Ruby Basic

1. Paradigm: Procedural, Functional, OO
2. Convention
   a. shebang: #!/usr/bin/env ruby
   b. obj1.object_id == obj2.object_id → same obj
3. Array
   a. arr[start, length].

```
arr1 = 1, 2, 3, 4                          arr[start, length]
arr2 = Array.new(3, "e")                   #=> ["e", "e", "e"]
arr3 = Array.new(arr2)                     # same e, diff arr
arr3[2] = 1; arr3      #=> [nil, nil, 1], created hole

%w{str}                     # str → raw string, split by space
%w{a b c}.combination(2).to_a  #3 comb. [[ ], [ ], [ ]]
%w{a b c}.permutation(2).to_a  #6 permutations
```

   b. Logic

```
arr1 & arr2, arr1 | arr2, arr1 | arr2 - arr1 & arr2   # XOR
[1, 2] * 2    #=> [1, 2, 1, 2]        [1, 2] – [2, 3]       # [1]
```

   c. Methods: change arr directly

```
arr << e     # append   .pop(n)# n>1→Array, 1→element
.push(2, 3)             .insert(index, val)
.shift(n)  # left pop   .unshift(n)  # left push
```

   d. Methods: not change arr

```
.last(n), .first(n), .length, .size,.empty?, .equal?(arr2)

[1, 2, 3].join(str)         # "123", ⇔ arr * str, default ""
str.split(str)              #=> array, can be RegEx
```

   e. Methods: only change arr in ! version

```
.sort  # ascend            .shuffle       # random
.reverse                   .uniq          # unique elements list
.rotate(n)  # rotate to make [n] first, default 1

.slice(start, n)  # w/o n→ arr[n]                   .slice(range)
.flatten(n) # flat n dim from outer, flat all dim w/o n
```

   f. Methods: iteration

```
arr.each {|e|}                          arr.each_index{|index|}
arr.each_with_index{|e, index|}
arr.map/collect{}  # map=>arr, arr.select{}  # filter→arr
arr.inject(init, :operator)             # accumulate
arr.inject {|sum, x| sum ... x}         # block return as accu
```

4. Hash

```
h = {'key' =>  'val'} || {:key => 'val'} || {key: 'val'}
h = Hash.new(1)          # default val when key not=exist

a = Array.new(2, Hash.new)
# a[0].object_id == a[1].object_id
```

   a. Methods: read only

```
.keys  #=> list of keys                  .key(val)
.has_key?(k) | h.include? | h.key? | h.member?
.values       # val list   .values_at(k, l)  # val | default list
.value?(k), .has_value?(k)              # bool
.default,    .default =  2,             h["notkey"]     # default

h.size || h.length, h.empty?
h.to_a                       # [[k, v], [k, v]], array
h.invert                     #=> {val=>key} pairs, de-dup
```

   b. Methods: only change in ! version

```
h[:key].upcase!
.merge(h2)                              # keep h2 val
.merge(h2){|k v1 v2| v1}                # keep h val
```

   c. Methods: write

```
.clear  # remove all                    .delete(key)#=> h[key]
.delete(k) {|k| p k}      # pass key if not found, return val
.delete_if {|k, val|}     h.keep_if {|k, val|}
.replace(h2)  # h == h2                 .shift # pop first pair
```

   d. Methods: iteration

```
h.each || h.each_pair {|key, val|}
h.each_key {|key|}       h.each_value {|val|}
```

Ruby Method

1. Convention
   a. Name: can_end_with_!?=.If start with Capital, must use () to call, Capital()
   b. () is optional: def m p1, p2; return ""; end, NOTHING before m if calling without ()
   c. def m(a, x:"1", y:"2"); p x, y; end, Keyword params must be at last
2. Nested
   a. Cannot contain class or module def
   b. Sub methods exist after sup-mthds called
3. Passed by:
   a. Val: immediate value: nil, true, false, Fixnums, Symbols, and some Floats.
   b. Ref: other objects.
4. puts = print + \n, puts a, b = puts a + puts b

```
def m(a, b=a*a); puts "#{a}, #{b}"; end
> m(3)      #=> 3, 9                  > m(3, 4)   #=> 3, 4
```

5. Splat: rest *args

```
def m(a, *b, c); puts "#{a}, #{b}, #{c}"; end
m(1, 2, 3, 4, 5)            #=> 1, [2, 3, 4], 5
m("I", "do", f:"g", h:"i") #=> I, ["do"], {:f=>"g", :h=>"i"}
# hash must be at last
def m2(a, *, c); puts "#{a}, #{c}"; end
m2(1, 2, 3, 4, 5)           #=> 1, 5
```

6. Get hash:**

```
def m(p, **rest); p "#{p}, #{rest}"; end

def search(field, genre:nil, duration:120, *rest)
   p [field, genre, duration, rest]; end
```

7. Alias new old: preserve original method.
8. obj.send(:m | "m", var): invoke dynamically

Ruby Expression Assignment

1. Parallel

```
a = (b = 2*3) + 4          # a = 10, b = 6
a = 1,2,3  # [1,2,3]       a,  = 1, 2, 3  # a=1
a, b = 1, 2, 3             # a =1, b =2
```

   a. Splat on right

```
a, b, c = (1..3)           # a=1, b=c=nil
a, b, c, d = *(1..2), *(3..4)          # a=1, b=2, c=3, d=4
a, b = [1, 2], [3, 4]      # a=[1,2], b=[3,4]
a, b = *[1, 2], [3, 4]     # a=1, b=2
a, b = *"abc"              # a=["abc"], b=nil
a, b = {1=>2, 3=>4}        # a={1=>2, 3=>4}, b=nil
a, b = *{1=>2, 3=>4}       # a=[1, 2], b=[3, 4], hash→array
```

   b. Splat on left (**only 1 * allowed**)

```
a, *b = 1, 2, 3            # a=1, b=[2, 3]
*a, b = 1, 2, 3            # a=[1, 2], b=3
a, *b, c = 1, 2, 3, 4      # a=1, b=[2, 3], c=4
a, *b, c = 1, 2            # a=1, b=[ ], c=2
*, last = 1, 2, 3          # last=3
```

   c. Unit: treated as 1 var

```
a, (b, c) = 1, 2, 3        # a=1, b=2, c=nil
a, (b, c) = 1, [2, 3], 4   # a=1, b=2, c=3
# decompose first: ( ) ⇔ var
```

Ruby Control

1. Condition (case, if returns last exec exp)

```
n = if ...     # use 'then' for branch at same line
               # puts "word" if age > 10
               # unless: if not, puts "young" unless age > 60
n = case var; when ...; ...;  else; ...; end
               # "===" used for "when" (Range:between, Obj:
==, RegEx: match, Module: is an instance of it)
```

2. Loop:
   a. break: : stop, next: skip

```
while; ..., end | until  # only built-in loop primitives
                                   # no i++, i-- in Ruby
Loop do; ..., end          # block
for                        # ".each" method

10.times {}, 1.upto(10),             "word".each_char {}
```

3. Block
   a. Params in yield are passed into block.
   b. yield( ) returns block val
   c. Scope: var def inside not avail outside, var def outside **AVAIL** inside, |; y| to block.

```
# call block and pass vals
class Hash; def each; len, x = self.length, 0
  while x < len
     yield(self.keys[x], self.values[x])  # pass |k, v|
     x += 1; end; end; end

# block return value through yield
class Array; def find; self.each do |val|
  puts val if yield(val, 'hello')   # get block return val
  end; end; end
[1,2,3].find{|x| x>1}              #=> 2, 3

# pass block
def merge!(h, &block)
  self.merge(h, &block) .each {|key, val| self[key] = val}
  end; end
```

   d. if block_given? block provided/not
   e. block vs. do; end: higher precedence

```
upto 10 do |x|; end     # "upto" binded with "10" first
upto 10 {do |x|}        # syntax err, 10 binded with {}
                        # should be upto(10) {do |x|}
```

Ruby Class

1. Convention
   a. MultiWorkdClassName
   b. Class definition **automatically** executed.
   c. self is current scope.
   d. Inst var in diff scopes are DIFFERENT

```
class C
  puts "A def"          # class def, auto exec
  attr_accessor: var    # obj inst accessor
  @var = 10             # class inst var, diff scope
  class << self
    attr_accessor: var; end         # class inst accessor

  def initialize(v)     # initializer
    @var = v            # obj inst var, won't change 10
    self.class.m; end   # call class mtd from inst mtd
  (def C.set | self.set # class (inst) mtd, class var setter
    @ var = 15; end     # change 10 to 15, not change v)
  (def get              # obj (inst) mtd,  obj var getter
    @var; end           # get v instead of 10/15)

class D < class C; def new; ...; end; end        # inheritance
class D = Class.new(C) do; def new; ...; end; end
E = Struct.new(:a, :b)               # class only have attr
```

	Obj instance	Class instance
Var	In obj inst	In class inst
Method	In obj class	In singleton class

2. Singleton mtd vs singleton var (duck typing)
   a. Obj: in singleton class (anonymous)
   b. Class: all class mtd are singleton

```
obj1 = MyClass.new
def obj1.mtd; ...; end               # mtd for "obj1" only
# or class << obj1; def mtd; ..;end; end
obj1.instance_variable_set(:var, "1")    # add inst var
```

3. Open Class: reopen same name Class.

Ruby Module

1. Same as Class, but no .new() and super, and can't be a super class

```
> Module.ancestors
=> [Module, Object, Kernel, BasicObject]
> MyModule = Module.new
> MyModule.new || > MyModule.superclass => error
```

2. Usage: organize CONSTANTS (class, module, method)
3. Constant: anything start w/ capital letter
   a. Val can be changed (w/ a warning)
4. Scope:
   a. Enter new scope: Module, Class, Method
   b. List
      i. Var: puts local_variables
      ii. CONST: puts MyModule.constants
   c. Variable: invisible to **other(👆/👇) scope.**
   d. Access constant (CONST, Class, Method)
      iii. From outside: M::Cls::C2
      iv. From inside: ::C1 (get top C1 in Cls.run)

```
C1 = 0
module M
  C1 = 1
  class Cls
    C2 = 2
    def Cls.run
      return C1, ::C1
    end
  end
end
```

```
puts M::C1              #=> 1
puts M::Cls::C2         #=> 2

# class method
puts M::Cls.run         #=> [1, 0]
# or M::Cls::run

M::C0 = 1
puts M::C0              #=> 1
```

5. Module method => Class method
6. Mix-in
   b. include → mix-in instance methods to upper level, can modify inst var.
   c. prepend: include to lower level, won't be overwritten if same method exists.
   d. extend→ add **inst** as **class methods**.

```
module MyModule; def my; p "#{self}"; end; end

class MyClass; include MyModule; end
obj = MyClass.new; obj.my        #=> "#<MyClass:...>"

class NewClass; extend MyModule; end
NewClass.my                      #=> "NewClass"
```

   e. include in main:→ instance methods available at top level.

```
module Math; def my; p "#{self}"; end; end

include Math
my                     #=> "main"
```

   f. Inst method → module method: module_function(:symbol)

```
module Math; def my; p "#{self}"; end
  module_function(:my); end
Math.my                #=> "Math"
```

7. Load modules
   g. System module: require "module"
   h. Own file: require_relative "folder/module"
8. Subclassing vs mix-in
   i. Sub: special case of parent→ car < vehicle
   j. Mix-in: mix other cases in
      → def Human; include Disease; end

RegEx

1. str.scan(RegEx) => list of match
2. escape: \

```
r = /re/ ⇔ Regexp.new(re) ⇔ %r{re} # last not escape!

# anchor → immediate char/group
/abc/i      # case      /(C|D|)og/ # ⇔ /[cd]og/
+ ⇔{1, }   * ⇔ {0, }   ? ⇔ {0, 1}   # {min, max}
. ⇔ any 1 char
\d: digit ⇔ ^\D,       \w:[z-aA-Z_0-9] ⇔^\W
\s: space, \t, \n ⇔ ^\S
\A:^, \z:$
\b, ^\B → boundary (not), one side

str.scan(re)  # matched list
```

```
re =~ str # position | nil            re !~ str  # not match
s.sub(re, t)  # replace first       s.gsub(re, t)   # replace all
.sub! | .gsub! returns modified or nil

# // method
.source: no / /, .inspect: /.source/, .to_s: (?-mix:.source)
m = /e/.match("new")
m.pre_match-m[0]-m.post_match              # n-e-w

# goruping
m[n] → n-th matched GROUP(, m[0] is matching str
# $1...$n is the same

/(w+)\1/  # \1→same as group 1
/(?<nm>\w+)\k<nm>/: same, nm also be local var

str = "it is a good class"              # max/min match
/\s.*\s/ → greedy, " is a good ", /\s.*?\s/→lazy, " is "
```

File IO

1. Methods

```
putc: char
gets          # readline: screen or (file in ARGV)
readlines   # ["each", "line"]

# File
file = File.open("f.txt", "r") do |f|     # r/r+/w/w+/a/a+
  while line = f.gets; puts "#{line}"              # reading
  # or f.each_line {|line| puts "#{line}"}
  f.puts "..."                                     # writing
# file.close auto called if use block
Puts File.read("file")
File.rename(s, s1), .size

#IO          .foreach('file') {|line| ...}
str = IO.read  # into str     arr = IO.readlines # into array
STDOUT << str << ...

ARGV: args array       # ARGV.each {|arg|}
ARGF.lineno, ARGF.filename, ARGF.file.lineno, line

Dir:          .pwd, .chdir(str), .entries(path) # all file
Dir.foreach(path), Dir.home(usr)
CSV.foreach(filename){|row|...}
```

2. Socket

```
require 'socket'
sock_serv = Socket.new(:INET, STREAM || DGRAM)
serv_addr =Socket.pack_sockaddr_in((1025..48999), ip)
sock_serv.bind(addr)
sock_serv.listen(n)    # default 5
loop {conn = sock_serv.accept; conn.close}
#S: sock_serv = TCPServer.new(ip, port)
      Socket.accept_loop(sock_serv) {|conn| conn.close}

sock_clnt = Socket.new(:INET, STREAM || DGRAM)
sock_clnt.connect(serv_addr)

# read socket
Socket.tcp_server_sockets(host=nil, port) {|conn|
   puts conn.gets; conn.close}

# write socket
sock_clnt = TCPSocket.new(ip, port)
sock_clnt.write(str)
```

3. STD Lib

```
require 'net/http'
site - %{domainName.com}; path = "/"
response = Net::HTTP.get_response(site, path)
puts "Code = #{response.code}",
puts "Message = #{response.message}"
response.each {|key, value|
  printf "%-15s = %-100s\n", key, value}
p response.body[0, 500]
// require 'open-uri'
```

CGI/Template Concept

1.

```
Str = <<END <html> END
print "Content-Type: text/html;charset=UTF-8\n"
print "Content-Length: #{str.size}\n"
print "Connection: close\n\n"; puts
print str
```

2. CGI#params collect request as hash

```
url/script?a="1"&a="2"&b=3

require 'cgi'
cgi = CGI.new; cgi.user_agent
cgi["a"]       # ["1", "2"],              cgi.keys  # ["a", "b"]
cgi.params  # {"a"=>["1", "2"], "b"=>"3"}
------------------
p cgi.params["a"] if cgi.params["a"] != ""
cgi.out do; cgi.html do
  cgi.head {cgi.title {"this is a cgi program"}} +
     cgi.body do
        cgi.h1 {"your submit from the form are:"} +
        cgi.p {p1} + cgi.p {p2}; end; end; end
```

3. Cookie: CGI::Cookie, save in browser

```
require 'cgi'; cgi = CGI.new("html5")
c_name, c_val = "visit, cig.cookie[c_name]   # access
mycookie = CGI::Cookie.new(c_name, (c_val.to_i+1).to_s)
mycookie.expires = Time.now + 30*24)3600
cgi.out("cookie" => mycookie) {msg}
```

4. Session:

```
require 'cgi'; require 'cgi/session'
cgi = CGI.new("html5")
session = CGI::Session.new(cgi,
  "session_key" => "mysession", "session_expires"=> ...)
session['visit'] = (session['visit']||0).to_i + 1
session.close             # store on server
```

5. Template
   a. ERB: filename.ouput_type.erb

```
<% code %>, % whole line code,
<%= expression %>, <% #comment %>

require 'erb'
class List; attr_accessor :items
  def initialize(items); items = items; end
  def bind; binding(); end; end  # filter can access inst v

list = List.new(["egg", "milk"])
render = ERB.new(template)
puts output = render.result(list.bind)

$> erb template.html.erb > output.html
```

   b. HAML (div can be ommited)

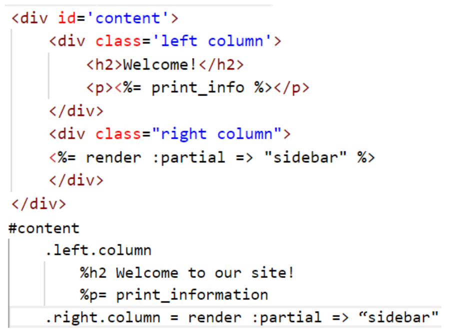
```
%:tag, =: replaced by val of ruby expression
-: execute without val replacement

<strong class="code" id="message">Hello!</strong>
%strong{:class => "code", :id => "message"} Hello!
%strong .code#message Hello!

<strong><%= item.title %></strong>
%strong= item.title

<div class='item' id='item<%= item.id %>'><%= item.

require 'haml'
engine = Haml::Engine.new("%p Haml code!")
# "<p>Haml code!</p>\n"
```



```
<div id='content'>
    <div class='left column'>
        <h2>Welcome!</h2>
        <p><%= print_info %></p>
    </div>
    <div class="right column">
    <%= render :partial => "sidebar" %>
    </div>
</div>
#content
    .left.column
        %h2 Welcome to our site!
        %p= print_information
    .right.column = render :partial => "sidebar"
```