

# 66310837

นายจิรัฐ ฟองดา

```
import numpy as np
```

```
np.int64(2**63-1)
```

```
np.int64(9223372036854775807)
```

```
np.int64(2**63)
```

```
-----  
-----  
OverflowError                                Traceback (most recent call  
last)  
Cell In[3], line 1  
----> 1 np.int64(2**63)
```

```
OverflowError: int too big to convert
```

```
2**100
```

```
1267650600228229401496703205376
```

```
import sys
```

```
max_size = sys.maxsize
```

```
min_size = -sys.maxsize - 1
```

```
print(min_size, max_size)
```

```
-9223372036854775808 9223372036854775807
```

```
print(100*(0.1 + 0.2))
```

```
print(100*0.1 + 100*0.2)
```

```
30.000000000000004
```

```
30.0
```

```
100*(0.1 + 0.2) == 100*0.1 + 100*0.2
```

```
False
```

```
abs((100*(0.1 + 0.2)) - (100*0.1 + 100*0.2)) < 1e-10
```

```
True
```

```
from time import sleep
```

```
x = 0.0
```

```

while x != (1.0):
    x += 0.1
    print(repr(x))

    sleep(0.4)

```

```

0.1
0.2
0.30000000000000004
0.4
0.5
0.6
0.7
0.7999999999999999
0.8999999999999999
0.9999999999999999
1.0999999999999999
1.2
1.3
1.4000000000000001
1.5000000000000002
1.6000000000000003
1.7000000000000004

```

```

-----
-----
KeyboardInterrupt                                Traceback (most recent call
last)
Cell In[11], line 9
      6 x += 0.1
      7 print(repr(x))
----> 9 sleep(0.4)

```

KeyboardInterrupt:

```

a = 1.0
b = 1.0
i = 0
while (a + b > a):
    print(i, b)
    b = b / 2.0
    i+=1

```

```

0 1.0
1 0.5
2 0.25
3 0.125
4 0.0625
5 0.03125
6 0.015625

```

```
7 0.0078125
8 0.00390625
9 0.001953125
10 0.0009765625
11 0.00048828125
12 0.000244140625
13 0.0001220703125
14 6.103515625e-05
15 3.0517578125e-05
16 1.52587890625e-05
17 7.62939453125e-06
18 3.814697265625e-06
19 1.9073486328125e-06
20 9.5367431640625e-07
21 4.76837158203125e-07
22 2.384185791015625e-07
23 1.1920928955078125e-07
24 5.960464477539063e-08
25 2.9802322387695312e-08
26 1.4901161193847656e-08
27 7.450580596923828e-09
28 3.725290298461914e-09
29 1.862645149230957e-09
30 9.313225746154785e-10
31 4.656612873077393e-10
32 2.3283064365386963e-10
33 1.1641532182693481e-10
34 5.820766091346741e-11
35 2.9103830456733704e-11
36 1.4551915228366852e-11
37 7.275957614183426e-12
38 3.637978807091713e-12
39 1.8189894035458565e-12
40 9.094947017729282e-13
41 4.547473508864641e-13
42 2.2737367544323206e-13
43 1.1368683772161603e-13
44 5.684341886080802e-14
45 2.842170943040401e-14
46 1.4210854715202004e-14
47 7.105427357601002e-15
48 3.552713678800501e-15
49 1.7763568394002505e-15
50 8.881784197001252e-16
51 4.440892098500626e-16
52 2.220446049250313e-16
```

```
print(2**(-52))
```

```
2.220446049250313e-16
```

```
print(np.finfo(float).eps)
2.220446049250313e-16

print(np.finfo(np.float32).eps)
1.1920929e-07

a = 1.0
while a > 0.0:
    a = a / 2.0
    print(a) #ถ้ามันน้อยถึงจุดหนึ่งจะถูกตัดเป็น 0

0.5
0.25
0.125
0.0625
0.03125
0.015625
0.0078125
0.00390625
0.001953125
0.0009765625
0.00048828125
0.000244140625
0.0001220703125
6.103515625e-05
3.0517578125e-05
1.52587890625e-05
7.62939453125e-06
3.814697265625e-06
1.9073486328125e-06
9.5367431640625e-07
4.76837158203125e-07
2.384185791015625e-07
1.1920928955078125e-07
5.960464477539063e-08
2.9802322387695312e-08
1.4901161193847656e-08
7.450580596923828e-09
3.725290298461914e-09
1.862645149230957e-09
9.313225746154785e-10
4.656612873077393e-10
2.3283064365386963e-10
1.1641532182693481e-10
5.820766091346741e-11
2.9103830456733704e-11
1.4551915228366852e-11
7.275957614183426e-12
```

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1.8189894035458565e-12  
9.094947017729282e-13  
4.547473508864641e-13  
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1.1368683772161603e-13  
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2.842170943040401e-14  
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3.552713678800501e-15  
1.7763568394002505e-15  
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2.117582368135751e-22  
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2.6469779601696886e-23  
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3.16e-322

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1.6e-322  
8e-323  
4e-323  
2e-323  
1e-323  
5e-324  
0.0
```

```
a = 1.0  
while a != np.inf:  
    a = a * 2.0  
    print(a)
```

```
2.0  
4.0  
8.0  
16.0  
32.0  
64.0  
128.0  
256.0  
512.0  
1024.0  
2048.0  
4096.0  
8192.0  
16384.0  
32768.0  
65536.0  
131072.0  
262144.0  
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1.4044477616111843e+306  
2.8088955232223686e+306  
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```
1.1235582092889474e+307
2.247116418577895e+307
4.49423283715579e+307
8.98846567431158e+307
inf
```

```
2**(1024)*(1-2**(-53)) # คำนวณไม่ได้ตัวเลขเกิน floating point
```

```
-----
-----
OverflowError                                Traceback (most recent call
last)
Cell In[19], line 1
----> 1 2**(1024)*(1-2**(-53))
```

```
OverflowError: int too large to convert to float
```

```
float(2**1024)
```

```
-----
-----
OverflowError                                Traceback (most recent call
last)
Cell In[20], line 1
----> 1 float(2**1024)
```

```
OverflowError: int too large to convert to float
```

```
float(2**1023)*(1-2**(-53))*2
```

```
1.7976931348623157e+308
```

```
import matplotlib.pyplot as plt
```

```
base = 2
```

```
exponent_min = -4
```

```
exponent_max = 4
```

```
fp_3 = []
```

```
for m in range(exponent_min, exponent_max + 1):
```

```
    for a_1 in range(0, base):
```

```
        for a_2 in range(0, base):
```

```
            for a_3 in range(0, base):
```

```
                singificand = 1 + a_1*base**-1 + a_2*base**-2 +
```

```
a_3*base**-3
```

```
                new_number = singificand * base**m
```

```
                fp_3.append(new_number)
```

```
print(fp_3[:4]) # first four number
```

```
print(fp_3[-2:]) # last two number
```

```
[0.0625, 0.0703125, 0.078125, 0.0859375]  
[28.0, 30.0]
```

```
print(fp_3)
```

```
[0.0625, 0.0703125, 0.078125, 0.0859375, 0.09375, 0.1015625, 0.109375,  
0.1171875, 0.125, 0.140625, 0.15625, 0.171875, 0.1875, 0.203125,  
0.21875, 0.234375, 0.25, 0.28125, 0.3125, 0.34375, 0.375, 0.40625,  
0.4375, 0.46875, 0.5, 0.5625, 0.625, 0.6875, 0.75, 0.8125, 0.875,  
0.9375, 1.0, 1.125, 1.25, 1.375, 1.5, 1.625, 1.75, 1.875, 2.0, 2.25,  
2.5, 2.75, 3.0, 3.25, 3.5, 3.75, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0,  
7.5, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 18.0, 20.0,  
22.0, 24.0, 26.0, 28.0, 30.0]
```

```
2**(-3)
```

```
0.125
```

```
2**(-4)
```

```
0.0625
```

```
plt.figure(figsize=(12, 2))  
plt.plot(fp_3, np.ones_like(fp_3), "o")  
plt.title('Distribution of all Floating Point Numbers')
```

```
Text(0.5, 1.0, 'Distribution of all Floating Point Numbers')
```

