

Problem statement:

You are selling donuts' boxes of capacity 7 and 13. The customer orders a random number of donuts between 1 and 100.

What is the probability that you can fulfill the order with your two types of boxes?

In [2]:

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#July 24th, 2020
import numpy as n
import matplotlib.pyplot as plt
import os
from itertools import islice
import math
```

In [5]:

```
#consider 13j+7k=i
#k represents the number of boxes of 7 donuts needed along j boxes of 13 boxes to obtain i donuts
total
#i is between 1 and 100, j has to be < 9 since 9*13>100; so j is between 0 and 8
#we let i run between 1 and 100, j from 0 to 8, and for each combination we compute k
#we then order the list
#remove the negative values, keep whole ones
#make a list called results which compiles the number i of donuts for each solution found in k
#probabilities of fulfilling the order if the length of results' list over 100

def donuts(a,b,n1,n2): #interval from a to b, with multiples n1 and n2
    k=[]
    results=[]
    j_range=math.floor((b-a+1)/n1)+1 #maximum value for j

    for i in range((b-a)+2):
        if i>0:
            for j in range(j_range):
                k.append((i - n1*j)/n2) #here the k list is formed

    length_to_split=[j_range for i in range((b-a+1))]

    Input = iter(k)
    Output = [list(islice(Input, elem)) for elem in length_to_split] #k list is ordered in sublists

    for i in range(len(Output)):
        for j in range(len(Output[i])):
            if float(Output[i][j]).is_integer() is True and Output[i][j]>=0:
                results.append(i+1) #results list is formed

    final_results = list(dict.fromkeys(results)) #remove possible redundant solutions
    print(final_results) #print the list of numbers that satisfy initial conditions

    probabilities = 100*(len(final_results)/(b-a+1))

    return print('probabilities of fulfilling the order is of', probabilities, '%')
```

In [6]:

```
donuts(1,100,13,7)
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[7, 13, 14, 20, 21, 26, 27, 28, 33, 34, 35, 39, 40, 41, 42, 46, 47, 48, 49, 52, 53, 54, 55, 56, 5
9, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85
, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100]
probabilities of fulfilling the order is of 64.0 %
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The list shown corresponds to each amount of donuts' order that can be fulfilled.

Notice we can now select different parameters for the function donuts

In [10]:

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donuts(1,400,13,8)
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[8, 13, 16, 21, 24, 26, 29, 32, 34, 37, 39, 40, 42, 45, 47, 48, 50, 52, 53, 55, 56, 58, 60, 61, 63, 64, 65, 66, 68, 69, 71, 72, 73, 74, 76, 77, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400]
probabilities of fulfilling the order is of 89.5 %
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In [ ]: