Les_Bases_3

July 16, 2025

1 Les différents types d'erreurs

1.1 Les erreurs à l'exécution

- A/ SyntaxError

[1]:
```
# La sensibilité à la casse

maj="ABC"
if not maj = "HH": # <----- Il fallait mettre == à la place de =
print("Echec")
```

```
  Cell In[1], line 4
    if not maj = "HH": # <----- Il fallait mettre == à la place de =
               ^
SyntaxError: invalid syntax
```

[2]:
```
# Les deux points

u = []
for i in range(1,9); # <----- Attention ! Il faut mettre un ":" au lieu de ";"
    u.append(i)
print(u)
```

```
  Cell In[2], line 4
    for i in range(1,9); # <----- Attention ! Il faut mettre un ":" au lieu de  ;
 ↪"
                         ^
SyntaxError: invalid syntax
```

[3]:
```
# Les guillemets

print("Ousmane Dembélé)
# Attention aux guillemets avec les <str> !
```

```
  Cell In[3], line 3
    print("Ousmane Dembélé)
          ^
SyntaxError: unterminated string literal (detected at line 3)
```

- B/ NameError

[4]:
```
# bonjour = "Bonjour" <----- La variable bonjour n'est pas définie
print(bonjour) # <----- Il n'y a aucune variable bonjour...
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[4], line 2
      1 # bonjour = "Bonjour" <----- La variable bonjour n'est pas définie
----> 2 print(bonjour) # <----- Il n'y a aucune variable bonjour…

NameError: name 'bonjour' is not defined
```

C/ TypeError

[5]:
```
"2"+ 2 # <----- Impossible de faire le calcul car ils ne sont pas du mm <type>
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[5], line 1
----> 1 "2"+ 2 # <----- Impossible de faire le calcul car ils ne sont pas du mm
 ↪<type>

TypeError: can only concatenate str (not "int") to str
```

1.2 Les erreurs sémantiques

[6]:
```
# Il faut que le programme ait de la logique... C'est évident
# Il faut utiliser un débugger
```

2 Quelques modules et fonctions

2.1 Le module random

[7]:
```
import random # <---- Importation de la bibliothèque random

n = random.randint(0,1) # <---- <int> aléatoire entre 0 et 1 (INCLUS)
m = random.randint(0,1) # <---- <int> aléatoire entre 0 et 1 (INCLUS)
```

```
print(n)
print(m)
```

```
0
1
```

[8]:
```
n = random.uniform(0,1) # <---- <float> aléatoire entre 0 et 1 (INCLUS)
m = random.uniform(0,1) # <---- <float> aléatoire entre 0 et 1 (INCLUS)
print(n)
print(m)
```

```
0.1792421207546172
0.5674750684064498
```

[9]:
```
n = random.randrange(1) # <---- <int> aléatoire entra 0 et 1 (EXCLU)
print(n)
# >>> Il affichera toujours 0 car la fct randrange(1) exclut la valeur 1 dans␣
 ↪l'intervalle
```

```
0
```

[10]:
```
m = random.randrange(0,101,5) # <---- <int> aléatoire entre 0 et 101 (EXCLU)␣
 ↪avec un pas de 5
print(m)
# >>> Il affichera un <int> entre 0 et 100 avec un pas de 5. (donc un multiple␣
 ↪de 5)
```

```
70
```

2.2 Le module os

[11]:
```
# La bibliothèque "os" est utilisée pour créer ou supprimer des fichiers
import os  # <---- Importation de la bibliothèque os

chemin = "/Users/zolen/Documents/Informatique_Etude/Python/"

dossier = os.path.join(chemin, "Cours") # <---- La fonction gère les slashs␣
 ↪elle-même :)
dossier_1= os.path.join(chemin, "dossier", "new_folder")

print(dossier_1) # <---- Affiche le chemin complet du dossier "Cours"
# >>> Permet de rejoindre le dossier "Cours" dans le dossier Python
```

```
/Users/zolen/Documents/Informatique_Etude/Python/dossier\new_folder
```

[12]:
```
os.makedirs(dossier_1)
print("Le dossier a été généré :)")
```

```
Le dossier a été généré :)
```

[13]:
```
os.makedirs(dossier_1) # <----- C'est une erreur car le dossier a déjà été crée
```

```
---------------------------------------------------------------------------
FileExistsError                           Traceback (most recent call last)
Cell In[13], line 1
----> 1 os.makedirs(dossier_1) # <----- C'est une erreur car le dossier a déjà␣
 ↪été crée

File <frozen os>:225, in makedirs(name, mode, exist_ok)

FileExistsError: [WinError 183] Impossible de créer un fichier déjà existant: '
 ↪Users/zolen/Documents/Informatique_Etude/Python/dossier\\new_folder'
```

[14]:
```
# Pour créer un fichier sans se soucier de l'erreur :

dossier_2 = os.path.join(chemin,"Autre_dossier")
if not os.path.exists(dossier_2):
    os.makedirs(dossier_2)
    print("Le dossier a bien été générée :)")
else:
    print("Le dossier existe déjà")
```

```
Le dossier a bien été générée :)
```

[15]:
```
if os.makedirs(dossier_2,exist_ok=True): # <----- "exist_ok" permet de ne pas␣
 ↪avoir d'erreur mm si le fichier existe
    phrase = "Bonjour, le dossier a été créé"
    print(phrase)
```

[16]:
```
# Comment supprimer un fichier ?

os.removedirs(dossier_2) # <----- Le dossier "Autre_dossier sera supprimée"
print("Le dossier a bien été supprimée :)")
```

```
Le dossier a bien été supprimée :)
```

[17]:
```
os.removedirs(dossier_2) # <---- Le dossier a déja été supprimée
# >>> Il ne détectera pas un fichier qui n'existe pas (logique)
```

```
---------------------------------------------------------------------------
FileNotFoundError                         Traceback (most recent call last)
Cell In[17], line 1
----> 1 os.removedirs(dossier_2) # <---- Le dossier a déja été supprimée
      2 # >>> Il ne détectera pas un fichier qui n'existe pas (logique)

File <frozen os>:243, in removedirs(name)
```

```
FileNotFoundError: [WinError 2] Le fichier spécifié est introuvable: '/Users/
  ↪zolen/Documents/Informatique_Etude/Python/Autre_dossier'
```

[18]:
```
# Il n'existe aucun argument exist_OK avec removedirs().
# Il faut une structure conditionnelle

if os.path.exists(dossier_2):
    os.removedirs(dossier_2)
    print("L'autre dossier a bien été supprimée :)")
else:
    print("Déja supprimée ;)")
```

```
Déja supprimée ;)
```

2.3 Les fonctions utiles

[19]:
```
# La fonction dir()
print(dir(random)) # <---- affichera toutes les fonctions que l'on peut␣
  ↪utiliser sur random{}
```

```
['BPF', 'LOG4', 'NV_MAGICCONST', 'RECIP_BPF', 'Random', 'SG_MAGICCONST',
'SystemRandom', 'TWOPI', '_ONE', '_Sequence', '__all__', '__builtins__',
'__cached__', '__doc__', '__file__', '__loader__', '__name__', '__package__',
'__spec__', '_accumulate', '_acos', '_bisect', '_ceil', '_cos', '_e', '_exp',
'_fabs', '_floor', '_index', '_inst', '_isfinite', '_lgamma', '_log', '_log2',
'_os', '_pi', '_random', '_repeat', '_sha512', '_sin', '_sqrt', '_test',
'_test_generator', '_urandom', '_warn', 'betavariate', 'binomialvariate',
'choice', 'choices', 'expovariate', 'gammavariate', 'gauss', 'getrandbits',
'getstate', 'lognormvariate', 'normalvariate', 'paretovariate', 'randbytes',
'randint', 'random', 'randrange', 'sample', 'seed', 'setstate', 'shuffle',
'triangular', 'uniform', 'vonmisesvariate', 'weibullvariate']
```

[20]:
```
# La fonction help()
import pygame
help(pygame) # <---- Affiche la documentation de pygame
```

```
pygame 2.6.1 (SDL 2.28.4, Python 3.12.10)
Hello from the pygame community. https://www.pygame.org/contribute.html
Help on package pygame:

NAME
    pygame

DESCRIPTION
    Pygame is a set of Python modules designed for writing games.
    It is written on top of the excellent SDL library. This allows you
    to create fully featured games and multimedia programs in the python
    language. The package is highly portable, with games running on
```

```
    Windows, MacOS, OS X, BeOS, FreeBSD, IRIX, and Linux.

PACKAGE CONTENTS
    __pyinstaller (package)
    _camera
    _camera_opencv
    _camera_vidcapture
    _freetype
    _sdl2 (package)
    _sprite
    base
    bufferproxy
    camera
    color
    colordict
    constants
    cursors
    display
    draw
    draw_py
    event
    examples (package)
    fastevent
    font
    freetype
    ftfont
    gfxdraw
    image
    imageext
    joystick
    key
    locals
    macosx
    mask
    math
    midi
    mixer
    mixer_music
    mouse
    newbuffer
    pixelarray
    pixelcopy
    pkgdata
    pypm
    rect
    rwobject
    scrap
    sndarray
```

```
    sprite
    surface
    surfarray
    surflock
    sysfont
    tests (package)
    threads (package)
    time
    transform
    version

CLASSES
    builtins.BufferError(builtins.Exception)
        BufferError
    builtins.RuntimeError(builtins.Exception)
        error

    class BufferError(builtins.BufferError)
     |  Method resolution order:
     |      BufferError
     |      builtins.BufferError
     |      builtins.Exception
     |      builtins.BaseException
     |      builtins.object
     |
     |  Data descriptors defined here:
     |
     |  __weakref__
     |      list of weak references to the object
     |
     |  ----------------------------------------------------------------------
     |  Methods inherited from builtins.BufferError:
     |
     |  __init__(self, /, *args, **kwargs)
     |      Initialize self.  See help(type(self)) for accurate signature.
     |
     |  ----------------------------------------------------------------------
     |  Static methods inherited from builtins.BufferError:
     |
     |  __new__(*args, **kwargs) class method of builtins.BufferError
     |      Create and return a new object.  See help(type) for accurate
signature.
     |
     |  ----------------------------------------------------------------------
     |  Methods inherited from builtins.BaseException:
     |
     |  __getattribute__(self, name, /)
     |      Return getattr(self, name).
```

```
 |
 |  __reduce__(…)
 |      Helper for pickle.
 |
 |  __repr__(self, /)
 |      Return repr(self).
 |
 |  __setstate__(…)
 |
 |  __str__(self, /)
 |      Return str(self).
 |
 |  add_note(…)
 |      Exception.add_note(note) --
 |      add a note to the exception
 |
 |  with_traceback(…)
 |      Exception.with_traceback(tb) --
 |      set self.__traceback__ to tb and return self.
 |
 |  ----------------------------------------------------------------------
 |  Data descriptors inherited from builtins.BaseException:
 |
 |  __cause__
 |      exception cause
 |
 |  __context__
 |      exception context
 |
 |  __dict__
 |
 |  __suppress_context__
 |
 |  __traceback__
 |
 |  args

class error(builtins.RuntimeError)
 |  Method resolution order:
 |      error
 |      builtins.RuntimeError
 |      builtins.Exception
 |      builtins.BaseException
 |      builtins.object
 |
 |  Data descriptors defined here:
 |
 |  __weakref__
```

```
      |      list of weak references to the object
      |
      |  ----------------------------------------------------------------------
      |  Methods inherited from builtins.RuntimeError:
      |
      |  __init__(self, /, *args, **kwargs)
      |      Initialize self.  See help(type(self)) for accurate signature.
      |
      |  ----------------------------------------------------------------------
      |  Static methods inherited from builtins.RuntimeError:
      |
      |  __new__(*args, **kwargs) class method of builtins.RuntimeError
      |      Create and return a new object.  See help(type) for accurate
signature.
      |
      |  ----------------------------------------------------------------------
      |  Methods inherited from builtins.BaseException:
      |
      |  __getattribute__(self, name, /)
      |      Return getattr(self, name).
      |
      |  __reduce__(…)
      |      Helper for pickle.
      |
      |  __repr__(self, /)
      |      Return repr(self).
      |
      |  __setstate__(…)
      |
      |  __str__(self, /)
      |      Return str(self).
      |
      |  add_note(…)
      |      Exception.add_note(note) --
      |      add a note to the exception
      |
      |  with_traceback(…)
      |      Exception.with_traceback(tb) --
      |      set self.__traceback__ to tb and return self.
      |
      |  ----------------------------------------------------------------------
      |  Data descriptors inherited from builtins.BaseException:
      |
      |  __cause__
      |      exception cause
      |
      |  __context__
      |      exception context
```

```
 |
 |  __dict__
 |
 |  __suppress_context__
 |
 |  __traceback__
 |
 |  args

FUNCTIONS
    Overlay(format, size)

    encode_file_path(…)
        encode_file_path([obj [, etype]]) -> bytes or None
        Encode a Unicode or bytes object as a file system path

    encode_string(…)
        encode_string([obj [, encoding [, errors [, etype]]]]) -> bytes or None
        Encode a Unicode or bytes object

    get_array_interface(…)
        return an array struct interface as an interface dictionary

    get_error(…)
        get_error() -> errorstr
        get the current error message

    get_init(…)
        get_init() -> bool
        returns True if pygame is currently initialized

    get_sdl_byteorder(…)
        get_sdl_byteorder() -> int
        get the byte order of SDL

    get_sdl_version(…)
        get_sdl_version(linked=True) -> major, minor, patch
        get the version number of SDL

    init(…)
        init() -> (numpass, numfail)
        initialize all imported pygame modules

    quit(…)
        quit() -> None
        uninitialize all pygame modules

    register_quit(…)
```

```
        register_quit(callable) -> None
        register a function to be called when pygame quits

    set_error(…)
        set_error(error_msg) -> None
        set the current error message

DATA
    ACTIVEEVENT = 32768
    ANYFORMAT = 268435456
    APPACTIVE = 4
    APPINPUTFOCUS = 2
    APPMOUSEFOCUS = 1
    APP_DIDENTERBACKGROUND = 260
    APP_DIDENTERFOREGROUND = 262
    APP_LOWMEMORY = 258
    APP_TERMINATING = 257
    APP_WILLENTERBACKGROUND = 259
    APP_WILLENTERFOREGROUND = 261
    ASYNCBLIT = 4
    AUDIODEVICEADDED = 4352
    AUDIODEVICEREMOVED = 4353
    AUDIO_ALLOW_ANY_CHANGE = 15
    AUDIO_ALLOW_CHANNELS_CHANGE = 4
    AUDIO_ALLOW_FORMAT_CHANGE = 2
    AUDIO_ALLOW_FREQUENCY_CHANGE = 1
    AUDIO_S16 = 32784
    AUDIO_S16LSB = 32784
    AUDIO_S16MSB = 36880
    AUDIO_S16SYS = 32784
    AUDIO_S8 = 32776
    AUDIO_U16 = 16
    AUDIO_U16LSB = 16
    AUDIO_U16MSB = 4112
    AUDIO_U16SYS = 16
    AUDIO_U8 = 8
    BIG_ENDIAN = 4321
    BLENDMODE_ADD = 2
    BLENDMODE_BLEND = 1
    BLENDMODE_MOD = 4
    BLENDMODE_NONE = 0
    BLEND_ADD = 1
    BLEND_ALPHA_SDL2 = 18
    BLEND_MAX = 5
    BLEND_MIN = 4
    BLEND_MULT = 3
    BLEND_PREMULTIPLIED = 17
    BLEND_RGBA_ADD = 6
```

```
BLEND_RGBA_MAX = 16
BLEND_RGBA_MIN = 9
BLEND_RGBA_MULT = 8
BLEND_RGBA_SUB = 7
BLEND_RGB_ADD = 1
BLEND_RGB_MAX = 5
BLEND_RGB_MIN = 4
BLEND_RGB_MULT = 3
BLEND_RGB_SUB = 2
BLEND_SUB = 2
BUTTON_LEFT = 1
BUTTON_MIDDLE = 2
BUTTON_RIGHT = 3
BUTTON_WHEELDOWN = 5
BUTTON_WHEELUP = 4
BUTTON_X1 = 6
BUTTON_X2 = 7
CLIPBOARDUPDATE = 2304
CONTROLLERAXISMOTION = 1616
CONTROLLERBUTTONDOWN = 1617
CONTROLLERBUTTONUP = 1618
CONTROLLERDEVICEADDED = 1619
CONTROLLERDEVICEREMAPPED = 1621
CONTROLLERDEVICEREMOVED = 1620
CONTROLLERSENSORUPDATE = 1625
CONTROLLERTOUCHPADDOWN = 1622
CONTROLLERTOUCHPADMOTION = 1623
CONTROLLERTOUCHPADUP = 1624
CONTROLLER_AXIS_INVALID = -1
CONTROLLER_AXIS_LEFTX = 0
CONTROLLER_AXIS_LEFTY = 1
CONTROLLER_AXIS_MAX = 6
CONTROLLER_AXIS_RIGHTX = 2
CONTROLLER_AXIS_RIGHTY = 3
CONTROLLER_AXIS_TRIGGERLEFT = 4
CONTROLLER_AXIS_TRIGGERRIGHT = 5
CONTROLLER_BUTTON_A = 0
CONTROLLER_BUTTON_B = 1
CONTROLLER_BUTTON_BACK = 4
CONTROLLER_BUTTON_DPAD_DOWN = 12
CONTROLLER_BUTTON_DPAD_LEFT = 13
CONTROLLER_BUTTON_DPAD_RIGHT = 14
CONTROLLER_BUTTON_DPAD_UP = 11
CONTROLLER_BUTTON_GUIDE = 5
CONTROLLER_BUTTON_INVALID = -1
CONTROLLER_BUTTON_LEFTSHOULDER = 9
CONTROLLER_BUTTON_LEFTSTICK = 7
CONTROLLER_BUTTON_MAX = 21
```

```
CONTROLLER_BUTTON_RIGHTSHOULDER = 10
CONTROLLER_BUTTON_RIGHTSTICK = 8
CONTROLLER_BUTTON_START = 6
CONTROLLER_BUTTON_X = 2
CONTROLLER_BUTTON_Y = 3
DOUBLEBUF = 1073741824
DROPBEGIN = 4098
DROPCOMPLETE = 4099
DROPFILE = 4096
DROPTEXT = 4097
FINGERDOWN = 1792
FINGERMOTION = 1794
FINGERUP = 1793
FULLSCREEN = -2147483648
GL_ACCELERATED_VISUAL = 15
GL_ACCUM_ALPHA_SIZE = 11
GL_ACCUM_BLUE_SIZE = 10
GL_ACCUM_GREEN_SIZE = 9
GL_ACCUM_RED_SIZE = 8
GL_ALPHA_SIZE = 3
GL_BLUE_SIZE = 2
GL_BUFFER_SIZE = 4
GL_CONTEXT_DEBUG_FLAG = 1
GL_CONTEXT_FLAGS = 20
GL_CONTEXT_FORWARD_COMPATIBLE_FLAG = 2
GL_CONTEXT_MAJOR_VERSION = 17
GL_CONTEXT_MINOR_VERSION = 18
GL_CONTEXT_PROFILE_COMPATIBILITY = 2
GL_CONTEXT_PROFILE_CORE = 1
GL_CONTEXT_PROFILE_ES = 4
GL_CONTEXT_PROFILE_MASK = 21
GL_CONTEXT_RELEASE_BEHAVIOR = 24
GL_CONTEXT_RELEASE_BEHAVIOR_FLUSH = 1
GL_CONTEXT_RELEASE_BEHAVIOR_NONE = 0
GL_CONTEXT_RESET_ISOLATION_FLAG = 8
GL_CONTEXT_ROBUST_ACCESS_FLAG = 4
GL_DEPTH_SIZE = 6
GL_DOUBLEBUFFER = 5
GL_FRAMEBUFFER_SRGB_CAPABLE = 23
GL_GREEN_SIZE = 1
GL_MULTISAMPLEBUFFERS = 13
GL_MULTISAMPLESAMPLES = 14
GL_RED_SIZE = 0
GL_SHARE_WITH_CURRENT_CONTEXT = 22
GL_STENCIL_SIZE = 7
GL_STEREO = 12
GL_SWAP_CONTROL = 0
HAT_CENTERED = 0
```

```
HAT_DOWN = 4
HAT_LEFT = 8
HAT_LEFTDOWN = 12
HAT_LEFTUP = 9
HAT_RIGHT = 2
HAT_RIGHTDOWN = 6
HAT_RIGHTUP = 3
HAT_UP = 1
HAVE_NEWBUF = 1
HIDDEN = 128
HWACCEL = 256
HWPALETTE = 536870912
HWSURFACE = 1
JOYAXISMOTION = 1536
JOYBALLMOTION = 1537
JOYBUTTONDOWN = 1539
JOYBUTTONUP = 1540
JOYDEVICEADDED = 1541
JOYDEVICEREMOVED = 1542
JOYHATMOTION = 1538
KEYDOWN = 768
KEYMAPCHANGED = 772
KEYUP = 769
KMOD_ALT = 768
KMOD_CAPS = 8192
KMOD_CTRL = 192
KMOD_GUI = 3072
KMOD_LALT = 256
KMOD_LCTRL = 64
KMOD_LGUI = 1024
KMOD_LMETA = 1024
KMOD_LSHIFT = 1
KMOD_META = 3072
KMOD_MODE = 16384
KMOD_NONE = 0
KMOD_NUM = 4096
KMOD_RALT = 512
KMOD_RCTRL = 128
KMOD_RGUI = 2048
KMOD_RMETA = 2048
KMOD_RSHIFT = 2
KMOD_SHIFT = 3
KSCAN_0 = 39
KSCAN_1 = 30
KSCAN_2 = 31
KSCAN_3 = 32
KSCAN_4 = 33
KSCAN_5 = 34
```

```
KSCAN_6 = 35
KSCAN_7 = 36
KSCAN_8 = 37
KSCAN_9 = 38
KSCAN_A = 4
KSCAN_AC_BACK = 270
KSCAN_APOSTROPHE = 52
KSCAN_B = 5
KSCAN_BACKSLASH = 49
KSCAN_BACKSPACE = 42
KSCAN_BREAK = 72
KSCAN_C = 6
KSCAN_CAPSLOCK = 57
KSCAN_CLEAR = 156
KSCAN_COMMA = 54
KSCAN_CURRENCYSUBUNIT = 181
KSCAN_CURRENCYUNIT = 180
KSCAN_D = 7
KSCAN_DELETE = 76
KSCAN_DOWN = 81
KSCAN_E = 8
KSCAN_END = 77
KSCAN_EQUALS = 46
KSCAN_ESCAPE = 41
KSCAN_EURO = 180
KSCAN_F = 9
KSCAN_F1 = 58
KSCAN_F10 = 67
KSCAN_F11 = 68
KSCAN_F12 = 69
KSCAN_F13 = 104
KSCAN_F14 = 105
KSCAN_F15 = 106
KSCAN_F2 = 59
KSCAN_F3 = 60
KSCAN_F4 = 61
KSCAN_F5 = 62
KSCAN_F6 = 63
KSCAN_F7 = 64
KSCAN_F8 = 65
KSCAN_F9 = 66
KSCAN_G = 10
KSCAN_GRAVE = 53
KSCAN_H = 11
KSCAN_HELP = 117
KSCAN_HOME = 74
KSCAN_I = 12
KSCAN_INSERT = 73
```

```
KSCAN_INTERNATIONAL1 = 135
KSCAN_INTERNATIONAL2 = 136
KSCAN_INTERNATIONAL3 = 137
KSCAN_INTERNATIONAL4 = 138
KSCAN_INTERNATIONAL5 = 139
KSCAN_INTERNATIONAL6 = 140
KSCAN_INTERNATIONAL7 = 141
KSCAN_INTERNATIONAL8 = 142
KSCAN_INTERNATIONAL9 = 143
KSCAN_J = 13
KSCAN_K = 14
KSCAN_KP0 = 98
KSCAN_KP1 = 89
KSCAN_KP2 = 90
KSCAN_KP3 = 91
KSCAN_KP4 = 92
KSCAN_KP5 = 93
KSCAN_KP6 = 94
KSCAN_KP7 = 95
KSCAN_KP8 = 96
KSCAN_KP9 = 97
KSCAN_KP_0 = 98
KSCAN_KP_1 = 89
KSCAN_KP_2 = 90
KSCAN_KP_3 = 91
KSCAN_KP_4 = 92
KSCAN_KP_5 = 93
KSCAN_KP_6 = 94
KSCAN_KP_7 = 95
KSCAN_KP_8 = 96
KSCAN_KP_9 = 97
KSCAN_KP_DIVIDE = 84
KSCAN_KP_ENTER = 88
KSCAN_KP_EQUALS = 103
KSCAN_KP_MINUS = 86
KSCAN_KP_MULTIPLY = 85
KSCAN_KP_PERIOD = 99
KSCAN_KP_PLUS = 87
KSCAN_L = 15
KSCAN_LALT = 226
KSCAN_LANG1 = 144
KSCAN_LANG2 = 145
KSCAN_LANG3 = 146
KSCAN_LANG4 = 147
KSCAN_LANG5 = 148
KSCAN_LANG6 = 149
KSCAN_LANG7 = 150
KSCAN_LANG8 = 151
```

```
KSCAN_LANG9 = 152
KSCAN_LCTRL = 224
KSCAN_LEFT = 80
KSCAN_LEFTBRACKET = 47
KSCAN_LGUI = 227
KSCAN_LMETA = 227
KSCAN_LSHIFT = 225
KSCAN_LSUPER = 227
KSCAN_M = 16
KSCAN_MENU = 118
KSCAN_MINUS = 45
KSCAN_MODE = 257
KSCAN_N = 17
KSCAN_NONUSBACKSLASH = 100
KSCAN_NONUSHASH = 50
KSCAN_NUMLOCK = 83
KSCAN_NUMLOCKCLEAR = 83
KSCAN_O = 18
KSCAN_P = 19
KSCAN_PAGEDOWN = 78
KSCAN_PAGEUP = 75
KSCAN_PAUSE = 72
KSCAN_PERIOD = 55
KSCAN_POWER = 102
KSCAN_PRINT = 70
KSCAN_PRINTSCREEN = 70
KSCAN_Q = 20
KSCAN_R = 21
KSCAN_RALT = 230
KSCAN_RCTRL = 228
KSCAN_RETURN = 40
KSCAN_RGUI = 231
KSCAN_RIGHT = 79
KSCAN_RIGHTBRACKET = 48
KSCAN_RMETA = 231
KSCAN_RSHIFT = 229
KSCAN_RSUPER = 231
KSCAN_S = 22
KSCAN_SCROLLLOCK = 71
KSCAN_SCROLLOCK = 71
KSCAN_SEMICOLON = 51
KSCAN_SLASH = 56
KSCAN_SPACE = 44
KSCAN_SYSREQ = 154
KSCAN_T = 23
KSCAN_TAB = 43
KSCAN_U = 24
KSCAN_UNKNOWN = 0
```

```
KSCAN_UP = 82
KSCAN_V = 25
KSCAN_W = 26
KSCAN_X = 27
KSCAN_Y = 28
KSCAN_Z = 29
K_0 = 48
K_1 = 49
K_2 = 50
K_3 = 51
K_4 = 52
K_5 = 53
K_6 = 54
K_7 = 55
K_8 = 56
K_9 = 57
K_AC_BACK = 1073742094
K_AMPERSAND = 38
K_ASTERISK = 42
K_AT = 64
K_BACKQUOTE = 96
K_BACKSLASH = 92
K_BACKSPACE = 8
K_BREAK = 1073741896
K_CAPSLOCK = 1073741881
K_CARET = 94
K_CLEAR = 1073741980
K_COLON = 58
K_COMMA = 44
K_CURRENCYSUBUNIT = 1073742005
K_CURRENCYUNIT = 1073742004
K_DELETE = 127
K_DOLLAR = 36
K_DOWN = 1073741905
K_END = 1073741901
K_EQUALS = 61
K_ESCAPE = 27
K_EURO = 1073742004
K_EXCLAIM = 33
K_F1 = 1073741882
K_F10 = 1073741891
K_F11 = 1073741892
K_F12 = 1073741893
K_F13 = 1073741928
K_F14 = 1073741929
K_F15 = 1073741930
K_F2 = 1073741883
K_F3 = 1073741884
```

```
K_F4 = 1073741885
K_F5 = 1073741886
K_F6 = 1073741887
K_F7 = 1073741888
K_F8 = 1073741889
K_F9 = 1073741890
K_GREATER = 62
K_HASH = 35
K_HELP = 1073741941
K_HOME = 1073741898
K_INSERT = 1073741897
K_KP0 = 1073741922
K_KP1 = 1073741913
K_KP2 = 1073741914
K_KP3 = 1073741915
K_KP4 = 1073741916
K_KP5 = 1073741917
K_KP6 = 1073741918
K_KP7 = 1073741919
K_KP8 = 1073741920
K_KP9 = 1073741921
K_KP_0 = 1073741922
K_KP_1 = 1073741913
K_KP_2 = 1073741914
K_KP_3 = 1073741915
K_KP_4 = 1073741916
K_KP_5 = 1073741917
K_KP_6 = 1073741918
K_KP_7 = 1073741919
K_KP_8 = 1073741920
K_KP_9 = 1073741921
K_KP_DIVIDE = 1073741908
K_KP_ENTER = 1073741912
K_KP_EQUALS = 1073741927
K_KP_MINUS = 1073741910
K_KP_MULTIPLY = 1073741909
K_KP_PERIOD = 1073741923
K_KP_PLUS = 1073741911
K_LALT = 1073742050
K_LCTRL = 1073742048
K_LEFT = 1073741904
K_LEFTBRACKET = 91
K_LEFTPAREN = 40
K_LESS = 60
K_LGUI = 1073742051
K_LMETA = 1073742051
K_LSHIFT = 1073742049
K_LSUPER = 1073742051
```

```
K_MENU = 1073741942
K_MINUS = 45
K_MODE = 1073742081
K_NUMLOCK = 1073741907
K_NUMLOCKCLEAR = 1073741907
K_PAGEDOWN = 1073741902
K_PAGEUP = 1073741899
K_PAUSE = 1073741896
K_PERCENT = 37
K_PERIOD = 46
K_PLUS = 43
K_POWER = 1073741926
K_PRINT = 1073741894
K_PRINTSCREEN = 1073741894
K_QUESTION = 63
K_QUOTE = 39
K_QUOTEDBL = 34
K_RALT = 1073742054
K_RCTRL = 1073742052
K_RETURN = 13
K_RGUI = 1073742055
K_RIGHT = 1073741903
K_RIGHTBRACKET = 93
K_RIGHTPAREN = 41
K_RMETA = 1073742055
K_RSHIFT = 1073742053
K_RSUPER = 1073742055
K_SCROLLLOCK = 1073741895
K_SCROLLOCK = 1073741895
K_SEMICOLON = 59
K_SLASH = 47
K_SPACE = 32
K_SYSREQ = 1073741978
K_TAB = 9
K_UNDERSCORE = 95
K_UNKNOWN = 0
K_UP = 1073741906
K_a = 97
K_b = 98
K_c = 99
K_d = 100
K_e = 101
K_f = 102
K_g = 103
K_h = 104
K_i = 105
K_j = 106
K_k = 107
```

```
K_l = 108
K_m = 109
K_n = 110
K_o = 111
K_p = 112
K_q = 113
K_r = 114
K_s = 115
K_t = 116
K_u = 117
K_v = 118
K_w = 119
K_x = 120
K_y = 121
K_z = 122
LIL_ENDIAN = 1234
LOCALECHANGED = 263
MIDIIN = 32771
MIDIOUT = 32772
MOUSEBUTTONDOWN = 1025
MOUSEBUTTONUP = 1026
MOUSEMOTION = 1024
MOUSEWHEEL = 1027
MULTIGESTURE = 2050
NOEVENT = 0
NOFRAME = 32
NUMEVENTS = 65535
OPENGL = 2
OPENGLBLIT = 10
PREALLOC = 16777216
QUIT = 256
RENDER_DEVICE_RESET = 8193
RENDER_TARGETS_RESET = 8192
RESIZABLE = 16
RLEACCEL = 16384
RLEACCELOK = 8192
SCALED = 512
SCRAP_BMP = 'image/bmp'
SCRAP_CLIPBOARD = 0
SCRAP_PBM = 'image/pbm'
SCRAP_PPM = 'image/ppm'
SCRAP_SELECTION = 1
SCRAP_TEXT = 'text/plain'
SDL = SDLVersion(major=2, minor=28, patch=4)
SHOWN = 64
SRCALPHA = 65536
SRCCOLORKEY = 4096
SWSURFACE = 0
```

```
    SYSTEM_CURSOR_ARROW = 0
    SYSTEM_CURSOR_CROSSHAIR = 3
    SYSTEM_CURSOR_HAND = 11
    SYSTEM_CURSOR_IBEAM = 1
    SYSTEM_CURSOR_NO = 10
    SYSTEM_CURSOR_SIZEALL = 9
    SYSTEM_CURSOR_SIZENESW = 6
    SYSTEM_CURSOR_SIZENS = 8
    SYSTEM_CURSOR_SIZENWSE = 5
    SYSTEM_CURSOR_SIZEWE = 7
    SYSTEM_CURSOR_WAIT = 2
    SYSTEM_CURSOR_WAITARROW = 4
    SYSWMEVENT = 513
    TEXTEDITING = 770
    TEXTINPUT = 771
    TIMER_RESOLUTION = 0
    USEREVENT = 32866
    USEREVENT_DROPFILE = 4096
    VIDEOEXPOSE = 32770
    VIDEORESIZE = 32769
    WINDOWCLOSE = 32787
    WINDOWDISPLAYCHANGED = 32791
    WINDOWENTER = 32783
    WINDOWEXPOSED = 32776
    WINDOWFOCUSGAINED = 32785
    WINDOWFOCUSLOST = 32786
    WINDOWHIDDEN = 32775
    WINDOWHITTEST = 32789
    WINDOWICCPROFCHANGED = 32790
    WINDOWLEAVE = 32784
    WINDOWMAXIMIZED = 32781
    WINDOWMINIMIZED = 32780
    WINDOWMOVED = 32777
    WINDOWRESIZED = 32778
    WINDOWRESTORED = 32782
    WINDOWSHOWN = 32774
    WINDOWSIZECHANGED = 32779
    WINDOWTAKEFOCUS = 32788
    rev = ''
    ver = '2.6.1'
    vernum = PygameVersion(major=2, minor=6, patch=1)

VERSION
    2.6.1

FILE
    c:\users\zolen\appdata\local\packages\pythonsoftwarefoundation.python.3.12_q
bz5n2kfra8p0\localcache\local-packages\python312\site-
```

```
packages\pygame\__init__.py
```

[21]:
```
# La fonction pprint()
from pprint import pprint
pprint(dir(random))
```

```
['BPF',
 'LOG4',
 'NV_MAGICCONST',
 'RECIP_BPF',
 'Random',
 'SG_MAGICCONST',
 'SystemRandom',
 'TWOPI',
 '_ONE',
 '_Sequence',
 '__all__',
 '__builtins__',
 '__cached__',
 '__doc__',
 '__file__',
 '__loader__',
 '__name__',
 '__package__',
 '__spec__',
 '_accumulate',
 '_acos',
 '_bisect',
 '_ceil',
 '_cos',
 '_e',
 '_exp',
 '_fabs',
 '_floor',
 '_index',
 '_inst',
 '_isfinite',
 '_lgamma',
 '_log',
 '_log2',
 '_os',
 '_pi',
 '_random',
 '_repeat',
 '_sha512',
 '_sin',
```

```
'_sqrt',
'_test',
'_test_generator',
'_urandom',
'_warn',
'betavariate',
'binomialvariate',
'choice',
'choices',
'expovariate',
'gammavariate',
'gauss',
'getrandbits',
'getstate',
'lognormvariate',
'normalvariate',
'paretovariate',
'randbytes',
'randint',
'random',
'randrange',
'sample',
'seed',
'setstate',
'shuffle',
'triangular',
'uniform',
'vonmisesvariate',
'weibullvariate']
```

3 Les objets callables

[22]:
```
import os
from pprint import pprint
print(callable(os)) # <---- On ne peut pas appeler un module
# >>> False
print(callable(pprint))
# >>> True
print(callable(os.name)) # <---- On ne peut pas appeler os.name
print(os.name())
```

```
False
True
False
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
```

```
Cell In[22], line 8
      6 # >>> True
      7 print(callable(os.name)) # <---- On ne peut pas appeler os.name
----> 8 print(os.name())

TypeError: 'str' object is not callable
```


28 mars 2025, mis à jour le 15 juillet 2025