debug hard

```
require 'test/unit'
require_relative '../introduction'

class IntroductionTest < Test::Unit::TestCase
  def test_introduction
    assert_equal(
      'Welcome to RubyConf Kenya',
      Introduction.new.method
    )
  end
end
```

```
test/introduction_test.rb:2:in `require_relative’:
cannot load such file —
/Users/vishalchandnani/Technical-Talks/idea_1
/introduction/introduction (LoadError)
from test/introduction_test.rb:2:in `<main>'
```

```ruby
class Introduction

  def method
    'Welcome to RubyConf Kenya'
  end

end
```

```
Finished in 0.000394 seconds.
1 tests, 1 assertions, 0 failures, 0 errors
0 pendings, 0 omissions, 0 notifications
100% passed
```

```
def method
  'Welcome to RubyConf Kenya'
end
```

no bugs were harmed in the making of this talk

once upon a time

0800 Arctan started { 1.2700 9.037 847 025
1000 " stopped - arctan ✓ 9.037 846 795 correct
13" sc (032) MP - MC ~~1.9826447000~~ ~~2.13047641~~5 (-3) 4.615925059(-2)
(033) PRO 2 2.130476415
correct 2.130676415
Relays 6-2 in 033 failed special speed test
in relay " 11.00 test.
Relays changed
1100 Started Cosine Tape (Sine check)
1525 Started Mult + Adder Test.

1545 

Relay #70 Panel F
(moth) in relay.

First actual case of bug being found.

~~1625~~ 1630 Arctangent started.
1700 closed down.

Relay 2145
Relay 3370


COMO HOPPE.


return
PROGRAM
TYPE
variables
function
POINTER
statement
array
int
define
char
CHARACTER
USED
operator
structure
String
declaration


vbox

https://www.ruby-lang.org/en/documentation/installation/

https://www.ruby-lang.org/en/downloads/

Ruby Version: 2.5.1

ruby.c

#1

grep

```
$ grep -r rb_str_reverse *
```

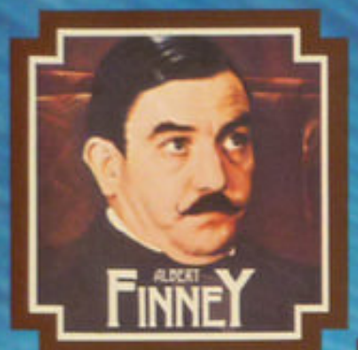
string.c

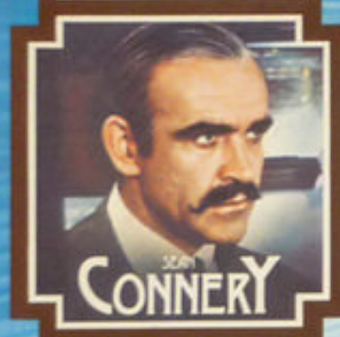
NAT COMEN PRESENTS FOR EMI FILM DISTRIBUTORS LTD. A JOHN BRABOURNE-RICHARD GOODWIN PRODUCTION

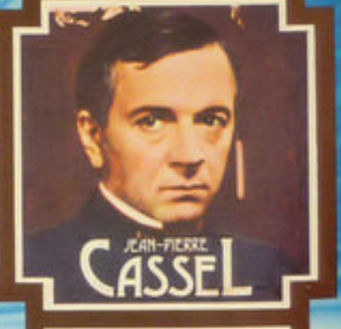
AGATHA CHRISTIE'S

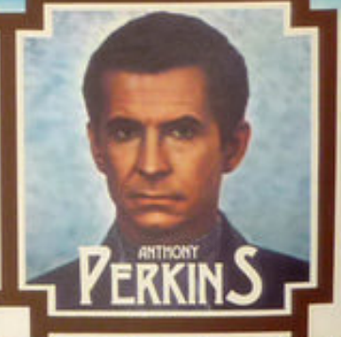
MURDER ON THE ORIENT EXPRESS

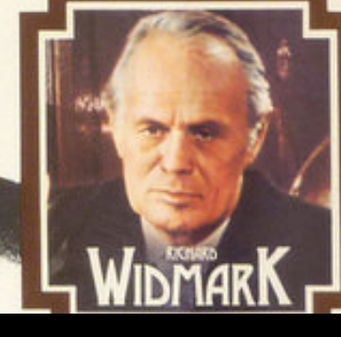
A

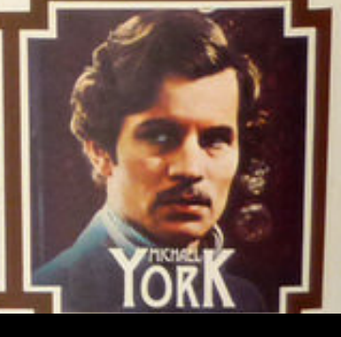












```
File: test/ruby/test_string.rb
require 'test/unit'

class TestString < Test::Unit::TestCase
  def test_reverse
    assert_equal(S("beta"), S("ateb").reverse)
    assert_equal(S("madamImadam"), S("madamImadam").reverse)

    a=S("beta")
    assert_equal(S("ateb"), a.reverse)
    assert_equal(S("beta"), a)
  end
end
```

```
File: string.c
/*
 *  call-seq:
 *     str.reverse. -> new_str
 *  Returns a new string with the characters from <i>str</i>
 *  in reverse order.
 *  “stressed”.reverse  #=> "desserts"
 */
static VALUE
rb_str_reverse(VALUE str)
{
   . . .
}
```

all you need to do

3 days later

debugger.rb

Raphaël


adidas
Fly
Emirates
aLiga

ïeahpaR

#2

chars

```
"Raphaël".chars
```

```
..
["R", "a", "p", "h", "a", "e", "", "l"]
```

ë

unicode

Twelve terrorists. One cop.
The odds are against John McClane…
That's just the way he likes it.

BRUCE WILLIS

DIE HARD

#3

codepoints

```
"Raphaël".codepoints do |c|
  puts "#{c} : 0x#{c.to_s(16)}"
end
```

```
“R” : 82  (0x52)
“a” : 97  (0x61)
“p” : 112 (0x70)
“h” : 104 (0x68)
“a” : 97  (0x61)
“e” : 101 (0x65)
¨”  : 776 (0x308)
“l” : 108 (0x6c)
```

#4

each_byte

```
"Raphaël".each_byte do |c|
  puts "#{c} : 0x#{c.to_s(16)}"
end
```

```
“R”  : 82  (0x52)
“a”  : 97  (0x61)
“p”  : 112 (0x70)
“h”  : 104 (0x68)
“a”  : 97  (0x61)
“e”  : 101 (0x65)
¨”   : 204 (0xcc) and 136 (0x88)
“l”  : 108 (0x6c)
```

pointers

```c
#include <stdio.h>
#include <string.h>

int main ( void ) {
  char str[25] = "hello world";
  char *ptr;

  for(ptr = str; *ptr != '\0'; ptr++) {
    printf("%c", *ptr);
  }
}
```

#5

printf

```
printf(“\n length: %d”, length);
```

```
static VALUE
rb_str_reverse(VALUE str)
{
  . . .
  while (s < e) {
    int clen = rb_enc_fast_mbclen(s, e, enc);
    printf("\nclen: %d", clen);
    p -= clen;
    memcpy(p, s, clen);
    s += clen;
  }
  . . .
}
```


TWENTY SHILLINGS
20
KENYA
SHILINGI ISHIRINI

#6

gdb

```
$ gdb ruby
(gdb) break string.c:5575
(gdb) run -Ilib debugger.rb
(gdb) s
```

```
$ gdb ruby
(gdb) break string.c:5575
(gdb) break regenc:62
(gdb) run -Ilib debugger.rb
(gdb) s
```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```
File: enc/utf_8.c
static int
mbc_enc_len(
const UChar* p,
const UChar* e,
OnigEncoding enc ARG_UNUSED) {
   . . .
   . . .
}
```

```
s: R 82 52
  clen: 1
s: a 97 61
  clen: 1
s: p 112 70
  clen: 1
s: h 104 68
  clen: 1
s: a 97 61
  clen: 1
s: e 101 65
  clen: 1
s: X -52 ffffffcc
  clen: 2
s: l 108 6c
  clen: 1
```

```
if(c1 == 'e') {
  vptr = s;
  *vptr = 0xc3;
  vptr++;
  *vptr = 0xab;
  vptr++;
  *vptr = 'l';
  vptr++;
  *vptr = '\0';
}
```

```
s: R 82 52
  clen: 1
s: a 97 61
  clen: 1
s: p 112 70
  clen: 1
s: h 104 68
  clen: 1
s: a 97 61
  clen: 1
s: e 101 65
  hack
  clen: 2
s: l 108 6c
  clen: 1
```

lëahpaR

unicode_normalize

Canonical Composition

```
irb> vc = “e\u0308”.unicode_normalize
=> “ë”
irb> vc.chars
=> [“ë”]
irb> vc.size
=> 1
```

Canonical Decomposition

```
irb> vc = “e\u0308”.unicode_normalize
=> “ë”
irb> vc.unicode_normalize(:nfd).chars
=> [“e”, “¨”]
irb> vc.unicode_normalize(:nfd).chars.size
=> 2
```

chars before	chars after
“R”	“R”
“a”	“a”
“p”	“p”
“h”	“h”
“a”	“a”
“e”	“ë”
¨”	“l”
“l”	

code_points
before

“R” : 82
“a” : 97
“p” : 112
“h” : 104
“a” : 97
“e” : 101
¨” : 776
“l” : 108

code_points
after

“R” : 82
“a” : 97
“p” : 112
“h” : 104
“a” : 97
“ë” : 235
“l” : 108

```
each_byte
before

“R”  : 82  (0x52)
“a”  : 97  (0x61)
“p”  : 112 (0x70)
“h”  : 104 (0x68)
“a”  : 97  (0x61)
“e”  : 101 (0x65)
¨”   : 204 (0xcc) and 136 (0x88)
“l”  : 108 (0x6c)
```

```
each_byte
after

“R” : 82  (0x52)
“a” : 97  (0x61)
“p” : 112 (0x70)
“h” : 104 (0x68)
“a” : 97. (0x61)
“ë” : 195 (0xc3) and 171(0xab)
“l” : 108 (0x6c)
```

```
File: lib/unicode_normalize/normalize.rb

  def self.normalize(string, form = :nfc)
    . . .
    . . .
    case form
      when :nfc then
        string.gsub REGEXP_C, NF_HASH_C
      . . .
    . . .
  end
```

```
m1 = string[REGEXP_C]
regex match: “ë”
chars: [“e”, ¨”]
codepoints: [101, 776]
each byte iteration
101:0x65 | 204:0xcc | 136:0x88
```

```
m2 = NF_HASH_C[m1]
hash value: “ë”
chars: [“ë”]
codepoints: [235]
each byte iteration
195:0xc3 | 171:0xab
```

Raphaël

léahpaR

```
def debug_hard
  grep
  chars
  code_points
  each_byte
  printf
  gdb
end
```

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