg 8 \frac{1}{4} \beta \cdot \varnothing \text{ @ } \cdot \text{WX} | > \cdot \check{E}^{\circ} \text{ " n } \cdot \text{Æ } \check{o}$$

$$f \varnothing \text{ " } \cdot \check{Y}^{\circ} \cdot \text{w} \{ \check{Z} \check{O} \text{ @ } \vee \text{E} \neg \check{Z}^1 1 f \varnothing \text{ @ } \times \check{Z} \cdot \varnothing \text{ " } \cdot$$

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· WX| > · È 1 – " · ß ñ v 3¹ ö f Ø© xç · Āž¹ ëĭ ÷ ·

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ºª ž ÷™S ¨ ·
```

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```
! f sys B → v 3÷ · ·
```

```
>>>importzsys
```

```
sys B ª ž · · → ý Ô1 EŸ %©ª · M3| B · ¨ · sys· ª° ¨ x© 3N• 1 ¨ ¨ †  
¨ Ð O• ¨ ¨ · | © sysB → · óž 1 ž · ·ª · M3| Ń ý Ôö| Ø© · WX| ® 2E 1 f  
Ø¨ ·
```

z

```
¨ n ¨ ¨ · ž ÷ · ·
```

```
>>>zsys.pathz  
>>>zsys.pathz  
['',z'c:\\',z'c:\\python21\\dlls',z'c:\\python21\\lib',z'c:\\python21\\lib\\plat-win',z  
'c:\\python21\\lib\\lib-tk',z'c:\\python21']
```

```
sys.path© ž · ·ª · M3| · ý Ôö| Ø© · WX| → ÷ ä ‡ ¨ ¨ ¨ ž · · B · ¨ —  
· WX| · ¨ | Ø© Z · © ž ĩ · WX| > · Ě 1 — ¨ ¨ · T> v 3¹ ö f Ń Ø¨ ·  
± w¨ Ø sys.path· C:\Python\Mymodulesª © · WX| ® ¨ ¨ Ń Ø ĩ - ö¹ Æ v 3ö f Ø→P?
```

z

```
ĩ œ ¨ ¨ ·
```

z

```
sys.path— · S · | ¨ 9 →Ĥ /> | © ¨ n ¨ ¨ · 1 f Ø→ O• ¨ ¨ ·
```

```
>>>zsys.path.append("C:\Python\Mymodules")z  
>>>zsys.pathz  
['',z'c:\\',z'c:\\python21\\dlls',z'c:\\python21\\lib',z'c:\\python21\\lib\\plat-  
-win',z'c:\\python21\\lib\\lib-tk',z'c:\\python21',z'C:\Python\Mymodules']z  
>>>
```

```
sys.path.append® · óž 1 C:\Python\Mymodulesª © · WX| ® sys.path· ¨ Ń † v ¼ ¨ ¨ †  
sys.path® ÷ x ¨ Ń Ń N € · , ¨ ¨ 1 · C:\Python\Mymodulesª ¼ ¨ ¨ Ń O→ 2E 1 f  
Ø ¨ ¨ ·
```

z

±w'' ø ò6> ß ñ v3¹ ö f Ø©• 2Ež ÷•.

```
>>>importzmod2z
>>>zprintzmod2.sum(3,4)z
7
```

• ''• v3¹ ö f Ø''• •w{ /„° • WX| • Ø© ß ñ v3¹ G¼ Èñ ½ó ©
O• T> sys.path.append(ß • WX|)— x¿• ''.

z

z

reload

reload© • ¶| v<È(import°) ß • AZ ½° • ¢ñ ''† ± ß ñ v3¹ t> • ½° ñ
¿ ó†v© O• ''• Ĩ ∈™ Ž•• (E÷• © • xž ñ -> ½ó1 ...• ''ñ O• ''• • Ÿ ß ñ
TU; Ñ) ÄÅ5 £¤¥| ¤•1 " " 91 reload© äó { G... O• ''• ''n ¢•
ÄÅ5 £¤¥| ¤•1 °ª ž ÷•.

```
>>>importzmod2z
>>>zprintzmod2.Plz
3.141592
```

z

ÄÅ5 £¤¥| ¤® Ĩ ë Û• +¼•• ¤> mod2.py— Pl ÛÛñ ''n LV f„ •.

```
Plz=z3.14
```

z

Pl® > QR° §(3.14)Ĭ> TU ''• ''n• ÄÅ5 £¤¥| ¤ ßú> Ĩ Ĩ¹ ''n ¢•
ž ÷•.

```
>>>zreload(mod2)z
>>>zprintzmod2.Plz
3.14
```

T' AfSĬ> CDô ññ 2E1 f Ø''• reloadÄÄ• import® ''† ä™ T' S•
¿ óó• ëñP?ª© —¾• ú© w• Ä ë| ° § ò ž ÷x® T' ''• reload® ø T'
S• ¿ óó• Ÿ import© •¾— §ñ ā• ¼ Øññ é{ µ O• ''• • Ÿ °•1
mod2.pyŽ...ñ f„° ''n ÄÅ5 £¤¥| ¤® Û¼ ''† ÄÅ5 £¤¥| ¤® ò ° § import
mod2® ø AZ ½° • ¿ óó© OÄ Ĩ œ° ...• ''•.

3) - ') á

- ') á(try, except)

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• ë× × " ° Ž••— • á•" . • Ÿ " > • 3° • 3® - † ¼ È¬ ™ Ø¼,
• 3Ñ H ±• ©© ¿ | ° L | ® ¼ È¬ Ñ × { " . • • Ž••• © try, except®
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þ • 3 ¢Á O• Ĩ Ñ òó ¥> ±² •¹ ó © • 3® ÷×> •. ! ƒ " © Ž...¬
8á¼ †™ž ÷•.

```
>>>zfz=zopen('Æ" ©Ž...',z'r')z
Tracebackz(mostzrecentzcallzlast):z
Filez"",zlinez1,zinz?z

IOError: z[Errnoz2]zNozsuchzfilezorzdi rectory: z'\xb3\xaa\xbe\xf8\xb4\xc2\xc6\xc4\xc0\xcf'
```

¬ — ö•¹ ÷Û• " © Ž...¬ 8á¼ †™ ø IOErrorª © • « — • 3Ñ { " . ¬ —
ö•¹ 'Æ" ©Ž... • ° ÿ•× • " nLV T â ÷• © O• " .z • OÁ ĀZG• +™s
• .

z'\xb3\xaa\xbe\xf8\xb4\xc2\xc6\xc4\xc0\xcf'

z

• § • © Æ • \ © • 3> 0Ĭ > ĩ " 7• ® Æ(© Z ® " ž ÷•.

```
>>>z4z/z0z
Tracebackz(mostzrecentzcallzlast):z
Filez"",zlinez1,zinz?z
ZeroDivisi onError: zintegerzdi visi onzorzmodul ozbyzzeroz
>>>
```

4® 0Ĭ > Æ(á ĩP ZeroDivisi onErrorª © • « — • 3Ñ ° " .z

z

€• , Ĩ > ° Ñ• • 3Ÿ ĩ ÷•.z" n— • 3© „ + Ĩ § { ...ĭ * " .

```
>>>zaz=z[1,2,3]z
>>>za[4]z
Traceback(mostrecentcalllast):z
Filez"",zlinez1,zinz?z
IndexError:zlistzindexzoutofzrangez
>>>
```

```
a© [1, 2, 3]• ' | " 9EÖ a[4]© a | " 9• 1 p1 f " © S• x • IndexErrorÑ Æ{
".zŽ•• Å• ~ • 3Ñ ÆØ ¥> ±² ¬ r R ¼ • 3S†• ® ÷ ä ‡ " .
```

z

z

```
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• , • 6 ã œ° ¥> ±K_¬ ¯ ° • 3L| — x¿ • Åž¹ ÊÇ÷•. " nÁ • 3 L| ® ¯ °
try, except — x‰ p®• " .
```

```
z
try:z
zzz...
exceptz[ • 3[,z• 3S†• Af]]:
zzz...
```

```
try • — f 1 N • • 3Ñ Æ• ë © " ø except " n— N Á f • ô • ë © " .
• Ÿ try • — N ¬ f r • 3Ñ ø except ¬ f ° " .
```

z

```
except ¬ • # ù ÷ • .
```

```
zexcept [ • 3 [, • 3S†• Af]]:
```

z

```
¬ • ¹ ÷ ø [ • 3 [, • 3S†• Af]]© ° • Ñž " © ¼5¿ £ Üx¿ • " . s " nLV
try, exceptŸ ø™ ô¼
| } ~
```

```
try:
zzz...
except:
zzz...
```

z

z

```
"""n = 3 * Y - E except n = 0.25
[ ] ~
```

```
try
zzz...
except z = 3:
zzz...
```

z

z

```
"""n = 3 * Y + 3 * S + A * P - E except n = 0.25
""" ~.
```

```
try
zzz...
except z = 3, z = 3 * S + A * f:
zzz...
```

```
• r • 1 • ñ • @ ž 1 G{ ô @ ô $ — Z © • 3 E • " " • 3 Ñ x Y
ô except " n — N — f " " © + • ¼ Ä $ Z © • 3 Ñ Ö — except •
¶ | „ ž ú Á • 3 • « ... Ö 1 Y except " n — N — f " " © + • ¼ # $ — Z ©
Ä $ — Z • " Ñ • 3 S + • @ — Ä A f Ä @ Æ { © x ž • " .
```

z

```
# $ x ž — ö @ î † | ÷ 0 " n = " .
```

```
try: z
zzz4z/z0z
except ZeroDivisionError, ze: z
zzzprintze
```

z

```
~ L V 4 @ 0 ĩ > Ä ( á ¼ ø ZeroDivisionError Ñ x • except • ö ö ¼ —
except Ä eª © • 3 S + • @ — Ä A f @ C D † v x • . $ Ä " n = 0 • " .
```

z. \$: integer division or modulo by zero

z

z

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÷ • . w •ª ø j Á { © Ñ?

z

— • © " n ¢ Á x² ¬ 1 O • " .

```
>>>ztry:z
.z.z.zzzzzfz=zopen("Æ" ©ž....txt",z'r')z
.z.z.zexceptzIOError:z
.z.z.zzzzzprintz"G×ßú> zž...¬zNñ" . "z
.z.z.zzzzzfz=zopen("Æ" ©ž....txt",z'w')z
.z.z.z
G×ßú> zž...¬zNñ" .
```

⁻ Ÿ ¢• ¬¬ try ¬ „ ò { ö©ö try — f = open("Æ" ©ž....txtú, 'r')LV
" © ž ...¬ F × ß ú> 8á¼ ø IOErrorñ Æ { " . T> • • 3ñ Æ© ØQ• except —
• 3• « U ¢ Á • ® QR { " . Ÿ d • 3• « • except • 1 „ ž ú Á • 3• « ...Ô1
except " n — N ¬ f { " . s, ⁻ — ö • 1 ÷ ø "G×ßú> ž ...¬ Nñ" Űª ©
• 8¬ CD ¼ Ű Æ" ©ž....txtŰª © ž ...¬ G × ß ú> 8 { ö © O • " .

ò 6> ¥> ±² ¬ ÿ j ÷ ø ⁻ LV ¶ | | • 3® ö × Ñ • è " . Å Ű Ű — • 3L | © ò 6
¥> ±² ¬ < £ ¼ ò µ © • 3® ®½° " n • try, except® • ó ž¹ • 3®
L | | { " .

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• ó ä • 3® ~ 6> † É " . z ö ® j Birdª © J K " ® Ä © • ² J K " © š ú †
flyª © E f ® p á { Ÿ ¼ Ě Á Z (~ 6> ± w { ¼ Ě Á Z) Ñ Ø ¬ f Ø " .

```
classzBird:
zzzdefzfly(self):
zzzzzzzrai sezNotImplementedError
```

Ÿ d ⁻ Bird J K " ® Ä © • ² J K " Ñ flyª © E f ® p á • è Á ^ • 1 fly E f Ñ
« C ö ø š ú † ⁻ • 3ñ { µ O • " .

z

BirdJ K " — flyE f ® p å ° • ² J K " ® ÷ • .

```
classEagle(Bird):  
    zzzdefzfly(self):  
        zzzzzzzreturnz"veryzfast"
```


4) „ ” á

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± OÁ • Å• Ÿ á © ¥> ±² ñ • ¶ () ÑÑ Ÿ j ú x ñ • ™ ß "... © ½ ð • "...

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" " 9 " ñ - f ù ? ° O • x ™ "... °ª 1 - . £Ñ t > • ¥> ±² ñ Ÿ x ¾ •
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Åž¹ ÊÇ÷ © OÁ r ° O• "...

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f © "... ¼ • \ G • © ã ó ° O • Åž¹ Ÿ "... Å x > ° "... "ª • M3 | ñ ÊÇ÷ x ¾ •
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Ž • • è N E f Ä î Û ß © | | import® — > • è © “. Ĩ - ~ ý, “. • T >  
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O • Ä ž ¹ Ÿ Q ° ù è Ĩ î O • “. ä × ¹ ý y ¼ Ø • è Ä O • Ä ž ¹ © ª • M 3 |  
ù } ~ “ ® > ¼ ™ S • .
```

z

z

abs

abs(x)© 7 • Š — B D Š Ĩ > × — , ± 7 • — | Ä Š — ĩ á \ © E f • “.

```
>>>zabs(3)z  
3z  
>>>zabs(-3)z  
3z  
>>>zabs(1+2j)z  
2.2360679774997898z  
>>>
```

z

o¹ f — | Ä Š Ä “ n ¢ • p ž ¢ “.

```
zabs(a + bj) = sqrt (a^2+b^2)
```

z

apply

apply(function, (args))© E f • « ± E f — E f ® B D Ĩ > Ĩ Q | ĺ Ĩ > E f ®
ò † v © y f ĭ • “.

```
>>>defzsum(a,b):z  
.z.z.zreturnza+bz  
>>>
```

z

Y Ç• Ä §- t- ö- á \© Ef® Y " ¼ Ö- İ KŸ Ç• apply® « C ä ö f Ø".

```
>>>zapply(sum,z(3,4))z
7
```

z

z

chr

chr(i)© „ f 5^ - İ " vµú§- BDÎ > İ ' ±• žİ © •® CD © Ef• ".

```
>>>zchr(97)z
'a'z
>>>zchr(48)z
'0'z
>>>
```

z

z

cmp

cmp(x,y)© Ä - ½ ® © Ef• ". Yd xŃ " ø àf§- < " ø nf§- šW° ".
ÇÁ Z • © 0® šW° ".

```
>>>zcmp(4,3)z
1z
>>>zcmp(3,4)z
-1z
>>>zcmp(3,3)z
0
```

z

z

dir

dirÁ ½ Ń Ń• ¼ Ø© AfÆ Ef® | " 9 5^ > ÷ ä ‡ ". İ K- ö© | " 9Ÿ ; <=|
½ - " ... Ef (S¹ ú)- ÷ ä \© ö• ". | Ń Ā¹¹ Ê Ç÷ xĖ " ...Ef - pZ1 f
Ø- O• ".

```
>>>zdir([1,2,3])z
['append','count','extend','index','insert','pop','remove','reverse','sort']z
>>>zdir({'1':'a'})z
['clear','copy','get','has_key','items','keys','setdefault','update','values']
```

z

z

divmod

divmod(a,b)© Ä — 7•® BDSİ > x¬ ± P Æ*•® ¢: — 5^> šW ©
Ef•''.

```
>>>zdivmod(7,3)z
(2,1)z
>>>zdivmod(1.3,z0.2)z
(6.0,z0.099999999999999978)
```

z

z

enumerate

enumerate© BDSİ > z†Q"•45(|"9, ¢:, •8)¬ BDİ > Ĩ enumerate½ ®
|®°''. enumerate½ © š > ± Ø¹ š, Äš > ± Ø¹ š•ž ĩ ö© †Q"•45—
ö6š¬ ¶|© ½ •''.

z

enumerate© Ĩ K— öŸ¢• ÷± for EŸ ½ö ''.

```
>>>zforzi,znamezinenumerate(['boby','foo','bar']):
...zzzzzprintzi,zname
...
0zboby
1zfoo
2zbar
```

šöþQ•¹†Q"•45— š öŸ Ĩ ñª äæj - Ö• Ø©•• Ä° £Ñ"š• - °
Z • enumerateEf© äö ''.

z

z

eval

eval(expression)Á BDŦ > ò Ñž ° • 8(1+2, 'hi' + 'a' ¢Á O)¬ BDŦ > Ĩ ¹
• 8¬ ò ° . Œ¬ ŒW © Ef• ¨ .

```
>>>eval('1+2')z
3z
>>>eval('"'hi'z+z'a'"')z
'hi'a'z
>>>eval('divmod(4,3)')z
(1,z1)
```

z

z

execfile

execfile(file)Á BDŦ > Ž•• Ž... • «¬ Ĩ ¹ ± Ž•• Ž...¬ ò †v© yf• ¨ . Ÿd,
¨ n ¢Á ¨ , 9® sum.pyª © • «Ŧ > Ÿ Ĩ ¹ fNÖ ¨ Ø ,

```
#zsum.pyz
defzsum(a,b):z
zzzreturnza+bz

printzsum(3,4)
```

z

¨ nLV £¤¥¦¦ ¢ú•¹ ò †Ç f Ø ¨ .

```
>>>zexecfile('sum.py')z
7
```

z

z

filter

filter(function, list)© EfŸ Ĩ " 9® BDŦ > Ĩ ¹ Ĩ " 9— Œ• ÆŦ Ef• Ef>
¾I µ , >¬ ŒW†v© ŒŸ¬ ° > BŦ ¹ Ĩ " 9— 5^> ŒW © Ef• ¨ . filter— ÄÄ
¬ . £Ñ® ~3Ó ¨ © Ä• ¨ . • —¶Ñ filter Ef• ¹ ™ ±Ä> ½ó ¨ ¨ . ¨ n— Ö® ÷• .

```
#positive.pyz
defzpositive(l):z
zzzresul tz=z[]z
```

```

zzzforzi in z:
zzzzzzzi fzi z>z0: z
zzzzzzzzzzresul t.append(i)z
zzzreturnzresul tz

printzposi tive([1, -3, 2, 0, -5, 6])

```

· §:

```
z[1, 2, 6]
```

s, - — posi tiveEf© | " 9® BDSĪ > Ĩ 1 " " — 1® Q- ž àf§Ÿ ° > | " 9•
 ßĪ ± . § ĩ ĩ á\© Ef• " .

z

filterEf® • ó ø Ĩ KY Φ• - — èó ĩ QR { ö f Ø" .

```

#filter1.pyz
defzposi tive(x): z
zzzreturnxz>z0z

printzfilter(posi tive, z[1, -3, 2, 0, -5, 6])

```

z

· §:

```
z[1, 2, 6]
```

filter Ef© § Ef> Efy ĩ, Ä § Ef> © ± Ef• &-> ĩ Ō †Q"
 • 45(| " 9, α: , • 8) ĩ ©" . filter Ef© Ä § Efe " | " 9— 1 •
 § Efe Ef• ĩ R ĩ | ®§• >E OŸ ĩ | " 9> ĩ 1 ĩ á†" . - — ö• 1 © 1,
 2, 6 Ÿ• àf> x > 0 •ª © N• >• ö /> [1, 2, 6]•ª © . § ĩ ĩ á\{ " .

z

lambda® Gø Q { ö f Ø" . (lambdaEf© ĩ † Š• yy° " .)

```

>>>zprintzfilter(lambdazx: xz>z0, z[1, -3, 2, 0, -5, 6])z
[1, z2, z6]

```

z

z

hex

hex(x)© BDÎ > „ f S ñ Ĩ ¹ ± S ñ —S ¢ f S (hexadecimal)> AW ä ¯ á \ © E f • ¨ .

```
>>>zhex(234)z
'0xea' z
>>>zhex(3)z
'0x3'
```

z

z

id

id(object)© ½ ® BDSÎ > Ĩ ¹ ½ —¼ã S (ù} ~ ") ñ Š W © E f • ¨ .

```
>>>zaz=z3z
>>>zid(3)z
135072304z
>>>zid(a)z
135072304z
>>>z bz=zaz
>>>zid(b)z
135072304
```

a, b 3• BÄ ¢ Á ½ ® Ñ | v ¼ Ø n ñ ÷ ä ‡ ¨ .

z

4© ¨ ½ • / > Ĩ œ ù id(4)© ¨ S ñ ÷ ä ‡ ¨ .

```
>>>zid(4)z
135072292
```

z

z

input

input([prompt])Á ½ó• BD ñ © E f • ¨ . raw_input ¨ \$• Ä ž ¹ © "BD CD"
Ž ¨ • ý y ö ĭ Ø ¨ .
BD E f > • 8 ñ \ ø Ĩ K — # S ö • ¹ ÷ Û • ± • 8 Á ¥ Ö ¥ 9 Ñ ¨ .

```
>>>zaz=input()z
'hi'z
>>>zaz
'hi'z
>>>zbz=input("Enter: z")z
Enter: z'hi'
```

z

· · 1 BD Å · 8 2#ž ÷ø " n ¢" .

```
>>>zbz
'hi'
```

z

z

int

int(x)© " 9T 5^ — 7• Æ 1 f\$ 7• 7 7 f— 5^ > šW†Ã " á†" . „ f® BDÎ >
Î ø ±Ã> " á†" .

```
>>>zint('3')z
3z
>>>zint(3.4)z
3
```

int(x, radix)© xª © · 8 radix(¢f)5^ > ' ¢° š 7 | ®° " .

z

'11'•ª © · ¢f š• Å} ô© —¢f šÅ " n ¢• p° " .

```
>>>zint('11',z2)z
3
```

z

'1A'ª © —SÃf š• Å} ô© —¢f šÅ " n ¢• p° " .

```
>>>zint('1A',z16)z
26
```


z

z

isinstance

isinstance(object, class)© BDŠĪ > £" ®" Ÿ J K" • « ¬ Ĩ 1 BDĪ > Á £" ®" Ñ ± J K" — £" ®" £• ® QR ä >• ∅ True, ?@• ∅ False® Š W° " .

```
>>>zclasszPerson:zpassz
.z.z.z
>>>zaz=zPerson()z
>>>zbz=z3z
>>>zisinstance(a,zPerson)z
True
```

z

¬ — Ö © aÑ Person J K" • —ž 1 Ą £" ®" Æ¬ 2£†Ä ‡" .

```
>>>zisinstance(b,zPerson)z
False
```

b© Person J K" • —ž Ą £" ®" Ñ Ĩ ñ" .

z

z

lambda

lambda© £f® Ą 1 ½óó© öd j > defŸ Ě... Æ ÷ ± ° o> Q. { Ÿ j ½ó1 ½ó° " . lambda© Ú©" Üª ¼ FĪ) ÷ ± def® ō „™> o • ě?Æ def® ō f" © Ó• G£" . lambda© " n Φ• „ — " .

```
lambda £f1, £f2,,, : £f® • ó° Üå²
```

z

° § Ÿ j ÷ • .

```
>>>zsumz=zlambdaza,zb:za+bz
>>>zsum(3,4)z
7
```

z

lambda® • ó° sumEƒ© £ƒ> a, b® ¼ aŸ b® †° S¬ ¯ á ‡¨. ¯ — lambda® • ó°
sumEƒ© ¨ n— def® • ó° EƒŸ © ...• Þ¼Û Ê... ¨.

```
>>>zdefzsum(a,zb):z
.z.z.zzzzzreturnza+bz
.z.z.z
>>>
```

z

±w¨ Ø defÑ Ø©õ \ lambdaª © O• Æ%{ õ ¬P? • ā © QR ¨. lambda© def ÃÃ
Q. { ½ó1 ƒ Ø¼ def> õ ƒ ¨ © Ó• lambda© G... ƒ Øx • ¨. | ¨ 9 è•
lambdaÑ j Q Z ® ÊÇ÷•.

```
>>>zl=z[lambdaza,b:a+b,zlambdaza,b:a*b]z
>>>zlz
[atx0x811eb2c>,zatz0x811eb64>]
```

z

s | ¨ 9 ¨ ¨ — ¹• lambda Eƒ® Ÿ j õ ƒ Ø¨. S ¹ l[0]Ã Ã — BDS¬
İ ¹ †¬ ¯ á \ © lambda Eƒ• ¨.

```
>>>zl[0]z
atz0x811eb2c>z
>>>zl[0](3,4)z
7
```

z

Ã S ¹ l[1]Ã Ã — BDS¬ İ ¹ ©¬ ¯ á \ © lambda Eƒ• ¨.

```
>>>zl[1](3,4)z
12
```

¥> ±K¬ ¨ ÷Ø lambda Eƒ— ½óó™© - r - ΦE¬ ê{ μ O• ¨.

z

z

len

len(s)Ã £ƒ> †Q¨ • 45(• 8, | ¨ 9, ¨:)¬ BD İ ± =• (¹ — ƒ)® ¯ á \ ©
Eƒ• ¨.

```
>>>len("python")z
6z
>>>len([1,2,3])z
3z
>>>len((1,z'a'))z
2
```

z

z

list

```
list(s)© £f> †Q" • 45¬ BD Ĩ ± ¹® U¢Á Ø¹ — | " 9> Ÿ | ¯ á\©
£f• ¨ . | " 9® BDĪ > \ø U¢Á | " 9® o½ ä ¯ á±¨ .
```

```
>>>list("python")z
['p','z'y','z't','z'h','z'o','z'n']z
>>>list((1,2,3))z
[1,z2,z3]z
>>>zaz=z[1,2,3]z
>>>zbz=list(a)z
>>>zbz
[1,z2,z3]z
>>>id(a)z
9164780z
>>>id(b)z
9220284
```

```
List(a)© | " 9® o½ž¹ ¨ | " 9® ¯ á\© O¬ ¯ — ö•¹ 2£1 f Ø¨ . s aŸ b—
id$• ¹ > ¨ • ¨ .
```

z

z

long

```
long(x)Á 7• 5^ — • 8• Æ 7• ® £f> BD Ĩ Ĩ „ f5(long integer)Ī > ¯ á\©
£f• ¨ .
```

```
>>>long('34567890')z
34567890Lz
>>>long(34567890)z
34567890L
```

z

z

map

map•ª©OÁEƒŸ†Q"•45(|"9,æ:,•8)¬BDÎ>İ¹†Q"•45—
" " — ¹ÑEƒ—BDÎ>İQ¨nÆ%©CDS¬İ¹|"9>¬á\©Eƒ•¨.

z

¨n—Eƒ®÷•.

```
defztwo_times(l):z
zzzresul tz=z[]z
zzzforzi zinl :z
zzzzzzzresul t.append(i*2)z
zzzreturnzresul t
```

•Eƒ©|"9®BDİ¹" " — ¹•2®©° . S¬¬á\©Eƒ•¨.

z

¨n ¢•G...O•¨.

```
#ztwo_times.pyz
defztwo_times(l):z
zzzresul tz=z[]z
zzzzzzzforzi zinl :z
zzzzzzzzzzresul t.append(i*2)z
zzzreturnzresul tz

resul tz=ztwo_times([1,2,3,4])z
printzresul t
```

z

. S:

```
z[2, 4, 6, 8]
```

z

•O¬¨n ¢•ž÷•.

```
>>>zdefztwo_times(x):zreturnx*2z
.z.z.z
>>>zmap(two_times,z[1,2,3,4])z
[2,z4,z6,z8]
```

s map•' E f© BDSĪ > E f y ± E f• ĩ Ō E f> ĩ " 9 — † Q" • 45—
 © " . • OĀ " n Φ• ž y " . ĩ " 9— Š 1 ∈ 1• two_times E f— BDSĪ >
 ĩ Ń¹ 1 * 2— „ — ? : 2— Š• . Š ĩ " 9 []• " Ń " . • . ŠĀ [2]Ń ō ¼,
 " n• ĩ " 9— Ā Š 1 ∈ 2Ń two_times E f— BDSĪ > ĩ Ń¹ 4Ń " n• Š•
 . Š ∈ [2]• " Ń ō ĩ . ŠĀ [2, 4]Ń " . 4 — 1 Š• š o ō ø . ŠĀ [2, 4, 6,
 8]• μ O• ¼ • — BDS• " Ī ø ĩ E . Š ∈ [2, 4, 6, 8]— " á ‡ " . • O• map
 E f Ń © ... " . s mapĀ . ŠĪ > ĩ " 9® ĩ ®° " .

z

— ö© ĩambda® Gø " nLV Q° Ā " .

```
>>>zmap(lambdaza:za*2,z[1,2,3,4])z
[2,z4,z6,z8]
```

z

[map— • ó ž¹ ĩ " 9— Š — 1Ī " Ń © ö]

```
#zmap_test.pyz
defzplus_one(x):z
zzzreturnzx+1z
printzmap(plus_one,z[1,2,3,4,5])
```

. Š : [2,3,4,5,6]

z

z

max

max(s)© E f> † Q" • 45(• 8, ĩ " 9, α :)— BD Ī ± ĩ Ā Š — " á \© E f• " .

```
>>>zmax([1,2,3])z
3z
>>>zmax("python")z
'y'
```

z

z

min

min(s)Á maxŸ © š Ā> † Q“ • 45¬ BD Ĩ ± l ¹ Š¬ ¯ á\© Ef• ¨.

```
>>>zmin([1,2,3])z
1z
>>>zmin("python")z
'h'
```

z

z

oct

oct(x)© „ f 5^ — 7• ® 8¢f • 8> T U¡ ¯ á\© Ef• ¨.

```
>>>zoct(34)z
'042'z
>>>zoct(12345)z
'030071'
```

z

z

open

open(filename, [mode])Á Ž... • « F × x¿¬ BD Ĩ Ž... ½ ® ¯ á\© Ef• ¨. F × x¿ (mode)• ° öø × %ø¿ Ĩ > F × %ó ß Ů('r')> Ž...½ ® Ÿ ¡ ¯ á‡ ¨. ± ĩ • • #° ½° Á ª • M3¡ ù} ~ " ® >® •.

mode	‡^
w	G × ß Ů> Z... 8 ×
r	F × ß Ů> Z... 8 ×
a	" N ß Ů> Z... 8 ×
b	Ŧ • =¡ ß Ů> Z... 8 ×

w+, r+, a+ © Ž...¬ ö• 91 ó™> ½ó ¨.

z

b© w, r, aŸ E Ÿ ½ó ¨.

```
>>>zfz=zopen("binary_file","rb")z
>>>zfwri tez=zopen("write_mode.txt","w")z
>>>zfreadz=zopen("read_mode.txt","r")z
```

```
>>>zfread2z=zopen("read_mode.txt")
```

freadȲ fread2© Ė...° Š ĩ Æ; Óȳ. s, F×Bú ÛÚ• ° ôø ×%ôŠĪ > 'r' ĩ ¶{ ȳȳ.

z

ȳ nĀ " Ń Bú> Ž... ĩ ä© ö• ȳȳ.

```
>>>zfappendz=zopen("append_mode.txt",z'a')
```

z

z

ord

ord(c)© • — Ī " v Š ĩ ĩ á\© Ef• ȳȳ.

```
>>>zord('a')z
```

```
97z
```

```
>>>zord('0')z
```

```
48
```

z

z

pow

pow(x, y)© x— y ĩ ° . Š ĩ ĩ á\© Ef• ȳȳ.

```
>>>zpow(2,z4)z
```

```
16z
```

```
>>>zpow(3,z3)z
```

```
27
```

z

z

range

range([start,] stop [,step])© for ô ½ôô© OĪ > Ef> „ fŠ ĩ \j ± 7••

ž ĩ ô© ĩ ĩ — Š ĩ | " 9— 5^> ĩ á\© Ef• ȳȳ.

z

EfŃ Æ... Z

```
>>>zrange(5)z
[0, z1, z2, z3, z4]
```

z

£ f Ñ Ä ... Z (BDÎ > \j • © Ä — 7 • © † < • ¬ Æ; Ó" . • § « Ñ E •
• " © O • \ — • .)

```
>>>zrange(5, z10)z
[5, z6, z7, z8, z9]
```

z

£ f Ñ # ... Z - # § £ f © † < § « Û ¢ • § « P • Ñ © ö 7 • ½ • — ? | ® + ° " .

```
>>>zrange(1, z10, z2)z
[1, z3, z5, z7, z9]z
>>>zrange(0, z-10, z-1)z
[0, z-1, z-2, z-3, z-4, z-5, z-6, z-7, z-8, z-9]
```

z

z

raw_input

raw_input([prompt])Ä ½ ó • BD¬ © E f > prompt © BD¬ © S † • • " . BD Ä § —
ø € • , • (' \ n ') ® " U § ¬ " á ‡ " .

```
>>>zaz=zraw_input()z
youzneedzpythonz
>>>zaz
'youzneedzpython'z
>>>zbz=zraw_input("----")z
---->youzneedzpythonz
>>>zbz
'youzneedzpython'
```

• ¶ ý y Ö Ë BCD Û Ú • input raw_input • Ä ° ý y ¬ ¬ " .

z

z

reduce(function, sequence) • OÁ £f® Ä © E f £ function † Q" • 45¬ £f>
BD Ĩ 1 † Q" 1 — ê Á Û ¤ &- Á> • P • ö 1 † v) BD Á E f ® ò † v ©
E f • " .

$$Z$$

z15
120

Z

$$z(((1+2)+3)+4)+5)$$

Z

$$z((((1*2)*3)*4)*5)$$
$$Z$$
$$Z$$

```

reload(module)© • ¶ √ 3» È (import) ß → ∙ † Û • © E f> ß ½ ® - ¢ ‡ ∙ . i Û
• ∙ g> ∙ ∙ n ∙ < Æ z ÷ • .

```

```
#ztest.py
defza():z
zzzprintz"li fezi sztoozshort"
```

z

.. n• ÄÄ5 £¤¥| ¤•¹ • ß ¬ √3÷• .

```
>>>importztestz
>>>ztest.a()z
'li fezi sztoozshort'
```

z

ÄÄ5 £¤¥| ¤® Û• +¼ î Û•• ¤> test.py Ž...¬ TUj ÷• .

```
#test.pyz
defza():z
zzzprintz"youzneedzpython"
```

z

.. n• "† ÄÄ5 £¤¥| ¤•¹ "n Φ• Ž÷• .

```
>>>ztest.a()z
'li fezi sztoozshort'z
>>>zreload(test)z
>>>ztest.a()z
'youzneedzpython'
```

s, - — Z LV • ¶ √3Ö ß ¬ f„ ° "n T' èó¬ ¿ó ¼ Ě¬ \> ½ó {
..

z

z

repr

repr(object)Á ½ ® CD1 f Ø© •8 5^> AW ä ¯ á\© Ef•"" . • AW \$Á
\> eval Ef— BDÎ > GE"" . str EfŸ— &• \$•ª ø strĪ > AW \$Á eval— BDS•
µ f "" © Z Ñ Ø"" © O• "" .

```
>>>zrepr("hi ".upper())z
"'HI '"z
>>>zeval (repr("hi ".upper()))z
'HI 'z
>>>zeval (str("hi ".upper()))z
Traceback(zinnermostzlast):z
Filez"",zlinez1,zinz?zeval (str("hi ".upper()))z
Filez"",zlinez0,zinz?z
NameError: zTherezisznozvariablenamez'HI '
```

ˆ — Z LV strˆ õ Z eval Ef — BDŠ • µ f " © Z Ñ Ø" .

z

z

sorted

sorted Ef © BDĪ > Á † Q" • 45ˆ 1 9° Š ± . ® | " 9> | ® © Ef • " .

```
>>>zsorted([3,1,2])
[1,z2,z3]
>>>zsorted(['a','c','b'])
['a',z'b',z'c']
>>>zsorted("zero")
['e',z'o',z'r',z'z']
>>>zsorted((3,2,1))
[1,z2,z3]
```

| " 9 • 45 • ™ sort^a © Ef Ñ Ø" . • Ÿ | " 9 • 45 — sortEf © | " 9 ½ ± • ®
1 91 õ • • 1 9 . ® | ® • © è ©" .

" n — õ 6> sortedŸ | " 9 • 45 — sortEfŸ — & • \$ˆ 2 Ež ÷ • .

```
>>>zaz=z[3,1,2]
>>>zresultz=za.sort()
>>>zprintzresult
None
>>>za
[1,z2,z3]
```

z

z

```
str(object)Ã ½ ® CD1 f Ø© • 8 5⁻ > AW à ¯ á\© Ef• ¨. R • 8 ±
• > ÿ ¯ á\© Ef• ¨. ¯ — reprEfÿ — & $ ↦ Ê Ç ÷ • .
```

$$Z$$
[illegible]

Z

$$\text{type(object)} \hat{A} \in f \times \frac{1}{2} \otimes \text{BD} \quad \ddot{\Gamma} \pm \frac{1}{2} - \bullet 45 \bullet - \cdot \in \cdot \hat{e} \acute{a} \backslash \textcircled{C} E f \cdot \ddot{\cdot}$$
$$\in \bullet, \quad \ddot{\circ} \bullet^1 \hat{=} f \emptyset \ddot{\cup} \bullet \quad \check{Z} \dots \neg G \times \beta \acute{u} \succ \propto \tfrac{1}{2} \quad - \bullet 45 \acute{A} \text{ 'file' } \acute{A} \neg \hat{=} f \emptyset''.$$
$$Z$$

zip E f © È ... ö f — 1 § 7 ¶ © † Q " • 45 7 j \ © 1 7 ° " . ö 6 > 2 f ž
÷ • .

```
>>>zzi p([1, 2, 3], z[4, 5, 6])  
[(1, z4), z(2, z5), z(3, z6)]  
>>>zzi p([1, 2, 3], z[4, 5, 6], z[7, 8, 9])  
[(1, z4, z7), z(2, z5, z8), z(3, z6, z9)]  
>>>zzi p("abc", z"def")  
[('a', z'd'), z('b', z'e'), z('c', z'f')]
```

[2] ' P Ō

ÿè´ f„ ... „" á®

Ž•• ½ó• H ® | Ĩ ÷•• ¾#´ — Ž•• ½ó• • —ž¹ • ¶ Ÿ Ĩ Ğ ¥> ±² ¬
Bĭ úÁ O• T> Ž•• ª• M3| • ¨• ³ª• M3| ´ © ³™¹ ¬ ´• ¨• s, [Ĩ ÷© Ó• ¨•
zB+ ª• M3| ® Ū1 — © ¨ ¨• ±f Ĩ Ó• Ĩ ª• M3| ® øÖ ° ¨ © OŸ êø
¨• z

±3× ¨ ž¹ Ĩ ª• M3| • • æ ¼ Ĩ Á{ ½ó ©•• Āž¹ ěĭ Ö 1 — Ñ Ø ¨• •
Ó• ¹ Ž•• — ß+ ª• M3| ® ¨ Ā• © ě¬ O• ¨• ¨ Ÿ, • \ G• ¼ Ā ěĭ ÖŸ ° ¨ ¼
ä—• © O • Āž¹ Ÿ ¨ Ā™s ¨ ¨•

±| ¼ ä×¹ © \> ò- ¨ \> ýy1 O• ¨• • #° OÁ Ž•• EŸ • ô© Ž••
ª• M3| ù} ¨ ¨ ® >¼ ™s ••
(ù Ž•• ª• M3| © Ž•• ýÔ† • Ěĭ > ^_¤• yŌÑ ¨•.)

z

z

ˆ• — £¤ μō« ° Ā(sys.argv)

sys ß Ā Ž•• £¤¥| ¨ Ñ 6 © Af Ef ¬ ě| | # ä 6| 1 f Ø{ ž \ ©
ß • ¨•

z

sys.argv

```
C:\Python21> python test.py abc pey guido
```

¬ — ö• ¹ Ÿ Ğ• python test.pyP• ¨ ¨ § ¬ EŸ ž Ĩ \ø sys.argvª © | " 9• ±
§ • " Ñô{ ¨ ¨•

z

ö6°ª ž ÷×)

1. ¨ ¨ ¨ n Ğ Ā Ž•• ¥> ±² ¬ < Œ •• (C:\Python\Mymoduelsª © • WX| • f ÑŌ ¨ ¼
Ñ ¨ ¬ ° ¨•.)

```
#zargv_test.pyz
import sys
print sys.argv
```

z

2. ™ ¨ • ¹ ¨ n Ğ• ž ÷••

```
C:\Python\Mymodules> python argv_test.py you need python
['argv_test.py', 'you', 'need', 'python']
```

```
^ LV python• ' y f i P— B+ O • h— x ‡ Î > ÆV i 1 sys.argv | " 9— 1 Ñ
é— è f Ø". 2N BCD ÛÛ— y f BCD• 1 • #° è ó— " Å¼ Ø".
```

z

z

```
÷" | —~ | ™¼î (sys.exit)
```

```
>>> sys.exit()
```

```
sys.exit© Ctrl-ZÆ Ctrl-D@ â 3¹ ÅÄ5 E¤¥| ¤@ E4 © O ¢Á xž— ° ". ,
¥> ±² Ž... è•¹ G• ø ¥> ±²— r R { " .
```

z

z

```
»Š„ Ç' —• Ž ¤ ` ^ (sys.path)
```

```
sys.path© Ž•• ß • f Nô i Ø© ^ Ô® Æ; Ó". s, • ^ Ô• Ø© xxx.py Ž... Å
Z> • ^ " • i • •¹ Æ v 3j f Ñ Ø".
```

z

```
" nÁ ± ò . • " .
```

```
>>>importsys
>>>sys.pathz
['',z'c:\python21',z'c:\python21\dlis',z'c:\python21\lib',z'c:\python21\l z
ib\plat-win',z'c:\python21\lib\lib-tk']z
>>>
```

z

```
^ — ö•¹ "'© åæ · WX | ® +° " .
```

```
#zpath_append.pyz
importsysz
sys.path.append("C:\Python\Mymodules")
```

```
^ Ý ¢• Ž•• ¥> ±² Ž...•¹ sys.path.append® • óž Z> y— " Ñ†Ç f Ø". • w{
¼ * P• © C:\Python\Mymodulesª © · WX | • Ø© xxx.py Ž...— v 3¹ ö f Ñ Ø".
```

z

z

```
> << < • < < i f' E Ž P Ø # $ " %(pickle)
pickle B Å ½ — 5 ^ ® ± Å > ä • { ä Ž ... • f N † v ¼ v 3 j f Ø { ©
B • " ,
```

z

```
Ÿ K — ö © Ž ... → G × B Ů > 8 j 1 ; < = | ½ E data ® ± Å > pickle.dump > f N ©
¾ 5 ĺ E x ĺ • " ,
```

```
>>>importzpicklez
>>>zfz=open("test.txt",z'w')z
>>>zdataz=z{1:z'python',z2:z'youzneed'}z
>>>zpickle.dump(data,zf)z
>>>zf.close()
```

z

```
pickle.dump • — Ž f N Ž ... → 8 j > K Ø Ě ; < = | ½ (data) ® ± Å > Ÿ â % © ¾ 5 ĺ E
ö • " ,
```

```
>>>importzpicklez
>>>zfz=open("test.txt",z'r')z
>>>zdataz=pickle.load(f)z
>>>zprintzdataz
{2:'youzneed',z1:'python'}
```

— ö • 1 © ; < = | ½ ® • ö → • Ÿ j • 45 • + • " " " ,

z

z

```
ĺ » ) á(string)
string B Å • 8 L | • GE " . • Ů 2 N Ž • • 45 r • 8 • " ° è ö • 1 • ¶
• 8 " ... Ef ® ë Ĩ ÷ x " . • string B — " ... Ef Å • 8 • — " ... Ef ? —
... Ö ) U Φ • Ě < ° " . ä × 1 © string B • Ÿ Ø © Ef M Ÿ ë Ĩ ÷ x > • ,
```

```
>>>importzstringz
>>>zdir(string)z
['_StringType',z'__builtins__',z'__doc__',z'__file__',z'__name__',z'_float',z'_imap',z'_imapL',z'_int',
'_long',z'atof',z'atof_error',z'atoi',z'atoi_error',z'atol',z'atol_error',z'capitalize',z'capwords',z
```



```
'center', 'z'count', 'z'digits', 'z'expandtabs', 'z'find', 'z'hexdigits', 'z'index', 'z'index_error', 'z'join', 'z'joinfields',
'letters', 'z'ljust', 'z'lower', 'z'lowercase', 'z'lstrip', 'z'maketrans', 'z'octdigits', 'z'printable', 'z'punctuation',
'replace', 'z'rfind', 'z'rindex', 'z'rjust', 'z'rstrip', 'z'split', 'z'splitfields', 'z'strip', 'z'swapcase', 'z'translate',
'upper', 'z'uppercase', 'z'whitespace', 'z'zfill']
```

z

```
~ · 1 ÷ Û · dir(string)~ ° · | Ñ · ¶ è Ĩ % · 8 ~ ... Ef ? — ...ÔE ~
2£1 f Ø" · s, " nÁ Þ¾û È... " ·
```

```
>>>importzstringz
>>>zstring.split("youzneedzpython")z
['you', 'z'need', 'z'python']z
>>>z"youzneedzpython".split()z
['you', 'z'need', 'z'python']
```

```
~ — ö© string ß — split Ef® · ó° O· ¼ W— ö© · 8 · — splitEf® · ó°
O· " · string ß · Ÿ Ø© Ef· © " n ¢Á O · Ø" ·
```

z

z

atof

```
· 8 5^ — 7 · ® òf> TUj ‡ " ·
```

```
>>>zstring.atof('3')z
3.0
```

z

```
atof© òf> AW Ñž ° · ® òf 5^> TUj \© Ef· " · OÁ " n ¢Á —¶ · " ·
```

```
>>>zfloat('3')z
3
```

z

z

atoi

```
~ — atofŸ €¼Ñ · > „ f> AW Ñž ° · ® „ f 5^> TUj \© Ef· " · int EfŸ
È...° · Š ~ CD° " ·
```

```
>>>zstring.atoi('3')z
3z
>>>zint('3')z
3
```

z

z

zfill

• OÁ \> 7• ® Ü† © õ G• © Ef> Ä— Ĩ Q¬ 0Ĭ > ëu ‡¨. zfill Ä zero + fill s 0Ĭ > ë¨¨ © —¶¨•¨.

```
>>>zstring.zfill(3,z8)z
'00000003'z
>>>zstring.zfill('a',z3)z
'00a'
```

string.zfill(a, b)• 1 S Ef(a)© Ü†1 S• ¼ Ä S Ef(b)© =• ® Æ; Ó¨. | © ÷ ± HĒ® f N1 2001-04-04 ² Ĩ > 04^ 04...LV Ä• 0¬ ø\© { EE — ¨. • zfill¬ ½ó ø ä ó 1 O•¨.

z

z

f' Ÿ ¨ (Stringl0)

Stringl0© Ž...LV B õ© ½ ® Ÿ Ĩ Ó¨. R ò 6 Ž...½ © Ĩ ñ¼ Xè® m õ¨¨.

z

[½óö6]

„ Stringl0 B ¬ ½ó x ¨ ž 1 v 3Ô¨ (import).

```
>>>zimportzStringl0
```

z

±| ¼ Stringl0— EfE Stringl0® • óž 1 Stringl0— ½ ® Æ Æ°¨. • ½ €Ö Ž... ½ LV Ē°¨. ° a 1 Ž... ½ • G• © Ef • ±Ä> ¿ ó ¨.

```
>>>zFz=zStringl0.Stringl0()
```

z

±|¼ ±½ • write® • ó ä "life is too short"^a © N↪ øž " .

```
>>>z.write("life is too short")
```

z

±|¼ Æ¹ ±½ • Gäϥ • 8↪ getvalue® • ó ä F|¹ Af value• ÄB ↪" . •
getvalue© Stringl0• ¹ Ÿ G• © Ef• " .

```
>>>zvalue=z.getvalue()
>>>zvalue
'life is too short'
```

z

±|¼ |E¿Î> close® • óž¹ Ž...½ ® SB|• ¹ "K^-" .

```
>>>z.close()
```

z

[8#] Stringl0Ñ • \ G• © • ä

| © ¥> ±K_↪ 1 Ñâ • 8 ö• ¨® Ž...• fN° "n• ä3 Ñ•
L|® ° " . • Ÿ ± Ž...• "† G• • ë¼ Ä fNμ – Ñ " " ø` •
Ž...• fN1 – © "↪ O• " . • w{ Ä Ž...↪ Ÿ |¹ L|® 1 – Ñ
" { ž\© B • T> Stringl0"D ° • 3° ó™> Ÿ G• © OÄ
İ ñ• Ÿ ÄÙÚ Ž... L|® © Ó• ¹ • Stringl0© äó " .

z

z

ù Èì þ LEÝðk" <#\$" %B? (os.environ)

† " aÁ 6" × " WZ Af S ↪ Ñ•¼ Ø©ö Ž••• © • 3° WZ Af S ↪ ÷ ä \ ©
osB — environ• " . " n↪ ° a ž ÷ • .

```
>>>importzsz
>>>zos.environz
{'CMDLINE':z'WIN',z'PATH':z'C:\WINDOWS;C:\WINDOWS\COMMAND;C:\PROGRA~1\ULTRAz
EDT;C:\JDK1.3\BIN;C:\ESSOLO.COM;C:\VIM\VIM\VIM57;C:\PYTHON21',z'BLASTER':z
```

```
'A240zI10zD1',z' TEMP':z' C:\WINDOWS\TEMP',z' COMSPEC':z' C:\WINDOWS\COMMAND.COz
M',z' PROMPT':z' $p$g',z' WINBOOTDIR':z' C:\WINDOWS',z' WINDIR':z' C:\WINDOWS',z' TMPz
':z' C:\WINDOWS\TEMP'}z
>>>
```

```
~ — . § Á — • — † " a „ ÷ • ". os.environÁ ; <=| ½ ® ¯ á ‡ ". • # ù ÷ ø ä 3
Ñ• ā ó ° „ ÷ ® [ ¬ f Ø".
```

z

```
; <=| • × • " n Φ • « C1 f Ø". — • — † " a — PATHAf • ". • OÁ , ™
C:\WINDOWS\autoexec.bat • ¹ ý „ ž ú Á „ ÷ • ".
```

```
>>>z=os.environ['PATH']z
'C:\WINDOWS;C:\WINDOWS\COMMAND;C:\PROGRA~1\ULTRAEDT;C:\JDK1.3\BIN;C:\ESSz
OLO.COM;C:\VIM\VI\M\VI\M57;C:\PYTHON21'z
>>>
```

z

z

```
Æj Φ á £ ¯ Ê®(os.chdir, os.getcwd)
```

```
.İ KŸ Φ • å æ · WX| — ¯ Ô® AZ1 f Ø".
```

```
>>>z=os.chdir("C:\WINDOWS")z
os.getcwd()
```

z

```
å æ • Å — · WX| ¯ Ô® ¯ á ‡ ".
```

```
>>>z=os.getcwd()z
'C:\WINDOWS'zz
```

z

z

```
Èl p ^ • (os.system, os.popen)
```

os.system

```
† " a — ā † | ‡ Å x; y f j ¬ Ž • • • ¹ « C1 f Ø". os.system(Ú y f j Ü)L V
½ ó ž Ô ° ". " n Á å æ · WX| • ¹ dir¬ ò © ö • ".
```

```
>>>zos.system("dir")
```

dir— . § CD

z

os.popen

os.popenÁ ¢“ a yfi ® ò ¢É . §¬ F× Bú 5^— Ž...½ > ¢ á ¢” .

```
>>>zfilesz=os.popen("dir")z
>>>zfilesz
>>>
```

z

F Á Ž...½ — èó¬ ÷× ¢ž¹ © ” n ¢• ø µ O•” .

```
>>>zprintzfiles.read()
```

z

x; äó° os ¢ ... Ef

ö	‡^
os.mkdir(· WX)	· WX ® Œ° ” .
os.rmdir(· WX)	· WX ® ÷ 6° ” .R, · WX Œ Øi Ö ÷ 6Œ Œž ” .
os.unlink(Ž...)	Ž...¬ •• ” .
os.rename(src, dst)	src ^a © • « — Ž...¬ dst ^a © • « Î > T Ö ” .

z

z

f' • (shutil)

shutilÁ Ž...¬ o½ž \© Ž•• B • ” .

z

shutil.copy(src, dst)

src^a © • « — Ž...¬ dst> o½° ” . Ýd dstŒ · WX| · « •^a ø src^a © Ž...• « Î >

dst = copy.copy(src, dst)

```
>>> import shutil
>>> shutil.copy("src", "dst")
```

z

z

shutil.copy2(src, dst)

Copy from src to dst with as many details as possible. If dst is a file, it will be replaced. If dst is a directory, the file will be created inside it.

z

shutil.copytree(src, dst)

Copy the entire directory tree from src to dst. If dst is a file, it will be replaced. If dst is a directory, the contents will be copied into it.

z

src = "C:\\Python\\src"
dst = "C:\\Python\\dst"
shutil.copytree(src, dst)

```
>>> import glob
>>> glob.glob("C:\\Python\\*")
['C:\\Python\\quiz.py', 'C:\\Python\\quiz.bak']
>>>
```

z

z

tempfile.mktemp()

Create a temporary file in the current directory. The file will be named with a unique name. The file will be created with mode 'w+b'.

```
>>> import tempfile
>>> filename = tempfile.mktemp()
>>> filename
'C:\\WINDOWS\\TEMP\\--275151-0'
```

z

tempfile.TemporaryFile()
tempfile.TemporaryFile().write("Hello World")
tempfile.TemporaryFile().close()

```
>>>importztempfilez
>>>zfz=ztempfile.TemporaryFile()z
```

z

z

time.time()

time.time() returns the current time in seconds since the epoch as a float. On Unix, the epoch is 00:00:00 UTC on January 1, 1970. On Windows, the epoch is 00:00:00 local time on January 1, 1970.

z

time.time

time.time() returns the current time in seconds since the epoch as a float. On Unix, the epoch is 00:00:00 UTC on January 1, 1970. On Windows, the epoch is 00:00:00 local time on January 1, 1970.

```
>>>importztimez
>>>ztime.time()z
988458015.73417199
```

z

z

time.localtime

time.localtime() returns the current time in seconds since the epoch as a float. On Unix, the epoch is 00:00:00 UTC on January 1, 1970. On Windows, the epoch is 00:00:00 local time on January 1, 1970.

```
>>>ztime.localtime(time.time())z
(2001, z4, z28, z20, z48, z12, z5, z118, z0)
```

z

z

time.asctime

time.asctime() returns the current time in seconds since the epoch as a float. On Unix, the epoch is 00:00:00 UTC on January 1, 1970. On Windows, the epoch is 00:00:00 local time on January 1, 1970.

```
>>>ztime.asctime(time.localtime(time.time()))z
'SatzAprz28z20: 50: 20z2001'z
```

z

z

time.ctime

time.ctime - time.asctime(0) { "nLV Üâ " }

```
>>>time.ctime()
'SatzAprz28z20: 56: 31z2001'
```

z

z

time.strptime

time.strptime('CD1 5² æµú', time.localtime(time.time())) strftime Eƒ© †Q• - '
O¬ #8 { Üâ1 ƒ Ø© ä3 Ñ• æµú® 6 ž ‡" }

7â	‡^	-
%a	... oÆ+	Mon
%A	...	Monday
%b	l oÆ+	Jan
%B	l	January
%c	HÊÝ †Q¬ CDE (> " ... ý„ • —° 5² • O" i)	06/01/01 17:22:21
%d	H(day)	[00, 31]
%H	†Q(hour)-24†Q CD 5^	[00, 23]
%I	†Q(hour)-12†Q CD 5^	[01, 12]
%j	1‡ r (¿ HÊ	[001, 366]
%m	l	[01, 12]
%M	Ú	[01, 59]
%p	AM or PM	AM
%S	Œ	[00, 61]
%U	1‡ r (¿ \¬... ...¬ † < Î >	[00, 53]
%w	7• > ...	[0(... ...), 6]

%W	1± r (¿ \ - ^ ...¬ † < Î >	[00, 53]
%x	â æ ý „ > “ ...• × š ° HÊ CD	06/01/01
%X	â æ ý „ > “ ...• × š ° † Q CD	17:22:21
%Y	‡ ™ CD	2001
%Z	† QÂ CD	Â° 1 ç Ü‡ †
%%	• %	z
%y	# × ÜÜ¬ 6î ° ‡ ™ CD	01

z

```
>>>importztime
>>>ztime.strftime('%x',ztime.localtime(time.time()))
'05/01/01'z
>>>ztime.strftime('%c',ztime.localtime(time.time()))z
'05/01/01z17:22:21'
```

z

z

time.sleep

time.sleep Eƒ© ÷ ± Å¥ • • ¹ é• G• ©ö ...„ ° †Q Qà¬ \ × ⁂ ž¹ \> G• {
 .. „ n ö6® ÷ • .

```
#sleep1.pyz
importztimez
forzizi nrange(10):z
zzzprintzi z
zzztime.sleep(1)
```

⁂ ö6© 1E QàÎ > 0Ü¤ 9P• — 7• ® CD { .. . time.sleep Eƒ— Eƒ> © òƒ
 5^ Ñ Ñž .. . s 1• ø 1E• ¼ 0.5 • ø 0.5EÑ ö© O• .. .

z

z

`f„...£¤ ÅÄ`´ (calendar)`

`Ž•••¹ | D¬ î f Ø{ ž \© ß •´´.`

`z`

`2001‡ — ¾ | D¬ î f Ñ Ø´´.`

```
>>>importzcalendar
```

```
>>>zprintzcalendar.calendar(2001)
```

`z`

`´ ¨ UΦÄ . §¬ ÷ ä ‡´´.`

```
>>>zcalendar.prcal(2001)
```

`z`

`2001‡ 4^ — | DŸ¬ ÷ ä ‡´´. • ¨ ¬ — O Ä ¥> ±K_ è•¹ © ? — G•´ ë©´´.´´ ¨ Ÿ
ÄÄ5 £¤¥| ¤•¹ %! HÊ® 2£ © „™ — ó™> ¨ GE´´.`

```
>>>zcalendar.prmnth(2001,z4)z
```

```
Aprilz2001z
```

```
MozTuzWezThzFrzSazSuz
```

```
1z
```

```
2z3z4z5z6z7z8z
```

```
9z10z11z12z13z14z15z
```

```
16z17z18z19z20z21z22z
```

```
23z24z25z26z27z28z29z
```

```
30
```

`z`

`´¬ — äó° calendar ß — Ef® ÷™s •. weekday(‡™, ^, ...) Ef© ± HÊ•
ž Ĩ © ...„ ÷® ¬ á ‡´´. ^ ...Ä 0, Ä ...Ä 1, f ...Ä 2, Ĩ ...Ä 3, ĩ ...Ä 4,
X ...Ä 5,Ä 6•ª © §¬ ¬ á ‡´´.`

```
>>>zcalendar.weekday(2001,z4,z28)z
```

```
5
```

`z`

`¬ — ö•¹ 2001‡ 4^ 28...Ä X ...• µ O•´´.zmonthrange(‡™, ^) Ef© BD Ä ĩ —
1...• - q ...£ ¨ Ÿ ± ĩ • M ...P• Ø©•• Ä° „ ÷® ¤: 5^> ¬ á ‡´´.`

```
>>>zcalendar.monthrange(2001,4)z
(6, z30)
```

ˆ — ö© 2001‡ 4^ — 1...Ä• ¼ 30...P• Ø" © O¬ ÷ ä ‡ " . \ > HÊ " ...
¥ > ± K _ ¬ 1 " — Ä Ñ • E f © ä ó { ½ ó " .

z

z

£ ö Ð V È " " (random)

randomÄ * f ß • " . random randint• Ä ž ¹ ê Ĩ ÷ • .

z

" n Ä 0.0 • ¹ 1.0 ½ • — ò f S r • ¹ * f S ¬ " á \ © ö ® ÷ ä ‡ " .

```
>>>importzrandom
>>>zrandom.random()z
0.53840103305098674
```

z

1 • ¹ 10½ • — „ f ½ • • ¹ * f S ¬ " á ‡ " .

```
>>>zrandom.randint(1,10)z
6
```

z

1 • ¹ 55 ½ • — „ f ½ • — * f S ¬ " á ‡ " .

```
>>>zrandom.randint(1,55)z
43
```

z

• 3 ° * f ® • ó ž ¹ æ ¶ Ø © E f ® Æ Ÿ j ÷ • .

```
#zrandom_pop.py
importzrandom
defzrandom_pop(data):
    zzznumberz=zrandom.randint(0,zlen(data)-1)
```

```

zzzreturnzdata.pop(number)

if __name__ == "__main__":
    zzzdataz=z[1,2,3,4,5]
    zzzwhilezdata: zprintzrandom_pop(data)

```

S:

```

2
3
1
5
4

```

z

```

- random_pop E f © | " 9- 1 r • 1 - < ~ >   Æ® ,   ä - Ó " n ± § - ~ á \ ©
E f • " . ...D - è i ¢ | " 9- 1 © ½ª ¢ " .

```

z

z

f „ ...£ ¢ ¶ | ` ¢ (thread)

```

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" . QR° ö 6> ý y - Ä Ä   " .

```

```

#zthread_test.py
importzthread
importztime
defzsay(msg):
    zzzwhilez1:
        zzzzzzzprintzmsg
        zzzzzzztime.sleep(1)
        thread.start_new_thread(say,z(' you' ,))
        thread.start_new_thread(say,z(' need' ,))
        thread.start_new_thread(say,z(' python' ,))
    forzi inzrange(100):
        zzzprintzi
        zzztime.sleep(0.1)

```

```

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```

ÜÜ• Main GüüÑ " .

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```
0
you
need
python
1
2
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7
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10
you
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11
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...
```

z

• O→ Ñž { ž\© OÁ thread.start_new_thread> ¹ ± ş Ef> © Efy→, Ä ş Ef> © ± Ef→ BD Af> i Ō ¢: 5^ → BD Ef® ©" . èNEf£ applyŸ È...° p®• " .

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z

¥" ž | - È" - (webbrowser)
webbrowser© • Ä→ †" a• ¹ ½ó © ×%o] Mª f Ñ • ÈÎ > ò ô{ © ß • " .

z

İ K→ ö©] Mª ä® • ÈÎ > ò † v¼ žİ URLE http://www.yahoo.co.kr> Ñ{ ž ‡ " .

```
>>>importzwebbrowserz
>>>zwebbrowser.open(http://www.yahoo.co.kr)
```

webbrowser— open E f ©] Mª f Ñ ò ^ • ø ž ĭ \ ¹ > • È ¼] Mª f Ñ
ò ò • è Á ^ • ø t > •] Mª f Ñ ò ò ĭ ž ĭ \ ¹ > • È ° ° ° .

z

open_new E f © • ¶] Mª f Ñ ò ^ • ¹ t > • Ĩ > ž ĭ \ ¹ Ñ 8 ĭ ™ s ° ° ° .

```
>>>zwebbrowser.open_new(http://www.yahoo.co.kr)z
```

06. | ÆǻÇ™ ÈªÉÊµš?

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f ‡• O©¹ " ® [© ... " . ±K¹ • Ū 5N•¹ © ĭ \ €• ö6Ū¤ † < ž¹ &]
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‡ " .

```
resul tz=zGuGu(2)
```

z

±w" ø • 6 . ſ ¬ ĩ 5^ > ¬ OE•® ¼1° " . 2R• ñ P 2,4,6,,,18P• Œ O• " .
ĭ - K™ - Ÿ ¢Ā ö• ¤© | " 9Ñ f ¬ O ¢ " . °ª¹ result = [2, 4, 6, 8, 10, 12, 14, 16,
18] • " . ® É© O• f " © " ¬ ! f ¼ Ą¹ ¥> ±K_ ¬ † < © O• " . ±w" ø
— ĭ > " • Ñ_{ ` ¼ • © O ¬ ā V f Ø ¬ O• "R Ef® " n ¢ • Ÿ ĩ ÷ • .

```
defzGuGu(n):  
zzzprintzn
```


ˆ Ỳ ¢Á Ef® Ỳ ¼ GuGu(2)LV ø 2ª © §¬ CD { ¨. s BDĪ > 2® © O¬
2£¬ © O•¨.

z

¨ n• ©. §¬ ¬¬ | " 9® Æ Æ •.

```
defzGuGu(n):  
    zzzresul tz=z[]
```

z

¨ n• © result• 2, 4, 6,,, 18¬ Ā{ ž ĭ \ ĭ Ö 1• " ž ÷•. –• © ¨ n ¢•
¬¨.

```
defzGuGu(n):  
    zzzresul tz=z[]  
    zzzresul t.append(n*1)  
    zzzresul t.append(n*2)  
    zzzresul t.append(n*3)  
    zzz...  
    zzzresul t.append(n*9)  
    zzzreturnzresul t
```

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š o• =- é¨. ÑŸù ÷ ħ 1Ŭ¤ 9P• – 7• Ỳ• - O¬ î f Ø• è ĀÑ? ±w¨ ø
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z

ÄÄ5 £¤¥| ¤® 8¼ –• © ¨ n ¢• " " 9 ž ÷ x¨.

```
>>>ziz=z1  
>>>zwhi lezi z<z10:  
.z.z.zprintzi  
.z.z.ziz=ziz+z1
```

. © Ĩ \ Ỳ p•¨. °ª 1 ˆ Ỳ ¢Á O¬ GuGuEf• ĵ ó†v x> . „ Ö¨.

z

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```
defzGuGu(n):
    zzzresul tz=z[]
    zzzi z=z1
    zzzwhi l ezi z<z10:
    zzzzzzzresul t.append(nz*zi)
    zzzzzzzi z=zi z+z1
    zzzreturnzresul t
```

z

“ n Õ• “ ” 9® ž ÷ x ” .

```
printzGuGu(2)
```

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w• • é • € ¯ LV QR • ë” ø — • Ñ ÕĚ x² • ¯™Ÿ• ” © O ¯ l x ê f
Ø ¯ O• ” .

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```
#zmemo.py
import sys
import time

def usage():
    zzzprintz"""
Usage
=====
%sz-vz: zVi ewzmemo
%sz-az: zAddzmemo
""""z%(sys.argv[0], zsys.argv[0])

if znotzsys.argv[1:]zorzsys.argv[1]znotzinz['-v', z'-a']:
    zzzusage()
elif zsys.argv[1]z==z'-v':
    zzztry: zprintzopen("memo.txt").read()
    zzzexceptzIOError: zprintz"memozdoesznotzexist!"
elif zsys.argv[1]z==z'-a':
    zzzwordz=zraw_input("Enterzmemo: z")
    zzzfz=zopen("memo.txt", z'a')
    zzzf.write(time.ctime()z+z': z' z+zword+'\\n')
    zzzf.close()
    zzzprintz"Added"
```

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" Ñ O• "¬ © "memo does not exist!"ª © N¬ CDž ‡ " . ³ python memo.py -a´ª ¼
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usage() E f® « C° " . z sys.argv® ĩ Á{ F ó © • ± ĩ ¼ try.. except p ¬ ĩ Á{
F ó Ö©• ® \ ĩ ž ¹ ÷™S •.

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```
#tabto4.py

import re
import sys

def usage():
    print("Usage: python %s filename %s" % sys.argv[0])

try:
    zf = open(sys.argv[1])
except:
    usage(); sys.exit(2)

msg = zf.read()
zf.close()
p = re.compile(r'\t')
changed = p.sub("z"*4, msg)

f = open(sys.argv[1], 'w')
f.write(changed)
f.close()
```

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 = re.compile(r'\t') > u ® Ÿ " . ä x 1 r'\t' — ¶© \ t l • ± Ä > ® Ä ° " . ä x 1
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```
p = re.compile('\t')
```

z

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```
p.sub("z"*4, msg)
```

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```
#zcommanumber.py
importzstring
defzcomma_number(number):
    zzzifznumber[0]zinz['+',z'-']:
    zzzzzzzsign_mark,znumberz=znumber[:1],znumber[1:]
    zzzelse:
    zzzzzzzsign_markz=z''
    zzztry:
    zzzzzzztmpz=zstring.spl it(number,z'.')
    zzzzzzznumz=tmp[0];zdecimal z=z'.'z+tmp[1]
    zzzexcept:
    zzzzzzznumz=znumber;zdecimal z=z''
    zzzhead_numz=zl en(num)z%3
    zzzresul tz=z''
    zzzforzposzi nrange(l en(num)):
    zzzzzzzifzposz==zhead_numzandzhead_num:
    zzzzzzzzzresul tz=zresul tz+z','
    zzzzzzzzel ifz(posz-zhead_num)z%3z==z0zandzpos:
    zzzzzzzzzresul tz=zresul tz+z','
    zzzzzzzresul tz=zresul tz+znum[pos]
    zzzreturnzsign_markz+zresul tz+zdecimal

printzcomma_number("12345678.345678")
```

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12,345,678.345678

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¹ ƒ\$ ÜÜ• /› . ÜÜ¬ decimal Aƒ• ž©`` .

```
zzzzhead_numz=zl en(num)z%3
```

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```
zzzzforzposzi nrange(len(num)):
zzzzzzzi fzposz==zhead_numzandzhead_num:
zzzzzzzzzzzresul tz=zresul tz+z' ,'
zzzzzzzz i fz(posz-zhead_num)z%z3z==z0zandzpos:
zzzzzzzzzzzresul tz=zresul tz+z' ,'
zzzzzzzresul tz=zresul tz+znum[pos]
```

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(at 2008.02 by | } ó)

```
importzuni ttest
defzcomma_number(no):
zzztz=zno.split(",")
zzzdecimalz=zt[0]
zzzsosuz=z""
zzzi fzlen(t)z>z1: zsosuz=zt[1]
zzzi fzsosu:
zzzzzzreturnzcomma(decimal)z+z". "z+zsosu
zzzelse:
zzzzzzreturnzcomma(decimal)

defzcomma(no):
zzzresul tz=z[]
zzznumbersz=zl ist(str(no))
```

```

zzznumbers.reverse()
zzzforzi,zninzenumerate(numbers):
zzzzzzzi fzi%3z==z0zandzi: zresult.insert(0,z,"")
zzzzzzzresult.insert(0,zn)
zzzreturnz"".join(result)

classzCommaTest(unittest.TestCase):
zzzdefztest1(self):
zzzzzzzself.assertEqual("",zcomma_number(""))
zzzzzzzself.assertEqual("1",zcomma_number("1"))
zzzzzzzself.assertEqual("12",zcomma_number("12"))
zzzzzzzself.assertEqual("123",zcomma_number("123"))
zzzzzzzself.assertEqual("1,234",zcomma_number("1234"))
zzzzzzzself.assertEqual("1,234.02",zcomma_number("1234.02"))
zzzzzzzself.assertEqual("3,312,345.3234",zcomma_number("3312345.3234"))

if__name__=="__main__":
zzzunittest.main()

```

[05] Ø³Æ¡ ¢á ©ª

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```
import zos

def zsearch(dirname):
    zzzflist = zos.listdir(dirname)
    zzzforzfzinflist:
    zzzzznext = zos.path.join(dirname, zf)
    zzzzzzi = zos.path.isdir(next):
    zzzzzzzzzsearch(next)
    zzzzzzzel se:
    zzzzzzzzzdoFileWork(next)

def zdoFileWork(filename):
    zzzext = zos.path.splitext(filename)[-1]
    zzzifzext == ' .py': zprintzfilename

search("d:/")
```

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Ÿ dz.pyª © 2N• ® Ũ ¢ B+Ž…•¹ "ABC"® "DEF"> T U á Ø doFileWork® İ K L V þ å ø
µ O• „.

```
def zdoFileWork(filename):
    zzzext = zos.path.splitext(filename)[-1]
    zzzifzext != ".py": zreturn
    zzzfz = zopen(filename)
```



```
zzzbeforez=zf.read()
zzzf.close()
zzzafterz=zbefore.replace("ABC",z"DEF")
zzzfz=zopen(filename,z"w")
zzzf.write(after)
zzzf.close()
```

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```
importzdatetime
defzapsed_time(sdate):
    zzzez=zdatetime.datetime.now()
    zzzi fznotzsdatezorzlen(sdate)z<z14: zreturnz0,0,0,0
    zzzsz=zdatetime.datetime(int(sdate[:4]),zint(sdate[4:6]),zint(sdate[6:8]),z
    zzzzzzzint(sdate[8:10]),zint(sdate[10:12]),zint(sdate[12:14]))
    zzzdaysz=z(e-s).days
    zzzsecz=z(e-s).seconds
    zzzhour,zsecz=zdivmod(sec,z3600)
    zzzminute,zsecz=zdivmod(sec,z60)
    zzzreturnzdays,zhour,zminute,zsec
```

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(datetime.datetime.now()z-zdatetime.datetime(7)).strftime("%Y%m%d")

datetime— now()^a © SØúŸ timedelta(...•) SØú® • ó ä 1\... ¾— datetime\$↯ p° Š
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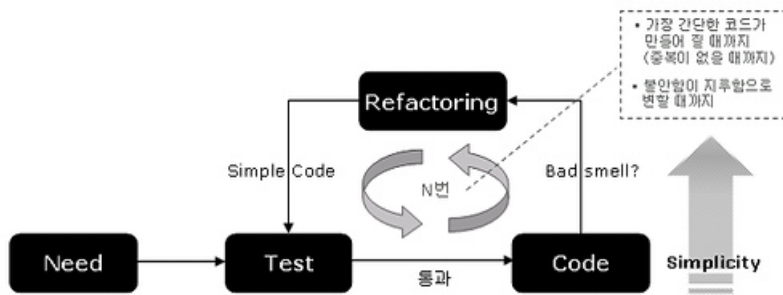
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[2] PyUnit

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```
import unittest

class SimpleTest(unittest.TestCase):
    zzzdef test1(self):
        zzzzzzself.assertEqual(1, z1)

if __name__ == '__main__':
    zzzunittest.main()
```

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- 1. " pyunit ĩ ½ó x " ž unittestß ĩ import° " .
- 2. unittest.TestCase® Ä ä SimpleTestª © Æ— J K " ® Ą° " .
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~ f • Ø " . unittest.main() • ª © N ĩ ± ž 1 " " 9 Ŧ ¢ µ unittestß Ä
S ø ú y • test ħ < © O Ÿ ĩ " " 9 S ø ú > QR x • " .).
- 4. self.assertEqualª © TestCase— S ø ú ® • ó ä 1 • ' § • 1 • ' § ... Ö © • ®
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TestCase • © assertEquals + ¼ " " 9® ™ Ÿ \ © é Ä S ø ú • Ø " . M Ŧ • Ÿ é Ĵ ÷ ™ s
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§ ± ^	‡ ^
assertEquals(x, y)	x Ÿ y — § • ... Ö © • ® ® ½° " .
assertTrue(x)	x Ŧ > £ • ® ® ½° " .

<code>assertFalse(x)</code>	$x \notin \{ \text{?} @ \mathbb{E} \bullet \text{®} \text{®} \frac{1}{2}^\circ \text{''} \}$
<code>fail(msg)</code>	$- \text{®} x \text{ } \partial u \text{ } \{ \text{ } \dot{Y} + \text{''} , \text{msg} \in \text{CDS} \dagger \bullet \}$
<code>failIf(x)</code>	$x \notin > \bullet \emptyset \partial u \text{ } \{ \text{ } \dot{Y} + \text{''} \}$

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[3] SubDate

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```
import unittest

class zSubDateTest(unittest.TestCase):
    zzzdef ztestGetDayByYear(self):
        zzzzzzzsubdate = zSubDate()
        zzzzzzzself.assertEqual(0, zsubdate.getTotalDayByYear(1))
        zzzzzzzself.assertEqual(365, zsubdate.getTotalDayByYear(2))

    if __name__ == '__main__':
        zzzunittest.main()
```

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1...•ª ¼ Æ« Ä> ý " ° O• " .) 2‡ P• — ... f© 1‡ 1^ 1...Û¤ 2‡ 1^ 1...P•• />
365...• μ O• " .

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```
classzSubDate:
zzzdefzgetTotalDayByYear(sel f, zyear):
zzzzzzzi fzyear==1: zreturnz0
zzzzzzzel se: zreturnz365
```

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```
sel f.assertEqual s(365*3+366, subdate.getTotalDayByYear(5))
```

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```
zzzzdefztestLeapYear(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzel f.assertTrue(subdate. i sLeapYear(0))
zzzzzzzel f.assertFal se(subdate. i sLeapYear(1))
zzzzzzzel f.assertTrue(subdate. i sLeapYear(4))
```

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```
classzSubDate:
zzzdefzgetTotalDayByYear(sel f, zyear):
zzzzzzzi fzyear==1: zreturnz0
zzzzzzzel se: zreturnz365

zzzdefzi sLeapYear(sel f, zyear):
zzzzzzzi fz(yearz==z0): zreturnzTrue
zzzzzzzi fz(yearz==z1): zreturnzFal se
```

```
zzzzzzzi fz(yearz==z4): zreturnzTrue
zzzzzzzreturnzFalsez
```

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```
zzzzdefzi sLeapYear(sel f, zyear):
zzzzzzzi fyearz%z4z==z0: zreturnzTrue
zzzzzzzreturnzFalsez
```

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```
zzzzdefztestLeapYear(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f. assertTrue(subdate. i sLeapYear(0))
zzzzzzzsel f. assertFalse(subdate. i sLeapYear(1))
```

```
zzzzzzself.assertTrue(subdate.isLeapYear(4))
zzzzzzself.assertTrue(subdate.isLeapYear(1200))
zzzzzzself.assertFalse(subdate.isLeapYear(700))
```

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```
zzzzdefzisLeapYear(self, year):
zzzzzzfyearz%100z==z0: zreturnzFalse
zzzzzzfyearz%4z==z0: zreturnzTrue
zzzzzzreturnzFalsez
```

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ò 6 μ ú ® ¯ Ÿ ¢ • f „ ñ • § • © assertTrue(subdate.isLeapYear(1200))• ¹ ò u ° " ,
± K¹ ò 6 μ ú © " n ¢ • T ç i Ö Ö " ,

```
zzzzdefzisLeapYear(self, year):
zzzzzzfyearz%400z==z0: zreturnzTrue
zzzzzzfyearz%100z==z0: zreturnzFalse
zzzzzzfyearz%4z==z0: zreturnzTrue
zzzzzzreturnzFalse
```

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```
#self.assertEqual(365*3+366, zsubdate.getTotalDayByYear(5))
```

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```
zzzzdefzgetTotalDayByYear(sel f, zyear):
zzzzzzzresul tz=z0
zzzzzzzforzi zinrange(1, zyear):
zzzzzzzzzzz ftsel f. isLeapYear(i): zresul tz+=z366
zzzzzzzzzzzel se: zresul tz+=z365
zzzzzzzreturnzresul t
```

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getTotalDayByYear^a © S ø ú y • ž ĭ ‡ P • — ...f Ē • ¾ ‡ ™ P • — ...f Ē • ® y 2 {
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getTotalDayByYearz=>zgetTotalDayLessThanYearOf

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```
zzzzdefztestGetDayByMonth(sel f):
zzzzzzzsubdate=zSubDate()
zzzzzzzsel f. assertEuql as(0, zsubdate. getTotalDayLessThanMonthOf(1))
zzzzzzzsel f. assertEqual s(31, zsubdate. getTotalDayLessThanMonthOf(2))
```

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```
zzzzdefzgetTotalDayLessThanMonthOf(sel f, zmonth):
zzzzzzzi fmonthz==z1: zreturnz0
zzzzzzzel se: zreturnz31
```

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O E Ñ ? © \$ • " . " " 9 µ ú • ± — ™ ® — Ĩ ÷ ò ,

```
zzzzdefztestGetDayByMonth(sel f):
zzzzzzzsubdate=zSubDate()
zzzzzzzsel f. assertEqual s(0, zsubdate. getTotalDayLessThanMonthOf(1, zTrue))
zzzzzzzsel f. assertEqual s(31, zsubdate. getTotalDayLessThanMonthOf(2, zFal se))
```

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° ¨ ¨ .

```
zzzzdefzgetTotalDayLessThanMonthOf(sel f, zmonth, zi sLeap):  
zzzzzzzi fzmonthz==z1: zreturnz0  
zzzzzzzel se: zreturnz31
```

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```
zzzzdefztestGetDayByMonth(sel f):  
zzzzzzzsubdatez=zSubDate()  
zzzzzzzsel f. assertEquals(31+28, zsubdate. getTotalDayLessThanMonthOf(3, zFalse))  
zzzzzzzsel f. assertEquals(31+29, zsubdate. getTotalDayLessThanMonthOf(3, zTrue))
```

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O• ¨ ¨ .

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```
zzzzdefzgetTotalDayLessThanMonthOf(sel f, zmonth, zi sLeap):  
zzzzzzzmonthDaysz=z[31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31]  
zzzzzzzresul tz=z0  
zzzzzzzforzi zinrange(1, zmonth):  
zzzzzzzzzzzi fzi sLeapzandzi ==1:  
zzzzzzzzzzzzzzzzzzresul tz+=zmonthDays[i -1]+1  
zzzzzzzzzzzzzzzzzzel se:  
zzzzzzzzzzzzzzzzzzresul tz+=zmonthDays[i -1]  
zzzzzzzzzzzzzzzzzzreturnzresul t
```

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```
zzzzmonthDaysz=z[31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31]  
zzzdefzgetTotalDayLessThanMonthOf(sel f, zmonth, zi sLeap):  
zzzzzzzzresul tz=z0  
zzzzzzzzforzi zinrange(1, zmonth):
```



```

zzzzzzzzzzresul tz+=zsel f.monthDays[i -1]
zzzzzzzi fzi sLeapzandzmonthz>z2: zresul tz+=z1
zzzzzzreturnzresul t

```

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```

zzzzdefztestGetTotalDay(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f. assertEquals(1, zsubdate.getTotalDayOf("00010101"))
zzzzzzzsel f. assertEquals(366, zsubdate.getTotalDayOf("00020101"))

```

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zzzzdefzgetTotalDayOf(sel f, zdate):
zzzzzzzyearz=zi nt(date[: 4])zmonthz=zi nt(date[4: 6])
zzzzzzzdayz=zi nt(date[6: ])
zzzzzzzreturnzsel f.getTotalDayLessThanYearOf(year)z+z\
zzzzzzzzzzzsel f.getTotalDayLessThanMonthOf(month, zsel f. i sLeapYear(year))+dayz

```

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 y 2 " .

```

zzzzdefztestSubDate(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f. assertEquals(1, zsubdate.getSubDate("20021231", z"20030101"))
zzzzzzzsel f. assertEquals(31+28+30+31+14, zsubdate.getSubDate("20030101", z"20030515"))
zzzzzzzsel f. assertEquals(31+29+30+31+14, zsubdate.getSubDate("20040101", z"20040515"))z

```

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2002±12^31... 2003±1^1...— &• ...• © 1...• " " 9® ± áø,

```
zzzzdefzgetSubDate(sel f, zdate1, zdate2):
zzzzzzzreturnzabs(sel f.getTotal DayOf(date1)z-zsel f.getTotal DayOf(date2))z
```

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Congratulations!!

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```
import unittest

classzSubDateTest(unittest.TestCase):
zzzzdefztestGetDayByYear(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f.assertEqual(s(0, zsubdate.getTotal DayLessThanYearOf(1))
zzzzzzzsel f.assertEqual(s(365, zsubdate.getTotal DayLessThanYearOf(2))
zzzzzzzsel f.assertEqual(s(365*3+366, zsubdate.getTotal DayLessThanYearOf(5))

zzzzdefztestLeapYear(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f.assertTrue(subdate.i sLeapYear(0))
zzzzzzzsel f.assertFalse(subdate.i sLeapYear(1))
zzzzzzzsel f.assertTrue(subdate.i sLeapYear(4))
zzzzzzzsel f.assertTrue(subdate.i sLeapYear(1200))
zzzzzzzsel f.assertFalse(subdate.i sLeapYear(700))

zzzzdefztestGetDayByMonth(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f.assertEqual(s(31+28, zsubdate.getTotal DayLessThanMonthOf(3, zFalse))
zzzzzzzsel f.assertEqual(s(31+29, zsubdate.getTotal DayLessThanMonthOf(3, zTrue))

zzzzdefztestGetTotal Day(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f.assertEqual(s(1, zsubdate.getTotal DayOf("00010101"))
zzzzzzzsel f.assertEqual(s(366, zsubdate.getTotal DayOf("00020101"))

zzzzdefztestSubDate(sel f):
zzzzzzzsubdatez=zSubDate()
zzzzzzzsel f.assertEqual(s(1, zsubdate.getSubDate("20021231", z"20030101"))
```

```

zzzzzzzf.assertEquals(31+28+30+31+14, zsubdate.getSubDate("20030101", z"20030515"))
zzzzzzzf.assertEquals(31+29+30+31+14, zsubdate.getSubDate("20040101", z"20040515"))

if __name__ == "__main__":
    zzzunittest.main()

```

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```

class zSubDate:
    zzzdef zgetTotalDayLessThanYearOf(sel f, zyear):
        zzzzzzzresultz=z0

        zzzzzzzfor zi in zrange(1, zyear):
            zzzzzzzzzzfzsel f. isLeapYear(i): zresultz+=z366
            zzzzzzzzzzsel se: zresultz+=z365
        zzzzzzzreturn zresult

    zzzdef zi sLeapYear(sel f, zyear):
        zzzzzzzzi fzyearz%z400z==z0: zreturn zTrue
        zzzzzzzzi fzyearz%z100z==z0: zreturn zFalse
        zzzzzzzzi fzyearz%z4z==z0: zreturn zTrue
        zzzzzzzreturn zFalse

    zzzmonthDaysz=z[31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31]
    zzzdef zgetTotalDayLessThanMonthOf(sel f, zmonth, zi sLeap):
        zzzzzzzresultz=z0
        zzzzzzzfor zi in zrange(1, zmonth):
            zzzzzzzzzzzresultz+=zsel f. monthDays[i-1]
        zzzzzzzzi fzi sLeapzand zmonthz>z2: zresultz+=z1
        zzzzzzzreturn zresult

    zzzdef zgetTotalDayOf(sel f, zdate):
        zzzzzzzyearz=zi nt(date[: 4])
        zzzzzzzmonthz=zi nt(date[4: 6])
        zzzzzzzdayz=zi nt(date[6: ])
        zzzzzzzreturn zsel f. getTotalDayLessThanYearOf(year)z+z\
        zzzzzzzzzzzsel f. getTotalDayLessThanMonthOf(month, zsel f. isLeapYear(year))+day

    zzzdef zgetSubDate(sel f, zdate1, zdate2):
        zzzzzzzreturn zabs(sel f. getTotalDayOf(date1)z-zsel f. getTotalDayOf(date2))

```

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```
import unittest
```

```
if __name__ == "__main__":  
    unittest.main()
```

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```
class TestMiniWeb(unittest.TestCase):  
    zzzdef ztest1(self):  
        zzzzzzminiweb = zMiniWeb(port=8080)
```

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```

class MiniWeb:
    def __init__(self, zport):
        self.port = zport

class TestMiniWeb(unittest.TestCase):
    def test1(self):
        m = MiniWeb(port=8080)

```

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- `self.port = zport`
- `self.port = 8080`

```

class MiniWeb:
    def __init__(self, zport):
        self.port = zport

    def start(self):
        s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
        s.bind(("localhost", self.port))
        s.listen(1)
        conn, addr = s.accept()

class TestMiniWeb(unittest.TestCase):
    def test1(self):
        m = MiniWeb(port=8080)
        m.start()

```

`self.start()` `socket` `8080` `localhost` `self.port`

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`s.accept()` `s.accept()` `s.start()`

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`Thread` `start()`

```

import unittest
import socket
import threading

class MiniWeb(threading.Thread):
    def __init__(self, zport):
        threading.Thread.__init__(self)
        self.port = zport

    def run(self):
        s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
        s.bind(("localhost", self.port))
        s.listen(1)
        conn, addr = s.accept()

class TestMiniWeb(unittest.TestCase):
    def test1(self):
        webz = MiniWeb(port=8080)
        webz.start()

if __name__ == "__main__":
    unittest.main()

```

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Š startEf— • « ↯ runĭ > TUj \ ¨. \€ ø ThreadJK" © start()Ef® f ø
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accept()Ef© ¨ Güü• —ž¹ ò ô/> • ¾ ¢Á wâ Á • ë• Ÿ
accept()Ñ E4ô• ë¼ ' Ä x¨ | ¼ Øx ¨. ĩ œ° . ¨.

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```

import unittest
import socket
import threading

class MiniWeb(threading.Thread):
    def __init__(self, zport):
        threading.Thread.__init__(self)

```

```

zzzzzzzself.port=zport
zzzzzzzself.sz=zNone

zzzdefzrun(self):
zzzzzzzself.sz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
zzzzzzzself.s.bind(("local host",zself.port))
zzzzzzzself.s.listen(1)
zzzzzzzconn,zaddrz=self.s.accept()

zzzdefzstop(self):
zzzzzzzself.s.close()

classzTestMiniWeb(unittest.TestCase):
zzzdefztest1(self):
zzzzzzzminiweb=zMiniWeb(port=8080)
zzzzzzzminiweb.start()
zzzzzzzminiweb.stop()

if__name__=="__main__":
zzzunittest.main()

```

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```

importztime
...

classzTestMiniWeb(unittest.TestCase):
zzzdefztest1(self):
zzzzzzzminiweb=zMiniWeb(port=8080)
zzzzzzzminiweb.start()
zzzzzzztime.sleep(0.5)
zzzzzzzminiweb.stop()

```

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 - ž self.join() ĩ Ō " . °] 1 ^ © ' Ä ž 1 Ě < ž Ō x • while ĩ " Ě ä
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```
import unittest
import socket
import threading
import time

class MiniWeb(threading.Thread):
    def __init__(self, zport):
        super(MiniWeb, self).__init__(self)
        self.zport = zport
        self.sz = None

    def run(self):
        self.sz = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
        self.sz.bind(("localhost", self.zport))
        self.sz.listen(1)
        while True:
            try:
                conn, zaddr = self.sz.accept()
                conn.close()
            except socket.error:
                break

    def stop(self):
        self.sz.close()
        self.join()

class TestMiniWeb(unittest.TestCase):
    def test1(self):
        zminiweb = MiniWeb(port=8080)
        zminiweb.start()
        time.sleep(0.5)
        zminiweb.stop()

if __name__ == "__main__":
    unittest.main()
```

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```
classzTestMiniWeb(unittest.TestCase):
    zzzdefztest1(self):
        zzzzzzzminiweb=zMiniWeb(port=8080)
        zzzzzzzminiweb.start()

        zzzzzzzsz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
        zzzzzzzsz.connect(("localhost",z8080))
        zzzzzzzsz.send("abc")
        zzzzzzzsz.close()

        zzzzzzztime.sleep(0.5)
        zzzzzzzminiweb.stop()
```

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```
classzTestMiniWeb(unittest.TestCase):
    zzzdefzsetUp(self):
        zzzzzzz
        zzzzzzzself.serverz=zMiniWeb(port=8080)
        zzzzzzzself.server.start()

    zzzdefztearDown(self):
        zzzzzzztime.sleep(0.5)
        zzzzzzzself.server.stop()

    zzzdefztest1(self):
        zzzzzzzsz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
        zzzzzzzsz.connect(("localhost",z8080))
        zzzzzzzsz.send("abc")
        zzzzzzzsz.close()
```

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} , Á] M^a f Ñ ž ý 1 f Ø © 5 ^ > ™ S • .] M^a f Ñ ž ý 1 f Ø © 5 ^ '

HTTP 200 OK
Server: SimpleHttpServer
Content-type: text/plain
Content-Length: 2

HI

z

HTTP 200 OK
Server: SimpleHttpServer
Content-type: text/plain
Content-Length: 2

HI

```
...
zzzdefzrun(sel f):
    zzzzzzzsel f.sz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
    zzzzzzzsel f.s.bind(("local host",zsel f.port))
    zzzzzzzsel f.s.listen(1)
    zzzzzzzwhi lez1:
    zzzzzzzzzztry:
    zzzzzzzzzzzzzconn,zaddrz=zsel f.s.accept()
    zzzzzzzzzzzzzrecvmsgz=zconn.recv(1024)
    zzzzzzzzzzzzzconn.send(sel f.simpleResponse(recvmsg))
    zzzzzzzzzzzzzconn.close()
    zzzzzzzzzzexceptzsocket.error:
    zzzzzzzzzzzzzbreak

    zzzdefzsimpleResponse(sel f,zmsg):
    zzzzzzzreturnz""""HTTP/1.1z200zOK
    Server: zSimpleHttpServer
    Content-type: ztext/plain
    Content-Length: z%s

    %s""""z%(len(msg),zmsg)
    ...
    zzzdefztest1(sel f):
    zzzzzzzsz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
    zzzzzzzs.connect(("local host",z8080))
    zzzzzzzs.send("abc")
    zzzzzzzsel f.assertEquals(sel f.server.simpleResponse("abc"),zs.recv(1024))
    zzzzzzzzs.close()
    ...z
```

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¶ñ] 1 ^ © ö y Î > E ¼] Mª f > | Å ž ÷™ S • .

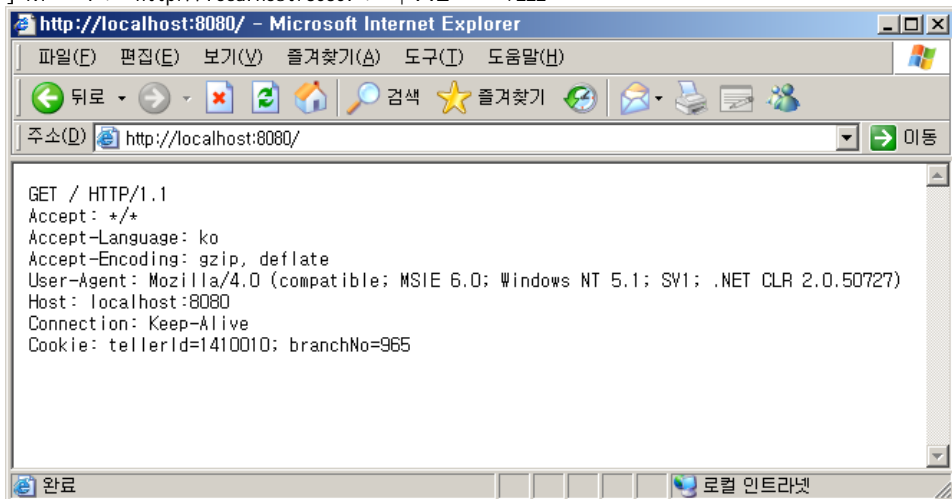
z

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```
ifz__name__z=="__main__":  
    zzz#unittest.main()  
    zzzMiniWeb(port=8080).start()
```

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] Mª f > http://localhost:8080Î > | Å ž ÷ • . zzz



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```
miniweb.py  
  
importunittest
```

```

importzsocket
importzthreading
importztime

classzMiniWeb(threading.Thread):
    zzzdefz__init__(self,zport):
        zzzzzzzthreading.Thread.__init__(self)
        zzzzzzzself.portz=zport
        zzzzzzzself.sz=zNone

    zzzdefzrun(self):
        zzzzzzzself.sz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
        zzzzzzzself.s.bind(("local host",zself.port))
        zzzzzzzself.s.listen(1)
        zzzzzzzwhile1:
            zzzzzzzzzzztry:
                zzzzzzzzzzzzzconn,zaddrz=zself.s.accept()
                zzzzzzzzzzzzzrecvmsgz=zconn.recv(1024)
                zzzzzzzzzzzzzconn.send(self.simpleResponse(recvmsg))
                zzzzzzzzzzzzzconn.close()
            zzzzzzzzzzzexceptzsocket.error:
                zzzzzzzzzzzzzbreak

    zzzdefzsimplereResponse(self,zmsg):
        zzzzzzzreturnz""""HTTP/1.1z200zOK
        Server: zSimpleHttpServer
        Content-type: ztext/plain
        Content-Length: z%s

        %s""""z%(len(msg),zmsg)

    zzzdefzstop(self):
        zzzzzzzifself.s:zself.s.close()
        zzzzzzzself.join()

classzTestMiniWeb(unittest.TestCase):
    zzzdefzsetUp(self):
        zzzzzzzself.serverz=zMiniWeb(port=8080)
        zzzzzzzself.server.start()

    zzzdefztearDown(self):
        zzzzzzztime.sleep(0.5)
        zzzzzzzself.server.stop()

```

```
zzzdefztest1(self):
    zzzzzsz=zsocket.socket(socket.AF_INET,zsocket.SOCK_STREAM)
    zzzzzzs.connect(("localhost",z8080))
    zzzzzzs.send("abc")
    zzzzzzself.assertEqual(self.server.simpleResponse("abc"),zs.recv(1024))
    zzzzzzs.close()

if__name__z=="__main__":
    zzz#unittest.main()
    zzzMiniWeb(port=8080).start()
```


[1] „™ „]

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MySQLdbB • Åž¹Ý"ĐO•"••¶ MySQL• ýÔôjã Ø©†"a•¼w•Ñ
×%ö¿£ MySQL yf• Åž¹ è¼ Ø"¼Ñ"¼ ýy1 O•". Ýd MySQL• Åž¹ ó
B "ø"…¹¿¼>¼™S •.

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MySQLdbB → ýÔ × •¾• Mysqluv•Ñ•¶ ^_¤• ýÔôj Øj Ö ° "••O• Å°
èóÅ• Û•¹"Å• è©"•,™½ó•ªø www.mysql.com•¹| Å ^¾¼→ "• Ĩ
ýÔ © O• Ĩ \ €ö O•"• ± ± C:\mysql•'• WX| • ×%ö¿ Ĩ > ýÔô¼ mysql öy→
pÊ†v× "ž¹™"•¹"n•Φ• BD ×Ý ø "•.

```
C:\mysql\bin\mysql dz
```

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"n— MySQLdb • ¥••• Ñø ,™ ^} → [Ĩ¹ → fÑ Ø".

< MySQLdb • ¥••• - <http://sourceforge.net/projects/mysql-python/files>

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windows installerª © T ® J ø Gerhard's Homepage> Ñ{ "• ±Ó•¹ | Å ,™ ó
MySQLdbB → "•™S •.z™" → 8¼ MySQLdb-python-0.3.5-win32-2.zip(• Û→ ö Ĩ†—
| Å ^}> X→ª Å • WX| > Ñ¹"n— yf→ ö •.

```
C:\temp\mysql db-python-0.3.5>> python setup.py install
```

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```
>>>import MySQLdb
>>>
```

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< MySQLdb • ¥ • • - <http://sourceforge.net/projects/mysql-python>

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< MySQL-python-0.3.5.tar.gz

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1. `$ tar xvfz MySQL-python-0.3.5.tar.gz`
2. `$ cd MySQL-python-0.3.5`
3. `$ python setup.py build`
4. `# python setup.py install`

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```
>>>importMySQLdb
>>>
```

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MySQLdbR ½óċ • Âž¹ êİ ÷ x ¾• QR° õ• ȡ `• " ® ! f < Ěž ÷ • .


```
C:\WINDOWS>cd \
C:\>cd mysql
C:\mysql>cd bin
C:\mysql\bin>mysql
Welcome to the MySQL monitor.  zCommands end with ; or \g.
Your MySQL connection id is 2 to server version: 3.23.38
Type 'help;' or '\h' for help. Type '\c' to clear the buffer
mysql>
```

```
>¼ - ¯ — C:\mysql\bin>mysql - × ¾• mysql d® ! f ò • è × ¨ ø
mysql dª © ¥> ±² ¬ ! f ò ° Š• mysql ¬ ò ž Öÿ ° ¨ .
```

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„ bookª © Ö• ¨ `• “ ® Ÿ + ¨ .

```
mysql>zCREATEzDATABASEzbook;
Queryz0K, z1rowzaffectedz(0.01zsec)
```

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bookÖ• ¨ `• “ ® ½ó × ¯ ž usey f ¬ ½ó ° ¨ .

```
mysql>zusezbook;
Databasezchanged
```

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```
mysql>zcreateztabl ezurl link(categoryzvvarchar(80), zauthorzvvarchar(80),
zzz->zsubjectzvvarchar(80), zurl zvvarchar(150));
Queryz0K, z0rowzsaaffectedz(0.01zsec)
```

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< category :] ¹ — E

< author z :] ¹ < Œ•

```
< subject z: ] 1 6i
< url z z z: ] 1 — URL
```

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```
mysql>zdescri bezurl link;
+-----+-----+-----+-----+-----+
|zFiel dzzzzzzzz|zTypezzzzzzzzzz|zNull zzz|zKeyz|zzzzDefault z|zExtraz|
+-----+-----+-----+-----+-----+
|zcategoryzzz|zvarchar(80)zzzz|zYESzz|zzzzzz|zNULLzzzz|zzzzzzz|
|zauthorzzzzz|zvarchar(80)zzzz|zYESzz|zzzzzz|zNULLzzzz|zzzzzzz|
|zsubjectzzzz|zvarchar(80)zzzz|zYESzz|zzzzzz|zNULLzzzz|zzzzzzz|
|zurl zzzzzzzzzzz|zvarchar(150)zzzz|zYESzz|zzzzzz|zNULLzzzz|zzzzzzz|
+-----+-----+-----+-----+-----+
4zrowszin zsetz(0.05zsec)
```

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```
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```

```
mysql>zquit
```

```
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```

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MySQLdb -• • èØ-

```
„ MySQLdbB - v3Ô `` n, connecty f - • óž 1 host• © localhost® BD ¼ dby Á
| Ñ Ÿ+ book- BDĪ > \j book Œ• ¢` • " Ÿ œ. ½ m- á ©``.
```

```
>>>import zMySQLdbz
>>>zmozMySQLdb.connect(host='localhost',zdb='book')
```

z

```
(>¼ - Ÿd user, passwd( 8$« ) - ý„ - `` ø `` n ¢• ž \j Ö ° ``
```

```
mz=zMySQLdb.connect(host='localhost',zuser='ã f',zpasswd=' 8$« ',zdb='book')
```

z

```
œ. ½ £ m— cursorE f® • ó ä Þ¹ ½ £ c® Ÿ j Ó``.
```

```
>>>zcZ=zm.cursor()
```

$$c^{-a} \odot p^{-1/2} \otimes \pm z^{-1} \beta + \tilde{A} \tilde{A} \tilde{N} \cdot \hat{A}_j \cdot \{ \mu \circ \dots \}.$$
$$\tilde{N}N \rightarrow f \bar{f} n \rightarrow BD\tilde{Z} \rightarrow \bullet \bullet \bullet$$

```
>>>zc.execute("select z* zfrom zurllink")
0L
```

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½ ó 1 f Ñ Ø ¨ . zur linkª © ¨ • i > Û ¢ ß + O ¬ Ö • Ÿ B D ½ ° • Æ ¯ ¯ ¯ x
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```
< category : python
```

```
< author z : Eung-Yong
```

< subject z: EungYong HomePage

```
< url z z z: http://tdd.or.kr/tddlog
```

```
mysql> insert into url link values('python', 'Eung-Yong', 'EungYongzHomepage', 'http://tdd.or.kr/tddllog');
```

.. nñ BD†É ö• ¨•• “ ® Ž••• 1 i Á{ Ėi m f Ø©• ® ÷••. Þ¹ ½ c—
 executeEf® • ó à urllink” • i — ß+ ö• ¨® © yfi ® \ ”. Æ— S•
 f Nô × • 1L šW © O 2E 1 f Ø”.

```
>>>zc.execute("select z* from zurl link")
1'
```

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 $\vdash \cdot \quad \S \vdash \vee 3 \acute{e} \quad \cdot \cdot \S W \quad \S \cdot \acute{\alpha} \vdash \acute{\alpha} \vdash \S \acute{A} \neg \setminus \vdash \quad \{ \div ^{TM} S \quad \cdot \cdot$

```
>>>zc.fetchall()
('python',z'Eung-Yong',z'EungYongzHomePage',z'http://tdd.or.kr/tddlog',)
```

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1. import MySQLdb> ! f B ¬ Û " .
2. MySQLdb.connect ® • ó ä õ• ¨ • " ½ ® ¢° " .
3. ¢ ½ > Û ¨ P¹ ½ ® Ý+ " .
4. P¹ ½ ® • ó ä mysql.yf¬ ½ó ¼ . S• Ø¬ © fetchall> . S¬ É j Ó " .

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readlines SøúÝ ý ¼ fetchoneÁ readline ý° O•ª " ø µ O• " .

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...D Ôª £ • ôj Ø© N¼• (<http://www.djangobook.com/en/2.0/>)Ã " . ° ° ÿ> Š ôj Ø© ° Š¹ ° • æ° ". (• 1• ü— "[¼¤ \] django](#)")z

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< <http://www.djangobook.com/en/2.0/>

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< <http://wiki docs.net/mybook/read/index?pageid=4901>

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< <http://www.djangoproject.com/download/>

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< Django-1.1. tar.gz

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```
C:\Django-1.1
```

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```
C:\Django-1.1>c:\python2.6\pythonzsetup.py install
```

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>¼ © Û ħ ÷ ĥ django-admin.py© Ž... ħ • óž 1 / „ zŽ... ħ • Ě Ĩ > Ąž \ ĭ Ō ©
Û " . django-admin.py© Ž...Á " ħ " Ō• o½ô ĭ Ø©O ħ 2Ě1 f Ø " .

```
\python2.6\Lib\site-packages\django\bin
```

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Ÿ+ Šz" ħ Φ• Ō" .

```
C:\work>c:\python2.6\pythonzc:\python2.6\Lib\site-packages\django\bin\django-admin.py startprojectzmysite
```

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" yf ħ ò ž ÷ ĥ c:\work• WX| " • mysiteª © • WX| Ĥ • Ě Ĩ > Ąô © O ħ
2Ě1 f Ø " .

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```

2009-07-29zz%$ z02: 09zzzzzzzzzzzzzzzzzz557zmanage.py
2009-07-29zz%$ z02: 09zzzzzzzzzzzzzzzzzz2, 852zsettings.py
2009-07-29zz%$ z02: 09zzzzzzzzzzzzzzzzzz554zurls.py
2009-07-29zz%$ z02: 09zzzzzzzzzzzzzzzzzz0z__init__.py

```

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```

C:\work\mysite>c:\python2.6\pythonzmanage.pyrunserver
Val idatingzmodel s...
Ozerrorszfound

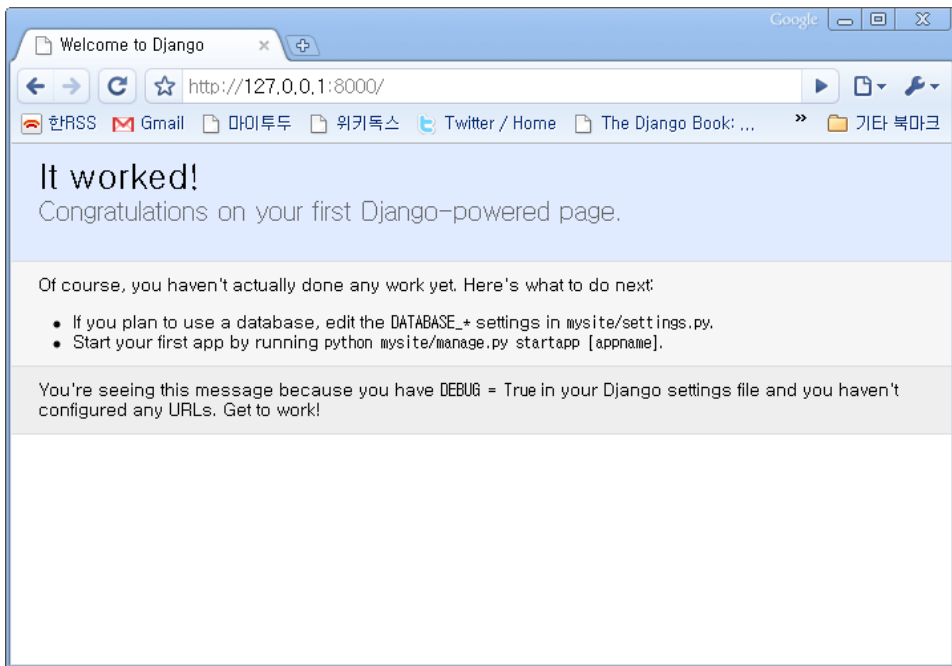
Dj angozversi onz1. 1, zusingzsettingsz' mysite. settings'
Devel opmentzserverziszrunningzatzhttp://127.0.0.1:8000/
Qui tzthezserverzwi thzCTRL-BREAK.

```

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„ " Hello World« ÁÄ Š».

„ mysiteª © · WX| ¯ · views.pyª © Ž...¬ "" n ¢• Ÿ+"".

mysite\views.py

```
from django.http import HttpResponse

def hello(request):
    return HttpResponse("Hello world")
```

z

± | ¼ mysite· ùX| è— urls.pyŽ...¬ "" n ¢• ¢„ ° "".

```
from django.conf.urls.defaults import *
from mysite.views import hello

urlpatterns = patterns('',
    (r'^hello/$', hello))
```

• w{ Ÿ+ Š• http://127.0.0.1:8000/hello> | Å ø "Hello World"Ń CDô© Ö¬ 2£1 ¢ Ø"".

z

ö6® °ª ø¹ ä" 1 ¢ Ø© Á "" n ¢Á Ö • "":

< urls.pyª © Ž...Á url~ ¢¬ Ÿ | è© Ž...• "" . zurl~ ¢Á regex(„ ~ Üá²)¬ • ö° ""

< views.pyª © Ž...Á ¯¬ žý ä } , ¬ L| © Ž...• "".

< HttpResponseª © Søú© Äø• • 8¬ CD © xž¬ Ń• ¼ Ø"".

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Hello WorldP• CDŽ ÷ x"".

02) Django (Templates)

• Django — a: b x ž • . a: b HTML • • è • 1 Ž • • 45 — § — » á 0 ° { ž \ © django — x ž £ Û .

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Django .f' a . 0# django £ ¤ ¥ | § -
django • 1 a: b Ž ... ½ ó x - Ž 1 © mysite/settings.py Ž ... " n • f, ž Ö ° " .

mysite/settings.py

```
TEMPLATE_DIRS=(
    os.path.join(BASE_DIR, 'templates'),
)
```

- µ ú — —™ © c:/work/mysite/templates © · WX | • a: b Ž ... → ž " © —™ • " .

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(° Ÿ → ½ ó Ö x • z Ž ... Ä D È UTF-8 ½ • j ž Pž Ö ° " . ± w • è → Z £ µ <
• 3 Ñ * ")

mysite/templates/test1.html

```
<html>
<head>
<title>djangoexamplez#1</title>
</head>
<body>

<p>
    ° Ÿ → zCDž z% " .
</p>

<p>
    • 8zÃBÁz • w{ z{{messagez}}
</p>

</body>
</html>
```

z

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mysite/views.py

```
# -*- coding: utf-8 -*-
from django.http import HttpResponse
from django.template.loader import get_template
from django.template import Context

def hello(request):
    return HttpResponse("Hello world")

def test(request):
    z = get_template('test1.html')
    zhtml = z.render(Context({'message': z " Ñ1 zS t • "}))
    return HttpResponse(html)
```

z

z

± | ¼ urls.pyŽ...™ " n Φ • f # • .

mysite/urls.py

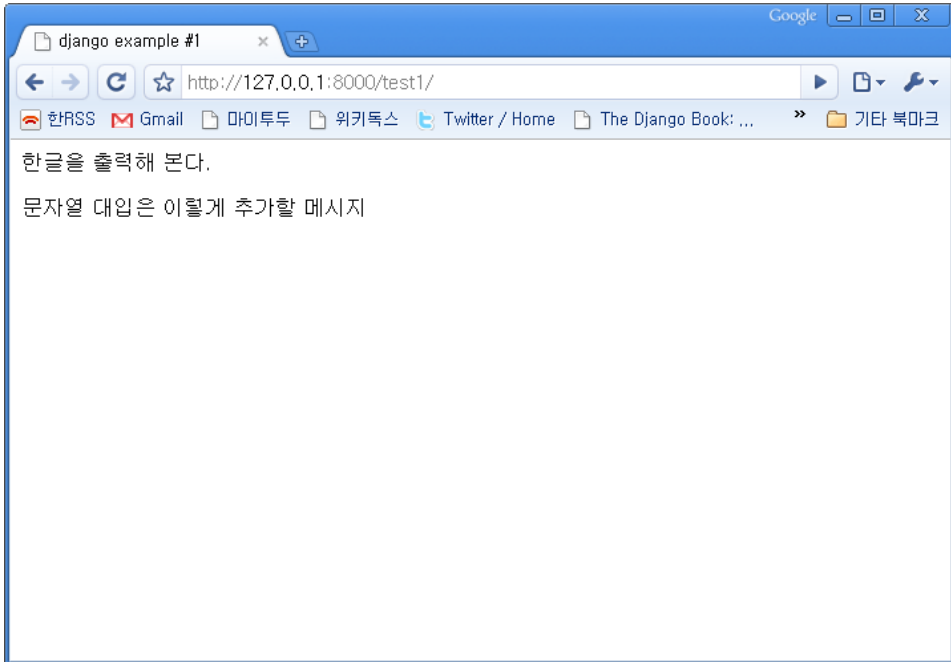
```
from django.conf.urls.defaults import *
from mysite.views import hello, test

urlpatterns = patterns('',
    ('^hello/$', hello),
    ('^test1/$', test),
)
```

z

± | ¼ http://127.0.0.1:8000/test1 Î > | Äž ÷ • .

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```

• 1 > a" 1 f 00 èóÁ " n  x":
< ° y ½óÁ 6Ñ "...
< get_template•ª © Sòú® •ó ø Template ½ ® É¬ f Ø".
    get_templateÁ " n É... "

```

```

fpz=fopen('c:/work/mysite/templates/test1.html')
tz=zTemplate(fp.read())
fp.close()

```

```

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z
a: bÁ { †QLV D { µ ½• ¶ „™™™ { L | 1 f 00 O x".
•O• ÄŽ 1™ èŸ ÷•.
z
! f a: b Ž...¬ Ÿ KY x• f„ •.
mysite/templates/test1.html

```

```

<html>
<head>
<title>dj angosexamplez#1</title>
</head>
<body>

<p>
° ¨ ¬ zCDž z%'' .
</p>

<p>
• 8zÃBÁz• w{ z{{zmessagez}}
</p>

<p>
š o ĵ £zO™zCDž z%'' .
</p>

<ul>
{%for.item.in.item_list.%}
.<li>{{.item.}}</li>
{%endfor.%}</ul>

</body>
</html>

```

z

z

± | ¼ views.pyž ...¬ '' n Φ• f„ • .
mysite/views.py

```

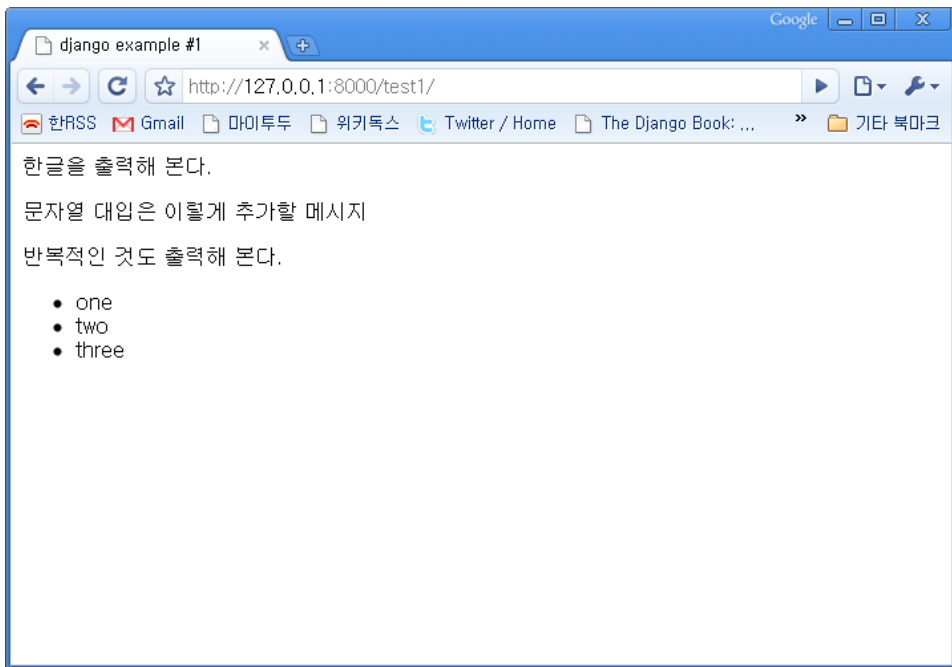
defztemplate_test(request):
zzztz=zget_template(' test1.html')
zzzcz=zContext({
zzzzzzzzzz' message': z''' Ñ1 zS † • ", z
zzzzzzzzzz"item_list": ["one", z"two", z"three"],
zzzzzzzz})
zzhtml z=zt.render(c)
zzzreturnzHttpResponse(html)

```

z

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03) ¼ (Models)

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ð® Ø "User"ª © " • i • "• « ", "• S...", "\ 1 "ª © " V • Ø " Ø • ~ " • i — ð • ¨®
Q { " Å x ° ž 1 Ĩ K Ÿ ¢Á ßØ • — ° O • " .

```
classzUser:
zzzdefz__init__(self):
zzzzzzzzself.namez=z""
zzzzzzzzself.emailz=z""
zzzzzzzzself.addressz=z""
```

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django— ÑÑ Ĩ &• \$A "...| "® è | ½ó • è ©\$— 7— f Ø "| ® è | ½ó •
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django † SQL— ½ó ž ÖŸ ° " . " Ÿ ± SQL— ¥ > ±K* Ñ è | < ĸ © O • Ĩ ñª **djangoš**
SQL" »¾Ÿj ¢® Ĩ # ðß Ê • " .

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SQL — " ž ÷ • . M hª £ ð © SQL— djangoLV ½ Å ¼ S ø ú Å 1 f Ø—P? œ
±w{ ° " ¼ ž 1 ±{ fÁ µú...P?

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...| ® ÅÅ © x ž Á RØ • Ÿ š o ĸ £ ...| — Q { Å ž o f Ø—O ¢ " .

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2. Ž • • ð • ¨ • " ® œ. 1 f Ø© Ž • • ß Ÿ Ö x

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• Ø • 1 © ð • ¨ • " > **MySQL**— ½ó 1 Ö • " .
MySQLÁ Ĩ K • 1 , ™ ^¾— " • > ú — f Ø " :

< <http://dev.mysql.com/get/Downloads/MySQL-5.1/mysql-essential-5.1.36-win32.msi/from/pick#mirrors>

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MySQL Ž•• ñ œ. © ß Á Ĩ K• 1 "•> ú ñ f Ø".

< <http://sourceforge.net/projects/mysql-python/>

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django & Models

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```
" • i y :
```

```
< ¥• • - mypage_page
```

```
„ V„ ÷ :
```

```
< ¥• • Ĩ • • - pageid (int)
```

```
< ¥• • y - page_name (varchar(100))
```

```
< ¥• • èó - page_content (text)
```

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⁻ —ß Ê ñ è f Ø " . app® Ÿ ĩ ÖŸ © „ 2° • ã© è f " • Ÿ ±8 Ĩ KŸ ¢•
appª © O ñ Ÿ ĩ ÷ •.


```
pythonmanage.pystartappmypage
```

z

```
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```

```
C:\work\mysite>cdmypage
```

```
C:\work\mysite\mypage>dir
```

```
Czúª • M—zî ‡ • ©z • « • z'' î ħ '' .
```

```
î ‡ z.....zŠ « :zD075-1035
```

```
C:\work\mysite\mypage> W ¢ |
```

```
2009-08-10zz%Š z05: 18zzzzzzzzzzzzzz.
```

```
2009-08-10zz%Š z05: 18zzzzzzzzzzzzzz. .
```

```
2009-08-10zz%Š z05: 18zzzzzzzzzzzzzzz60zmodels.py
```

```
2009-08-10zz%Š z05: 18zzzzzzzzzzzzzzz537ztests.py
```

```
2009-08-10zz%Š z05: 18zzzzzzzzzzzzzzz27zviews.py
```

```
2009-08-10zz%Š z05: 18zzzzzzzzzzzzzzz0z__init__.py
```

```
zzzzzzzzzzzzzz4 zŽ ...zzzzzzzzzzzzzzz624zT • 9
```

```
zzzzzzzzzzzzzz2 z• W ¢ | zzz4,267,645,952zT • 9z— n
```

```
mypageª © • WX | Ÿ 4 — Ž ... • Ė Î > Æ ô " .
```

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```
" • i Æ - ħ ž ¹ ħ • ¹ • Ė Î > Ÿ ħ ¢ models.pyŽ ...- ħ n ¢ • f , ™ s • .
```

```
mysite/mypage/models.py
```

```
fromdjango.dbimportmodels
```

```
#zCreateyourzmodelshere.
```

```
classzPage(models.Model):
```

```
zzzpageid=models.IntegerField(primary_key=True)
```

```
zzzpage_name=models.CharField(max_length=100)
```

```
zzzpage_content=models.TextField()
```

z


```

    zzz#'django.contrib.sessions',
    zzz#'django.contrib.sites',
    zzz'mysite.mypage',
)

```

```

mysql> ½ó × ° ý„ ÉÛ „. mysql É Z © ° Ý ¢• ý„ 1 f Ø“. Ö• ¨`•“
y , ½ó• , u“ uú©• Ä— ý„ O{ â f„ ™s •. INSTALLED_APPS• ©
mysite.mypage® Ä " Ñž \j ÖÝ ° “.

```

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```

C:\work\mysite>c:\python2.6\pythonzmanage.py sqlall mypage
c:\python2.6\lib\site-packages\MySQLdb\__init__.py: 34: ZDeprecationWarnin
g: zthezsetszmodulezi szdeprecated
zfromzsetszi mportzImmutabl eSet
BEGIN;
CREATEzTABLEz`mypage_page`z(
  zzz`pageid`zintegerzNOTzNULLzPRI MARYzKEY,
  zzz`page_name`zvarchar(100)zNOTzNULL,
  zzz`page_content`zlongtextzNOTzNULL
)
;
COMMIT;

C:\work\mysite>

```

```

manage.py— sqlall yf↦ • ó Ø ° Ý ¢• SQL • • Ê Î > Ǝôj CDô© O↦ 2É1 f
Ø“.

```

z

° SQL↦ ^j 1 ë| f 1 f™ Ø • Ý django© ®l Ä | ° x¿↦ 6 ž ‡“.

```

C:\work\mysite>c:\python2.6\pythonzmanage.py syncdb

c:\python2.6\lib\site-packages\MySQLdb\__init__.py: 34: ZDeprecationWarni ng: zthezsetszmodul ezi szdeprecated
zfromzsetszi mportzImmutabl eSet
Creati ngztabl ezmypage_page

```

z

° LV syncdb yf↦ ½ó Ö ñ • Ê Î > “ • i • Ǝôj ^B“.

```
mysql>zdesczmypage_page;
```

```
+-----+-----+-----+-----+
|zFiel dzzzzzzzz|zTypezzzzzzzz|zNull z|zKeyz|zDefaul tz|zExtraz|
+-----+-----+-----+-----+
|zpagei dzzzzzzzz|zi nt(11)zzzzzz|zN0zzz|zPRI z|zzzzzzzzzz|zzzzzzzz|
|zpage_namezzzzz|zvarchar(100)z|zN0zzz|zzzzzz|zzzzzzzzzz|zzzzzzzz|
|zpage_contentz|zlongtextzzzzz|zN0zzz|zzzzzz|zzzzzzzzzz|zzzzzzzz|
+-----+-----+-----+-----+
3zrowszi nzsetz(0.00zsec)
```

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ë| " " 9® 1 f Ø© | ° x¿ ¬ 6 ° ". (N¼© „ + a • " !)

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```
C:\work\mysi te>c:\python2.6\pythonzmanage.pyzshel l
```

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```
c:\python2.6\lib\site-packages\MySQLdb\__init__.py: 34: zDeprecati onWarni ng: zthezsetszmodul ezi szdeprecated
zfromzsetszi mportzImmutabl eSet
Pythonz2. 6. 2z(r262: 71605, zAprz14z2009, z22: 40: 02)z[MSCzv. 1500z32zbi tz(Intel )]zonwi n32
Typez"hel p", z"copyri ght", z"credi ts"zor z"Li cense"zforzmorezi nformati on.
(Interacti veConsol e)
>>>
```

z

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```
fromzmypage.model szimportzPage
>>>zp1z=zPage(pagei d=1, zpage_name=' testzpage', zpage_content=' testzpagezcontent')
>>>zp1. save()
```

z

PageBÖ ½ — save' Sôú® • ó ä ö • ¢ BD• Ńž " . ò 6> ö • ¢` • " •
f Nô © • ® 2£ž ÷ x " .

```
mysql>zselect*zfromzmpage_page;
+-----+-----+-----+
|zpagei dz|zpage_namez|zpage_contentzzzzzz|
+-----+-----+-----+
|zzzzzz1z|ztestzpagez|ztestzpagezcontentz|
+-----+-----+-----+
1zrowzinzsetz(0.00zsec)
```

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Ÿd p1.save()^a © Søú® ° § ò ø ĭ Á{ μP?
ö Å> ö• ¨ ro• 3Ñ HP?
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ĭ KŸ ¢• p1.save()® " † ò ž ÷ • .

```
>>>zp1.save()
```

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ë x" . \ ± ~ • • Äž¹ © N¼• • Æ%• ë © O ¢ " . ° § save^a © SøúÑ « C• öø
Ä§ #§ « Cò ^a ™ - † ö © ~ P? ...R rĭ • Á P> ° ë t> • BÖ¬ Ÿ ĭ ¹ " †
save()® « Cž ÷ ™ S • .

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ž Ö • Ÿ N¼© " † "ÄÄ"° " .

```
>>>zp2z=zPage(pagei d=1,zpage_name=' testzpage' ,zpage_content=' testzpagezcontent')
>>>zp2.save()
```

z

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" † savež ÷ • .

```
>>>zp3z=zPage(pagei d=2,zpage_name=' testzpage' ,zpage_content=' testzpagezcontent')
>>>zp3.save()
```

z

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```
mysql>zselectz*zfromzmypage_page;
+-----+-----+-----+
|zpagei dz|zpage_namez|zpage_contentzzzzzz|
+-----+-----+-----+
|zzzzzz1z|ztestzpagez|ztestzpagezcontentz|
|zzzzzz2z|ztestzpagez|ztestzpagezcontentz|
+-----+-----+-----+
2zrowszinzsetz(0.00zsec)
```

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£ ; μ' Øœ Åß—© ½ò• ¨ .

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```
>>>zp4z=zPage(pagei d=3,zpage_name=' ° ý',zpage_content='testzpagezcontent')
>>>zp4.save()
```

z

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OÁ ™¨ • ¹ mysql ö• ¨ ® ÷ á ¼ Ö× £ Û ¨ .

```
mysql>zselectz*zfromzmypage_page;
+-----+-----+-----+
|zpagei dz|zpage_namez|zpage_contentzzzzzz|
+-----+-----+-----+
|zzzzzz1z|ztestzpagez|ztestzpagezcontentz|
|zzzzzz2z|ztestzpagez|ztestzpagezcontentz|
|zzzzzz3z|z?%?zzzzzz|ztestzpagezcontentz|
+-----+-----+-----+
3zrowszinzsetz(0.00zsec)
```

z

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```
>>>zpage_list=zPage.objects.all()
>>>zpage_list
[<Page: zPagezobj ect>, z<Page: zPagezobj ect>, z<Page: zPagezobj ect>]
```

```
>>>zforzpagezi nzpage_l i st: zpri ntzpage. page_name
...
testzpage
testzpage
° ŷ
```

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• 6 ° Ħ• " ž Ö 1 \$• Ø¨. " mypage_page" • i • ö• ¼® E¹ 9 1 Z " — ö• ¹ ©
 ~6> pageid\$↪ 1,2,3↪ ê¼¹ BDÖ• Ÿ ...š ĸ E] ¥> ±²• ª ø max(pageid)+1 \$↪ F Ā
 Š• E¹ 9 © x²↪ ½ó1 O• ¨.

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N¼• ¹ © • O↪ Ĩ Ā{ ¨ Ð f Ø©• " ž ÷• .
 N¼— order_by® ½óž ÷• .

```
>>>zpageid_l i st=zPage. objects. order_by("pageid")
>>>zpageid_l i st
[<Page: zPagezobj ect>, z<Page: zPagezobj ect>, z<Page: zPagezobj ect>]
```

ˆ Ÿ Φ• pageid> order_by° Š• ĦN €• , \$— pageid\$• å æ ĦN Ĩ \$Æ↪ ê f Ø¨.

z

ĦN €• , \$↪ p × ˆ ž -1 EĦÖ↪ Ö ĩ æ¶Ø© . ĦÆ» ¨.

```
>>>zpageid_l i st[-1]. pageid
Tracebackz(mostzrecentzcallzlast):
zFilez"", zlinez1, zinz
zFilez"c: \python2. 6\lib\site-packages\django\db\model s\query. py", zline126, zinz__getitem__
zzz"Negati ve zindexi ngzsznotzsupported."
AssertionError: zNegati ve zindexi ngzsznotzsupported.
```

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 ö• ¼` • " — P¹ xž • Ĩ kP? ā" ž Ĩ ö• ¨.

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```
>>>zpage_list[len(page_list)-1].pageid
3L
```

len(page_list)-1Å ÑÑ €•, S¬ Å © 7• S•". • 6 ÑÑ €•, S¬ è f ØĪ ñ 3+1°
4ª © S¬ " n £¹ 9† ½ó ø µ O•". • Ÿ ò 6 ¥> ±² •¹ • Ÿ ¢ Å x¿ ¬ G©OÁ
ĭ ĭ ý Å @•". max(pageid)+1 S¬ è x¬ ž¹ ß+ õ• ¨® Ñâ Ô Š order by° ÑÑ €•,
S¬ F© ¬ © Ĩ €™ é• ÜH O•".

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oder by desc limit 1¬ ½ó ø maxŸ ý° • ® m f™ Ø".

```
>>>zPage.objects.order_by("-pageid")[0].pageid
3L
```

desc® þå x¬ ž¹ N¼© „ Vy Å• "-" • ® BD ø õ™s Œ".

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• Ÿ ÷" #‰¿ Ĩ > Ĩ KŸ ¢ Å SQL • ó © N¼ SøúÑ Ø©• èĭ ÷•.

```
selectzmax(pageid)+1zfromzmypage_page
```

z

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```
>>>zfromzdjango.db.modelszimportzMax
>>>zPage.objects.all().aggregate(Max("pageid"))
{'pageid__max': z3}
```

z

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N¼• ¬ ÷ñ • Ó•¹ èĭ ÷x ĒzO +¼™ filterª ĒÑ get — Søú® • ó ä õ• ¨®
" C © x¿ ¬ ÷ä ±". filter, get+¼™ likeª Ē• joinÅ ĭ Å{ ©• subquery¢ ÅOÁ
ĭ Å{ ©• — \$• é• —Ĩ Ø". • O • Åž¹ © x5Ñ ó©õ> &]
èĭ ÷x> •.

04) Ä(Forms)

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• Ö x • Ÿ . .)
c Ä ĩ œ Ů HTML— form ^ ± ® + © O • ' .

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“ n ¢ Ä HTML ñ ÷ • .

```
<formzname="pageform"zaction="/save_page/"zmethod="post">
<inputztype="text"zname="page_name"zi d="page_name"z/>
<textareazname="page_content"zi d="page_content"zrows="5"zcol s="20"></textarea>
</form>
```

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„ “ Ÿ ¢ Ä HTML ñ Ä Ø • < T © ¥ > ± ² ñ < Ê ž ÷ • .

mysite/views.py

```
#z-*-coding: utf-8z-*-
fromdjango.httpzimportzHttpResponse
fromdjango.template.loaderzimportzget_template
fromdjango.templatezimportzContext
frommypage.modelszimportzPage

...

defzpage_form(request):
zzztz=zget_template('page_form.html')
zzzreturnzHttpResponse(t.render(Context({})))
```

z

mysite/urls.py

```
fromdjango.conf.urls.defaultszimportz*
frommysite.viewszimportzhello, zpage_form
```

```
urlpatterns=urlpatterns(' ',
    zzz(' ^hello/$', zhello),
    zzz(' ^page_form/$', zpage_form),
)
```

z

mysite/templates/page_form.html

```
<html>
<head>
<title>pagezform</title>
</head>
<body>
<formname="pageform"zaction="/save_page/"zmethod="post">
<table>
<tr>
z<td>¥••y</td>
z<td>
zzz<inputztype="text"zname="page_name"zid="page_name"z/>
z</td>
</tr>
<tr>
z<td>¥••zèó</td>
z<td>
zzz<textareazname="page_content"zid="page_content"zrows="5"zcols="20"></textarea>
z</td>
</tr>
<tr>
z<tdzcolspan="2">
zzz<inputztype="submi t"z/>
z</td>
</tr>
</table>
</form>
</body>
</html>
```

z

~ Ÿ ¢• ¥> ±² ↳ AZ ¼ Œ° Š http://localhost:8000/page_form/ î > | Äž ÷ø
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페이지명

페이지 내용

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 O• " .

mysite/views.py

```
#z-*-coding: utf-8z-*-
fromdjango.httpzimportHttpResponse
fromdjango.template.loaderzimportget_template
fromdjango.templatezimportContext
frommypage.modelszimportPage
fromdjango.db.modelszimportMax

...

defzsave_page(request):
    zzzpage_namez=request.POST['page_name']
    zzzpage_contentz=request.POST['page_content']
    zzzpageidz=zi nt(Page.objects.all().aggregate(Max("pageid"))).get("pageid__max"))z+z1

    zzzpagez=zPage(pageid=pageid, zpage_name=page_name, zpage_content=page_content)
    zzzpage.save()

    zzzreturnzpage_form(request)
```

post5^ — c ö• ¤ request.POST['c ö• ¤y'] LV Fĭ £" . €¾Ñ•> get5^ — c
 ö• ¤ request.GET['c ö• ¤y'] LV Fĭ Ö ° " .

z

mysite/urls.py

```
from django.conf.urls.defaults import *
from mysite.views import hello, zpage_form, zsave_page
```

```
urlpatterns = zpatterns('',
    zzz('^hello/$', hello),
    zzz('^page_form/$', zpage_form),
    zzz('^save_page/$', zsave_page),
)
```

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BDô© O¬ 2£1 f Ø".

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N¼© c¬ ½ Ä ä ½ó1 f Ø{ â • > ž ‡".
from django import forms ® • ó © x¿ £õ ä x• ¹ © • ÛÁ x = £x> ° ".
• ÛÁ N¼® ÑN ' | î S ¼ • ž x ° £QR • Y• ".

05) Å (Sessions)

• §ñ N¼— #d• Åž¹ ëĭ ÷•.

#d• Åž¹ „ 2ù êáø „ Å" (Cookie)Ñ - . É• ëĭ Ö ° " .
³√Ñ™Å \ - Ö©•® êáø HTTP•ĭ ÇÇ ' • Åž¹ ° • žžÖ ° " .
#d¬ ê×¬ ž¹ © Å ëĭ Ö © èó• /> ">¼"® Fĭ ÷•.

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[8# - Åĭ „]

½ó• © Mª f® Ñ•¼ HTTP¥> X ¬ pä° ¹ ^• | Å ä - ° „ ÷®
É©" . • O• | Ñ ...šžĭ > " × © "] ¹ • " " .

HTTP¥> X Å | Å• ā•ó© 5^Ñĭñª Jª• §9Ñ° § ¬ ÷Ó Š
, ¬ ĭ ø ¹ ' • Êĭ • © 5^" " . IÆ] ¹ " Å HTMLŸ 6 Ö " .
°ª¹ Mª fÑ ø }, HTMLŸ ÷èø ô " . „ + QRÖ" .

• Ÿ a ½ó• „ ÷Ñ - ž' " . () Ñĭ ¥••• | Å° Š ±
ŠÅ¥••• | Å¹ Z • •¾ ¥•••¹ ĭ @¬ Ö©• ëĭ Ö 1 - Ñ
¥ O• " . • K¹ Ÿ ĭ Ç O• ± āy° ³√ (Cookie)• " .

³√© Jª• §9 ×b• " .] ¹ ^> ¬ ÷è?Æ ¬ z HTTPÇ •
Cookie® #ā © xž• " . s Mª fÆ] ¹ ^Ñ CookieŠ¬ AZ) ¹ >
ō•¤® \¼ © ×b• " . • Ÿ ³√© ō•¤Ñ Jª• §9(Mª f)•
fNô× • ÷• 6Ñ ÅĀô{ ô " .

ō•¤® Jª• §9• fN • è¼ ¹ ^• fN © ×b• T>
#d(Sessions)• " . ¹ ^© #d ō•¤® fN ¼ ¹ ^— #d ō•¤® • ó1
f Ø© #d v ŠŸ ³√® ±ž¹ \¼ ©" .

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N¼•¹ #d¬ ½ó ×¬ ž¹ ž\ĭ Ö 1 O • Ø" .
„ WZý„ Ž...É settings.py•¹ " n ° ĭ ¬ 2ÉžÖ ° " .

mysite/settings.py

```

MIDDLEWARE_CLASSES=z(
    zzz...
    zzz'django.contrib.sessions.middleware.SessionMiddleware',
    zzz...
)

INSTALLED_APPS=z(
    zzz...
    zzz'django.contrib.sessions',
    zzz...
)

```

z

• w{ ý„ ° Š ¨ n— y f ¬ • ó ä django_session• ' " • i ¬ Æ Ž Ö Ÿ ° ¨ ¨ .

```

C:\work\mysite>c:\python2.6\pythonzmanage.pyzsyncdb
c:\python2.6\lib\site-packages\MySQLdb\__init__.py: 34: zDeprecationWarning: zthezsetszmodulezi szdeprecated
zfromzsetszimportzImmutableSet
Creati ngztbl ezdj angosessi on

```

z

Æ " • i ¬ 2Æ Ž ÷ • .

```

mysql>zdesczdjango_session;
+-----+-----+-----+-----+-----+
| zFiel dzzzzzzzzz| zTypezzzzzzzz| zNull z| zKeyz| zDefault z| zExtraz|
+-----+-----+-----+-----+-----+
| zsessi on_keyzz| zvvarchar(40)z| zNOzzzz| zPRI z| zzzzzzzzzz| zzzzzzzz|
| zsessi on_dataz| zlongtextzzzz| zNOzzzz| zzzzzz| zzzzzzzzzz| zzzzzzzz|
| zexpi re_datezz| zdateti mezzzz| zNOzzzz| zzzzzz| zzzzzzzzzz| zzzzzzzz|
+-----+-----+-----+-----+-----+
3zrowszi nzsetz(0.00zsec)

```

• 6 # d ¬ ½ó1 f Ø¨ .

z

d• ; Á{ Š ¬ f N ¼ F ¬ f Ø©• ® 2£1 f Ø© QR° ¥> ±² ¬ < Æ Ž ÷ • .

mysite/urls.py

Z

```
mysite/views.py
```

Z

#d§¬ #ã ?Æ AZ x ° URL« C x¿ Á ¨ n ¢¨.

Z

P#B _{ y_i .. Å „™« 2ĭ ' ë ž P © O Ć” .
 django_session” · i — expire_dateª © „ VŠ¬ Fĭ ÷ ñ ° Š #d ō• ¤Ŋ f Nôø 2\ ...
 · Š†Q · #ãô© O Ć” .
 Ÿd Mª f Ŋ Ū · #dŠ¬ ÷ 6 ¼ È” ø ĭ KŸ Ć · ý, ž Ö ° ” .

Z

```
mysite/settings.py
```

wiki docs.net PDF, page : 287

06) z ù

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"ÿ N¼Ñ - . £•• Å° ö¬ ¼ •ó j • ¹ Ù¤ † < žÖ 1 • ê{ ó "ø ±Oĭ >
f • © Ÿp° " .

• ó žÖ 1 ...Å django® • ó ä òó ¥> ±² ¬ < Ğž ÷ © O• " .

h • vā...Ö• ¢ ÖĚÑ!

ëĭ ¥> ±² ¬ < Ğž ÷ • ë©" ø ĭ - O™ É¬ f "¬ O• " . • Ñ ¼: q• ±á ¢
±2¬ hH: " ÷ ĭ™ • Ñ ù• • ë© OLV • ĭ T> django® • ó° ¥> ±² ¬ < Ğž
÷ x® j Å° " .

• •YÁ ' Åž¹ ¾† Å ÆÖ O•) ° éÁ™ÿ¬ - > ¼ Ø". Ÿd • ¹®
EŸ Ÿ ¼ È" ø f • © §óÆ "We"• " . ĭ K— • S...> æ• Ÿ \ø T> "vw"
" Ěf• "> ý, 1 O• " .

pahkey@gmail.com

09. *f* „ ... Tips

Ž•• Tips•¹ © Ž•• ↯ F ó ä 1 *f* Ø© ä 3 ä ó° O • Äž¹ ° ° ° .

[01] AĖAPI« „ è´ „ • Ą É;

{†Q —] ¹ “ ® • e1 Z • ħ • > ú • Āž¹ “ žÖ ° “.] ¹ ^ • è | • ħ • Ž...¬ > ú1 Z ± Ž... • Ā° “ | — ŪÆ” • ×{ ô× • “. Ÿd • ħ • ® ĀĀ ÷ “ ž \¼ ± T ® 6 ž \© ¹ “ Ń Ø” ø “ • • Ā— ¹ ^ • • ħ • ® fN1 — © “ ¬ O • “ • Ó • ¹ © OpenAPI® • ó° • ħ • > ú xž • Āž¹ ¹ ° “.

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1. QáĖ« „ è´ „ • Ą É;

[: | P](#)® • ó° • ħ • > ú xž • Āž¹ ýy° “.

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„ : | P OpenAPI® • ó × “ ž¹ © : | P OpenAPI v® ĄžÖ ° “. Ĩ K URL • ¹ vŸ 8v® Ą ¼ £ • Š • « C1 URL¬ “ † Ā ú© “. (: | P • ¹ žÖ 1 ...Ā ä xP • “.)

< <http://flickr.com/services/api/keys/>

(£ • Š « C1 URLö : http://lab.pyframe.org/example/openapi/flickrcallback)

z

• 6 multipart/form¬ • ó ä • ħ • ® > ú ž ÷ •.

`<formzname="imageForm"zaction="/example/openapi/upload"zmethod="post"zenctype="multipart/form-data">`

¬ form¬ submit ø ¹ ^Ÿ > ±² (¬ :/example/openapi/upload) • ò μ O • “.
(ä x¹ © Q { • ħ • Ž...¬ #d • fNž ú© x² ¬ ½ó x > ° “.)

z

/example/openapi/upload

```
importzmd5

...

defzupload(self):
    zzzfilename,zcontentz=zfelf.getfile("filename")
    zzzsessionz=zfelf.getSession()
    zzzsession['file_content']=zcontent
    zzzsession['file_filename']=zfelf.filename
```

```

zzzmz=zmd5.new()
zzzsig=z"%sapi_key%sperms%s"z%(API_SECRET,zAPI_KEY,z"wri te")
zzzm.update(sig)
zzzapi_sig=zm.hexdigest()
zzzauthurl=z"http://www.flickr.com/services/auth/?api_key=%s&perms=wri te&api_sig=%s"z\zzzzzzzzzzzz
zzzzzzz%(self.getAppCfg()).API_KEY, zapi_sig)
zzzself.redirect(authurl)

```

```

- self.getFileSøú© pyframe— APIr  Æ>  Ž...y  Ž...— èó¬ | ®° "...
(• pyframe• Ĩ ñ  ª™ ¬ Ÿ ¢Á  1¬  ¯™s Ÿ  f Ø"... )
±~ Š• ~ f• ºª  authurl¬ Ÿ ¼ authurl> | "...W9 ä « C ¯™s º "...
authurl¬ Ÿ ½ó  © API_SECRET, API_KEY© flickr½• 9• 1  (° vŸ 8v® +° "...
£• • • Äĵ  ¢ Š• © flickr½• 9• 1  s° £• Š « Cö© callback URL• « C "...
(ö: /example/openapi/flickrcallback)

```

z

```

I EŁ Ĩ > Ĩ K— callbackSøú• 1  òó : | P• Ž...¬  > ú  ©  „ • ...ĵ * "...

```

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/example/openapi/flickrcallback

```

importzflickrapi
...

defzflickrcallback(self):
zzzmz=zmd5.new()
zzzfrobz=zself.get("frob")
zzzsig=z"%sapi_key%sfrob%smethodflickr.auth.getToken"z%\
zzzzzzz(API_SECRET,zAPI_KEY,zfrob)
zzzm.update(sig)
zzzapi_sig=zm.hexdigest()
zzzauthurl=z"http://api.flickr.com/services/rest/?method=flickr.auth.getToken&api_key=%s&frob=%s&api_sig=
zzzzzzz(API_KEY,zfrob,zapi_sig)
zzzfz=zurllib2.urlopen(authurl)
zzzdataz=zf.read()
zzzf.close()
zzztz=zflickrapi.XMLNode.parseXML(data)
zzzflickr_tokenz=zt.auth[0].token[0].elementText

zzzflickrz=zflickrapi.FlickrAPI(API_KEY,zAPI_SECRET)
zzzflickr.tokenz=zflickr_token

```

```

zzzsession=zself.getSession()
zzzcontent=zsession['file_content']
zzzfilename=zsession['file_filename']

zzzrz=zflickr.upload(filename=filename,zpayload=content,zcallback=None)
zzzphotoid=zr.photoid[0].elementText

zzxmlnode=zflickr.photos_getSizes(photo_id=photoid)
zzpz=zflickrapi.XMLNode.parseXML(xmlnode.xml)

zzzimageurl=zstr(p.sizes[0].size[-1].attrib["source"])

zzzdelzsession['file_content']
zzzdelzsession['file_filename']

```

~ E f • 1 : | P API® ½ó x ~ Ž flickrapiª ©ª • M3 | ® • óÖ".

see also : <http://flickrapi.sourceforge.net/flickrapi.html>

z

flickr.uploadSøú® • ó ä ' { Ž...(#d• ¶ | f Nž ú×É)~ > ú 1 f Ø".
> ú Š• © : | P• ¶ • ¼āĬ • • £ photoid\$ imageurl~ è f Ø". (| ® Å
photoid\$~ • ó ä f„ " ÷ 6 ~ 1 f Ø". f„ " ÷ 6• Å° • #° ½° Å flickrapi®
> ¼™s •)

• 6 | ® Å imageurl\$~ • ó ä • er£] 1 " • 1 T ä Ü† ø ".

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ýy° ".

i ½ © þÿ•¹ 6 © ½¢, • ¶ • > ú ½• 9> x• • © ýÖó Jª • Š 9
¥> ±² Ÿ~ • ó ä > úŊ Ŋž ŐĬ Æ • Ĭ Å open api® ±ž > ú® © x²~ • > ¼
Ø".

„ Ž• • Ĭ > pi casa api® ½ó x ~ ž¹ © gdataª • M3 | ® " • > ú Ĭ Ö° ".

< <http://code.google.com/p/gdata-python-client/downloads/list>

z

Picasa— Z : | P LV v® Œ ?Æ s © — Ĭ &Ŋ — " ".
" Ÿ þÿ' „ Ÿ ŐĬ ø " " „ + Q " " .

• multipart/form→ • ó ä • ¶ • ® > ú® ž ÷ • .

```
<formzname="imageForm"zaction="/example/openapi/upload"zmethod="post"zenctype="multipart/form-data">
```

- form→ submit Ø¹^¥> ±² (~:/example/openapi/upload)• ò µ O• " .
ä x¹ © • ¶ • ž ...→ #d• f Nž ú© x² → ½ó x> ° " .

z

/example/openapi/upload

```
importzdata.photos.service
importzdata.media
importzdata.geo

...
defzupload(sel f):
    zzzfilename,zcontentz=zsels.f.getFile("filename")
    zzzsessonz=zsels.f.getSession()
    zzzsessonz['file_content']=zcontent
    zzzsessonz['file_filename']=zfilename
    zzzauthSubUrlz=zsels.f.picasaAuth()
    zzzsels.f.redirect(authSubUrl)

defzpicasaAuth(sel f):
    zzznextz=z'http://%s/example/openapi/picasaAuthAfter'z\
    zzzzzzzzsels.f.getAppCfg().DOMAIN_NAME
    zzzscopez=z'http://picasaweb.google.com/data/'
    zzzsecurez=zFalse
    zzzsessonz=zTrue
    zzzgd_cli entz=zgdata.photos.service.PhotosService()
    zzzreturnzgd_cli ent.GenerateAuthSubURL(next,zscope,zsecure,zsessonz)
```

- ÝΦ• uploadSøúŃ « Còø „ ž...y ž...èó→ #d• î†fNž ž©" . ±~Š•
picasaAuthª © Søú® "† « C° " . • Ó•¹ © picasa api® • ó ä £• → ?Ô™S ° " .
£• → Þ4° Š• © picasaAuthAfterª © SøúŃ "† ò µ f Ø™S next URL→ ý„ ° " .

z

/example/openapi/picasaAuthAfter

```
defzpicasaAuthAfter(sel f):
    zzzauthsub_tokenz=zsels.f.get("token")
```

```

zzz#ztokenzupdate
zzzgd_clientz=zgdata.photos.service.PhotosService()
zzzgd_client.auth_token=zauthsub_token
zzzgd_client.UpgradeToSessionToken()

zzz#zaddzal bum
zzz#entryz=zgd_client.InsertAlbum('example',z'example')

zzzsessonz=zself.getSession()
zzzcontentz=zsessonz['file_content']
zzzfifileamez=zsessonz['file_filename']
zzzfz=zcStringl0.Stringl0(content)

zzzal bum_urlz=z' /data/feed/api /user/%s/album/%s' z%z("default",z"example")
zzzentryz=zgd_client.InsertPhotoSimple(album_url,zfileame,
zzzzzzz'Uploadedzbyzexample',zf,zcontent_type='image/jpeg')

zzzdel zsessonz['file_content']
zzzdel zsessonz['file_filename']

zzzself.redirect(entry.content.src)

```

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 ú×É•¶•® > ú 1 f Ø".

z

¯ öó•¹ ÷ø Ĩ KŸ Φ• t>• ĩ → Ÿú© apiŊ Ø".

```
gd_client.InsertAlbum('example',z'example')
```

^±£• InsertAlbumÄ „ ğ Ĩ > È<• ë©O Φ". ±K¹ ë ĩ pica½• 9• ĩ Ä ä
 example•ª © ĩ → ¶ ĩ Ÿ ĩ ú Ĩ ÖŸ Ō". (ĭ • ø • Ÿ → < Ğ © • ĩ Ä ¯ ^±(?)Ŋ
 ½ª / →™ β ".)z2òù þŸ — apiŊ : ĩ P — api÷" © ¾: ° N\$• Ø".z • Ÿ
 • ¶ • — \$´•Æ ×; — • ä> Ĩ ëP• © : ĩ P — ´ → ĩ \¼ È".

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• Φ• : ĩ PŸ ĩ ½ — API® • ó ä • ¶ •® > ú © xġ• Äž¹ ë Ĩ ÷ ×".


```

fromzemail.mime.baseimportzMIEMBase
fromzemail.mime.multipartimportzMIEMultipart
fromzemail.importzencoders

BACKUP_DIR=z"/var/lib/postgresql/backup"

defztodaytime(fmt):zreturnztime.strftime(fmt)

#zCreatezthezcontainerz(outer)zemailzmessage.
msgz=zMIEMultipart()
msg['Subject']=z'BACKUPzMYDBz[%s]'z%ztodaytime("%Y/%m/%d")
#zmez==zthezsender' szemailzaddress
#zfamilyz=zthezlistzofzalzrecipients' zemailzaddresses
msg['From']=z"÷ è © • zS... \ 1 "
msg['To']=z"pahkey@gmail.com"

filenamesz=zglob.glob("%s/*%s*"z%z(BACKUP_DIR,ztodaytime("%Y%m%d")))
forzfilenenezinzfilenames:
zzzctypez=z'application/octet-stream'
zzzmaintype,zsubtypez=zctype.split('/',z1)
zzzmbz=zMIEMBase(maintype,zsubtype)
zzzfpz=zopen(filename,z'rb')
zzzmb.set_payload(fp.read())
zzzfp.close()
zzzencoders.encode_base64(mb)
zzzmb.add_header('Content-Disposition',z'attachment',zfilename=filename)

zzzmsg.attach(mb)

mailServerz=zsmtpplib.SMTP("smtp.gmail.com")
mailServer.ehlo()
mailServer.starttls()
mailServer.ehlo()
mailServer.login("÷ è © • zS... \ 1 ",z"÷ è © • zu " u ú")
mailServer.sendmail(msg["From"],zmsg["To"],zmsg.as_string())

```

• S...(Gmail)> Ž ... • Û ä S...ŠÄ © Ž•• " , 9•". h Ð • Ø© Ž... r %o!
HÊŸ ÷ Ó".z

z

3. crontab " „ è Ø & » ¾ P

```
00z03z*z*z/var/lib/postgresql/backup.sh
20z03z*z*z/var/lib/postgresql/email_backup.pyz
```

- È Ī > t 3† • backup.sh → ò ¼ 3† 20Ú • • S...> Š Ā° " .

[03] Ĩ ĩ Ò£ Ð Ñáˉ

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¥ > ±² • ¹ < £° ŷ ĩ ĭ > ±• • — ĭ ¼ È Á Z • © ĭ Á{ ž Œ 1 P?z

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' k / k { ÷ • x™ ĩ ± ĭ f Á x ĭ Á Ĩ ĩ ĩ . • • M Ĩ • x ĭ • x ĩ Ĩ Ü ± Á Ó•
T> MetaWebLogApi• ĩ .

MetaWebLogApi © API, s ĩ f• ĩ .z ç è ā y ĭ > ± ½ • 9 £ • ŷ Å" , ‡ " X ĭ ©
MetaWebLogApi ® ° • ¼ Ø" .z ± K¹ ĩ % Œ • £ " ¥ T « 9 , € • % Å ¢ Á ½ • 9 • ¹ © ± Ó • ¹
° ŷ ĩ • ŷ Å" £ ‡ " X ĭ > Ĩ \ { • È † Á ‡ ĩ .

MetaWebLogApi— ĩ f Á ĭ Ó • Ø © • è Ĩ ÷™ s • .
(MetaWebLogApi © XML-RPCª © ¥ > X ĩ ½ Ó° ĩ . • Ó • ¹ © XML-RPC © ŷ y • è © ĩ .)

z

1. Ĩ ĩ Ò 1 6 Øˉ

```
metaWeblog.newPost (blogid, username, password, struct, publish)
returns string
```

z

metaWeblog © XML-RPC ĩ f • —ž £ ½ • ĩ .z
ž • • Á ĩ n ¢ Á µ ú > metaWeblog½ ® Ÿ f Ø" .

```
metaWeblog=xmlrpcclib.Server("http://pahkey.tistory.com/api").metaWeblogz#z‡ " X ĭ £ z Z
```

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BD§ Ĩ > ½ Ó © Ó Á 5 Ĩ • • ĩ .

1. blogid : ĭ > ± Ĩ • • (‡ " X ĭ £ Z , ĩ ĭ • ¥ • • • ¹ 2 £ 1 f Ø" . • ŷ Å" © •
§ ĩ ½ Ó • è © ĩ)
2. username : ½ Ó • Ĩ • • (ĭ > ± ½ • 9 > ± £ Ĩ • •)
3. password : ½ Ó • u" u ú (‡ " X ĭ £ Z ĭ > ± ½ • 9 > ± £ u" u ú , • ŷ Å" ©
ĩ ĭ • ¥ • • • ¹ 2 £ 1 f Ø")
4. struct : " ā 1 è Ó ĩ — ¼ Ø © Af (6 ĩ , è Ó ..)
5. publish : " ā ° è Ó ĩ 1 O £ • , > 1 O £ •

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struct• j f Ø © ° ĩ Ĩ > © ĩ n ¢ Á Ó • Ø" .

< category : ĭ > ± • ¹ ½ Ó © " ¼ ĭ y

```

< description : " ã ÿ èó
< title : " ã ÿ öï

(i > ±      €" • struct© dQí " • " . ‡ " X| — Z      mt_keywords(^ ±y)® ½ó1 f
Ø" .)

Z

Ž•• Á struct® Ĩ KÝ ¢• ; <=| > þÆ ø " .

```

```
datastruct={'category':z',z'description':z'èóBñ" ',z'title':'öï Bñ" '}
```

```
CD$Á Æ £ Z      postid( " ã° ÿ— id)® ¼ • 3£ Z      • 3èó¬ ©" .
```

Z

Z

2. Ĩ ĩ Ò ó Ø⁻

```
metaWeblog.editPost (postid, username, password, struct, publish)
returns true
```

Z

```
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```

```
< postid - " ã Æ † | ® Á id$
```

```
< Æ* • 4 © È
```

Z

```

- Y È... Æ &• $Á $ Žª ¶ ¤ $Ĭ > " ã Æ † | ® Á postid$¬ ŠĂž Ö ° " ©
$• " .z

```

```
} , Ĭ > © ĩ > ± f" • Æ Œ©• òuŒ©• ® Æ; è© boolean$¬ ©" .
```

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3. Ĩ ĩ Ò ¥⁻

```
metaWeblog.getPost (postid, username, password) returns struct
```

Z

```
BD$Ĭ > ½ó © O Á      3Ñ• • " .
```

```
< postid - "ã æ † | ® Á id$
< Æ* • 2 © Ě
```

z

```
}, î > © struct® ©''.
```

```
< category : i > ± • 1 ½ó © " ¼| y
< description : " ã ý èó
< title : " ã ý öï
```

z

```
• #° ½° Á '' n— URL— 2£ ™s •.
```

```
< http://www.xmlrpc.com/metaWeblogApi
```

z

```
ÿ K © Ž • • î > MetaWebLog API® " " 9° 1 " • ''.
```

```
#z-*zcoding: zutf-8z-*
importxmlrpclib

#ztistory
tistory=xmlrpclib.Server("http://pahkey.tistory.com/api")
datastruct={'category':z',z'description':z"è ó Bñ''.",
zzz'title':' öï Bñ''.',z'mt_keywords':"mytodo,€ • %Ä"}
no=tistory.metaWeblog.newPost("blogid",z"username",
zzz"passwd",zdatastruct,zTrue)
rz=ztistory.metaWeblog.getPost(no,z"username",z"passwd")

printzr

#zegloos
egloos=xmlrpclib.Server("https://rpc.egloos.com/rpc1")
datastruct={'category':z',z'description':z"è ó Bñ''.",
zzz'title':' öï Bñ''.'}
no=egloos.metaWeblog.newPost("",z"username",z"passwd",zdatastruct,zTrue)
rz=zegloos.metaWeblog.getPost(no,z"username",z"passwd")

printzr
```

[04] ² Ð Ò Ó « „ è Ø & ¹ ¼ ¡ SMS § -

• § • © þÿ k- ® • ó ä %ú' î > SMS® ÷ è © × ž • Å ž ¹ Ê Ç ÷ " .

þÿ k- • ¹ 6 © SMS© å æ P • © (i • ø Å î > ™ ' Å) - 4 • " . z... D þÿ k- • ¹
• Å — %ú' • î Ñ " ½ © — %ú' î > • ® ÷ m f © " " . z • Ý " ½ © —
þÿ' „ u" uú® è ø ± ½ © • { • St • ® ÷ m f Ø " . z þÿ Å ä 3 — o f' „ ¬
Ý ú © O ¬ ¼ ó × • SMS f Å ¾ ó ' „ ¬ Ý ¼ m ¬ f Ø © ½ © ä ° " ø z- 4 >
¹ > • St • ® \ ¼ ¬ f Ø { " .

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```
#z-*-zcoding: zutf-8z-*-  
try:  
zfromzxml.etreezimportzElementTreez#zforzPythonz2.5zusers  
exceptzImportError:  
zfromzelementtreezimportzElementTree  
importzgdata.calendar.service  
importzgdata.service  
importzatom.service  
importzgdata.calendar  
importzatom  
importzgetopt  
importzsys  
importzstring  
importztime  
  
classzGoogleCalendarSMS:  
zzzdefz__init__(self, zemail, zpassword):  
zzzzzzzself.cs=zgdata.calendar.service.CalendarService()  
zzzzzzzself.cs.email=zemail  
zzzzzzzself.cs.password=zpassword  
zzzzzzzself.cs.sourcecz="mytodo"  
zzzzzzzself.cs.ProgrammaticLogin()  
  
zzzdefzsend(self, zcalendar_name, zsms_content, zsms_time='', zreminder_use=True):  
zzzzzzzcalendarz=zelf.get_calendar(calendar_name)  
zzzzzzzeventz=zgdata.calendar.CalendarEventEntry()
```

```

zzzzzzevent.title=zatom.Title(text=sms_content)
zzzzzzevent.content=zatom.Content(text="")
zzzzzz#event.where.append(gdata.calendar.Where(value_string=calendar_name))
zzzzzzi fznotzsms_time:
zzzzzzzzsms_time=ztime.strftime('%Y-%m-%dT%H:%M:%S.000Z',ztime.gmtime(time.time()+60))z#z1zminzlater.
zzzzzzevent.when.append(gdata.calendar.When(
zzzzzzzzstart_time=sms_time, zend_time=sms_time))
zzzzzzi fzreminder_use:
zzzzzzzzreminder=zgdata.calendar.Reminder(minutes='0')
zzzzzzzzreminder._attributes['method']=z' method'
zzzzzzzzreminder.method=z' sms'
zzzzzzzzevent.when[0].reminder.append(reminder)
zzzzzzreturnzself.cs.InsertEvent(event,zcalendar.GetAlternateLink().href)

zzzdefzsenddate(self,zcalendar_name,zsms_content,zstime,zetime):
zzzzzzcalendar=zself.get_calendar(calendar_name)
zzzzzzevent=zgdata.calendar.CalendarEventEntry()
zzzzzzevent.title=zatom.Title(text=sms_content)
zzzzzzevent.content=zatom.Content(text="")
zzzzzzevent.where.append(gdata.calendar.Where(value_string=calendar_name))
zzzzzzevent.when.append(gdata.calendar.When(
zzzzzzzzstart_time=stime, zend_time=etime))
zzzzzzreturnzself.cs.InsertEvent(event,zcalendar.GetAlternateLink().href)

zzzdefzget_calendar(self,zcalendar_name):
zzzzzzfeed=zself.cs.GetAllCalendarsFeed()
zzzzzzforzi,za_calendarzinenumerate(feed.entry):
zzzzzzzzzi fza_calendar.title.textz==zcalendar_name:
zzzzzzzzzzzzzzzzreturnza_calendar
zzzzzzcalendar=zgdata.calendar.CalendarListEntry()
zzzzzzcalendar.title=zatom.Title(text=calendar_name)
zzzzzzcalendar.summary=zatom.Summary(text=calendar_name)
zzzzzzreturnzself.cs.InsertCalendar(new_calendar=calendar)

if__name__z=="__main__":
zzzgssz=zGoogleCalendarSMS("pahkey@gmail.com",z"xxxxxxx")z#zparameterz:zþÿ' , , zu " u ú
zzzgss.send("MYzTODO",z"• " # ")z#zparameterz:zþÿk - zk - y,zŠ Ā 1 zSMSS † •

```

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```
gssz=zGoogleCalendarSMS("pahkey@gmail.com",z"xxxxxxx")z#zparameterz:zþÿ' , zu" u ú
gss.send("MYzTODO",z"• " # ")z#zparameterz:zþÿk- zk- y,zŠÃ1zSMSS†•
```

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< <http://googlekoreablog.blogspot.com/2008/08/google.html>

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< <http://code.google.com/p/gdata-python-client/>

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†Q•SMSŠÃ1fØ™s þäÖ¬.

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[Ö„]

```

result=z[]
defzforLi fe(l):
    zzzforzi temzinzl : zzzzzzz
    zzzzzzzi fztype(i tem)z==zlist:
    zzzzzzzzzzzforLi fe(i tem)
    zzzzzzzzel se:
    zzzzzzzzzzzresult.append(i tem)

forLi fe([1, z2, z[3, z4, z[5]], z6, z[[7, 8]])
printzresult

```

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[Ö„]

```
#z-*-zcoding: zeuc-krz-*-
import unittest

defzadd_digi t(no):
    zzzreturnzsum(map(int,z'z'.join(str(no)).split()))

defzf(no):
    zzzreturnzadd_digi t(no)+no

referz=z{}
forzi inzrange(1,z5001): zrefer[i]z=zf(i)

defzgetgen(no):
    zzzresul tz=z[]
    zzzforznzinzrange(1,zno+1):
        zzzzzzz#i fzf(n)z==zno: zresul t.append(n)
```

```

zzzzzzzi fzrefer[n]z==zno: zresult. append(n)
zzzreturnzresult

defzsel fno(limi t):
zzzresult z=[]
zzzforzi zinrange(1, zlimi t+1):
zzzzzzzi fznotzgetgen(i): zresult. append(i)
zzzreturnzresult

classGeneratorTest(unittest.TestCase):
zzzdefztest1(sel f):
zzzzzzzsel f. assertEquals(2, zadd_digi t(200))
zzzzzzzsel f. assertEquals(10, zadd_digi t(91))
zzzzzzzsel f. assertEquals(101, zf(91))
zzzzzzzsel f. assertEquals(101, zf(100))
zzzzzzzsel f. assertEquals([1], zgetgen(2))
zzzzzzzsel f. assertEquals([91, z100], zgetgen(101))
zzzzzzzsel f. assertEquals([1, 3, 5, 7, 9], zsel fno(10))
zzzzzzzprintz"result: ", zsum(sel fno(5000))

if__name__z=="__main__":
zzzunittest.main()

```

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[03] PrimaryArithmetic

About PrimaryArithmetic

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Input

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output

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Sample Input

123 456

555 555

123 594

0 0.

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Sample Output

No carry operation.

3 carry operations.

1 carry operation..

z

[Ö,]

```
import unittest

class Number:
    def __init__(self, znum):
        self.num = list(str(num))
    def __getitem__(self, index):
        try:
            return self.num[index]
        except IndexError:
            return 0
    def __len__(self):
        return len(self.num)

class Adder:
    def __init__(self):
        self.carries = [0] * 10
    def add(self, zsrc, ztarget):
        for i in range(1, max(len(src), len(target)) + 1):
            if self.carries[-i] + self.carries[-i] >= 10:
                self.carries[-i - 1] = 1
    def carryCount(self):
        return self.carries.count(1)

class CarryTest(unittest.TestCase):
    def test1(self):
        adder = Adder()
        adder.add(Number(1), Number(1))
        self.assertEqual(0, adder.carryCount())
    def test2(self):
        adder = Adder()
        adder.add(Number(9), Number(1))
        self.assertEqual(1, adder.carryCount())
```

```

zzzdefztest3(self):
    zzzzzzzadderz=zAdder()
    zzzzzzzadder.add(Number(99),zNumber(1))
    zzzzzzzself.assertEqual(2,zadder.carryCount())
zzzdefztest4(self):
    zzzzzzzadderz=zAdder()
    zzzzzzzadder.add(Number(899),zNumber(1))
    zzzzzzzself.assertEqual(2,zadder.carryCount())
zzzdefztest5(self):
    zzzzzzzadderz=zAdder()
    zzzzzzzadder.add(Number(555),zNumber(555))
    zzzzzzzself.assertEqual(3,zadder.carryCount())
zzzdefztest6(self):
    zzzzzzzadderz=zAdder()
    zzzzzzzadder.add(Number(123),zNumber(594))
    zzzzzzzself.assertEqual(1,zadder.carryCount())

importzsys
sui tez=zunittest.TestSuite()
sui te.addTest(unittest.makeSuite(CarryTest))
unittest.TextTestRunner(verbosity=2,zstream=sys.stdout).run(sui te)

```

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[04] Spiral Array

Spiral Array

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```
6 6

z0 z 1 z 2 z 3 z 4 z 5
19 z20 z21 z22 z23 z 6
18 z31 z32 z33 z24 z 7
17 z30 z35 z34 z25 z 8
16 z29 z28 z27 z26 z 9
15 z14 z13 z12 z11 z10
```

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```
import unittest

"""
6z6

z0zzz1zzz2zzz3zzz4zzz5
19zz20zz21zz22zz23zzz6
18zz31zz32zz33zz24zzz7
17zz30zz35zz34zz25zzz8
16zz29zz28zz27zz26zzz9
15zz14zz13zz12zz11zz10

"""
```



```

class SpiralArray:
    zzzdef __init__(self, zrow, zcol):
        zzzzzzzself.maxcol = zcol - 1
        zzzzzzzself.maxrow = zrow - 1
        zzzzzzzself.factorsz = z{
            zzzzzzzzz"right": (0, 1),
            zzzzzzzzz"down": (1, 0),
            zzzzzzzzz"left": (0, -1),
            zzzzzzzzz"up": (-1, 0)
        }
        zzzzzzzself.init()
    zzzdef init(self):
        zzzzzzzself.curz = z0
        zzzzzzzself.curPointz = z0, 0
        zzzzzzzself.mapz = z{}
        zzzzzzzfor zr in range(self.maxrow + 1):
            zzzzzzzzzfor zc in range(self.maxcol + 1):
                zzzzzzzzzzzzzzzself.map[r, c] = z - 1
            zzzzzzzself.map[self.curPoint] = 0
            zzzzzzzself.setDirection("right")
        zzzdef setDirection(self, zdirection):
            zzzzzzzself.directionz = zdirection
        zzzdef getDirection(self):
            zzzzzzzreturn self.directionz
        zzzdef getCol(self):
            zzzzzzzreturn self.curPoint[1]
        zzzdef getRow(self):
            zzzzzzzreturn self.curPoint[0]
        zzzdef isDown(self, znextPoint):
            zzzzzzzreturn self.getDirection() == z"right"z\
            zzzzzzzzzandz(self.getCol() == self.maxcol or self.hasValue(nextPoint))
        zzzdef isLeft(self, znextPoint):
            zzzzzzzreturn self.getDirection() == z"down"z\
            zzzzzzzzzandz(self.getRow() == self.maxrow or self.hasValue(nextPoint))
        zzzdef isUp(self, znextPoint):
            zzzzzzzreturn self.getDirection() == z"left"z\
            zzzzzzzzzandz(self.getCol() == 0 or self.hasValue(nextPoint))
        zzzdef isRight(self, znextPoint):
            zzzzzzzreturn self.getDirection() == z"up"z\
            zzzzzzzzzandz(self.getRow() == 0 or self.hasValue(nextPoint))
        zzzdef changeDirection(self):
            zzzzzzznextPointz = self.nextPoint()
            zzzzzzzif self.isDown(nextPoint): self.setDirection("down")

```

```

zzzzzzzel i fzel f. i sLeft(nextPoi nt): zsel f. setDi recti on("left")
zzzzzzzel i fzel f. i sUp(nextPoi nt): zsel f. setDi recti on("up")
zzzzzzzel i fzel f. i sRight(nextPoi nt): zsel f. setDi recti on("right")
zzzdefznextPoi nt(sel f):
zzzzzzfactorz=zsel f. factors[sel f. di rectFactor]
zzzzzzreturnzsel f. getRow()+factor[0], zsel f. getCol ()+factor[1]
zzzdefzal l Poi nted(sel f):
zzzzzzreturnzsel f. map. val ues(). count(-1)z==z0
zzzdefzpoi nt(sel f):
zzzzzzzi fzel f. al l Poi nted(): rai sezRun ti meError()
zzzzzzzel f. changeDi recti on()
zzzzzzzel f. curPoi ntz=zsel f. nextPoi nt()
zzzzzzzel f. cur+=1
zzzzzzzel f. setVal ue(sel f. curPoi nt)
zzzdefzhasVal ue(sel f, zpoi nt):
zzzzzzreturnzsel f. getVal ue(poi nt)z!=z-1
zzzdefzsetVal ue(sel f, zpoi nt):
zzzzzzzel f. map[poi nt[0], zpoi nt[1]]z=zsel f. cur
zzzdefzgetVal ue(sel f, zpoi nt):
zzzzzzreturnzsel f. map[poi nt[0], zpoi nt[1]]
zzzdefzrun(sel f):
zzzzzzwhi lez1:
zzzzzzzzzztry: zsel f. poi nt()
zzzzzzzzzzexcept: zbreak
zzzdefz__str__(sel f):
zzzzzzresul tz=z[]
zzzzzzforzrowzi nrange(sel f. maxrow+1):
zzzzzzzzzzforzcol zi nrange(sel f. maxcol +1):
zzzzzzzzzzzzzzresul t. append("%4s"z%zsel f. map[row, col ])
zzzzzzzzzzzzresul t. append('\n')
zzzzzzreturnz' '. join(resul t)

```

```

classzSpi ral ArrayTest(uni ttest. TestCase):
zzzdefztestChangeDi rect(sel f):
zzzzzzzsa=zSpi ral Array(2, 2)
zzzzzzzel f. assertEqual s((0, 0), zsa. curPoi nt)
zzzzzzzsa. setDi recti on("right")
zzzzzzzsa. poi nt()
zzzzzzzel f. assertEqual s((0, 1), zsa. curPoi nt)
zzzzzzzsa. poi nt()
zzzzzzzel f. assertEqual s(1, zsa. getVal ue((0, 1)))
zzzzzzzel f. assertEqual s((1, 1), zsa. curPoi nt)
zzzzzzzsa. poi nt()

```

```

zzzzzzself.assertEqual((1,0),zsa.curPoint)
zzzzzztry:
zzzzzzzzzsa.point()
zzzzzzzzzself.fail("shouldnotreachhere")
zzzzzzexcept:
zzzzzzzzzpass
zzzzzzdefztest1(self):
zzzzzzsaz=SpiralArray(6,6)
zzzzzzsa.run()
zzzzzzprintzsa

importzsys
sui tez=zunittest.TestSuite()
suite.addTest(unittest.makeSuite(SpiralArrayTest))
unittest.TextTestRunner(verbosity=2,zstream=sys.stdout).run(suite)

```

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[05] Four Boxes

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zzzzzzzzzz-(n(AŠ B)+n(AŠ C)+n(AŠ D)+n(BŠ C)+n(BŠ D)+n(CŠ D))
zzzzzzzzzz+(n(AŠ BŠ C)+n(AŠ BŠ D)+n(AŠ CŠ D)+n(BŠ CŠ D))
zzzzzzzzzz-n(AŠ BŠ CŠ D)

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ö ``. combination®†¬ p © combSøú© `` ½©— O¬ ™óÖ``. (generatorÝ æ~ ®
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```
import unittest

class RectError(RuntimeError):
    zzzpass

class Rect:
    zzzdef __init__(self, lx, ly, rx, ry): zzzzzz
    zzzzzzself.lx=lx
    zzzzzzself.ly=ly
    zzzzzzself.rx=rx
    zzzzzzself.ry=ry

    zzzdef size(self):
    zzzzzzreturn abs(self.rx-self.lx)*abs(self.ry-self.ly)

    zzzdef intersect(self, zother):
    zzzzzztry:
    zzzzzzzzzlx, rx= self.get(self.lx, self.rx, zother.lx, zother.rx)
```

```

zzzzzzzzzzly, zryz=zsel f. get(sel f. ly, zsel f. ry, zother. ly, zother. ry)
zzzzzzzzzzreturnzRect(lx, ly, rx, ry)
zzzzzzzzzzexceptzRectError:
zzzzzzzzzzreturnzRect(0, 0, 0, 0)

```

```

zzzdefz__eq__(sel f, zother):
zzzzzzzzreturnzsel f. lx==zother. lx\
zzzzzzzzzzandzsel f. ly==zother. ly\
zzzzzzzzzzandzsel f. rx==zother. rx\
zzzzzzzzzzandzsel f. ry==zother. ry

```

```

zzzdefz__repr__(sel f):
zzzzzzzzreturnzstr((sel f. lx, sel f. ly))+str((sel f. rx, sel f. ry))

```

```

zzzdefzget(sel f, zsl eft, zsri ght, zol eft, zori ght):
zzzzzzzzfzol eftz<=zsl eftz<=zori ght:
zzzzzzzzzzfzsri ghtz<=zori ght: zreturnzsl eft, zsri ght
zzzzzzzzzzzel se: zreturnzsl eft, zori ght
zzzzzzzzzzli fzsl eftz<=zol eftz<=zsri ght:
zzzzzzzzzzfzori ghtz<=zsri ght: zreturnzol eft, zori ght
zzzzzzzzzzzel se: zreturnzol eft, zsri ght
zzzzzzzzzzzel se:
zzzzzzzzzzzrai sezRectError("i ntersecti ondoesznotzexist s!")

```

```

defzcomb(fromSet, choi ce):
zzzi fzchoi ce==0:
zzzzzzzzzyi el dz[]
zzzel se:
zzzzzzzzforzi , zpi votzi nzenumerate(fromSet):
zzzzzzzzzzforzeachzi nzcomb(fromSet[i +1: ], choi ce-1):
zzzzzzzzzzzzzzzyi el dz[pi vot]+each

```

```

defzi ntersectSum(*rect):
zzzresul tz=z0
zzzforzrectGroupzi nzrect:
zzzzzzzzforztargetRectzi nzrectGroup:
zzzzzzzzzzseedz=ztargetRect[0]
zzzzzzzzzzforztzi nztargRect[1: ]:
zzzzzzzzzzzzzzseedz=zseed. i ntersect(t)
zzzzzzzzzzzzresul tz+=zseed. si ze()
zzzreturnzresul t

```

```

defzcal c(*rect):

```

```

zzzresult z=0
zzzfor zi in xrange(len(rect)):
    zzzzzzzsignz=zi%2 and z-1 or z+1
    zzzzzzzresult z+=signz*zi*intersectSum(comb(rect, zi+1))
zzzreturn zresult

class SumOfRectTest(unittest.TestCase):
    zzzdef testTwoRectNoIntersect(self):
        zzzzzzzAz=zRect(0, 0, 1, 1)
        zzzzzzzBz=zRect(1, 1, 2, 2)
        zzzzzzzself.assertEqual(2, zA.size()+B.size())
        zzzzzzzself.assertEqual(0, zA.intersect(B).size())

    zzzdef testTwoRectIntersect(self):
        zzzzzzzAz=zRect(0, 0, 2, 2)
        zzzzzzzBz=zRect(1, 1, 3, 3)
        zzzzzzzself.assertEqual(8, zA.size()+B.size())
        zzzzzzzself.assertEqual(1, zA.intersect(B).size())

    zzzdef testIntersect1(self):
        zzzzzzzAz=zRect(0, 0, 2, 2)
        zzzzzzzBz=zRect(1, 1, 3, 3)
        zzzzzzzCz=zRect(1, 1, 2, 2)
        zzzzzzzself.assertEqual(C, zA.intersect(B))
        zzzzzzzself.assertEqual(C, zB.intersect(A))
        zzzzzzzself.assertEqual(C, zA.intersect(C))
        zzzzzzzself.assertEqual(C, zC.intersect(B))
        zzzzzzzself.assertEqual(C, zC.intersect(A))
        zzzzzzzself.assertEqual(C, zB.intersect(C))

    zzzdef testThreeRect1(self):
        zzzzzzzAz=zRect(-1, -1, 1, 1)
        zzzzzzzBz=zRect(0, 0, 2, 2)
        zzzzzzzCz=zRect(1, 1, 3, 3)
        zzzzzzzself.assertEqual(4+4+4, zA.size()+B.size()+C.size())
        zzzzzzzself.assertEqual(1, zA.intersect(B).size())
        zzzzzzzself.assertEqual(1, zB.intersect(C).size())
        zzzzzzzself.assertEqual(0, zA.intersect(C).size())
        zzzzzzzself.assertEqual(0, zA.intersect(B).intersect(C).size())

    zzzdef testThreeRect2(self):
        zzzzzzzAz=zRect(0, 0, 2, 2)
        zzzzzzzBz=zRect(1, 1, 3, 3)

```

```

zzzzzzzCz=zRect(0, 1, 2, 3)
zzzzzzzself.assertEqual(1, zA.intersection(B).intersection(C).size())

zzzdefztestFourRect1(self):
zzzzzzzAz=zRect(0, 0, 2, 2)
zzzzzzzBz=zRect(1, 1, 3, 3)
zzzzzzzCz=zRect(1, 0, 3, 2)
zzzzzzzDz=zRect(-1, 0, 1, 3)
zzzzzzzself.assertEqual(0, zA.intersection(B).intersection(C).intersection(D).size())
zzzzzzzself.assertEqual(1, zA.intersection(B).size())
zzzzzzzself.assertEqual(2, zA.intersection(C).size())
zzzzzzzself.assertEqual(2, zA.intersection(D).size())
zzzzzzzself.assertEqual(2, zB.intersection(C).size())
zzzzzzzself.assertEqual(0, zB.intersection(D).size())
zzzzzzzself.assertEqual(0, zC.intersection(D).size())
zzzzzzzself.assertEqual(1, zA.intersection(B).intersection(C).size())
zzzzzzzself.assertEqual(4+4+4+6, zA.size()+B.size()+C.size()+D.size())
zzzzzzzself.assertEqual(12, zA.size()+B.size()+C.size()+D.size()-(1+2+2+0+0)+1)

zzzdefztestFourRect2(self):
zzzzzzzAz=zRect(0, 0, 2, 2)
zzzzzzzBz=zRect(0, -1, 2, 1)
zzzzzzzCz=zRect(-1, -1, 1, 1)
zzzzzzzDz=zRect(-1, 0, 1, 2)
zzzzzzzself.assertEqual(2, zA.intersection(B).size())
zzzzzzzself.assertEqual(1, zA.intersection(C).size())
zzzzzzzself.assertEqual(2, zA.intersection(D).size())
zzzzzzzself.assertEqual(2, zB.intersection(C).size())
zzzzzzzself.assertEqual(1, zB.intersection(D).size())
zzzzzzzself.assertEqual(2, zC.intersection(D).size())
zzzzzzzself.assertEqual(1, zA.intersection(B).intersection(C).size())
zzzzzzzself.assertEqual(1, zA.intersection(B).intersection(D).size())
zzzzzzzself.assertEqual(1, zA.intersection(C).intersection(D).size())
zzzzzzzself.assertEqual(1, zB.intersection(C).intersection(D).size())
zzzzzzzself.assertEqual(1, zA.intersection(B).intersection(C).intersection(D).size())
zzzzzzzself.assertEqual(4+4+4+4, zA.size()+B.size()+C.size()+D.size())
zzzzzzzself.assertEqual(9, 4+4+4+4-(2+1+2+2+1+2)+(1+1+1+1)-1)
zzzzzzzself.assertEqual(9, zcalc(A, B, C, D))

zzzdefztest1(self):
zzzzzzzAz=zRect(0, 0, 2, 1)
zzzzzzzBz=zRect(0, 0, 1, 2)
zzzzzzzCz=zRect(-1, -1, 1, 1)
zzzzzzzDz=zRect(-2, 0, -1, 3)

```



```
zzzzzzzself.assertEqual(9, zcalc(A, B, C, D))
```

```
zzzdefztest2(self):
zzzzzzzAz=zRect(0,0,2,2)
zzzzzzzBz=zRect(1,1,3,3)
zzzzzzzCz=zRect(2,2,4,4)
zzzzzzzDz=zRect(3,3,5,5)
zzzzzzzself.assertEqual(13, zcalc(A, B, C, D))
```

```
zzzdefztest3(self):
zzzzzzzAz=zRect(1,2,4,4)
zzzzzzzBz=zRect(2,3,5,7)
zzzzzzzCz=zRect(3,1,6,5)
zzzzzzzDz=zRect(7,3,8,6)
zzzzzzzEz=zRect(1,2,4,4)
zzzzzzzself.assertEqual(26, zcalc(A, B, C, D, E))
```

```
importzsys
sui tez=zunittest.TestCase()
sui te.addTest(unittest.makeSuite(SumOfRectTest))
unittest.TextRunner(verbose=2, stdout=sys.stdout).run(sui te)
```

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```
classzRectBox:
zzzdefz__init__(self):
zzzzzzzself.boxz=z{}
zzzdefzadd(self, zx1, zy1, zx2, zy2):
zzzzzzzforzxin xrange(x1, zx2):
```

```
zzzzzzzzzzforzyzi nzrange(y1, zy2):  
zzzzzzzzzzzzzzzzsel f. box[(x, y)]z=z1  
zzzdefzarea(sel f):  
zzzzzzzzreturnzl en(sel f. box)
```

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[06] Slurpy

Slurpy

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< z'A' + " V¥ + 'C'.
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Slumps : DFG, EFG, DFFFFFFG, DFDFDFDG, DFEFFFFFFG
Not Slumps: DFEFF, EFAHG, DEFG, DG, EFFFFDG
Slimps: AH, ABAHC, ABABAHCC, ADFGC, ADFFFFGC, ABAEFGCC, ADFDFGC
Not Slimps: ABC, ABAH, DFGC, ABABAH, SLIMP, ADGC
Slurpys: AHDFG, ADFGCDFFFFFFG, ABAEFGCCDEFFFFFFG
Not Slurpys: AHDFGA, DFGAH, ABABCC

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" 3i £ • ® "YES" © "NO"> Ü×° ~ .zz€• , î > "END OF OUTPUT"®
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z

Sample Input

2

AHDFG

DFGAH

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Sample Output

SLURPYS OUTPUT
YES
NO
END OF OUTPUT

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[Ö„]

#z-* -zcoding: zeuc-krz-* -

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```

*zsl urpyz(sl i mpzandzsl ump)

*zsl umpz-z(Dzor zE)zandzF+zandz(sl umpzor zG)
*zsl i mpz-zAzandz(Hzor z((Bzandzsl i mpzandzC)zor z(sl umpzandzC))

**zfi ndzsl urpy!

[example]
Sl umpsz: zDFG, zEFG, zDFFFFFFG, zDFDFDFDFG, zDFFFFFFFG
NotzSl umpsz: zDFFFF, zEFAHG, zDEFG, zDG, zEFFFFDG
Sl i mps: zAH, zABAH, zABABAHCC, zADFGC, zADFFFFFFGC, zABAEFGCC, zADDFGCG
NotzSl i mps: zABC, zABAH, zDFGC, zABABAH, zSLIMP, zADGC
Sl urpys: zAHDFG, zADFGCDFFFFFFG, zABAEFGCCDFFFFFFFG
NotzSl urpys: zAHDFGA, zDFGAH, zABABCC
'''

import unittest

classzUnitPattern:
    zzzdefz__init__(self, z*args):
        zzzzzzzself. argsz=zargs
        zzzzzzzself._remain z=z''

    zzzdefzmatch(self, ztarget):
        zzzzzzzraisezNotImplementedError

    zzzdefzremain(self):
        zzzzzzzreturnzself._remain

classzWord(UnitPattern):
    zzzdefzmatch(self, ztarget):
        zzzzzzzifznotztarget: zreturnzFalse
        zzzzzzzself._remain z=target[1:]
        zzzzzzzreturnzself. args[0][0]z=target[0]

classzAnd(UnitPattern):
    zzzdefzmatch(self, ztarget):
        zzzzzzzforzargzi nzself. args:
            zzzzzzzzzzzifznotzarg. match(target):
                zzzzzzzzzzzzzreturnzFalse

```

```

zzzzzzzzzztargetz=zarg. remain()
zzzzzzzzself._remainz=ztarget
zzzzzzzzreturnzTrue

classz0r(Uni tPattern):
zzzdefzmatch(self, ztarget):
zzzzzzzzforzargzinzself. args:
zzzzzzzzzzzifzarg. match(target):
zzzzzzzzzzzzzzzzself._remainz=zarg. remain()
zzzzzzzzzzzzzzzzreturnzTrue
zzzzzzzzreturnzFalse

classzMore(Uni tPattern):
zzzdefzmatch(self, ztarget):
zzzzzzzzifznotztarget: zreturnzFalse
zzzzzzzzmorewordz=zself. args[0][0]
zzzzzzzzforzcount, ztzinzenumerate(target):
zzzzzzzzzzzifztz!=zmoreword:
zzzzzzzzzzzzzzzzifzcountz==z0z: zreturnzFalse
zzzzzzzzzzzzzzzzbreak
zzzzzzzzself._remainz=ztarget[count:]
zzzzzzzzreturnzTrue

classzMul ti Pattern:
zzzdefzmatch(self, ztarget):
zzzzzzzzreturnzself. pat. match(target)

zzzdefzremain(self):
zzzzzzzzreturnzself. pat. remain()

classzSl ump(Mul ti Pattern):
zzz''' zsl umpz-z(Dzor zE)zandzF+zandz(sl umpzor zG)z'''

zzzdefz__ini t__(self):
zzzzzzzzself. patz=zAnd(
zzzzzzzzzzzzzzzzz0r(Word(' D' ), zWord(' E' )),
zzzzzzzzzzzzzzzzzMore(' F' ),
zzzzzzzzzzzzzzzzz0r(self, zWord(' G' ))
zzzzzzzzzzzz)

```

```
classSimp(MultiPattern):
    zzz'''zsimpz-zAzandz(Hzorz((BzandzsimpzandzC)zorz(simpzandzC))z'''
```

[illegible]

```
class Szurpy(MultiPattern):
    zzz'''zsurpyz(slimpzandzslump)z'''
```

```
zzzdefz__init__(self):
zzzzzzzzself.patz=zAnd(SImp(), zSIump())
```

```
defzi sSI urpy(target):
    zzzpatz=zSI urpy()
    zzzresul tz=zipat. match(target)
    zzzzi fzpat. remain(): zreturnzFal se
    zzzreturnzresul t
```

###ztestzcodezzz#####

```
classSlurpyTest(unittest.TestCase):
    zzzdefztestWord(self):
        zzzzzzzword=zWord('D')
        zzzzzzzself.assertEqual(True, zword.match('DEF'))
        zzzzzzzself.assertEqual('EF', zword.remaining())

    zzzdefztestAnd(self):
        zzzzzzzDz=zWord('D')
```

```

zzzzzzzEz=zWord('E')
zzzzzzzandDEz=zAnd(D,E)
zzzzzzzsel f. assertEquals(True,zandDE.match('DE'))

zzzdefztestMore(sel f):
zzzzzzzsel f. assertEquals(True,zMore('F').match('FFFF'))
zzzzzzzsel f. assertEquals(True,zAnd(Word('D'),zMore('F')).match('DFFF'))
zzzzzzzmorez=zMore('F')
zzzzzzzmore.match('FGHG')
zzzzzzzsel f. assertEquals('GHG',zmore.remain())

zzzdefztestOr(sel f):
zzzzzzzsel f. assertEquals(True,zOr(Word('F'),zWord('E')).match('F'))
zzzzzzzsel f. assertEquals(True,zOr(Word('F'),zWord('E')).match('E'))
zzzzzzzsel f. assertEquals(True,
zzzzzzzzzzAnd(More('K'),zOr(Word('F'),zWord('E'))).match('KKKKE'))

zzzdefztestSlump(sel f):
zzzzzzz#Slumpsz: zDFG, zEFG, zDFFFFG, zDFDFDFDG, zDEFFFFFG
zzzzzzzsel f. assertEquals(True,zSlump().match('DFG'))
zzzzzzzsel f. assertEquals(True,zSlump().match('EFG'))
zzzzzzzsel f. assertEquals(True,zSlump().match('DFFFFG'))
zzzzzzzsel f. assertEquals(True,zSlump().match('DFDFDFDG'))
zzzzzzzsel f. assertEquals(True,zSlump().match('DEFFFFFG'))
zzzzzzz#NotzSlumpsz: zDEFF, zEFAHG, zDEFG, zDG, zEFFFDG
zzzzzzzsel f. assertEquals(False,zSlump().match('DEFF'))
zzzzzzzsel f. assertEquals(False,zSlump().match('EFAHG'))
zzzzzzzsel f. assertEquals(False,zSlump().match('DEFG'))
zzzzzzzsel f. assertEquals(False,zSlump().match('DG'))
zzzzzzzsel f. assertEquals(False,zSlump().match('EFFFDG'))

zzzdefztestSlimp(sel f):
zzzzzzz#Slimps: zAH, zABAH, zABABAHCC, zADFGC, zADFFFFGC, zABAEFGCC, zADFDFGC
zzzzzzzsel f. assertEquals(True,zSlimp().match('AH'))
zzzzzzzsel f. assertEquals(True,zSlimp().match('ABAH'))
zzzzzzzsel f. assertEquals(True,zSlimp().match('ABABAHCC'))
zzzzzzzsel f. assertEquals(True,zSlimp().match('ADFGC'))
zzzzzzzsel f. assertEquals(True,zSlimp().match('ADFFFFGC'))
zzzzzzzsel f. assertEquals(True,zSlimp().match('ABAEFGCC'))
zzzzzzzsel f. assertEquals(True,zSlimp().match('ADFDFGC'))
zzzzzzz#NotzSlimps: zABC, zABAH, zDFGC, zABABAH, zSLIMP, zADGC
zzzzzzzsel f. assertEquals(False,zSlimp().match('ABC'))
zzzzzzzsel f. assertEquals(False,zSlimp().match('ABAH'))
zzzzzzzsel f. assertEquals(False,zSlimp().match('DFGC'))

```



```

zzzzzzzf.assertEquals(False, zSImp().match('ABABAHC'))
zzzzzzzf.assertEquals(False, zSImp().match('SLIMP'))
zzzzzzzf.assertEquals(False, zSImp().match('ADGC'))

zzzdefztestSIurpy(sel f):
zzzzzz#SIurpys: zAHDFG, zADFGCDFFFFFG, zABAEFGCCDFEFFFFFG
zzzzzzzf.assertEquals(True, zi sSIurpy('AHDFG'))
zzzzzzzf.assertEquals(True, zi sSIurpy('ADFGCDFFFFFG'))
zzzzzzzf.assertEquals(True, zi sSIurpy('ABAEFGCCDFEFFFFFG'))
zzzzzz#NotzSIurpys: zAHDFGA, zDFGAH, zABABCC
zzzzzzzf.assertEquals(False, zi sSIurpy('AHDFGA'))
zzzzzzzf.assertEquals(False, zi sSIurpy('DFGAH'))
zzzzzzzf.assertEquals(False, zi sSIurpy('ABABCC'))

importzsys
sui tez=zunittest.TestSuite()
sui te.addTest(unittest.makeSuite(SIurpyTest))
unittest.TextTestRunner(verbosity=2, zstream=sys.stdout).run(sui te)

```

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```
countz=z0
```

```
zzzdefz__init__(self, zrow, zcol):
```

```
zzzzzzzzsel f.col z=zcol
```

```

zzzzzzzsel f. mapz=z{}
zzzzzzzforzrzi nrange(sel f. row):
zzzzzzzzzzforzczi nrange(sel f. col):
zzzzzzzzzzzzzzzzsel f. map[r,c]z=z' 0'
zzzdefzi sQueenAvai l a b l e(sel f, zpoi nt):
zzzzzzzi fzsel f. i sQueenExi stAtLi ne(poi nt): zreturnzFal se
zzzzzzzi fzsel f. i sQueenExi stAtDi agonal (poi nt): zreturnzFal se
zzzzzzzzreturnzTrue
zzzdefzsetQueen(sel f, zpoi nt):
zzzzzzzsel f. map[poi nt]z=z' X'
zzzdefzi sExi stQueen(sel f, zpoi nt):
zzzzzzzzreturnzsel f. map[poi nt]z==z' X'
zzzdefzi sQueenExi stAtLi ne(sel f, zpoi nt):
zzzzzzzzforzczi nrange(sel f. col):
zzzzzzzzzzzi fzsel f. i sExi stQueen((poi nt[0], c)): zreturnzTrue
zzzzzzzzforzrzi nrange(sel f. row):
zzzzzzzzzzzi fzsel f. i sExi stQueen((r, zpoi nt[1])): zreturnzTrue
zzzzzzzzreturnzFal se
zzzdefzi sQueenExi stAtDi agonal (sel f, zpoi nt):
zzzzzzzi fzsel f. i sQueenExi stAtDi agonal LeftUp(poi nt): zreturnzTrue
zzzzzzzi fzsel f. i sQueenExi stAtDi agonal Ri ghtUp(poi nt): zreturnzTrue
zzzzzzzzreturnzFal se
zzzdefzgetStartForDi agonal SearchLeftUp(sel f, z(row, col)):
zzzzzzzzwhi l e z1:
zzzzzzzzzzzi fzrow==0orzcol ==0: zbreak
zzzzzzzzzzzzrowz=zrow-1
zzzzzzzzzzzzcol z=zcol -1
zzzzzzzzreturnzrow, zcol
zzzdefzgetStartForDi agonal SearchRi ghtUp(sel f, z(row, col)):
zzzzzzzzwhi l e z1:
zzzzzzzzzzzi fzrow==0orzcol ==sel f. col -1: zbreak
zzzzzzzzzzzzrowz=zrow-1
zzzzzzzzzzzzcol z=zcol +1
zzzzzzzzreturnzrow, zcol
zzzdefzi sQueenExi stAtDi agonal LeftUp(sel f, zpoi nt):
zzzzzzzzstartRow, zstartCol z=zsel f. getStartForDi agonal SearchLeftUp(poi nt)
zzzzzzzzforzi zi nrange(8):
zzzzzzzzzzzzrz=zstartRow+i
zzzzzzzzzzzzcz=zstartCol +i
zzzzzzzzzzzi fzrz==zsel f. row: zbreak
zzzzzzzzzzzi fcz>=zsel f. col : zbreak
zzzzzzzzzzzi fzsel f. i sExi stQueen((r, c)): zreturnzTrue
zzzzzzzzreturnzFal se
zzzdefzi sQueenExi stAtDi agonal Ri ghtUp(sel f, zpoi nt):

```



```

zzzdefzassertCantSet(sel f, zbd, zpoint):
zzzzzzzsel f. failIf(bd. isQueenAvai lable(point))
zzzdefzassertSet(sel f, zbd, zpoint):
zzzzzzzsel f. failUnless(bd. isQueenAvai lable(point))
zzzdefztestLineSet(sel f):
zzzzzzzbdz=zBoard(8,8)
zzzzzzzbd. setQueen((0,0))
zzzzzzzsel f. assertCantSet(bd, z(0,1))
zzzzzzzsel f. assertCantSet(bd, z(1,0))
zzzdefztestDiagonalSetLeftUp(sel f):
zzzzzzzbdz=zBoard(8,8)
zzzzzzzbd. setQueen((4,4))
zzzzzzzsel f. assertCantSet(bd, z(1,1))
zzzzzzzsel f. assertCantSet(bd, z(7,7))
zzzzzzzsel f. assertCantSet(bd, z(3,5))
zzzzzzzsel f. assertCantSet(bd, z(5,3))
zzzdefztestDiagonalSetRightUp(sel f):
zzzzzzzbdz=zBoard(8,8)
zzzzzzzbd. setQueen((2,3))
zzzzzzzsel f. assertCantSet(bd, z(0,1))
zzzzzzzsel f. assertCantSet(bd, z(5,6))
zzzzzzzsel f. assertCantSet(bd, z(0,5))
zzzzzzzsel f. assertCantSet(bd, z(5,0))
zzzdefztestNormalSet(sel f):
zzzzzzzbdz=zBoard(8,8)
zzzzzzzsel f. assertSet(bd, z(0,0))
zzzzzzzsel f. assertSet(bd, z(1,2))
zzzzzzzsel f. assertSet(bd, z(2,6))
zzzdefztestRun(sel f):
zzzzzzzbdz=zBoard(8,8)
zzzzzzzbd. run()

importzsys
sui tez=zunittest. TestSuite()
sui te. addTest(unittest. makeSuite(EightQueenTest))
unittest. TextTestRunner(verbosity=2, zstream=sys. stdout). run(sui te)

```

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z

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Sample Output

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175 180

138 139

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150 250

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387
143
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```
import unittest

class Team:
    zzzdef __init__(self, weights):
        zzzzzzzself.weights = weights
    zzzdef sumOfWeight(self):
        zzzzzzzreturn sum(self.weights)
    zzzdef pull(self, index):
        zzzzzzzreturn self.weights.pop(index)
    zzzdef push(self, weight):
        zzzzzzzself.weights.append(weight)
    zzzdef __str__(self):
        zzzzzzzreturn "Sum: [%d]z==>z%s"z%(self.sumOfWeight(), zstr(self.weights))
```

```

class Judge:
    def __init__(self, blue, red):
        self.blue = blue
        self.red = red
        self.blueIndex = 0
        self.redIndex = 0
        self.blueWeight = self.blue.pull(blueIndex)
        self.redWeight = self.red.pull(redIndex)
        self.blue.push(self.redWeight)
        self.red.push(self.blueWeight)
        self.forBestBalance(self):
            self.currentGap = abs(self.blue.sumOfWeight() - self.red.sumOfWeight())
            self.minGap = 450 * len(self.blue.weights)
            self.found = False
            self.blueSum = self.blue.sumOfWeight()
            self.redSum = self.red.sumOfWeight()
            self.forBlueIndex, self.blueWeight = self.enumerate(self.blue.weights)
            self.forRedIndex, self.redWeight = self.enumerate(self.red.weights)
            self.gap = self.blueWeight - self.redWeight
            self.nextGap = abs((self.blueSum - gap) - (self.redSum + gap))
            self.fzNextGap < self.currentGap and self.nextGap < self.minGap:
                self.minGap = self.nextGap
                self.found = True
                self.foundBlueIndex = self.blueIndex
                self.foundRedIndex = self.redIndex
            self.fzFound = self.returnFoundBlueIndex, self.foundRedIndex
        def makeBalancedTeam(self):
            self.count = 0
            self.whileTrue:
                self.foundIndex = self.forBestBalance()
                self.fzFoundIndex:
                    self.blueIndex, self.redIndex = self.foundIndex
                    self.changeWeight(self.blueIndex, self.redIndex)
                    self.count += 1
                self.printz("count: %d, gap: %d" % (self.count,
                    self.gap))
                self.gap = abs(self.blue.sumOfWeight() - self.red.sumOfWeight())
            self:
                break

def tugOfWar(data):
    all = zip(*data.split())
    half = len(all) / 2
    blue, red = Team(all[:half]), Team(all[half:])
    judge = Judge(blue, red).makeBalancedTeam()
    result = []

```

```

zzzresult.append('*'*z*z78)
zzzresult.append(str(all))
zzzresult.append('-'*z*z78)
zzzresult.append(str(blue))
zzzresult.append(str(red))
zzzresult.append('*'*z*z78)
zzzprint
zzzprintz'\n'.join(result)

import random
class TugWarTest(unittest.TestCase):
    zzzdef ztestTeam(self):
        zzzzzzzAz=zTeam([1,2,3])
        zzzzzzzself.assertEqual(6,zA.sumOfWeight())
        zzzzzzzself.assertEqual(1,zA.pull(0))
        zzzzzzzself.assertEqual(5,zA.sumOfWeight())
    zzzdef ztestJudge(self):
        zzzzzzzAz=zTeam([1,2,3])
        zzzzzzzBz=zTeam([4,5,6])
        zzzzzzzjudge=zJudge(A,B)
        zzzzzzzjudge.changeWeight(1,0)
        zzzzzzzself.assertEqual([1,3,4],zA.weights)
        zzzzzzzself.assertEqual([5,6,2],zB.weights)
    zzzdef ztestJudgeforBestBalance(self):
        zzzzzzzblue=zTeam([1,2,3])
        zzzzzzzred=zTeam([4,5,6])
        zzzzzzzjudge=zJudge(blue,red)
        zzzzzzzself.assertEqual((0,1),judge.forBestBalance())
        zzzzzzzjudge.changeWeight(0,1)
        zzzzzzzself.assertEqual(10,zblue.sumOfWeight())
        zzzzzzzself.assertEqual(11,zred.sumOfWeight())
    zzzdef ztestJudgeUntilBalance(self):
        zzzzzzzblue=zTeam([1,2,3])
        zzzzzzzred=zTeam([4,5,6])
        zzzzzzzjudge=zJudge(blue,red)
        zzzzzzzjudge.makeBalancedTeam()
        zzzzzzzself.assertEqual([2,3,5],zblue.weights)
        zzzzzzzself.assertEqual([4,6,1],zred.weights)
    zzzdef zgetRandomData(self,zn):
        zzzzzzzreturnz'z'.join([str(random.randint(1,z450))zfor zi in xrange(n)])
    zzzdef ztestTugOfWar(self):
        zzzzzzztugOfWar("1z2z3z4z5z6")
        zzzzzzztugOfWar("100z90z200z")
        zzzzzzztugOfWar("45z55z70z60z50z75z")

```

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zzzzzzztugOfWar("92z56z47z82z")
zzzzzzztugOfWar("2z3z4z7z8")
zzzzzzztugOfWar("50z50z100z200")
zzzzzzztugOfWar(self.getRandomData(100))
zzzzzzztugOfWar(self.getRandomData(500))
zzzzzzztugOfWar(self.getRandomData(1000))

import sys
suite = unittest.TestSuite()
suite.addTest(unittest.makeSuite(TugWarTest))
unittest.TextTestRunner(verbosity=2, stream=sys.stdout).run(suite)

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[09] LCD Display

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[Ö,,]

```
import unittest

classNumber:
    zzz@staticmethod
```



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zzzdefzget(num):
zzzzzzzinfof=z{
zzzzzzzzzz0: [' U', ' D', ' LU', ' LD', ' RU', ' RD' ],
zzzzzzzzzz1: [' RU', ' RD' ],
zzzzzzzzzz2: [' U', ' C', ' D', ' LD', ' RU' ],
zzzzzzzzzz3: [' U', ' C', ' D', ' RU', ' RD' ],
zzzzzzzzzz4: [' C', ' LU', ' RU', ' RD' ],
zzzzzzzzzz5: [' U', ' C', ' D', ' LU', ' RD' ],
zzzzzzzzzz6: [' U', ' C', ' D', ' LU', ' LD', ' RD' ],
zzzzzzzzzz7: [' U', ' RU', ' RD' ],
zzzzzzzzzz8: [' U', ' C', ' D', ' LU', ' LD', ' RU', ' RD' ],
zzzzzzzzzz9: [' U', ' C', ' D', ' LU', ' RU', ' RD' ]
zzzzzzz}
zzzzzzzreturnzNumber(info[num])
zzzdefz__init__(self,info):
zzzzzzself.infof=zinfo
zzzdefzhasValue(self,value):
zzzzzzzreturnzself.info.count(value)

classzLcd:
zzzdefz__init__(self):
zzzzzzself.numbersz=z[]
zzzzzzself.resultz=z[]
zzzdefzadd(self,znumber):
zzzzzzself.numbers.append(number)
zzzdefzinit(self,z*numbers):
zzzzzzforznumberzinznumbers:
zzzzzzzzzzself.add(Number.get(number))
zzzdefzmakeHori zon(self,zzoom,zC):
zzzzzzforznumberzinzself.numbers:
zzzzzzzzzzself.result.append(' z')
zzzzzzzzzzzifznumber.hasValue(C): zself.result.append(' -' z*zzoom)
zzzzzzzzzzzel se: zself.result.append(' z' z*zzoom)
zzzzzzzzzzzzself.result.append(' z' z*z2)
zzzzzzself.result.append('\n')
zzzdefzmakeVerti cal (self,zzoom,zL,zR):
zzzzzzforzizi nzrange(zoom):
zzzzzzzzzzforznumberzinzself.numbers:
zzzzzzzzzzzzzzzzzifznumber.hasValue(L): zself.result.append(' |')
zzzzzzzzzzzzzzzel se: zself.result.append(' z')
zzzzzzzzzzzzzzzzself.result.append(' z' *zoom)
zzzzzzzzzzzzzzzzzifznumber.hasValue(R): zself.result.append(' | z')
zzzzzzzzzzzzzzzel se: zself.result.append(' zz')
zzzzzzzzzzself.result.append('\n')

```

```

zzzdefzmake(sel f, zzoom):
zzzzzzzsel f. makeHori zon(zoom, z' U' )
zzzzzzzsel f. makeVerti cal (zoom, z' LU' , z' RU' )
zzzzzzzsel f. makeHori zon(zoom, z' C' )
zzzzzzzsel f. makeVerti cal (zoom, z' LD' , z' RD' )
zzzzzzzsel f. makeHori zon(zoom, z' D' )
zzzdefzgetResult(sel f):
zzzzzzzreturnz' '. join(sel f. resul t)[: -1]

classzLcdTest(uni ttest. TestCase):
zzzdefztestNormal (sel f):
zzzzzzzl cdz=zLcd()
zzzzzzzl cd. add(Number. get(8))
zzzzzzzl cd. make(1)
zzzzzzzexpectz=z""""
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zzzzzzzsel f. assertEquals(expect[1: -1], zl cd. getResult())
zzzdefztestZoom(sel f):
zzzzzzzl cdz=zLcd()
zzzzzzzl cd. add(Number. get(8))
zzzzzzzl cd. make(2)
zzzzzzzexpectz=z""""
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""""

zzzzzzzsel f. assertEquals(expect[1: -1], zl cd. getResult())
zzzdefztestAl lNumberWi thZoom(sel f):
zzzzzzzl cdz=zLcd()
zzzzzzzl cd. i ni t(1, 2, 3, 4, 5, 6, 7, 8, 9)
zzzzzzzl cd. make(2)
zzzzzzzprint
zzzzzzzprintzl cd. getResult()

```

```
import sys
suite = unittest.TestSuite()
suite.addTest(unittest.makeSuite(LcdTest))
unittest.TextTestRunner(verbosity=2, stream=sys.stdout).run(suite)
```

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Curses Programming with Python

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Socket Programming HOWTO

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Sorting Mini-HOWTO

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XML HOWTO

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Why Python? Eric. S. Raymond

<http://www2.linuxjournal.com/lj-issues/issue73/3882.html>

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Learning to Program - by Alan Gauld

<http://www.crosswinds.net/~agauld/>

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Non-Programmers Tutorial - Josh Cogliati

<http://www.honors.montana.edu/~jjc/easytut/easytut/>

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Instant Python - by Magnus Lie Hetland

<http://www.hetland.org/python/instant-python.php>

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Python for experienced programmers - Mark Pilgrim

<http://diveintopython.org/toc.html>

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How to think like a computer scientist Python Version by Allen B.Downey and Jeffrey Elkner

<http://www.ibiblio.org/obp/thinkCSpy/>

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www.python.org

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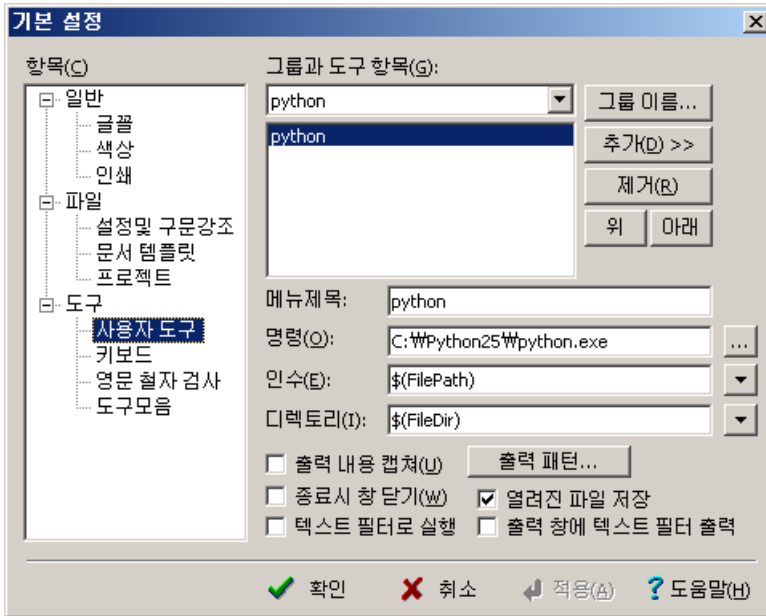
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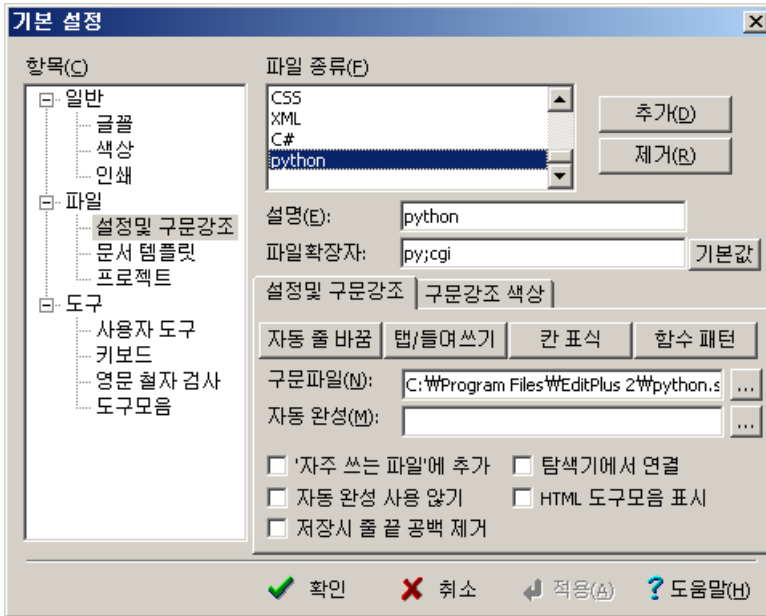
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 Guido van Rossumf . (• ¬ Ē)

z

PythonÁ ° ù Java, JavaScript, Perl, Tcl © SamIItalkŸ ¢Á E¤¥| ¢ Š Ĩ Ÿ ” .
 C++, Common Lisp ±| ¼ Scheme ¢Á ò Ū” ” . • ĩ • 1 * • Š Ĩ ® QRù 1
 O•” . • © Š Ĩ ž E ø• 1 Ÿ ” °” . ò6žĪ > , ¥> ±K_ Š Ĩ — „ Á ” ò#'

6d(ó, āóĖ, í î ±|¼ „ %• ó ZÁ öĖĹ Ė #öP•™). —ž • \ \$ ö×™
° °. • 3° ø Á Ĩ \ ŃAĹ • ¼, • 3° øĀ > ® ° ° © OÁ †Q | • Ń\$°.

z

Java (» 1)

...šĹĪ > Python ¥> ±² Á Java ¥> ±² ÷ ° © ā | { f ° °. • Ÿ Python ¥> ±² Á
© †Q• ŠĹ Ĺ { ~- ° °. Python ¥> ±² Á Java ¥> ±² ÷ ° °™ 3-5• „™ μúŃ ° ° °.
• &• © Python— èN ¼f‡ ö• ¢ 5 ĖĹ Ė 5. „ xž•¹ xĖ° ° ¼ „ ° °. ö®
ø, Python ¥> ±K* © ĖfĖ Af— 5- „ \$ ©ö †Q- ¼ • è¼, þ Ĺ Ė • > •
\$ ĩ • • èNö ĩ Ø© Python— ~D° ° ° 5´ — | ° 9(polymorphic list)Ÿ ½¾ 5Á ?— B+
Python ¥> ±² •¹ āó { Fóö¼ Ø°. ö †Q 5. „ Ī > Ėž¹ Python— ö †Q•
JavaŃ © O÷ ° ° > éÁ ...- ° °. ö® ø, a+bŸ ĤÁ² - ' Ĥ¹ , ! f ^ž...†•
èá• • éÁ aŸ b ½ ® ½ ä ± — 5- èĭ èÖ ° °. ±|¼ Ė¹ Ĺ ĩ ° —Á æĤ-
« C° °. ± —Á æĤÁ ½ • °ª ½ó• • —ž %^> ú (overloaded) O... f Ø°. šø• ,
Java© • Ĺ Ė „ f 5, öf 5 —Á - ° °. • Ÿ aŸ b— Af „ \$ - þ ¼, +æĤ• • Ā°
½ó• „ —æĤ• %^> <- ¼ó • è©°.

• 3° • ā > , PythonÁ ' Ī ' \$ ĩ >¹ Ĩ \ Ĺ ĩ ° šø, Java© f f‡ þā \$ ĩ > /ĖĀ
• - f Ø°. ½ö • Ā \$ ĩ © Ĩ \ ° ® †- ° °. Java•¹ ¹ (components) •
Python•¹ Fó ° °; Python † Java> þāöx ¾• ± ¥> X; B- „ ©ö Fó ° °. 3°
5— - > • x ° ž, Java> GäĤ Python þā (implementation)• r ° °. OÁ
Java•¹ Python- « C ¼ ± šĀ™ Ńž { ž ‡ ° °. • þāĪ > , Python¹ " μú© Java
T• 9μú > (Python— ĖĹ —¶® > • x ° ° ö †Qª • M3 | —™ŸĪ >)\$ ° °.

z

Javascript (» 1 ĩ — ĩ)

Python— '½ xš' ŪŪ • †• Ā° JavaScriptŸ Ė... ° °. JavaScriptŸ Ĥ• (±3Ė JavaŸ ©
° ° {), PythonÁ J K" • • „ — • èĭ™ ö©, RØ° ĖfŸ Af® ½ó © ¥> ±K_
" ; ...- > ° °. • Ÿ JavaScript© • O • > © ¾Ū ° °. PythonÁ, šø• , ŠĹ ĩ
¥> ±² - J K" Ÿ Ā• r ° ° 1- © Ĥ „ ½ • ĩ ¥> ±K_ " ; ...- ± ä
fĀ μú æ½ó-™\$ > ° °.

z

Perl (ā)

Python PerlĀ Ÿ° • Z•¹ ö ° ° (ā | " " , 9\$ ĩ •¹ ĖNÖ° °). ±|¼ éÁ
Ÿ° xž- > ° °. ±3Ė ĩ Á ° ° °. PerlĀ ÷ Ĺ Ė } ó• ĩ ^" ® > ©ö
r¾- Ā • Ÿ (ö:èN „ ~² Ūā, Ž... " ĩ o ÷¼¹ Ė xž), PythonĀ ÷ Ĺ Ė
¥> ±K_ xĹ D (• 4þ® Ÿ' " ½ • ĩ ¥> ±K_- > ° °. ±|¼ ¥> ±K* Ń
Ī ¼(elegant) ' « Ĥ• èÁ μú® ±ž Fx ¼ - | x ° °™\$ ° °. • ĹĪ > ,
Python• Perl Ń\$• Ÿ ± > K } ó• ĩ - © ĩ © ...Ā é• è° °. • Ÿ PythonĀ Perl—
Ĺ †° } óŪÖ ĩ • éÁ ŪŪ•¹ Ĺ óĖ- ¶® ° °.

z

Tcl (€)

Python Ĥ• TclĀ w, Ĺ Ė ¥> ±K_ \$ ĩ Ū ĩ ĩª, } ó 2N\$ ĩ (extension language)>™
½ó ° °. • Ÿ, ¾±ĹĪ > B+ ö• ¢® • 8> L | © TclĀ • 4þ®• d ¼ Python

÷'' ò • †Q• é• ~-'' . TclÁ ° β 3 • «e (name space)Ÿ ΦÁ, l † > ±² ¬
 G×• ¿†° /O ¬ Ñ• ¼ Ø• è'' . ° a 1 Tcl¬ ½ó © ¾5¿ E l } ó † > ±² Á
 /- ù ± } ó• - ° CÆ C++ 2N ÙÚ¬ ¶©'' . • • šž 1 Python } ó † > ±² Á
 'Øf° Python' l > Ÿ ° ù × b ''D Øf° Python¬ • ó° Á CÆ C++ÙÚ¬ G¼
 . ^a © O÷''™ Š< ×• '' . Tcl- . \$¬ © ÙÚ• Tk «¬• '' . PythonÁ Tk¬ Ù‡ GUI
 a • M3 l > G™s ¿óÖ'' .

Tcl 8.0Á T• 9μú®™B ä × L l ® Ö¼, 6° ò• × 5 • > • «e ¬ • > ° '' ¼
 • Ÿ ä¾ù ?" N" 3• † > ±K_ S j • '' .

z

Smalltalk (l äΦ—)

Ÿ ∈™ Python Smalltalk— ÑÑl &• © Python• ÷'' ' \ (mainstream)' p ¬ ÑΦ'' ©
 O• '' . PythonÁ Smalltalk Φ• È¿ E 5. „ . † (binding)¬ ° '' . Python— β+ OÁ
 ½ • '' . • Ÿ, PythonÁ èN ½ 5 ½ó• „ — JK" ® p- ¼, èN 5 l > Ù×—
 ÁÁ äæ° 1 ¼ó • è©'' . Smalltalk— ò j × ; B— Ù‡ a • M3 l βnÁ Š< æ#°
 šø, Python— a • M3 l © E × WWW #' (email, HTML, FTP) • ¿ } × f Á éÁ xž ¬
 6 ° '' .

PythonÁ WZ μú• • Ø j 1 '' í ¬ ¶©'' . Smalltalk• WZ ½ó• † > ±² ¬
 E © ±... '†" a • ¶• '® ¶©ö šž, PythonÁ Ù‡ β ½ó• β ¬ '' Ž...
 f N ä { æ• 8ó¼†" a A l > • μ f Ø'' . ° . ® ö® ø, GUIÑ†" a • • 1
 ý' O• l ñ /> , GUI® Ö• × ¬ ° Ñ• • — „ • Python † > ±² • Ø'' .

z

C++

Java• Äž 1 • Ö× ° ÄÙÚ• C++™ ¿ó '' . PythonμúÑ Java μú÷'' 3-5• '' l) ,
 C++μú• ž 5-10• '' !! ... ö° y— Python † > ±K* © C++† > ±K* Ä y• 1‡•
 • m f '' © ...¬ Ä l Ÿ• • m f Ø'' . PythonÁ C++ GäΦ μú® ½ó © l l S j > - ¬
 ° '' .

z

Common Lisp and Scheme

• S j © È¿ E —¶ž ý• 1 Python• ÑS'' . ±3Æ p ž ý l #Á =- l a 1 ¾°
 ®? l Ñ μ Ÿ° Ñ '' : Lisp— p ¿ E ÙpE• N\$...P R\$...P? PythonÁ Lisp
 ΦÁ èÆ¿ E ž D(capabilities)• Ø¼, Python † > ±² Á l \ { † > ±² ÙÚ¬ pÆž 1
 ò 1 f Ø'' © O¬ ¬ ¼Ö ''šž l > , ò#' ò Ñ . „ ¿• '' : Common LispÁ
 '' (j à° - \$• 1™ ±W'') . Scheme #' © éÁ j ò l • è© ^¾ > Æ(j äØ'' . ±•
 šž 1 PythonÁ Æ• ¼, - 4• ¼, < { p ä ö '' . • #° SchemeŸ— • - ž „ Moshe
 ZadkaÑ • Python vs. Scheme¬ ÷a .

01. f „ ... 3.0£¤ • ; ð å €

CL : <http://bluekyu.textcube.com/111>

< Ⓖ• : [Bluekyu](#)

z

```
** Ž•• 3®▷ { •ž • è° ÛÚ•¹ % Ñ © O¬ I¹ Ä × ¯ ž B+
ÛÚ•¹ è| ò ¬ ž÷¼ ĸ î ñ¨. ±K™ % Ñ °¨ ø ° Š†ñ¨.
```

1. PEP 3105 : Print Is A Function

Print þ • Ef> Tç î ñ¨. Ef—> 5Ä Ĩ KÝ Φ• AZ ô î ñ¨.

```
print([object,z...],z*,zsep='z',zend='\n',zfile=sys.stdout)
```

ö® ø print "Hello, Python.", "I like Python" Φ• . µú® 3.0 ^¾Ī > ¯† Gø
print("Hello, Python.", "I like Python") LV ö f Øĭ ñ¨. ±| ¼ sep v u ú— Š Ä Ä•
ÆÖ ½ ¬ Öä G© x²¬ • „†ñ¨. x%S• ' ' Ĩ > öĵ Øĭ /> ¯— ö•¹ © Hello,
Python. I like Python LV Gä•• Ÿ sep=' 'ª ¼ • „ ø Hello, Python.I like Python Φ•
Gä• ñ¨. ö¾• © œÄž¹ Æ%© • 8¬ Öä¹ öäø print •¹ T> ž. •• [•Ÿ
sep —™BĪ > Ñžž' î ñ¨.

```
>¼> • print Ef•¹ © "softspace"Ñ •> ö• èî ñ¨.(softspace ' print •¹  
^€® ½óž¹ ° o• BD1 • ĒĪ > CDS ½•• " ¥• " ® žĵ \© xž Bñ¨.)
```

2. Views And Iterators Instead Of Lists

MM— API • • | " 9® | ® • è{ [î ñ¨. ! f, ½¾ ½ — S¹ ú£ dict.keys(),
dict, itmes(), dict, values() © views ½ ® | ® { š ñ¨. °ª¹ k = d.keys(), k.sort() Ý
ΦÄ xĸ Ä ½ó¹ f¨ { š ñ¨. ÄÄ• k = sorted(d) ® ½óž Ö†ñ¨.

```
>¼> views ½ © ½¾• •æ © ½ £ö, ½¾— AZ• • — ½ • è| šešñ¨. ö®  
ĵ a = {'one': 1, 'two': 2}® ¼, b = a.keys() ® Ö¬ a Š¬ AZ { öø ± AZ•  
b•™ eĭ ¬ ¶±ñ¨. • ĩ•™ views ½ © — ö•¤® ÇC™s šøµ(iterated) f  
Ø¼, ² ^ " " 9® >†ñ¨. ±| ¼ dict.iterkeys() Ý dict.iteritmes(), dict.itervalues()  
S¹ úÑ • •> ö• èî ñ¨. °ª¹ • ¬ ' Ä Gáø keysÆ items, values S¹ úÑ  
| ® © views ½ • iter() Ef® ½óž Ö¹ Û Ēî ñ¨. , map() filter()© š o• ®  
| ®†ñ¨. °ª¹ | " 9® š ú† Ēĵ Ö °¨ ø list() Ef> | " 9® þž Ö¹ OBñ¨.  
±| ¼ range() EfÑ Æ— x® ¶© Š < Ē © Z ® ġ ¼© xrange() LV  
< Ē†ñ¨. °ª¹ xrange() © • •æ • è{ š ñ¨. €•, Ĩ > zip()™ š o• ®
```

| ®†ñ".

3. Ordering Comparisons

Ž•• 3.0•¹© x²• RØž' îñ". ...šĸĲ> —¶" "© (<, >, <=, >=)® Ñ´
TypeError òĲ ® ...Ĳ v™s AZ [îñ". ö® Ĳ 1<'a', 0<None Φ• ö¼• ©
False ® Ĳ ®Ö• Ÿ 3.0 Ū¤© • 3® ...Ĳ ³ñ". °ª¹ " " — ¹ • µ f "©
Ĳ " 9LĲ — © • 3® ...Ĳ v{ šñ". R, = != © • ~ f ¬ ° • • èx •
ä¼û Ñ Ñž†ñ".
èN EfE sorted() Ÿ list.sort() EfÑ • cmp E•® • èîñ". ÄÄ key E•®
½óžÖ†ñ". ±Ĳ ¼ key Ÿ reverse © %è v u ú Ÿ © E•Ñ ò îñ". €•, Ĳ> cmp
EfŸ __cmp__() S¹ úÑ • • > ò• èîñ". °ª¹ __lt__(), __eq__(), __hash__() Æ
" Ef® ½óžÖ†ñ". ±Ĳ ¼ cmp() EfÑ — " ø (a > b) - (a < b) Ÿ Φ•
½ó ø cmp() Ÿ È { ½ó¹ f Øîñ".

4. Integers

long • int > • «• AZ ò îñ". s, B+ èN „ f© int 5 Æ ðBñ". ±3Æ ä¼û
long 5LV ½ó¹ f Øîñ". , 1/2 Ÿ ΦÁ Ūf5 Ūä• òf5¬ Ĳ†ñ". Ÿd,
ö¼LV „ fS¬ É¼ È" ø 1/2 Ÿ Φ• ½óžÖ†ñ". ±Ĳ ¼ „ f5• • 6°• " x
• sys.maxint fÑ 6? ò îñ". ÄÄ sys.maxsize ® ½óž¹ ö¼— sys.maxint Ÿ ΦÁ
S¬ É¬ f Øîñ". long 5• 6? ò x • repr() ¬ ½óEĲ > ø long 5 P• x©
L Á • x• èîñ". €•, Ĳ> 8¢f 5^Ñ 0123 • Ĳñ 0o123 Ĳ> AZ
ò îñ".

5. Text Vs. Date Instead Of Unicode Vs. 8-bit

1) Ž•• 3.0Ū¤© • 8¬ " Ä© x²• Ĳª' îñ". ö¼ © Ĳ Ĳ B+ ¶" 9© äñµúÑ
ò îñ". (R, Eµ< äñµú© T•=Ĳ ò•; > Ūä šñ".) ¶" 9> ½ó ; BÄ str
JK" • ¼, ò•; > ½ó ; BÄ T•9 JK" Bñ". Ÿd, ò'ĸ E ½óĸ¬ è¼ È" ø
Ĳ K® >® # .

< <http://di.veintopython3.org/strings.html#byte-arrays>

2) Ž•• 2^¼ ÑÑĲ &• \$•ª¼ ø ¶" 9Ÿ ò• ¤® ūĲ á© †™Ñ Ø¬ Z
TypeError ® ...Ĳ ³ñ". Ž•• 2^¼•¹© äñµúŸ 8 9 • 8¬ ūĲ á¼ ø 8 9
• 8• Ĳ" v µú• " ø < È¬ Ö•Ÿ 8 9 • 8• Ĳ" v µúÑ Ø " ø
UnicodeDecodeError ® ...Ĳ Ðîñ".

3) B+ ¶" 9Ñ äñµúE Ÿ] • u'...' ŪäÁ ½ó¹ f " îñ". ÄÄ T•=Ĳ
ò•; •¹© š ú t b'...' Ūä¬ ½óžÖ†ñ".

4) ¶" 9Ÿ T•9Ñ ū... f " x • 1> ¼W¬ žÖ ©ö, ¶" 9•¹ T•9> ©

str.encode()Æ bytes(s, encoding = ...) ® ½ó ø ö¼, T• 9• ¹ ¶" 9> ©
bytes.decode()Æ str(b, encoding=...)¬ ½ó ø šň".

5) ¶" 9 Ûä• AZ vŇž E OLV T• 9 Ûä™ AZ vŇž Bň". ÄÄ, bytearrayª ©
; B•ª © AZ Ňž° ; B• Øî ñ".z bytes ® Ĩ • © ?— ÄÜÜ— API • bytearray
™ Ĩ Bň". AZ Ňž° API © collections.MutableSequence • x%¬ ´ ñ".

Z

6) raw 5² — • 8• ¹ ß+ hÆK€Ň • ±Ä> žýšň". ö¾• © ur'\u20ac' ® ä>
• > žýÖ• Ÿ 3 ^¾Ü¤© r'\u20ac' ® 6 — • > žý¬ †ň". R, '\u20ac' —
Z • © ä¾Ü ä> • > žýšň".

Z

7) 2.3 ^¾• ¹ ™B basestring ; B• 6? šň". ÄÄ str® ½ó ø šň". 2to3 • ¹ ©
str> AW¬ †ň".
(basestring Ä 2^¾• ¹ — • 8•Æ äñµúÝ £" ®" ® 1 ½ó ; B•ª ¼
†ň".)

Z

8) ¶" 9 Ž...> 8| © Ž... Ä (Sß| • ¹) • 8 (· " • ¹)T• 9 ½• ® Ô ©
£µ<¬ ½ó†ň". ±| ¼ b Bú® ½óž¹ 8Á T• =| Ž...Ä Sß| • ¹ T• 9®
½ó†ň". s, Ž...¬ óê BúÆ £µ<¬ ½óž¹ 8{ öø I/0Ň óê ö•¤® 9—\ ©
O• Ĩ ñª òu® ...Ī³ň". , ä| " ½ó• ™j T Bú® ½óžÖ†ň". (Ž• •
Û• ÷ñP ä| " © ß+ Ž...¬ 2¢(T• =|) Ž...> L| ° " ¼ öĵ Ø» . ±~ ö • 8
T• =® Ö†Ä¹ ½ó° " ¼ ñP - ®x Bú® ĵĵ\ĵ Ö » .) ±| ¼ £µ<™
¼ážÖ x • • Ð9 £µ<• —• © OÄ • 6žÖžÖ†ň". (Sĵ WZ Af®
ý, 1 f Ø© ä| " ' 8— Z ÄÜÜ(¾ÜŇ Ĩ Ň) · Ð9 £µ<• UTF-8 •ª ¼ ©ö,
±K™ • O• —• ž¹ © • ö .) ±| ¼ £µ<¬ • „ ž¹ Gx • • codecs ß •
Ø© £µ< " 92 Ä ½ó1 — Ň" { ö î ñ".

9) Ž... • « Ä äñµú® ½ó { šň". ±wx • T• 9 • 8¬ ½ó © ...Û
: µc• ¹ © 6® ...Ī Ç f Øî ñ". ÄÄ " xĵĪ> , Ž... • «¬ Ĩ • © ÄÜÜ—
API(open() •Æ os ß) Ä T• 9 ½ ™ Ĩ Bň". ±| ¼ MM— API ™ T• 9 | ®S¬
p © xĵ¬ Ň• ¼ Øî ñ". s, os.listdir()Ä £• Ň T• 9... Z T• 9— | " 9®
| ®†ň". >¼> , os.listdir() • • 8¬ | ®1 • µúµ f "© Ž... • « Ä
UnicodeError öĭ ® ...Ī v÷" © ° šň".

10) os.environ •Æ sys.argv Ý ¢Ä ...Û †" a API— Z , T• 9Ň x% £µ<Ī> žýµ f
"¬ 6® ...Ī Ç f Øî ñ". • Z • © Sĵ WZ Af® ý, ° P æò © O• ŇN
fÄ xĵ Bň".

11) PEP 3138

Ĩ " v µú • 8• repr • —ž¹ • escape ö• ëî ñ". ±3Æ CDµ f "©

Φ î ñ''.

```
defzf(a, zb, z*, zc=key)z:  
zz...
```

3) PEP 3104 èóBñ'' . • èó•¹ © nonlocal •ª © (ödi)Ñ NÖî ñ'' . •« ±Â>
• OÁ ý> H• . • İ Ñ T• . ñ 1 f Ø{ tñ'' . 8, ~— Ž••• Ø© ö r•¹

```
>>>zdefzbank_account1(ini tial_bal ance)z:  
zzzbal ancez=zi ni tial_bal ance  
zzzdefzdeposi t(amount)z:  
zzzzzzzbal ancez=zb al ancez+zamount  
zzzzzzzreturnzbal ance  
zzzdefzwi thdraw(amount)z:  
zzzzzzzbal ancez=zb al ancez-zamount  
zzzzzzzreturnzbal ance  
zzzreturnzdeposi t, zwi thdraw  
  
>>>zdz, zwz=zbank_account1(100)  
>>>zpr int(d(100))
```

Ý ÇÁ μúÑ Ø¬ , bal ance = bal ance + amount o•¹ • 3Ñ { š ñ'' . bal ance ©
• è• „ Š O™ İ ñ¼, ý> H• „ Š O™ İ ñx • r Q• Ø© Af® >® 1 f
'' x Bñ'' . ±K¹ Ü•¹ © • O¬ ž . x ~ ž bal ance ® | " 9> T Uj¹ ž . ñ
Öî ñ'' . ±3Æ nonlocal — " Ñ> • O¬ QR { ž . 1 f Ø{ ô î ñ'' .

```
>>>zdefzbank_account1(ini tial_bal ance)z:  
zzzbal ancez=zi ni tial_bal ance  
zzzdefzdeposi t(amount)z:  
zzzzzzznonl ocal zbal ance  
zzzzzzzbal ancez=zb al ancez+zamount  
zzzzzzzreturnzbal ance  
zzzdefzwi thdraw(amount)z:  
zzzzzzznonl ocal zbal ance  
zzzzzzzbal ancez=zb al ancez-zamount  
zzzzzzzreturnzbal ance  
zzzreturnzdeposi t, zwi thdraw  
  
>>>zdz, zwz=zbank_account1(100)  
>>>zpr int(d(100))  
200
```


Ÿ • nonlocal balance ® r Q• ĖBž\{ öø Ef r Q• Ø© balance Af® >®1 f
Ø{ šň" .

4) PEP 3132 èóBň" . • èó•¹© šo šl¹ xž• 2Nö î ě" . Ef•¹ E•® ñ
äÚ— E•© *arg Ÿ • © 5² LV šl¹ ñ 1 äÚ— E•® ñ f Ø™s
Tç î ě" . ö® ĵ

```
a,z*rest,zbz=zrange(5)
```

Ÿ • BDñ ž\ø †Q" — šñ 3 > Æ(ĵ¹ šl¹ ñ ž ě" . a=0, rest=[1,2,3], b=4 >
ĀB• öø¹ šl¹ • šň" .

5) PEP 0274 èóBň" . ĵ " 9 èNLV ½¾ èN• " Ľö î ě" . G© x² Ā Ĩ KŸ •
½ó ø šň" .

```
{k:zvzforzk,zvzinzstuff}
```

ñ x² Ā dict(stuff)Ÿ • Ā xžñ ©ö, ñ x² • äó "¼ PEP èó•¹ B• ö "¼
» .

6) set • 45— Üâ• Tç î ě" . ö¾ ^¾•¹© set(['a', 'b'])Ÿ • Üâ• ö Ĩ Æ
3^¾Ü¤© {'a', 'b'} Ÿ • Üâ• šň" . " Ÿ, \— 1 \$Ā {} x² Ā ½¾ñ —¶† ě" .
Ĩ set 5ñ ½ó áø set()Ĩ > ½óž Ö † ě" . , set èN• • > šň" . s, {x for x in
stuff}Ÿ • ½ó1 f ØĨ ě" . set(stuff)Ÿ • Ā xž••Ÿ äæ "¼ † ě" .

7) 8ç Üâ 5² • Tç î ě" . 0o720Ÿ • ½óó) 0720— ÜâĀ ½ª ' î ě" . • ÜâĀ
2.6•¹ •¶ çóó î ě" .

8) 2ç 5² • çĨ ě" . 0b1010 ç • ½óó) •• } © èN Ef> bin() • ØĨ ě" .
• Üâ † 2.6•¹ •¶ çóó î ě" .

9) • 8•¹ •¶ +Ö Ü• T• 9 5² •¹ ö î ě" . b'...' Æ B'...'> Üâ• ó) , ••
{ © Ef> bytes() Ľ çĨ ě" .

< 1æ çĨ >

1) PEP 3109, PEP 3134 èóBň" . raise ç • t™{ Tç î ě" . • #° OĀ Ĩ K• ýy
öĵ ØĨ ě" .

2) as Ÿ with Ľ t> • ödĵ Ľ ö î ě" .

3) True Ÿ False, None • ödĵ Ľ ö î ě" .

4) PEP 3110. `except exc, var 5^ > T Ć ĩ ĥ''`.
`• èó™ ĩ K• Ø ĩ ĥ''`.

5) PEP 3115. `S; J K" Ć • T Ć ĩ ĥ''`.

```
class Ć:
    zzz__metaclass__=zM
    zzz...
```

ÃÃ•

```
class Ć(metaclass=zM)z:
    zzz...
```

`5² ĩ > T Ć ĩ ĥ''`. `°ª 1 • __metaclass__ Af© • > • è ĩ ĥ''`.

6) `| " 9 è N Ć • 1 [... for var in item1, item2, ...] • • • > ò • è ĩ ĥ''`. `ÃÃ• [... for var in (item1, item2, ...)] © ½ó ø š ĥ''`. `± | ¼ | " 9 è NÃ''`
`—¶(semantics)® Ĩ• ĥ''`. `| " 9 p® è Û— • Ûâ Ć ĨŠ ĩ ĥ''`.
 surrounding scope è— loop control AfĨ • (f ò • è ĩ ĥ''

7) `° (ellipsis) p • $ Ûâ x² (...) ĩ > j • 1 + ½óµ f Ø ĩ ĥ''`. `ö¾ ^¾ P• © Æª • Ò • 1 Ÿ ½ó • Ĩž Ő ĩ ĥ''`. `± | ¼ š ú† ... ø Ő) , ... x² Ã • š ĥ''`. `(ö¾ P• © [ĩ ĥ'')`

`< " M Ć ĩ >`

1) PEP 3113. `Û: E• Š u¹ Ć • 6? ò ĩ ĥ''`. `ö® j¹ def foo(a, (b, c)) : ... ®`
`• ö f'' ¼, ÃÃ• def foo(a, b_c) : b, c = b_c ... Ÿ Ć • ø Ő † ĥ''`. `©`
`E f• 1™ €¾ Ĩ• B ĥ''`.

2) backtick `x« () Ĩ ½ª ' ĩ ĥ''`. `ÃÃ• repr ¬ ½óž Ő † ĥ''`.

3) `<> x« Ĩ ½ª ' ĩ ĥ''`. `ÃÃ• != ½óž Ő † ĥ''`.

4) `exec v u ũ Ĩ ½ª ' ĩ ĥ''`. `ÃÃ• E f > — ĩ Ø{ š ĥ''`. `°, exec()© • stream E• ® • è ĩ ĥ''`. `ö® j¹ print 1 • f N ò j Ø© Ž• • Ž...¬ Af f • 8 ¬ , exec f ® G{ øø print 1 ¬ T> F ¼ ò • ò ĩ Æ • • O• v Ĩž ¼, ÃÃ• exec(f.read()) Ÿ Ć • ½óž Ő † ĥ''`.

5) `# f Ÿ • 8 • 1 l, L, u, U Ĩ • • > ò • è ĩ ĥ''`.

6) `from (module) import * Ć Ã B ù ĩ • 1 Ÿ ò • š ĥ''`. `• E f è • 1 © v Ĩž † ĥ''`. `Ÿ Ÿ, from (module) import (name) Ã ½ó • Ĩž † ĥ''`.

„ | ® ž Ä î ñ ”.

< <http://bluekyu.textcube.com/136>

6) PEP 3105 : print As a Function

“ • 1 • # ù ý y ° Û Ú B ñ ”.

7) PEP 3110 : Exception-Handling Changes

“ • 1 ” { § Ö¼, Ĩ K • 1 “ • # ù 1 † ñ ”.

8) PEP 3112 : Byte Literals

“ • 1 § ° è ó ¼, 1 “ • © ¸ Ý ĩ Á { “ ... ò ĩ Ø © • Æ Ý Ø î ñ ”. • # ° O Á è | > ® ž \ # .

9) PEP 3116 : New I/O Library

io B “ • Ž ... BCD — t > • Ü ‡ • ö î ñ ”. sys.stdin, sys.stdout, sys.stderr ©
io.TextIOWBase — £ “ ® “ B ñ ”. è N E f £ open() ™ io.open() L V ½ ó ö ¼ “ Ñ ĸ £
v u ú ™ Ö î ñ ”. ± ĩ ¼ ā • “ è Á mode £ • ... Z IOError Ñ Ĩ ñ “ ValueError ®
† ³ ñ ”. “ • # ° O Á è | > ® ž \ # .

10) PEP 3118 : Revised Buffer Protocol

buffer() è N E f Ñ ” ĩ ¼, ā ½ ° × ž Î > memoryview() Ñ è Ñ Î > 6 š ñ ”. • # °
O Á è | > ®.

11) PEP 3119 : Abstract Base Classes

½ “ • ĩ “ ... è ó £ O ¢ Á ö, ó B • » . • # ° O Á è | > ®.

12) PEP 3127 : Integer Literal Support and Syntax

„ f Ý “ ... ž 1 “ • 1 § ° è ó B ñ ”.

13) PEP 3129 : Class Decorators

J K “ • 1 ™ N ² • ® S 1 ú N ² • L V ½ ó 1 f Ø { ö î ñ ”.

14) PEP 3141 : A Type Hierarchy for Numbers

f • Ä ° “ Ĩ Ñ A Z ö î ñ ”. “ • 1 § “ • è ° ABC Ñ t ™ { T Ç ø 1 • Ü Ú ™ T ‘ O
Φ î ñ ”. Ñ N ... š ĸ £ ABC © Number B ñ ”. Complex © Number — 1 M J K “ B ñ ”. Real Á
Complex — 1 M J K “ B ñ ”. Rational Á Real — 1 M J K “ B ñ ”. Integer © Rational —
1 M J K “ B ñ ”. ± ĩ ¼ Ú f Ý “ ... B £ fractions B • “ Ñ ö î ñ ”. • # ° O Á
è | > ® # .

8. Library Changes

“ • M 3 ĩ “ • é • T Ç î ñ ”. • Ü Ú • Ä ž 1 © = - é Ĩ 1 — ° M Ý ĸ î ñ ”.
Æ * • © PEP 3108 — > ® ž \ # .

1) md5 B sha B • hashlib B > Ä ö î ñ ”.

2) cPickle B • « • _pickle > TÇ î ñ” .

3) StringIO Y cStringIO — JK“ Ñ io B • " Ñô î ñ” .

4) ä 3 ± • æ± Ä ô î ñ” .

< dbm uv • >

Current Name zzz Replacement Name

anydbm zzz dbm.__init__

dbhash zzz dbm.bsd

dbm zzz dbm.ndbm

dumbdbm zzz dbm.dumb

gdbm zzz dbm.gnu

whichdb zzz dbm.__init__

< urllib uv • >

Current Name zzz Replacement Name

urllib2 zzz urllib.request, urllib.error

urlparse zzz urllib.parse

urllib zzz urllib.parse, urllib.request, urllib.error

robotparser zzz urllib.robotparser

< tkinter uv • >

Current Name zzz Replacement Name

Dialog zzz tkinter.dialog

FileDialog zzz tkinter.filedialog

FixTk zzz tkinter._fix

ScrolledText zzz tkinter.scrolledtext

SimpleDialog zzz tkinter.simpledialog

Tix zzz tkinter.tix

Tkconstants zzz tkinter.constants

Tkdnd zzz tkinter.dnd

Tkinter zzz tkinter.__init__

tkColorChooser zzz tkinter.colorchooser

tkCommonDialog zzz tkinter.commondialog

tkFileDialog zzz tkinter.filedialog

tkFont zzz tkinter.font

tkMessageBox zzz tkinter.messagebox

tkSimpleDialog zzz tkinter.simpledialog

turtle zzz tkinter.turtle

” n èóÁ PEP 3108• ” © èóBñ” .

1) sets B • 6? ô î ñ” . èN EƒE set ñ Gø šñ” .

2) sys.B = „|õ ĩñ“. sys.exitfunc(), sys.exc_clear(), sys.exc_type, sys.exc_value, sys.exc_traceback = 6?õ ĩñ“.

3) array.array; B = „|õ ĩñ“. read(), write() S¹úÑ ĩ •¼, fromfile(), tofile() ĩ ½ó øšñ“. ±|¼c; B µúÑ ĩ •¼ bÆu; B µú® ½ó øšñ“.

4) operator.B = „|õ ĩñ“. sequenceIncludes() Ÿ isCallable() = ĩ ĩ ĩñ“.

5) thread.B = „|õ ĩñ“. acquire_lock() release_lock() = ĩ ĩ •¼, acquire()Ÿ release() ® ½ó øšñ“.

6) random.B = „|õ ĩñ“. jumpahead() Ñ 6?õ ĩñ“.

7) new.B = ĩ ĩ ĩñ“.

8) tmpfile.B ĩ ĩž os.tmpnam(), os.tempnam(), os.tmpfile() = 6?õ ĩñ“.

9) tokenize.B = T•9Ÿ <Ë™s Tç ĩñ“. \ BD = \$(Main Entry Point)© generate_tokens ÃÃ tokenize.tokenize()> Tç ĩñ“.

10) string.lettersŸ string.lowercase, string.uppercase Ñ ½ª ĩñ“. ÃÃ•, string.ascii_letters ĩ ½ó øšñ“.

11) B __builtin__ = «• builtins > Tç ĩñ“. global = « Q•¹ ĩ f Ø© __builtins__ Af© Tç• èx ĩñ“. builtin ĩ f„ áø __builtins__ Ñ ĩ Ñ builtins ® ½ó øšñ“.

9. Changes To Exceptions

õĭ L| ÛÚ• é• Tç ĩñ“.

1) PEP 0352

B+ õĭ © BaseException ĩ ÅžÖ†ñ“. ĩ ĩ> •8 õĭ © ½ª ĩñ“.

2) ?— B+ õĭ © Exception ĩ Å†ñ“. s, BaseException Á SystemExit Æ KeyboardInterrupt Ÿ ΦÁ ĩ ùĪ ĩ ĩ Åx ĩ° õĭ JK— xšBñ“. ÅÛÛ— õĭ ĩ L| x ĩž¹ 6• © x²Ī> © except Exception ĩ ½ó øšñ“.

3) StandardError © 6? ô î ñ".

4) öì © • †Q" > < È • èî ñ". ÃÃ• args ÅÆ¬ ½ó ø š ñ".
(8, ~— Ž•• p. 481 — ö6•¹ 16\$ ö£ Ĩ K— μúÑ • < È• • " © —¶
Bñ".)

z

```
print(a[0],za[0].__class__.__name__,zid(a[0]))
```

5) PEP 3109

raise Exception, args ÃÃ• raise Exception(args) ® ½óž Ö †ñ". " ÑĴÎ > •
traceback y†1 ƒ "î ñ". Ÿd, • O¬ áø __traceback__ ÅÆ• èĴ 1ī 1 ƒ
Øī ñ".

6) PEP 3110

except Exception, variable ÃÃ except Exception as variable ¬ ½óž Ö †ñ". Ÿd, Å Ñ•
öì ® Ĩ èáø ü: ¬ ½ó ø š ñ". ±Ĵ ¼ except i s• ½ª ´ variable Af© 6? Ñ
š ñ". s, Ĩ KY ΦÁ μú©

```
exceptzEzaszNz:  
zzzfoo
```

" n Φ• AWμ ƒ Øī ñ".

```
exceptzEzaszNz:  
zzztryz:  
zzzzzzzfoo  
zzzfīnalīyz:  
zzzzzzzNz=zNone  
zzzzzzzdel zN
```

°ª¹ öì LĴ p • Š•™ \$¬ ' Å >® x® > ° " ø öì LĴ •¹ Af—•«¬ "•{
•„ž\Ĵ Ö †ñ".

7) PEP 3134

öì — œ» LĴ x²• AZ ö î ñ". Å Ñ• x²• Ø©ö, Å© ¼†Ĵ (implicit)
x²• ¼, " Å© y†Ĵ (explicit) x² Bñ". ¼†Ĵ œ» (2& öì)© except Å finally
p •¹ { š ñ".

```
>>>ztryz:
... zzzzzrai sezeException('first')
... zexceptz:
... zzzzzrai sezeException('second')
...
Tracebackz(mostzrecentzcal l zlast):
zFilez"<stdi n>", zlinez2, zinz<module>
Exception: zfirst
```

Duri ngzhandl i ngzofzthezabovexexcepti on, zanotherzexcepti onzoccurred:

```
Tracebackz(mostzrecentzcal l zlast):
zFilez"<stdi n>", zlinez4, zinz<module>
Exception: zsecond
```

```
~ Y ¢ try p • 1 • 3Ñ Ò , except p • 1 L | ® { ô © õ , 2 ^ ¾ — Z
except • 1 • 3Ñ ø try • 1 ° • 3© - † Ñ š ñ " . ± 3 Æ 3 ^ ¾ Û ¤ © ~ Y ¢ •
§ • 1 • 3Ñ > ¼ , L | ™ r • Ä § • 3Ñ Ö " © O — é á ñ " . • w {
§ • 1 ° • 3Ñ 1 G © O — x • x ~ ž § • 3© Ä § • 3 J K " —
__context__ Ä ¢ • f N • š ñ " .
```

```
" n î > y † ç œ » B ñ " . y † ç ö ï © raise EXCEPTION from CAUSE — p • — ž 1 •
ô ¼ , • p Ä
exc = EXCEPTION
exc.__cause__ = CAUSE
raise exc
Y ¢ Ä — ¶ ® Ñ • ñ " . s , y † ç ö ï Ñ ø ö ï ® ... î É CAUSE ® EXCEPTION ö ï
J K " — __cause__ Ä ¢ • f N — † ñ " . ö ® Æ ø
```

```
>>>ztryz:
... zzzzz1/0
... zexceptzExceptionzaszvarz:
... zzzzzrai sezeException('1/0zisError!')zfromzvar
...
Tracebackz(mostzrecentzcal l zlast):
zFilez"<stdi n>", zlinez2, zinz<module>
ZeroDivisi onError: zintzdi visi onzorzmodul ozbyzzero
```

Thezabovexexcepti onzwaszthezdi rectzcausezofzthezfoll owi ngzexcepti on:

```
Tracebackz(mostzrecentzcal l zlast):
zFilez"<stdi n>", zlinez4, zinz<module>
Exception: z1/0zisError!
```



```

- Y Φ • try • 1 öi Ñ      Ö©ö, ± öi ® except • 1   İ è¹ y t ç Î > var      •
öi Ñ ...j >¨ © Ö¬ é á \¼ Øî ñ¨¨. s, ¼ t ç œ» © —¶ ± Å> Z•• è Û • 1 2&
• 3®      t É 1& • 3— > £¬ é á \{ š ñ¨¨. ± 3Æ y t ç œ» © ¥> ± K* Ñ
~ 6 ç Î > 2& • 3Ý È Ý 1& • 3— > £¬ é á \{ á t ñ¨¨. (>¼ ç Î > IDLE • 1 © • 3°
œ» • Æ; Æ• è î ñ¨¨.)

```

8) PEP 3134

```

Öi ½ — traceback • __traceback__ ÄÆ è • f N• š ñ¨¨. ö¾• © traceback — ½ ®
É x ¯ ž ¹ © sys.exc_traceback • Æ sys.exc_info()[2] ® ½ ó ž Ö Ö• Ý • 6© QR {
__traceback__ ÄÆ Ý > ®® ø š ñ¨¨. ½ ó x ç Ä İ K Ý Φ • Gø š ñ¨¨.

```

```

defzdo_logged(file,zwork):
    zzztry:
    zzzzzzzwork()
    zzzexceptzException,zexc:
    zzzzzzzwrite_exception(file,zexc)
    zzzzzzzraisezexc

fromztracebackzimportzformat_tb

defzwrite_exception(file,zexc):
    zzz...
    zzztypez=zexc.__class__
    zzzmessagez=zstr(exc)
    zzzlinesz=zformat_tb(exc.__traceback__)
    zzzfile.write(...ztypez...zmessagez...zlinesz...)
    zzz...

```

9) , ™ • 1 2N β ¬ > ú © ö ò u Ö¬ , M Ñ• öi S t • Ñi ö î ñ¨¨.

10. Miscellaneous Other Changes

< Operators And Special Methods >

1) == œÇ• Ñ NotImplemented ® | ® © Ö¬ 6i ¼, != © == — š Å B ñ¨¨.

2) S T • ú S¹ ú (unbound methods)— Ý • ½ª ' î ñ¨¨. J K" ÄÆ Î > S¹ ú ® > ® {
ö ø R I ° E f ½ ® É { š ñ¨¨.

3) __getslice__(), __setslice__(), __delslice__() • ½ª ' î ñ¨¨. a[i:j] ç Ä
a.__getitem__(slice(i, j)) Î > ¾W š ñ¨¨. Ý d, 1 İ • Æ ÷ 6> ½ ó • µ © __setitem__()
• Æ __delitem__() Î > T ½ ñ¨¨.

4) PEP 3114. `__next__()` `__next__()` `> AZ` `ô` `î` `ñ`. `s`,
`__next__()` `S` `1` `ú` `LV` `S` `T` `®` `½` `ó` `†` `ñ`. `±` `|` `¼` `so` `®` `«` `C` `×` `˘` `ž` `a.next()` `Ä` `Ä`
`è` `NE` `f` `E` `next(a)` `®` `½` `ó` `ž` `1` `so` `®` `«` `C` `1` `f` `Ø` `î` `ñ`.

5) `__oct__()` `Y` `__hex__()` `S` `1` `ú` `Ñ` `6?` `ô` `î` `ñ`. `Ä` `Ä`, `oct()` `Y` `hex()` `S` `1` `ú` `©` `__index__()`
`S` `1` `ú` `®` `½` `ó` `†` `ñ`.

6) `__members__` `Y` `__methods__` `S` `1` `ú` `Ñ` `6?` `ô` `î` `ñ`.

7) `E` `f` `Ä` `—` `«` `•` `È` `func_X` `Ñ` `__X__` `5` `²` `Î` `>` `AZ` `ô` `î` `ñ`. `°` `a` `1`, `•` `—` `«` `•` `E` `f`
`Ä` `—` `«` `Q` `•` `1` `ž` `6` `ô` `î` `ñ`.

8) `__nonzero__()` `Ñ` `__bool__()` `>` `AZ` `ô` `î` `ñ`.

< Builtins >

1) PEP 3135. `è` `N` `E` `f` `E` `super()` `Ñ` `E` `•` `˘` `•` `1` `f` `Ø` `{` `ô` `î` `ñ`. `±` `|` `¼` `•` `O` `•` `J` `K` `"`
`p` `è` `•` `„` `—` `E` `"` `®` `"` `S` `1` `ú` `è` `•` `Ø` `˘` `¼` `Ö` `˘`, `j` `T` `J` `K` `"` `Y` `E` `"` `®` `"` `Ñ` `•` `È` `¿` `Î` `>`
`„` `ô` `j` `•` `ñ`. `Y` `d`, `E` `•` `Y` `Φ` `•` `G` `ä` `•` `{` `ô` `ø` `ö` `¼` `—` `super()` `LV` `½` `ó` `š` `ñ`.

2) PEP 3111. `raw_input()` `•` `input()` `Î` `>` `•` `«` `•` `AZ` `ô` `î` `ñ`. `s`, `input()` `Á` `sys.stdin` `Î` `>`
`Ü` `¤` `ª` `E` `˘` `F` `¼` `t` `ª` `E` `(newline)` `˘` `˘` `U` `S` `S` `˘` `|` `®` `†` `ñ`. `±` `|` `¼` `BD` `•` `•` `{` `(prematurely)`
`E` `4` `ô` `˘` `ø` `EofError` `®` `†` `ñ`. `ö` `¼` `•` `input()` `E` `f` `®` `½` `ó` `á` `ø` `eval(input())` `˘` `½` `ó` `ø`
`š` `ñ`.

3) `__next__()` `S` `1` `ú` `®` `«` `C` `×` `˘` `ž` `è` `N` `E` `f` `next()` `Ñ` `"` `Ñ` `ô` `î` `ñ`.

4) `intern()` `•` `sys.intern()` `•` `ô` `î` `ñ`.

5) `apply()` `Ñ` `6?` `ô` `î` `ñ`. `s`, `apply(f, args)` `Ä` `Ä` `f(*args)` `>` `½` `ó` `ø` `š` `ñ`.

6) `callable()` `•` `6?` `ô` `î` `ñ`. `callable(f)` `Ä` `Ä` `isinstance(f, collections.Callable)` `®`
`½` `ó` `ø` `š` `ñ`. `operator.isCallable()` `E` `f` `™` `6?` `ô` `î` `ñ`.

7) `coerce()` `Ñ` `6?` `ô` `î` `ñ`. `classic` `J` `K` `"` `Ñ` `½` `ª` `'` `×` `•` `•` `E` `f` `©` `•` `ı` `¿` `˘`
`6` `•` `è` `î` `ñ`.

8) `execfile()` `•` `6?` `ô` `î` `ñ`. `execfile(fn)` `Ä` `Ä` `•` `exec(open(fn).read())` `®` `½` `ó` `ø` `š` `ñ`.

9) file ; B• 6? ô î ñ". open() ⇢ ½ó ø š ñ". io B è• Ø© open • | ®1 f
Ø© M Ñ• " E4— " 92(stream) • Øî ñ".

10) reduce() Ñ 6? ô î ñ". functools.reduce() ® ½ó ø š ñ". (1 • © "±~ õ
±O• „ +> — " ø, 99% y 2° for Å¥Ñ F × f" "¼ † ñ".)

11) reload() Ñ 6? ô î ñ". ÅÅ, imp.reload() ® ½ó ø š ñ".

12) dict.has_key() Ñ 6? ô î ñ". ÅÅ, in œÇ• ® ½ó ø š ñ".

11. Build and C API Changes

1 • • ÛÛ• †Q> | • v▷¾ " ¼ † ñ". • ÛÛ• ¯ž¹ © è |
>¼ † = TŠ ñ".

• OĪ > Ž•• 3— t> • \$• ¯ž¹ ŷ⇢ €±ñ". Ÿd, ABC Æ S; J K" Ÿ Φ• %• • 1
ýy• Ûp° ÛÛ• Åž¹ © Ĩ K Å ŷ⇢ >¼ž \# .

< <http://www.ibm.com/devel operworks/kr/library/l-python3-1/>

< <http://www.ibm.com/devel operworks/kr/library/l-python3-2/>

€ • , Ĩ > , Ž•• 3Ñ Ž•• 2.5÷" Å™Ñ 10% „™ ĩ ' " ¼ † ñ" ÑN Ĩ
> E• < Å „ f5(int) • ½ª • ø¹ ° 6ª ¼ † ñ". Ær • é• „ μ O•ª ¼
" † ñ". ^^

z

Ž••• Ā° ×%⊃ ©ōz_v + lTMŸ• ô î ñ^{''}.z • ö½ú, ñ^{''}. 2009.04.12 by
Robinson

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3.0• Ā° ~TM> Û_i úá

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Ž••⊃ • ×• =- f» . ö½†ñ^{''}. by Lak

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Ž••— D⊃ Ñ•: \<¹ ö½†ñ^{''}. by simon

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CS_i• ÆĪ |^{''} Ñ × ¼ ØĒ >• Ž••⊃ ê{ ô î ñ^{''}. ö½†ñ^{''}. ±| ¼ 3.0• Ā°
„ ÷TM Ñ•: \ø ö½ » . ĊĊ

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ö½†ñ^{''}. œ Û• © ¹ © Ž•• " , 9 :)z 10.01.15 by •~1