entrega_01

February 6, 2024

[67]:
```
%pip install numpy
%pip install matplotlib
%pip install scipy
%pip install pandas
%pip install tabulate

from numpy import random as rd
import numpy as np
from typing import List, Callable, Tuple
import matplotlib.pyplot as plt
import math
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: numpy in /home/heitor/.local/lib/python3.10/site-
packages (1.24.1)
Note: you may need to restart the kernel to use updated packages.
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: matplotlib in
/home/heitor/.local/lib/python3.10/site-packages (3.6.3)
Requirement already satisfied: contourpy>=1.0.1 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (1.0.7)
Requirement already satisfied: cycler>=0.10 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (4.38.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (1.4.4)
Requirement already satisfied: numpy>=1.19 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (1.24.1)
Requirement already satisfied: packaging>=20.0 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (23.0)
Requirement already satisfied: pillow>=6.2.0 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (9.4.0)
Requirement already satisfied: pyparsing>=2.2.1 in /usr/lib/python3/dist-
packages (from matplotlib) (2.4.7)
Requirement already satisfied: python-dateutil>=2.7 in
/home/heitor/.local/lib/python3.10/site-packages (from matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in /usr/lib/python3/dist-packages (from
```

```
python-dateutil>=2.7->matplotlib) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: scipy in /home/heitor/.local/lib/python3.10/site-
packages (1.12.0)
Requirement already satisfied: numpy<1.29.0,>=1.22.4 in
/home/heitor/.local/lib/python3.10/site-packages (from scipy) (1.24.1)
Note: you may need to restart the kernel to use updated packages.
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: pandas in
/home/heitor/.local/lib/python3.10/site-packages (1.5.2)
Requirement already satisfied: python-dateutil>=2.8.1 in
/home/heitor/.local/lib/python3.10/site-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in
/home/heitor/.local/lib/python3.10/site-packages (from pandas) (2022.7)
Requirement already satisfied: numpy>=1.21.0 in
/home/heitor/.local/lib/python3.10/site-packages (from pandas) (1.24.1)
Requirement already satisfied: six>=1.5 in /usr/lib/python3/dist-packages (from
python-dateutil>=2.8.1->pandas) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: tabulate in
/home/heitor/.local/lib/python3.10/site-packages (0.9.0)
Note: you may need to restart the kernel to use updated packages.
```

1 Definindo comportamento

1.1 Individuo

[68]:
```python
class Individuo():
    def __init__(self,
                 genotipo: List[float],
                 fn_objetivo: Callable,
                 fabric_fn_mutacao: Callable,
                 mutation_rate: float = 0.1,
                 constrains: List[Callable[[List[float]], bool]] = [],
                 is_minimization: bool = True):
        self.genotipo = genotipo
        self.fenotipo = None
        self.fn_objetivo = fn_objetivo
        self.fn_mutacao = fabric_fn_mutacao(mutation_rate)
        self.fabric_fn_mutacao = fabric_fn_mutacao
        self.constrains = constrains
        self.is_minimization = is_minimization

    def get_fenotipo(self) -> float:
        if self.fenotipo == None:
```

```
            for constrain in self.constrains:
                if not constrain(*self.genotipo):
                    # Se não estiver de acordo com as restrições, retorna infinito positivo para minimização e infinito negativo para maximização
                    self.fenotipo = math.inf if self.is_minimization else -math.inf
                    return self.fenotipo
            # Se chego aqui, está de acordo com as restrições
            self.fenotipo = self.fn_objetivo(*self.genotipo)
            return self.fenotipo
        else:
            return self.fenotipo

    def reproduzir_assexuado(self, quant_filhos: int = 1) -> List['Individuo']:
        filhos = []
        for _ in range(quant_filhos):
            genotipo_mutado: List[float] = self.fn_mutacao(self.genotipo)
            filhos.append(Individuo(genotipo_mutado,
                                    self.fn_objetivo, self.fabric_fn_mutacao))
        return filhos

    def reproduzir_sexuado(self, outro: 'Individuo', quant_filhos: int = 1) -> List['Individuo']:
        filhos = []
        for _ in range(quant_filhos):

            genotipo_mutado: List[float] = self.fn_mutacao(
                self.genotipo, outro.genotipo)
            filhos.append(Individuo(genotipo_mutado,
                                    self.fn_objetivo, self.fabric_fn_mutacao))

        return filhos

    def __str__(self) -> str:
        return f"({self.genotipo}, {self.get_fenotipo()})"

    def __lt__(self, obj):
        return ((self.get_fenotipo()) < (obj.get_fenotipo()))

    def __gt__(self, obj):
        return ((self.get_fenotipo()) > (obj.get_fenotipo()))

    def __le__(self, obj):
        return ((self.get_fenotipo()) <= (obj.get_fenotipo()))

    def __ge__(self, obj):
        return ((self.get_fenotipo()) >= (obj.get_fenotipo()))
```

```
    def __eq__(self, obj):
        return (self.get_fenotipo() == obj.get_fenotipo())
```

1.2 População

[69]:
```
class Populacao():
    def __init__(self,
                 quant_pais: int,
                 fn_objetivo: Callable[..., float],
                 fabric_fn_mutacao: Callable[[float], Callable[[List[float]],␣
 ↪List[float]]],
                 quant_parametros_fn_objetivo: int = 1,
                 is_minimization: bool = True,
                 lim_inf: List[float] = [-math.inf],
                 lim_sup: List[float] = [math.inf],
                 quant_filhos: int = -1,
                 constrains: List[Callable[[List[float]], bool]] = []
                 ):
        self.individuos: List[Individuo] = []
        for _ in range(quant_pais):
            genotipo: List[float] = [rd.uniform(
                lim_inf[i], lim_sup[i]) for i in␣
 ↪range(quant_parametros_fn_objetivo)]

            novo_individuo = Individuo(genotipo=genotipo,
                                       fn_objetivo=fn_objetivo,
                                       fabric_fn_mutacao=fabric_fn_mutacao,
                                       is_minimization=is_minimization,
                                       constrains=constrains
                                       )
            self.individuos.append(novo_individuo)

        self.__quant_pais = quant_pais
        self.__quant_filhos = quant_filhos if quant_filhos > 0 else quant_pais
        self.is_minimization = is_minimization
        self.quant_geracoes = 0

    def sexo_descontrolado_sozinho(self):
        """
        Realiza reprodução assexuada de indivíduos selecionados aleatoriamente.

        Esta função seleciona aleatoriamente um indivíduo existente na␣
 ↪população e realiza
        a reprodução assexuada do mesmo para gerar um número específico de␣
 ↪filhos. Os filhos
```

```
        são adicionados à população existente.

        Parâmetros:
        - self: A instância da classe que invoca o método.

        Retorna:
        - Nenhum valor de retorno.

        Mutações no estado do objeto:
        - A lista de indivíduos é ampliada para incluir os novos filhos.
        """
        filhos: List[Individuo] = []
        for _ in range(self.__quant_filhos):
            pai = self.individuos[rd.randint(0, len(self.individuos))]
            filhos.extend(pai.reproduzir_assexuado())
        self.individuos.extend(filhos)

    def sexo_descontrolado(self):
        """
        Realiza reprodução sexuada de indivíduos selecionados aleatoriamente.

        Esta função seleciona aleatoriamente dois indivíduos existentes na␣
↪população e realiza
        a reprodução sexuada dos mesmos para gerar um número específico de␣
↪filhos. Os filhos
        são adicionados à população existente.

        Parâmetros:
        - self: A instância da classe que invoca o método.

        Retorna:
        - Nenhum valor de retorno.

        Mutações no estado do objeto:
        - A lista de indivíduos é ampliada para incluir os novos filhos.
        """
        filhos: List[Individuo] = []
        for _ in range(self.__quant_filhos):
            pai = self.individuos[rd.randint(0, len(self.individuos))]
            mae = self.individuos[rd.randint(0, len(self.individuos))]
            filhos.extend(mae.reproduzir_sexuado(pai))
        self.individuos.extend(filhos)

    def matar_os_fracos(self):
        """
        Remove os indivíduos mais fracos da população.
```

```
        A função ordena a lista de indivíduos e remove os indivíduos mais␣
↪fracos,
        mantendo apenas os melhores indivíduos de acordo com a quantidade de␣
↪pais
        definida.

        Se a função de avaliação for de minimização, os primeiros self.
↪__quant_pais
        individuos da lista ordenada (por fenótipo) são selecionados, caso␣
↪contrário,
        o mesmo acontecerá pegando do final da lista.

        Parâmetros:
        - self: referência ao objeto da classe

        Retorno:
        - None

        Mutações no estado do objeto:
        - A lista de indivíduos é reduzida para o tamanho original de modo a
        conter apenas os melhores indivíduos dessa geração.
        """
        self.individuos.sort(reverse=not self.is_minimization)
        self.individuos = self.individuos[:self.__quant_pais]

    def melhor_individuo(self) -> Individuo:
        return sorted(self.individuos)[0] if self.is_minimization else␣
↪sorted(self.individuos)[-1]

    def individuo_medio(self) -> Individuo:
        return sorted(self.individuos)[math.floor(self.__quant_pais / 2)]

    def selecionar_melhor(self, individuos: List[Individuo]) -> Individuo:
        return sorted(individuos)[0] if self.is_minimization else␣
↪sorted(individuos)[-1]

    def selecionar_medio(self, individuos: List[Individuo]) -> Individuo:
        return sorted(individuos)[math.floor(len(individuos) / 2)]

    def __str__(self):
        r = "População:\n"
        for individuo in self.individuos:
            r += individuo.__str__() + ", "
        return r
```

2 Problema 1:

maximizar f (x) = xsin 10 x+ 1
sujeito a: −1 x 2

2.1 Gerando população

[70]:
```
def evoluir(quantidade_geracoes: int, pop: Populacao) -> Tuple[Individuo,␣
↪Individuo]:
    melhores_de_cada_geracao: List[Individuo] = []
    pau_medio: List[Individuo] = []

    for _ in range(quantidade_geracoes):
        pop.sexo_descontrolado_sozinho()
        pop.matar_os_fracos()
        melhores_de_cada_geracao.append(pop.melhor_individuo())
        pau_medio.append(pop.individuo_medio())

    return (pop.selecionar_melhor(melhores_de_cada_geracao), pop.
↪selecionar_medio(pau_medio))


def fabric_fn_mutacao(mutation_rate: float) -> Callable:
    def fn_mutacao(genotipo: List[float]) -> List[float]:
        return [g + rd.uniform(-mutation_rate, mutation_rate) for g in genotipo]
    return fn_mutacao


def new_exp(quant_pais: int = 100, quant_filhos: int = 100) -> Populacao:

    return Populacao(quant_pais=quant_pais,
                     quant_filhos=quant_filhos,
                     fn_objetivo=(lambda x: x*np.sin(10*3.14*x) + 1),
                     fabric_fn_mutacao=fabric_fn_mutacao,
                     is_minimization=False,
                     lim_inf=[-1], lim_sup=[2]
                     )


# Assuming evoluir function and new_exp function are defined correctly

results: List[Tuple[int, int, int, Tuple[Individuo, Individuo]]] = []
for quantidade_geracoes in range(10, 110, 10):
    for quant_pais in range(10, 110, 10):
        for quant_filhos in range(10, 110, 10):
            pop = new_exp(quant_pais, quant_filhos)  # Create the population
            # Evolve and get the best and average
```

```
            best, avg = evoluir(quantidade_geracoes, pop)
            # Append the results with the structure including the parameters
            results.append(
                (quantidade_geracoes, quant_pais, quant_filhos, (best, avg)))
```

2.2 Mostrando tabela solicitada

[71]:
```
from tabulate import tabulate

data = []

for entry in results:
    quantidade_geracoes, quant_pais, quant_filhos, (
        best_individuo, avg_individuo) = entry
    row = [
        quantidade_geracoes,  # Number of generations
        quant_pais,            # Number of parents
        quant_filhos,          # Number of children
        best_individuo.genotipo[0],  # list of parameters of the best individuo
        best_individuo.get_fenotipo(),  # f(x) of the best individuo
        avg_individuo.genotipo[0],   # list of parameters of the average␣
 ↪individuo
        avg_individuo.get_fenotipo(),   # f(x) of the average individuo
    ]
    data.append(row)

# Define headers for your new columns
headers = ["tmax", " ", " ", "best x",
           "best f(x)", "avg x", "avg f(x)"]

# Print the table using tabulate
table = tabulate(data,
                 headers=headers,
                 tablefmt="github",
                 floatfmt=".4f"
                 )
print(table)
```

tmax			best x	best f(x)	avg x	avg f(x)
10	10	10	1.6505	2.6504	1.2550	2.2430
10	10	20	1.6495	2.6479	1.6456	2.6232
10	10	30	1.2511	2.2510	1.2459	2.2320
10	10	40	1.6515	2.6511	1.6489	2.6459
10	10	50	1.4511	2.4510	1.4491	2.4473
10	10	60	1.8515	2.8512	1.8529	2.8495
10	10	70	1.8516	2.8512	1.8523	2.8506

10	10	80	1.8516	2.8512	1.8506	2.8504
10	10	90	1.4513	2.4511	1.4525	2.4503
10	10	100	2.0517	3.0513	2.0524	3.0506
10	20	10	1.8434	2.7917	1.6815	1.9623
10	20	20	2.0538	3.0459	1.2776	1.8451
10	20	30	2.0607	2.9663	1.6466	2.6320
10	20	40	2.0519	3.0512	1.8439	2.7987
10	20	50	1.8516	2.8512	1.8563	2.8303
10	20	60	2.0525	3.0503	2.0579	3.0098
10	20	70	1.8519	2.8511	1.8611	2.7668
10	20	80	1.8518	2.8511	1.8665	2.6481
10	20	90	1.8512	2.8511	1.8560	2.8323
10	20	100	1.8516	2.8512	1.8491	2.8461
10	30	10	1.8448	2.8106	-0.8708	1.6990
10	30	20	2.0461	3.0218	1.8757	2.3369
10	30	30	1.8592	2.7971	1.2723	1.9892
10	30	40	1.8498	2.8486	1.6417	2.5739
10	30	50	2.0512	3.0512	1.6476	2.6392
10	30	60	2.0513	3.0512	2.0397	2.9118
10	30	70	1.8515	2.8512	1.8435	2.7934
10	30	80	2.0518	3.0512	2.0367	2.8348
10	30	90	1.8515	2.8512	1.8444	2.8056
10	30	100	1.6515	2.6511	1.6453	2.6204
10	40	10	1.4535	2.4480	2.0066	1.3473
10	40	20	1.8569	2.8244	0.8483	1.8464
10	40	30	1.8558	2.8343	1.4192	1.7771
10	40	40	1.8500	2.8492	1.4302	2.1433
10	40	50	1.8465	2.8285	1.4581	2.4196
10	40	60	1.8521	2.8509	1.6397	2.5412
10	40	70	1.8543	2.8440	1.4553	2.4405
10	40	80	1.8519	2.8511	1.8674	2.6239
10	40	90	1.8518	2.8511	1.8404	2.7412
10	40	100	2.0520	3.0510	2.0372	2.8470
10	50	10	1.8539	2.8460	-0.6778	1.4410
10	50	20	1.8624	2.7436	1.2166	1.5841
10	50	30	1.8485	2.8430	0.8472	1.8430
10	50	40	1.8516	2.8512	1.0438	2.0202
10	50	50	2.0532	3.0486	1.6620	2.5612
10	50	60	1.8520	2.8509	1.6578	2.6182
10	50	70	1.8515	2.8512	1.8654	2.6763
10	50	80	1.8513	2.8512	1.8669	2.6371
10	50	90	1.8516	2.8512	1.6534	2.6481
10	50	100	1.8503	2.8498	1.6538	2.6466
10	60	10	1.8523	2.8506	1.2872	1.5278
10	60	20	1.8545	2.8428	0.8880	1.3377
10	60	30	1.8529	2.8494	0.8320	1.6958
10	60	40	1.6504	2.6503	0.8648	1.7781
10	60	50	1.8521	2.8508	1.4269	2.0458

10	60	60	2.0521	3.0510	1.8691	2.5730
10	60	70	1.8581	2.8108	1.6726	2.2958
10	60	80	1.8505	2.8503	1.8699	2.5481
10	60	90	2.0517	3.0513	1.8359	2.6361
10	60	100	2.0470	3.0304	1.6626	2.5511
10	70	10	1.8543	2.8438	-0.4318	1.3619
10	70	20	1.8567	2.8266	0.8205	1.4838
10	70	30	2.0511	3.0511	0.8282	1.6338
10	70	40	2.0565	3.0260	1.4788	1.9398
10	70	50	1.8528	2.8496	1.4331	2.2193
10	70	60	2.0505	3.0501	1.0613	2.0012
10	70	70	1.8514	2.8512	1.0521	2.0508
10	70	80	2.0497	3.0479	1.6701	2.3729
10	70	90	2.0417	2.9538	1.8681	2.6027
10	70	100	1.8515	2.8512	1.8416	2.7625
10	80	10	1.6561	2.6336	0.6897	1.2271
10	80	20	1.8478	2.8391	0.4527	1.4513
10	80	30	1.8542	2.8446	1.2126	1.4451
10	80	40	1.4558	2.4377	0.4569	1.4469
10	80	50	1.8491	2.8461	1.0486	2.0466
10	80	60	1.8522	2.8507	1.6779	2.1085
10	80	70	2.0488	3.0436	1.2532	2.2492
10	80	80	2.0478	3.0372	1.4522	2.4507
10	80	90	2.0512	3.0512	1.8312	2.4889
10	80	100	2.0472	3.0325	1.4645	2.3289
10	90	10	1.8586	2.8057	-0.8857	1.3968
10	90	20	1.8473	2.8352	0.6279	1.4789
10	90	30	1.8406	2.7438	-0.4549	1.4500
10	90	40	2.0513	3.0512	0.8747	1.6328
10	90	50	1.8516	2.8512	1.8203	2.0390
10	90	60	1.8523	2.8506	1.2704	2.0328
10	90	70	1.8510	2.8510	1.2470	2.2390
10	90	80	1.8503	2.8500	1.2566	2.2344
10	90	90	1.8509	2.8509	1.6302	2.2995
10	90	100	1.8521	2.8508	1.6696	2.3884
10	100	10	1.8441	2.8019	-0.8076	1.1803
10	100	20	1.8527	2.8499	0.6256	1.4460
10	100	30	1.8499	2.8490	0.6399	1.6060
10	100	40	1.8497	2.8482	1.8109	1.5562
10	100	50	1.8511	2.8511	0.8661	1.7633
10	100	60	2.0469	3.0297	1.0620	1.9937
10	100	70	1.8493	2.8467	1.2353	2.0941
10	100	80	2.0535	3.0474	1.4425	2.3949
10	100	90	2.0512	3.0512	1.8285	2.3943
10	100	100	2.0501	3.0492	1.4708	2.1890
20	10	10	1.8512	2.8512	1.8434	2.7925
20	10	20	1.4514	2.4511	1.4558	2.4377
20	10	30	1.0517	2.0510	1.0497	2.0494

20	10	40	1.8516	2.8512	1.8504	2.8501
20	10	50	1.4515	2.4511	1.4535	2.4480
20	10	60	1.8515	2.8512	1.8532	2.8485
20	10	70	1.8514	2.8512	1.8510	2.8510
20	10	80	1.8515	2.8512	1.8526	2.8502
20	10	90	1.6515	2.6511	1.6508	2.6508
20	10	100	2.0516	3.0513	2.0523	3.0506
20	20	10	1.6618	2.5637	1.4306	2.1532
20	20	20	1.4516	2.4511	1.2514	2.2510
20	20	30	1.6512	2.6511	1.6567	2.6284
20	20	40	1.8518	2.8511	1.6502	2.6499
20	20	50	1.8514	2.8512	1.8538	2.8463
20	20	60	1.6514	2.6511	1.6536	2.6473
20	20	70	1.8513	2.8512	1.8529	2.8494
20	20	80	1.8513	2.8512	1.8499	2.8489
20	20	90	1.8515	2.8512	1.8502	2.8497
20	20	100	1.8515	2.8512	1.8524	2.8505
20	30	10	1.6518	2.6510	0.8574	1.8368
20	30	20	1.8517	2.8512	1.6553	2.6393
20	30	30	2.0487	3.0434	1.8383	2.6963
20	30	40	1.8515	2.8512	1.8421	2.7708
20	30	50	1.8515	2.8512	1.8567	2.8263
20	30	60	1.8515	2.8512	1.8586	2.8047
20	30	70	2.0514	3.0513	2.0556	3.0345
20	30	80	1.8514	2.8512	1.8536	2.8472
20	30	90	1.8515	2.8512	1.8495	2.8477
20	30	100	2.0514	3.0513	2.0531	3.0488
20	40	10	1.8505	2.8503	0.8525	1.8507
20	40	20	1.8495	2.8477	1.8721	2.4750
20	40	30	1.8513	2.8512	1.8344	2.5936
20	40	40	2.0523	3.0507	2.0764	2.4513
20	40	50	2.0509	3.0508	1.8555	2.8367
20	40	60	1.8514	2.8512	1.6494	2.6476
20	40	70	2.0516	3.0513	2.0612	2.9581
20	40	80	1.8513	2.8512	1.8474	2.8360
20	40	90	1.8515	2.8512	1.8594	2.7937
20	40	100	1.8514	2.8512	1.8494	2.8472
20	50	10	1.8466	2.8292	1.0281	1.7826
20	50	20	1.8513	2.8512	1.2584	2.2212
20	50	30	1.4557	2.4383	0.8480	1.8456
20	50	40	1.8517	2.8512	1.4472	2.4383
20	50	50	1.8517	2.8512	1.8613	2.7635
20	50	60	1.8514	2.8512	1.6567	2.6291
20	50	70	1.8515	2.8512	1.8418	2.7665
20	50	80	1.8506	2.8505	1.6537	2.6470
20	50	90	1.8516	2.8512	1.8469	2.8323
20	50	100	1.8516	2.8512	1.8547	2.8417
20	60	10	2.0391	2.8972	0.6805	1.3978

20	60	20	1.8512	2.8511	1.8846	1.9283
20	60	30	1.8517	2.8512	1.6524	2.6504
20	60	40	1.8513	2.8512	1.4351	2.2650
20	60	50	1.8517	2.8512	1.6489	2.6458
20	60	60	1.8515	2.8512	1.6653	2.4973
20	60	70	2.0490	3.0447	1.8579	2.8136
20	60	80	2.0515	3.0513	2.0679	2.7851
20	60	90	1.8516	2.8512	1.8648	2.6907
20	60	100	2.0514	3.0513	1.8534	2.8479
20	70	10	1.8477	2.8379	-0.6293	1.4967
20	70	20	1.8511	2.8511	1.8129	1.6654
20	70	30	1.8514	2.8512	1.2572	2.2303
20	70	40	2.0522	3.0509	1.6263	2.1656
20	70	50	1.8514	2.8512	1.6538	2.6467
20	70	60	2.0511	3.0511	1.6622	2.5583
20	70	70	2.0560	3.0315	1.6586	2.6097
20	70	80	1.8515	2.8512	1.8361	2.6399
20	70	90	1.8514	2.8512	1.8580	2.8127
20	70	100	1.8514	2.8512	1.6520	2.6509
20	80	10	2.0690	2.7500	1.2856	1.5872
20	80	20	1.8467	2.8303	1.6877	1.6794
20	80	30	1.8509	2.8509	1.6757	2.1890
20	80	40	2.0523	3.0506	2.0760	2.4715
20	80	50	1.8523	2.8506	1.4347	2.2557
20	80	60	1.8495	2.8475	1.4596	2.4031
20	80	70	1.8515	2.8512	1.6592	2.6022
20	80	80	1.8522	2.8507	1.4540	2.4463
20	80	90	2.0514	3.0513	1.8477	2.8380
20	80	100	1.8516	2.8512	1.8391	2.7142
20	90	10	1.8361	2.6405	0.4252	1.3002
20	90	20	1.8607	2.7739	0.8270	1.6129
20	90	30	1.8514	2.8512	1.0431	2.0144
20	90	40	1.8517	2.8512	1.0590	2.0215
20	90	50	1.8511	2.8511	1.0581	2.0287
20	90	60	2.0514	3.0513	1.6624	2.5533
20	90	70	2.0520	3.0511	1.6478	2.6403
20	90	80	1.8517	2.8512	1.6614	2.5705
20	90	90	2.0514	3.0513	2.0672	2.8079
20	90	100	2.0515	3.0513	1.8593	2.7957
20	100	10	1.8469	2.8324	-0.4494	1.4493
20	100	20	1.8532	2.8484	-0.8315	1.6885
20	100	30	1.8501	2.8494	1.6216	1.9841
20	100	40	1.8515	2.8512	1.4754	2.0545
20	100	50	2.0544	3.0433	1.2542	2.2464
20	100	60	1.8515	2.8512	1.8705	2.5277
20	100	70	1.8515	2.8512	1.6372	2.4900
20	100	80	2.0515	3.0513	1.4492	2.4474
20	100	90	1.8510	2.8510	1.6360	2.4616

20	100	100	2.0512	3.0511	1.6557	2.6364
30	10	10	1.6513	2.6511	1.6546	2.6433
30	10	20	1.6514	2.6511	1.6505	2.6504
30	10	30	1.0517	2.0510	1.0531	2.0497
30	10	40	1.6513	2.6511	1.6510	2.6510
30	10	50	2.0515	3.0513	2.0500	3.0488
30	10	60	2.0515	3.0513	2.0519	3.0512
30	10	70	1.4514	2.4511	1.4511	2.4510
30	10	80	1.8515	2.8512	1.8521	2.8509
30	10	90	1.8515	2.8512	1.8508	2.8507
30	10	100	1.8515	2.8512	1.8512	2.8511
30	20	10	1.8485	2.8429	1.8825	2.0323
30	20	20	1.6518	2.6511	1.6439	2.6045
30	20	30	2.0512	3.0512	2.0541	3.0444
30	20	40	1.6516	2.6511	1.6488	2.6455
30	20	50	1.8515	2.8512	1.8507	2.8506
30	20	60	1.6515	2.6511	1.6526	2.6502
30	20	70	2.0517	3.0512	2.0531	3.0487
30	20	80	1.8515	2.8512	1.8520	2.8509
30	20	90	1.8515	2.8512	1.8525	2.8503
30	20	100	1.8515	2.8512	1.8505	2.8503
30	30	10	1.6493	2.6473	1.0575	2.0321
30	30	20	1.8519	2.8510	1.8358	2.6312
30	30	30	1.8514	2.8512	1.8570	2.8235
30	30	40	2.0515	3.0513	2.0479	3.0380
30	30	50	2.0517	3.0513	2.0538	3.0459
30	30	60	1.8515	2.8512	1.8538	2.8463
30	30	70	1.8516	2.8512	1.8529	2.8493
30	30	80	1.8515	2.8512	1.8502	2.8498
30	30	90	1.8516	2.8512	1.8527	2.8500
30	30	100	2.0515	3.0513	2.0524	3.0505
30	40	10	1.8508	2.8507	1.2650	2.1387
30	40	20	1.8516	2.8512	1.6444	2.6111
30	40	30	2.0518	3.0512	1.8560	2.8329
30	40	40	2.0516	3.0513	1.8510	2.8510
30	40	50	2.0516	3.0513	2.0454	3.0137
30	40	60	2.0515	3.0513	2.0480	3.0385
30	40	70	2.0515	3.0513	2.0472	3.0321
30	40	80	1.8515	2.8512	1.8536	2.8472
30	40	90	1.8515	2.8512	1.8499	2.8490
30	40	100	2.0514	3.0513	2.0473	3.0333
30	50	10	2.0395	2.9067	0.8195	1.4630
30	50	20	1.8513	2.8512	1.8701	2.5417
30	50	30	1.8519	2.8510	1.6481	2.6417
30	50	40	2.0513	3.0513	1.8499	2.8488
30	50	50	2.0516	3.0513	1.8472	2.8341
30	50	60	1.8515	2.8512	1.8478	2.8386
30	50	70	2.0513	3.0512	2.0594	2.9884

30	50	80	1.8514	2.8512	1.8542	2.8445
30	50	90	2.0515	3.0513	2.0551	3.0382
30	50	100	1.8515	2.8512	1.8497	2.8484
30	60	10	1.6492	2.6469	0.6627	1.6131
30	60	20	1.8497	2.8482	1.4559	2.4365
30	60	30	1.8525	2.8503	1.2576	2.2277
30	60	40	1.8515	2.8512	1.6545	2.6434
30	60	50	2.0515	3.0513	2.0636	2.9062
30	60	60	2.0518	3.0512	2.0384	2.8794
30	60	70	1.8517	2.8512	1.8475	2.8367
30	60	80	1.8515	2.8512	1.8551	2.8395
30	60	90	1.6515	2.6511	1.6536	2.6473
30	60	100	2.0515	3.0513	2.0472	3.0327
30	70	10	1.8606	2.7750	0.8634	1.7933
30	70	20	1.8517	2.8512	1.6731	2.2791
30	70	30	1.8516	2.8512	1.6601	2.5907
30	70	40	2.0508	3.0507	1.6500	2.6494
30	70	50	1.8517	2.8512	1.8665	2.6479
30	70	60	1.8515	2.8512	1.8651	2.6837
30	70	70	1.8517	2.8512	1.8637	2.7159
30	70	80	1.8515	2.8512	1.4501	2.4499
30	70	90	2.0514	3.0513	1.8492	2.8464
30	70	100	1.8515	2.8512	1.8561	2.8315
30	80	10	1.8515	2.8512	-0.8767	1.5943
30	80	20	1.8505	2.8503	1.6277	2.2158
30	80	30	2.0487	3.0431	1.4658	2.3045
30	80	40	1.8515	2.8512	1.2487	2.2464
30	80	50	1.8515	2.8512	1.8630	2.7320
30	80	60	2.0513	3.0512	1.8437	2.7964
30	80	70	1.8513	2.8512	1.8410	2.7527
30	80	80	1.8515	2.8512	1.8453	2.8163
30	80	90	1.8518	2.8511	1.8423	2.7744
30	80	100	1.8515	2.8512	1.8485	2.8428
30	90	10	1.8578	2.8144	-0.8212	1.4983
30	90	20	1.8450	2.8134	1.2655	2.1293
30	90	30	2.0525	3.0503	1.0439	2.0216
30	90	40	1.8516	2.8512	1.8756	2.3417
30	90	50	2.0513	3.0512	1.8669	2.6384
30	90	60	1.8514	2.8512	1.6569	2.6271
30	90	70	2.0512	3.0512	2.0663	2.8342
30	90	80	2.0515	3.0513	1.8461	2.8251
30	90	90	2.0516	3.0513	1.8407	2.7471
30	90	100	1.8516	2.8512	1.8577	2.8165
30	100	10	1.8514	2.8512	1.0853	1.4995
30	100	20	1.8520	2.8510	-0.8610	1.8139
30	100	30	2.0509	3.0509	2.0201	2.1381
30	100	40	1.8511	2.8510	1.4661	2.2990
30	100	50	1.8515	2.8512	1.6606	2.5836

30	100	60	1.8516	2.8512	1.8664	2.6517
30	100	70	1.8515	2.8512	1.6545	2.6436
30	100	80	1.8518	2.8511	1.8634	2.7221
30	100	90	2.0517	3.0513	1.6501	2.6497
30	100	100	2.0513	3.0512	1.8589	2.8007
40	10	10	1.8519	2.8510	1.8482	2.8417
40	10	20	1.8516	2.8512	1.8508	2.8507
40	10	30	1.6518	2.6511	1.6505	2.6504
40	10	40	1.0514	2.0510	1.0503	2.0503
40	10	50	1.8515	2.8512	1.8517	2.8512
40	10	60	1.4514	2.4511	1.4511	2.4510
40	10	70	1.8515	2.8512	1.8511	2.8511
40	10	80	1.6514	2.6511	1.6518	2.6511
40	10	90	1.8514	2.8512	1.8517	2.8512
40	10	100	1.6515	2.6511	1.6516	2.6511
40	20	10	2.0507	3.0506	2.0418	2.9566
40	20	20	1.6514	2.6511	1.6461	2.6278
40	20	30	1.8514	2.8512	1.8536	2.8470
40	20	40	1.6514	2.6511	1.6504	2.6502
40	20	50	2.0515	3.0513	2.0505	3.0501
40	20	60	1.4514	2.4511	1.4528	2.4497
40	20	70	2.0515	3.0513	2.0507	3.0506
40	20	80	2.0516	3.0513	2.0513	3.0512
40	20	90	1.6515	2.6511	1.6510	2.6510
40	20	100	1.6515	2.6511	1.6520	2.6509
40	30	10	1.6509	2.6509	1.0663	1.9383
40	30	20	2.0517	3.0513	2.0629	2.9226
40	30	30	1.8518	2.8511	1.8553	2.8381
40	30	40	1.8514	2.8512	1.8550	2.8399
40	30	50	2.0515	3.0513	2.0502	3.0495
40	30	60	2.0515	3.0513	2.0541	3.0447
40	30	70	2.0516	3.0513	2.0495	3.0469
40	30	80	2.0517	3.0513	2.0500	3.0489
40	30	90	1.8515	2.8512	1.8503	2.8498
40	30	100	1.6514	2.6511	1.6510	2.6509
40	40	10	1.6516	2.6511	1.4662	2.2974
40	40	20	1.8518	2.8511	1.8409	2.7511
40	40	30	1.6513	2.6511	1.6421	2.5800
40	40	40	1.8515	2.8512	1.8463	2.8272
40	40	50	2.0514	3.0513	2.0591	2.9934
40	40	60	2.0512	3.0511	1.8527	2.8499
40	40	70	1.8515	2.8512	1.8498	2.8487
40	40	80	1.8514	2.8512	1.8500	2.8492
40	40	90	1.8517	2.8512	1.8529	2.8494
40	40	100	1.6515	2.6511	1.6525	2.6503
40	50	10	1.8521	2.8509	-1.0447	2.0275
40	50	20	1.8514	2.8512	1.6440	2.6068
40	50	30	1.8493	2.8470	1.4479	2.4422

40	50	40	1.8514	2.8512	1.8550	2.8401
40	50	50	2.0515	3.0513	2.0414	2.9492
40	50	60	2.0514	3.0513	1.8530	2.8491
40	50	70	1.8515	2.8512	1.8535	2.8476
40	50	80	2.0515	3.0513	2.0545	3.0427
40	50	90	1.8515	2.8512	1.8500	2.8492
40	50	100	1.8515	2.8512	1.8530	2.8492
40	60	10	1.8483	2.8418	1.0342	1.9012
40	60	20	1.8505	2.8503	1.6702	2.3701
40	60	30	2.0511	3.0511	1.8535	2.8476
40	60	40	1.4513	2.4511	1.4609	2.3876
40	60	50	1.8516	2.8512	1.8582	2.8098
40	60	60	1.8514	2.8512	1.6532	2.6487
40	60	70	2.0516	3.0513	1.8495	2.8477
40	60	80	1.8515	2.8512	1.8494	2.8472
40	60	90	2.0516	3.0513	2.0494	3.0467
40	60	100	1.8515	2.8512	1.8491	2.8462
40	70	10	1.6484	2.6434	-0.8678	1.7422
40	70	20	2.0510	3.0510	2.0251	2.3915
40	70	30	1.8515	2.8512	1.8624	2.7435
40	70	40	1.8515	2.8512	1.8563	2.8303
40	70	50	1.8515	2.8512	1.8599	2.7874
40	70	60	2.0515	3.0513	2.0610	2.9606
40	70	70	1.8515	2.8512	1.8552	2.8388
40	70	80	2.0515	3.0513	2.0628	2.9245
40	70	90	1.8514	2.8512	1.8546	2.8422
40	70	100	2.0515	3.0513	2.0415	2.9514
40	80	10	1.8500	2.8492	1.8175	1.9034
40	80	20	1.8518	2.8511	1.8795	2.1742
40	80	30	1.8514	2.8512	1.6424	2.5846
40	80	40	1.8516	2.8512	1.4533	2.4486
40	80	50	2.0515	3.0513	1.8458	2.8215
40	80	60	2.0516	3.0513	1.8511	2.8510
40	80	70	1.8515	2.8512	1.8474	2.8360
40	80	80	1.8515	2.8512	1.8559	2.8334
40	80	90	1.8515	2.8512	1.8542	2.8447
40	80	100	2.0515	3.0513	2.0473	3.0330
40	90	10	1.8516	2.8512	0.6586	1.6364
40	90	20	1.8505	2.8504	1.6352	2.4410
40	90	30	2.0514	3.0513	1.8731	2.4360
40	90	40	1.8514	2.8512	1.8628	2.7347
40	90	50	1.8515	2.8512	1.4563	2.4343
40	90	60	2.0513	3.0512	1.8465	2.8283
40	90	70	1.8515	2.8512	1.8401	2.7337
40	90	80	1.8515	2.8512	1.8552	2.8389
40	90	90	1.8515	2.8512	1.8561	2.8314
40	90	100	1.8514	2.8512	1.8482	2.8413
40	100	10	1.8622	2.7461	0.6300	1.5059

40	100	20	2.0498	3.0481	1.4714	2.1732
40	100	30	1.8517	2.8512	1.6688	2.4104
40	100	40	2.0553	3.0366	1.8660	2.6608
40	100	50	2.0515	3.0513	1.6456	2.6239
40	100	60	1.8515	2.8512	1.8398	2.7294
40	100	70	1.8514	2.8512	1.8666	2.6459
40	100	80	1.8515	2.8512	1.8465	2.8283
40	100	90	1.8515	2.8512	1.8547	2.8416
40	100	100	1.8515	2.8512	1.8472	2.8346
50	10	10	-0.8518	1.8510	0.8503	1.8503
50	10	20	2.0515	3.0513	2.0523	3.0507
50	10	30	1.8514	2.8512	1.8509	2.8509
50	10	40	2.0515	3.0513	2.0522	3.0508
50	10	50	2.0515	3.0513	2.0511	3.0511
50	10	60	1.8515	2.8512	1.8509	2.8509
50	10	70	2.0515	3.0513	2.0512	3.0512
50	10	80	0.8516	1.8510	0.8518	1.8510
50	10	90	1.8515	2.8512	1.8516	2.8512
50	10	100	1.6515	2.6511	1.6513	2.6511
50	20	10	1.8513	2.8512	1.8459	2.8225
50	20	20	1.8514	2.8512	1.8495	2.8476
50	20	30	1.6515	2.6511	1.6495	2.6479
50	20	40	2.0517	3.0513	2.0527	3.0498
50	20	50	2.0515	3.0513	2.0523	3.0507
50	20	60	1.8515	2.8512	1.8526	2.8502
50	20	70	1.4514	2.4511	1.4507	2.4507
50	20	80	1.6515	2.6511	1.6517	2.6511
50	20	90	1.8515	2.8512	1.8509	2.8509
50	20	100	1.8515	2.8512	1.8508	2.8508
50	30	10	1.6516	2.6511	1.4455	2.4260
50	30	20	1.8515	2.8512	1.6538	2.6465
50	30	30	1.8515	2.8512	1.8480	2.8401
50	30	40	1.6514	2.6511	1.6492	2.6468
50	30	50	1.8515	2.8512	1.8527	2.8498
50	30	60	1.6515	2.6511	1.6527	2.6499
50	30	70	2.0515	3.0513	2.0507	3.0505
50	30	80	1.8515	2.8512	1.8526	2.8500
50	30	90	1.8514	2.8512	1.8521	2.8509
50	30	100	2.0515	3.0513	2.0496	3.0477
50	40	10	1.8424	2.7765	1.0556	2.0424
50	40	20	1.8515	2.8512	1.8555	2.8364
50	40	30	1.8513	2.8512	1.8392	2.7149
50	40	40	1.8516	2.8512	1.8489	2.8452
50	40	50	1.8515	2.8512	1.8539	2.8461
50	40	60	1.8514	2.8512	1.8496	2.8479
50	40	70	2.0515	3.0513	2.0534	3.0478
50	40	80	1.8515	2.8512	1.8528	2.8496
50	40	90	1.6515	2.6511	1.6525	2.6502

50	40	100	1.8515	2.8512	1.8523	2.8507
50	50	10	1.8515	2.8512	1.6334	2.3934
50	50	20	1.8515	2.8512	1.8407	2.7469
50	50	30	1.6514	2.6511	1.6670	2.4574
50	50	40	1.8517	2.8512	1.8373	2.6721
50	50	50	1.8515	2.8512	1.8537	2.8467
50	50	60	2.0516	3.0513	2.0433	2.9827
50	50	70	2.0515	3.0513	2.0497	3.0478
50	50	80	1.8515	2.8512	1.8506	2.8504
50	50	90	2.0516	3.0513	2.0498	3.0484
50	50	100	1.8515	2.8512	1.8499	2.8491
50	60	10	1.8516	2.8512	1.2440	2.2175
50	60	20	1.6515	2.6511	1.4424	2.3930
50	60	30	1.8514	2.8512	1.6492	2.6470
50	60	40	1.8515	2.8512	1.8437	2.7969
50	60	50	1.8516	2.8512	1.8482	2.8416
50	60	60	1.8515	2.8512	1.8546	2.8423
50	60	70	1.8515	2.8512	1.8489	2.8453
50	60	80	1.6514	2.6511	1.6536	2.6473
50	60	90	2.0516	3.0513	2.0483	3.0407
50	60	100	1.8515	2.8512	1.8499	2.8488
50	70	10	1.8530	2.8490	1.8864	1.8310
50	70	20	1.8519	2.8511	1.6685	2.4173
50	70	30	1.8513	2.8512	1.6541	2.6454
50	70	40	1.8514	2.8512	1.6549	2.6412
50	70	50	2.0515	3.0513	1.8535	2.8476
50	70	60	1.8515	2.8512	1.8543	2.8440
50	70	70	2.0515	3.0513	2.0552	3.0379
50	70	80	1.8515	2.8512	1.8537	2.8467
50	70	90	1.8515	2.8512	1.8486	2.8438
50	70	100	2.0515	3.0513	2.0541	3.0447
50	80	10	1.8523	2.8506	1.2319	2.0252
50	80	20	2.0517	3.0513	1.4530	2.4493
50	80	30	1.8514	2.8512	1.8692	2.5700
50	80	40	1.8513	2.8512	1.6512	2.6511
50	80	50	2.0516	3.0513	2.0641	2.8930
50	80	60	1.8515	2.8512	1.8468	2.8316
50	80	70	1.8515	2.8512	1.8553	2.8383
50	80	80	2.0515	3.0513	2.0461	3.0212
50	80	90	2.0515	3.0513	2.0567	3.0241
50	80	100	1.8515	2.8512	1.8496	2.8481
50	90	10	1.8482	2.8414	-0.8325	1.7034
50	90	20	1.8519	2.8511	1.6694	2.3932
50	90	30	1.8514	2.8512	1.6587	2.6081
50	90	40	1.8514	2.8512	1.8633	2.7244
50	90	50	2.0515	3.0513	1.8465	2.8287
50	90	60	1.8515	2.8512	1.8570	2.8236
50	90	70	2.0516	3.0513	2.0562	3.0292

50	90	80	1.8516	2.8512	1.8444	2.8058
50	90	90	1.8515	2.8512	1.8475	2.8369
50	90	100	1.8515	2.8512	1.8555	2.8366
50	100	10	2.0506	3.0503	0.6662	1.5850
50	100	20	2.0517	3.0513	1.2614	2.1904
50	100	30	1.8518	2.8511	1.8753	2.3532
50	100	40	1.8515	2.8512	1.6531	2.6489
50	100	50	1.8514	2.8512	1.6463	2.6298
50	100	60	2.0515	3.0513	1.8535	2.8476
50	100	70	1.8515	2.8512	1.8564	2.8292
50	100	80	1.8515	2.8512	1.8553	2.8378
50	100	90	1.8515	2.8512	1.8541	2.8451
50	100	100	2.0514	3.0513	2.0450	3.0081
60	10	10	1.6515	2.6511	1.6503	2.6501
60	10	20	1.6514	2.6511	1.6501	2.6496
60	10	30	1.6515	2.6511	1.6519	2.6510
60	10	40	1.8514	2.8512	1.8520	2.8510
60	10	50	2.0515	3.0513	2.0520	3.0511
60	10	60	1.8515	2.8512	1.8518	2.8511
60	10	70	1.6514	2.6511	1.6511	2.6510
60	10	80	1.8515	2.8512	1.8516	2.8512
60	10	90	1.4514	2.4511	1.4516	2.4511
60	10	100	2.0515	3.0513	2.0517	3.0513
60	20	10	1.6518	2.6511	1.6462	2.6288
60	20	20	1.8516	2.8512	1.8502	2.8497
60	20	30	1.6514	2.6511	1.6504	2.6502
60	20	40	1.8516	2.8512	1.8525	2.8502
60	20	50	1.2515	2.2510	1.2522	2.2507
60	20	60	1.8515	2.8512	1.8519	2.8511
60	20	70	1.8516	2.8512	1.8511	2.8510
60	20	80	2.0515	3.0513	2.0513	3.0512
60	20	90	2.0515	3.0513	2.0520	3.0511
60	20	100	2.0516	3.0513	2.0512	3.0512
60	30	10	1.6492	2.6471	1.2482	2.2446
60	30	20	1.8514	2.8512	1.8563	2.8301
60	30	30	1.8515	2.8512	1.8530	2.8492
60	30	40	1.4514	2.4511	1.4497	2.4490
60	30	50	1.8515	2.8512	1.8469	2.8322
60	30	60	1.8515	2.8512	1.8527	2.8498
60	30	70	2.0515	3.0513	2.0507	3.0505
60	30	80	1.6514	2.6511	1.6508	2.6508
60	30	90	1.8514	2.8512	1.8522	2.8508
60	30	100	1.8515	2.8512	1.8507	2.8506
60	40	10	1.8526	2.8500	1.2564	2.2361
60	40	20	1.8517	2.8512	1.8431	2.7873
60	40	30	1.8516	2.8512	1.8380	2.6885
60	40	40	1.8516	2.8512	1.8492	2.8466
60	40	50	2.0516	3.0513	2.0540	3.0452

60	40	60	2.0516	3.0513	2.0538	3.0462
60	40	70	1.8514	2.8512	1.8503	2.8499
60	40	80	1.8515	2.8512	1.8505	2.8502
60	40	90	2.0515	3.0513	2.0524	3.0506
60	40	100	1.6514	2.6511	1.6523	2.6506
60	50	10	1.8495	2.8477	1.6741	2.2460
60	50	20	2.0512	3.0512	1.6403	2.5517
60	50	30	1.8515	2.8512	1.8384	2.6970
60	50	40	1.8515	2.8512	1.8533	2.8482
60	50	50	1.8515	2.8512	1.8487	2.8441
60	50	60	1.8515	2.8512	1.8528	2.8496
60	50	70	1.8515	2.8512	1.8527	2.8499
60	50	80	1.8515	2.8512	1.8528	2.8497
60	50	90	2.0516	3.0513	2.0528	3.0498
60	50	100	1.8515	2.8512	1.8525	2.8502
60	60	10	1.8517	2.8512	1.6529	2.6494
60	60	20	1.8512	2.8512	1.8360	2.6378
60	60	30	1.8516	2.8512	1.8577	2.8155
60	60	40	1.8514	2.8512	1.8465	2.8290
60	60	50	1.8515	2.8512	1.8490	2.8456
60	60	60	1.8515	2.8512	1.8484	2.8427
60	60	70	2.0515	3.0513	2.0542	3.0441
60	60	80	2.0516	3.0513	2.0475	3.0349
60	60	90	2.0515	3.0513	2.0498	3.0483
60	60	100	1.6515	2.6511	1.6505	2.6504
60	70	10	1.8510	2.8510	-0.8370	1.7641
60	70	20	2.0513	3.0512	1.6615	2.5691
60	70	30	1.8514	2.8512	1.8398	2.7275
60	70	40	2.0515	3.0513	1.8609	2.7708
60	70	50	2.0515	3.0513	2.0436	2.9884
60	70	60	2.0514	3.0513	2.0564	3.0277
60	70	70	2.0515	3.0513	2.0486	3.0427
60	70	80	2.0516	3.0513	2.0543	3.0433
60	70	90	1.8514	2.8512	1.8494	2.8473
60	70	100	1.8515	2.8512	1.8530	2.8492
60	80	10	1.8519	2.8511	1.2376	2.1361
60	80	20	1.8516	2.8512	1.6346	2.4270
60	80	30	1.8513	2.8512	1.6556	2.6372
60	80	40	1.8516	2.8512	1.8392	2.7153
60	80	50	1.8515	2.8512	1.8471	2.8335
60	80	60	1.8515	2.8512	1.8484	2.8424
60	80	70	1.8514	2.8512	1.8540	2.8454
60	80	80	2.0515	3.0513	2.0490	3.0448
60	80	90	2.0515	3.0513	2.0488	3.0439
60	80	100	2.0515	3.0513	2.0493	3.0461
60	90	10	1.8504	2.8502	1.0733	1.8102
60	90	20	1.8518	2.8511	1.6366	2.4763
60	90	30	1.8515	2.8512	1.6412	2.5671

60	90	40	2.0515	3.0513	1.8426	2.7790
60	90	50	2.0515	3.0513	1.8474	2.8358
60	90	60	1.8515	2.8512	1.8558	2.8341
60	90	70	1.8515	2.8512	1.8468	2.8308
60	90	80	1.8515	2.8512	1.8540	2.8455
60	90	90	2.0515	3.0513	2.0472	3.0325
60	90	100	1.8515	2.8512	1.8497	2.8484
60	100	10	1.8500	2.8491	1.4859	1.6676
60	100	20	1.8518	2.8511	1.4618	2.3747
60	100	30	1.8515	2.8512	1.8709	2.5144
60	100	40	2.0516	3.0513	1.8481	2.8409
60	100	50	2.0522	3.0508	1.8462	2.8257
60	100	60	2.0515	3.0513	2.0465	3.0254
60	100	70	1.8516	2.8512	1.8545	2.8428
60	100	80	2.0515	3.0513	2.0439	2.9920
60	100	90	1.8515	2.8512	1.8546	2.8426
60	100	100	2.0516	3.0513	2.0633	2.9118
70	10	10	2.0518	3.0512	2.0491	3.0455
70	10	20	1.8513	2.8512	1.8520	2.8510
70	10	30	-0.8517	1.8510	-0.8515	1.8510
70	10	40	1.8516	2.8512	1.8505	2.8503
70	10	50	1.2515	2.2510	1.2519	2.2509
70	10	60	1.2514	2.2510	1.2517	2.2510
70	10	70	1.8515	2.8512	1.8513	2.8512
70	10	80	1.2515	2.2510	1.2516	2.2510
70	10	90	2.0515	3.0513	2.0514	3.0513
70	10	100	1.8515	2.8512	1.8514	2.8512
70	20	10	1.8520	2.8509	1.8470	2.8332
70	20	20	1.6513	2.6511	1.6500	2.6494
70	20	30	1.8515	2.8512	1.8526	2.8500
70	20	40	1.8515	2.8512	1.8520	2.8510
70	20	50	1.6515	2.6511	1.6511	2.6511
70	20	60	2.0515	3.0513	2.0521	3.0510
70	20	70	1.8515	2.8512	1.8512	2.8511
70	20	80	1.6515	2.6511	1.6512	2.6511
70	20	90	1.4514	2.4511	1.4510	2.4509
70	20	100	2.0515	3.0513	2.0520	3.0510
70	30	10	2.0515	3.0513	1.8497	2.8482
70	30	20	1.6513	2.6511	1.6488	2.6456
70	30	30	1.8517	2.8512	1.8540	2.8456
70	30	40	1.6515	2.6511	1.6525	2.6502
70	30	50	2.0515	3.0513	2.0505	3.0502
70	30	60	1.8516	2.8512	1.8523	2.8507
70	30	70	1.8515	2.8512	1.8510	2.8510
70	30	80	2.0515	3.0513	2.0509	3.0508
70	30	90	2.0516	3.0513	2.0511	3.0511
70	30	100	1.8515	2.8512	1.8511	2.8511
70	40	10	1.6516	2.6511	1.4494	2.4481

70	40	20	2.0518	3.0512	2.0480	3.0386
70	40	30	1.8515	2.8512	1.8540	2.8452
70	40	40	1.8515	2.8512	1.8534	2.8479
70	40	50	2.0515	3.0513	2.0555	3.0351
70	40	60	2.0515	3.0513	2.0525	3.0503
70	40	70	1.6515	2.6511	1.6526	2.6501
70	40	80	2.0516	3.0513	2.0508	3.0508
70	40	90	2.0515	3.0513	2.0523	3.0507
70	40	100	1.8515	2.8512	1.8522	2.8507
70	50	10	1.8514	2.8512	1.8629	2.7337
70	50	20	1.8514	2.8512	1.8441	2.8013
70	50	30	1.8515	2.8512	1.8563	2.8300
70	50	40	1.6515	2.6511	1.6559	2.6353
70	50	50	1.6514	2.6511	1.6533	2.6482
70	50	60	2.0515	3.0513	2.0501	3.0491
70	50	70	1.8515	2.8512	1.8526	2.8501
70	50	80	1.8515	2.8512	1.8526	2.8502
70	50	90	1.8515	2.8512	1.8502	2.8497
70	50	100	2.0515	3.0513	2.0523	3.0506
70	60	10	1.8516	2.8512	1.6424	2.5857
70	60	20	1.8515	2.8512	1.8603	2.7797
70	60	30	1.8515	2.8512	1.8554	2.8374
70	60	40	1.8514	2.8512	1.8557	2.8349
70	60	50	1.8515	2.8512	1.8530	2.8492
70	60	60	2.0516	3.0513	2.0545	3.0424
70	60	70	1.8514	2.8512	1.8528	2.8497
70	60	80	2.0515	3.0513	2.0531	3.0488
70	60	90	1.8515	2.8512	1.8506	2.8505
70	60	100	2.0516	3.0513	2.0526	3.0502
70	70	10	1.8518	2.8511	1.4443	2.4150
70	70	20	1.8514	2.8512	1.6582	2.6141
70	70	30	1.8520	2.8510	1.6470	2.6349
70	70	40	2.0516	3.0513	2.0414	2.9496
70	70	50	1.8515	2.8512	1.8537	2.8468
70	70	60	1.6515	2.6511	1.6548	2.6421
70	70	70	1.8515	2.8512	1.8486	2.8436
70	70	80	1.8515	2.8512	1.8501	2.8494
70	70	90	1.8515	2.8512	1.8497	2.8484
70	70	100	2.0515	3.0513	2.0490	3.0449
70	80	10	1.8523	2.8507	1.0581	2.0283
70	80	20	1.8518	2.8511	1.8688	2.5821
70	80	30	2.0506	3.0504	1.8628	2.7344
70	80	40	1.8515	2.8512	1.8475	2.8368
70	80	50	1.6514	2.6511	1.6542	2.6449
70	80	60	2.0515	3.0513	2.0556	3.0347
70	80	70	1.8515	2.8512	1.8491	2.8458
70	80	80	2.0515	3.0513	2.0538	3.0459
70	80	90	2.0515	3.0513	2.0499	3.0487

70	80	100	1.8515	2.8512	1.8541	2.8449
70	90	10	1.6472	2.6364	1.2765	1.8794
70	90	20	2.0537	3.0464	1.6632	2.5401
70	90	30	1.8517	2.8512	1.8383	2.6958
70	90	40	1.8516	2.8512	1.8445	2.8066
70	90	50	1.8515	2.8512	1.8471	2.8339
70	90	60	2.0515	3.0513	2.0565	3.0264
70	90	70	1.8515	2.8512	1.8542	2.8446
70	90	80	1.8515	2.8512	1.8490	2.8454
70	90	90	2.0515	3.0513	2.0493	3.0464
70	90	100	1.8515	2.8512	1.8500	2.8492
70	100	10	2.0395	2.9068	1.2605	2.2005
70	100	20	1.8509	2.8509	1.6675	2.4445
70	100	30	1.8515	2.8512	1.8361	2.6412
70	100	40	2.0515	3.0513	1.8552	2.8387
70	100	50	2.0515	3.0513	1.8518	2.8511
70	100	60	1.8515	2.8512	1.8543	2.8438
70	100	70	1.8515	2.8512	1.8462	2.8258
70	100	80	2.0515	3.0513	2.0562	3.0293
70	100	90	1.8515	2.8512	1.8540	2.8456
70	100	100	1.8515	2.8512	1.8489	2.8451
80	10	10	1.6514	2.6511	1.6495	2.6480
80	10	20	1.8515	2.8512	1.8521	2.8508
80	10	30	1.6514	2.6511	1.6512	2.6511
80	10	40	2.0515	3.0513	2.0518	3.0512
80	10	50	1.2515	2.2510	1.2511	2.2510
80	10	60	1.8515	2.8512	1.8517	2.8512
80	10	70	1.6514	2.6511	1.6513	2.6511
80	10	80	1.8515	2.8512	1.8515	2.8512
80	10	90	1.6515	2.6511	1.6516	2.6511
80	10	100	1.8515	2.8512	1.8516	2.8512
80	20	10	1.8515	2.8512	1.8497	2.8482
80	20	20	1.8515	2.8512	1.8490	2.8458
80	20	30	1.4515	2.4511	1.4524	2.4505
80	20	40	1.4514	2.4511	1.4523	2.4506
80	20	50	1.2515	2.2510	1.2518	2.2510
80	20	60	1.6514	2.6511	1.6518	2.6510
80	20	70	1.8515	2.8512	1.8510	2.8510
80	20	80	1.8515	2.8512	1.8518	2.8511
80	20	90	2.0515	3.0513	2.0518	3.0512
80	20	100	1.8515	2.8512	1.8517	2.8512
80	30	10	1.8514	2.8512	1.8435	2.7932
80	30	20	1.8515	2.8512	1.8548	2.8413
80	30	30	1.8514	2.8512	1.8536	2.8470
80	30	40	1.8515	2.8512	1.8504	2.8501
80	30	50	1.8515	2.8512	1.8525	2.8502
80	30	60	1.8515	2.8512	1.8505	2.8504
80	30	70	2.0515	3.0513	2.0509	3.0509

80	30	80	2.0515	3.0513	2.0520	3.0511
80	30	90	1.8515	2.8512	1.8511	2.8511
80	30	100	2.0515	3.0513	2.0519	3.0511
80	40	10	1.8516	2.8512	1.8633	2.7242
80	40	20	1.8516	2.8512	1.8463	2.8269
80	40	30	1.8515	2.8512	1.8537	2.8466
80	40	40	2.0516	3.0513	2.0494	3.0468
80	40	50	1.8515	2.8512	1.8499	2.8489
80	40	60	1.8514	2.8512	1.8503	2.8500
80	40	70	2.0515	3.0513	2.0520	3.0510
80	40	80	2.0515	3.0513	2.0509	3.0509
80	40	90	1.8515	2.8512	1.8508	2.8508
80	40	100	1.8515	2.8512	1.8510	2.8510
80	50	10	1.8546	2.8421	1.6647	2.5099
80	50	20	1.8515	2.8512	1.8586	2.8051
80	50	30	1.8514	2.8512	1.6503	2.6500
80	50	40	1.8515	2.8512	1.8498	2.8485
80	50	50	2.0515	3.0513	2.0533	3.0481
80	50	60	1.8515	2.8512	1.8531	2.8487
80	50	70	1.8515	2.8512	1.8504	2.8501
80	50	80	2.0515	3.0513	2.0524	3.0505
80	50	90	1.8515	2.8512	1.8508	2.8507
80	50	100	2.0515	3.0513	2.0526	3.0502
80	60	10	1.8514	2.8512	1.8751	2.3612
80	60	20	1.8513	2.8512	1.8431	2.7869
80	60	30	1.8514	2.8512	1.8458	2.8219
80	60	40	1.8515	2.8512	1.8490	2.8454
80	60	50	1.8516	2.8512	1.8488	2.8445
80	60	60	2.0515	3.0513	2.0496	3.0476
80	60	70	1.8515	2.8512	1.8499	2.8489
80	60	80	1.8515	2.8512	1.8526	2.8501
80	60	90	1.8515	2.8512	1.8525	2.8503
80	60	100	1.8515	2.8512	1.8504	2.8501
80	70	10	1.8510	2.8510	1.2513	2.2510
80	70	20	1.8515	2.8512	1.8609	2.7709
80	70	30	1.8516	2.8512	1.6575	2.6211
80	70	40	1.8515	2.8512	1.8559	2.8333
80	70	50	2.0515	3.0513	2.0598	2.9816
80	70	60	1.8515	2.8512	1.8541	2.8452
80	70	70	1.8515	2.8512	1.8538	2.8463
80	70	80	1.8515	2.8512	1.8507	2.8506
80	70	90	2.0515	3.0513	2.0503	3.0497
80	70	100	1.6515	2.6511	1.6505	2.6505
80	80	10	1.8511	2.8511	1.2538	2.2476
80	80	20	1.8520	2.8510	1.8649	2.6896
80	80	30	1.8514	2.8512	1.8583	2.8083
80	80	40	1.8515	2.8512	1.8404	2.7411
80	80	50	1.8513	2.8512	1.8456	2.8200

80	80	60	1.8515	2.8512	1.8538	2.8463
80	80	70	2.0515	3.0513	2.0494	3.0467
80	80	80	2.0515	3.0513	2.0541	3.0449
80	80	90	2.0515	3.0513	2.0531	3.0489
80	80	100	1.8515	2.8512	1.8532	2.8485
80	90	10	1.8515	2.8512	1.2615	2.1887
80	90	20	1.8497	2.8483	1.6648	2.5081
80	90	30	2.0513	3.0512	2.0371	2.8450
80	90	40	1.8515	2.8512	1.8466	2.8296
80	90	50	2.0516	3.0513	2.0398	2.9130
80	90	60	2.0515	3.0513	2.0555	3.0357
80	90	70	1.8515	2.8512	1.8477	2.8383
80	90	80	2.0515	3.0513	2.0496	3.0474
80	90	90	2.0515	3.0513	2.0443	2.9994
80	90	100	1.8515	2.8512	1.8531	2.8487
80	100	10	1.8512	2.8511	1.0504	2.0504
80	100	20	2.0516	3.0513	1.8353	2.6195
80	100	30	1.8515	2.8512	1.6570	2.6259
80	100	40	1.8514	2.8512	1.8413	2.7567
80	100	50	2.0516	3.0513	1.8490	2.8456
80	100	60	2.0515	3.0513	1.8486	2.8436
80	100	70	1.8515	2.8512	1.8489	2.8451
80	100	80	1.8515	2.8512	1.8535	2.8476
80	100	90	1.8515	2.8512	1.8529	2.8495
80	100	100	1.8515	2.8512	1.8498	2.8487
90	10	10	-0.8519	1.8510	-0.8528	1.8504
90	10	20	2.0516	3.0513	2.0510	3.0510
90	10	30	1.6514	2.6511	1.6511	2.6510
90	10	40	1.4514	2.4511	1.4517	2.4510
90	10	50	2.0516	3.0513	2.0512	3.0512
90	10	60	1.6515	2.6511	1.6516	2.6511
90	10	70	1.2514	2.2510	1.2517	2.2510
90	10	80	1.8515	2.8512	1.8514	2.8512
90	10	90	1.2514	2.2510	1.2515	2.2510
90	10	100	-0.8516	1.8510	0.8515	1.8510
90	20	10	1.6514	2.6511	1.6550	2.6408
90	20	20	1.4515	2.4511	1.4506	2.4506
90	20	30	2.0515	3.0513	2.0507	3.0506
90	20	40	1.8515	2.8512	1.8522	2.8507
90	20	50	2.0515	3.0513	2.0511	3.0511
90	20	60	1.8515	2.8512	1.8511	2.8511
90	20	70	1.8515	2.8512	1.8511	2.8511
90	20	80	1.6515	2.6511	1.6517	2.6511
90	20	90	1.8515	2.8512	1.8512	2.8511
90	20	100	1.8515	2.8512	1.8513	2.8512
90	30	10	2.0523	3.0507	2.0433	2.9834
90	30	20	1.8513	2.8512	1.8534	2.8478
90	30	30	1.8516	2.8512	1.8531	2.8489

90	30	40	1.8515	2.8512	1.8505	2.8504
90	30	50	1.8515	2.8512	1.8505	2.8504
90	30	60	1.8515	2.8512	1.8521	2.8508
90	30	70	2.0515	3.0513	2.0509	3.0508
90	30	80	1.8515	2.8512	1.8511	2.8510
90	30	90	1.8515	2.8512	1.8511	2.8511
90	30	100	1.6515	2.6511	1.6511	2.6510
90	40	10	1.8511	2.8511	1.6536	2.6474
90	40	20	1.6515	2.6511	1.6477	2.6399
90	40	30	1.8515	2.8512	1.8491	2.8462
90	40	40	2.0515	3.0513	2.0540	3.0452
90	40	50	1.8515	2.8512	1.8504	2.8501
90	40	60	1.8515	2.8512	1.8526	2.8501
90	40	70	2.0515	3.0513	2.0508	3.0507
90	40	80	1.8515	2.8512	1.8507	2.8507
90	40	90	1.8515	2.8512	1.8519	2.8511
90	40	100	1.8515	2.8512	1.8510	2.8510
90	50	10	2.0516	3.0513	1.8478	2.8392
90	50	20	1.8515	2.8512	1.8646	2.6956
90	50	30	1.8515	2.8512	1.8452	2.8149
90	50	40	1.8516	2.8512	1.8487	2.8442
90	50	50	1.8515	2.8512	1.8499	2.8490
90	50	60	1.8515	2.8512	1.8528	2.8496
90	50	70	1.8515	2.8512	1.8505	2.8502
90	50	80	1.8515	2.8512	1.8523	2.8506
90	50	90	2.0515	3.0513	2.0520	3.0511
90	50	100	1.6514	2.6511	1.6506	2.6506
90	60	10	1.8502	2.8496	1.4595	2.4047
90	60	20	1.8516	2.8512	1.6502	2.6499
90	60	30	1.8515	2.8512	1.8569	2.8247
90	60	40	1.8514	2.8512	1.8482	2.8412
90	60	50	2.0514	3.0513	2.0500	3.0489
90	60	60	1.8515	2.8512	1.8530	2.8491
90	60	70	1.8515	2.8512	1.8504	2.8501
90	60	80	1.8515	2.8512	1.8522	2.8507
90	60	90	1.8515	2.8512	1.8505	2.8504
90	60	100	2.0515	3.0513	2.0524	3.0505
90	70	10	1.8501	2.8495	1.4630	2.3561
90	70	20	2.0513	3.0512	1.8402	2.7369
90	70	30	1.8514	2.8512	1.8546	2.8424
90	70	40	1.8514	2.8512	1.8566	2.8275
90	70	50	2.0517	3.0513	2.0472	3.0322
90	70	60	1.8515	2.8512	1.8493	2.8469
90	70	70	2.0515	3.0513	2.0497	3.0479
90	70	80	2.0515	3.0513	2.0530	3.0491
90	70	90	1.8515	2.8512	1.8524	2.8505
90	70	100	2.0515	3.0513	2.0503	3.0498
90	80	10	1.8512	2.8511	1.6696	2.3894

90	80	20	1.8518	2.8511	1.8676	2.6166
90	80	30	2.0512	3.0512	1.8477	2.8381
90	80	40	2.0514	3.0513	2.0558	3.0330
90	80	50	1.8514	2.8512	1.8489	2.8453
90	80	60	2.0515	3.0513	2.0562	3.0290
90	80	70	1.8515	2.8512	1.8501	2.8493
90	80	80	1.8514	2.8512	1.8502	2.8497
90	80	90	1.8515	2.8512	1.8526	2.8501
90	80	100	1.8515	2.8512	1.8504	2.8501
90	90	10	1.8500	2.8493	1.6219	1.9989
90	90	20	1.8516	2.8512	1.6472	2.6362
90	90	30	1.6515	2.6511	1.6580	2.6159
90	90	40	1.8514	2.8512	1.8546	2.8425
90	90	50	1.8515	2.8512	1.8488	2.8447
90	90	60	1.8515	2.8512	1.8541	2.8451
90	90	70	1.8515	2.8512	1.8538	2.8462
90	90	80	2.0515	3.0513	2.0540	3.0452
90	90	90	2.0515	3.0513	2.0533	3.0480
90	90	100	1.8515	2.8512	1.8527	2.8499
90	100	10	1.8519	2.8510	1.8785	2.2165
90	100	20	1.8513	2.8512	1.6433	2.5977
90	100	30	1.8515	2.8512	1.4495	2.4485
90	100	40	1.8515	2.8512	1.8564	2.8290
90	100	50	1.6515	2.6511	1.6460	2.6275
90	100	60	1.8515	2.8512	1.8538	2.8465
90	100	70	1.8515	2.8512	1.8492	2.8465
90	100	80	1.8515	2.8512	1.8537	2.8465
90	100	90	1.8515	2.8512	1.8529	2.8493
90	100	100	1.8515	2.8512	1.8528	2.8497
100	10	10	1.8516	2.8512	1.8527	2.8499
100	10	20	1.6514	2.6511	1.6518	2.6510
100	10	30	1.8514	2.8512	1.8509	2.8509
100	10	40	1.8516	2.8512	1.8508	2.8508
100	10	50	1.8515	2.8512	1.8517	2.8512
100	10	60	2.0515	3.0513	2.0514	3.0513
100	10	70	1.8515	2.8512	1.8513	2.8512
100	10	80	2.0515	3.0513	2.0516	3.0513
100	10	90	1.6514	2.6511	1.6514	2.6511
100	10	100	2.0515	3.0513	2.0514	3.0513
100	20	10	1.8515	2.8512	1.8533	2.8481
100	20	20	1.8516	2.8512	1.8497	2.8483
100	20	30	1.8514	2.8512	1.8526	2.8501
100	20	40	1.8515	2.8512	1.8519	2.8510
100	20	50	1.8515	2.8512	1.8510	2.8510
100	20	60	1.8515	2.8512	1.8520	2.8510
100	20	70	1.8515	2.8512	1.8510	2.8510
100	20	80	1.8515	2.8512	1.8512	2.8512
100	20	90	1.8515	2.8512	1.8512	2.8511

100	20	100	1.8515	2.8512	1.8513	2.8512
100	30	10	2.0515	3.0513	2.0593	2.9902
100	30	20	1.8515	2.8512	1.8492	2.8463
100	30	30	1.6514	2.6511	1.6530	2.6492
100	30	40	1.8515	2.8512	1.8521	2.8508
100	30	50	1.8515	2.8512	1.8504	2.8502
100	30	60	1.8515	2.8512	1.8512	2.8511
100	30	70	2.0515	3.0513	2.0522	3.0509
100	30	80	2.0515	3.0513	2.0510	3.0510
100	30	90	2.0515	3.0513	2.0519	3.0511
100	30	100	1.8515	2.8512	1.8512	2.8511
100	40	10	1.6533	2.6483	1.4376	2.3171
100	40	20	1.8515	2.8512	1.8540	2.8455
100	40	30	1.8515	2.8512	1.8493	2.8470
100	40	40	1.6515	2.6511	1.6502	2.6498
100	40	50	1.8515	2.8512	1.8528	2.8495
100	40	60	1.6515	2.6511	1.6521	2.6508
100	40	70	2.0516	3.0513	2.0524	3.0505
100	40	80	1.8515	2.8512	1.8521	2.8509
100	40	90	1.8515	2.8512	1.8519	2.8511
100	40	100	1.8515	2.8512	1.8510	2.8510
100	50	10	1.8517	2.8512	1.8413	2.7584
100	50	20	1.8517	2.8512	1.8547	2.8416
100	50	30	1.8515	2.8512	1.8538	2.8463
100	50	40	2.0515	3.0513	2.0565	3.0268
100	50	50	2.0515	3.0513	2.0499	3.0485
100	50	60	1.8515	2.8512	1.8530	2.8491
100	50	70	1.6515	2.6511	1.6521	2.6508
100	50	80	2.0515	3.0513	2.0526	3.0502
100	50	90	2.0515	3.0513	2.0524	3.0506
100	50	100	1.8515	2.8512	1.8506	2.8505
100	60	10	1.8513	2.8512	1.8325	2.5336
100	60	20	1.8515	2.8512	1.8461	2.8250
100	60	30	1.8515	2.8512	1.8540	2.8456
100	60	40	2.0515	3.0513	2.0538	3.0461
100	60	50	2.0516	3.0513	2.0491	3.0454
100	60	60	1.8514	2.8512	1.8529	2.8495
100	60	70	2.0516	3.0513	2.0527	3.0499
100	60	80	1.8515	2.8512	1.8504	2.8502
100	60	90	2.0515	3.0513	2.0522	3.0509
100	60	100	2.0515	3.0513	2.0508	3.0508
100	70	10	1.8527	2.8499	1.4568	2.4302
100	70	20	1.8515	2.8512	1.8431	2.7880
100	70	30	1.8515	2.8512	1.8470	2.8331
100	70	40	2.0515	3.0513	2.0457	3.0176
100	70	50	1.8515	2.8512	1.8491	2.8460
100	70	60	1.8515	2.8512	1.8525	2.8502
100	70	70	1.8515	2.8512	1.8532	2.8485

100	70	80	2.0515	3.0513	2.0528	3.0496
100	70	90	1.8515	2.8512	1.8526	2.8502
100	70	100	1.8515	2.8512	1.8508	2.8508
100	80	10	1.8513	2.8512	1.4352	2.2676
100	80	20	1.8515	2.8512	1.8439	2.7986
100	80	30	1.8515	2.8512	1.8576	2.8166
100	80	40	1.8515	2.8512	1.8543	2.8440
100	80	50	1.8516	2.8512	1.8492	2.8462
100	80	60	1.8515	2.8512	1.8499	2.8490
100	80	70	1.8515	2.8512	1.8527	2.8498
100	80	80	1.8515	2.8512	1.8503	2.8499
100	80	90	1.8515	2.8512	1.8522	2.8507
100	80	100	1.6515	2.6511	1.6522	2.6507
100	90	10	1.8517	2.8512	1.2505	2.2505
100	90	20	2.0516	3.0513	2.0384	2.8811
100	90	30	1.8515	2.8512	1.8572	2.8209
100	90	40	1.8515	2.8512	1.8552	2.8388
100	90	50	1.8515	2.8512	1.8488	2.8445
100	90	60	1.8515	2.8512	1.8489	2.8453
100	90	70	2.0515	3.0513	2.0548	3.0402
100	90	80	1.8515	2.8512	1.8531	2.8488
100	90	90	2.0515	3.0513	2.0527	3.0499
100	90	100	1.8515	2.8512	1.8527	2.8499
100	100	10	1.8494	2.8473	1.2726	1.9823
100	100	20	1.8516	2.8512	1.6425	2.5859
100	100	30	1.8514	2.8512	1.8604	2.7795
100	100	40	1.8515	2.8512	1.8483	2.8417
100	100	50	1.8515	2.8512	1.8489	2.8452
100	100	60	1.8516	2.8512	1.8495	2.8475
100	100	70	1.8515	2.8512	1.8496	2.8479
100	100	80	2.0515	3.0513	2.0541	3.0446
100	100	90	1.8515	2.8512	1.8530	2.8492
100	100	100	2.0515	3.0513	2.0497	3.0478

2.3 Plotando

2.3.1 Criando o data frame

[72]:
```
import pandas as pd

data = []

for (quantidade_geracoes, quant_pais, quant_filhos, (best_individuo,␣
 ↪avg_individuo)) in results:
    data.append({
        'Quantidade Gerações': quantidade_geracoes,
        'Quant Pais': quant_pais,
        'Quant Filhos': quant_filhos,
```

```
        # Assuming this is accessible and meaningful (e.g., a list or tuple of␣
 ↪parameters)
        'Best Genotipo': best_individuo.genotipo,
        'Best Fitness': best_individuo.get_fenotipo(),
        # Similarly, assuming this is a list or tuple
        'Average Genotipo': avg_individuo.genotipo,
        'Average Fitness': avg_individuo.get_fenotipo()
    })

df = pd.DataFrame(data)

df[['Best x']] = pd.DataFrame(
    df['Best Genotipo'].tolist(), index=df.index)

df[['Avg x']] = pd.DataFrame(
    df['Average Genotipo'].tolist(), index=df.index)

df.drop(['Best Genotipo', 'Average Genotipo'], axis=1, inplace=True)

# Display the first few rows to verify
print(df.head())
```

```
   Quantidade Gerações  Quant Pais  Quant Filhos  Best Fitness  \
0                   10          10            10      2.650417
1                   10          10            20      2.647932
2                   10          10            30      2.250964
3                   10          10            40      2.651143
4                   10          10            50      2.451021

   Average Fitness    Best x     Avg x
0         2.243010  1.650506  1.255049
1         2.623205  1.649464  1.645579
2         2.231974  1.251096  1.245873
3         2.645855  1.651480  1.648901
4         2.447332  1.451136  1.449143
```

2.3.2 Plotando o gráfico

[73]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy.optimize import minimize_scalar


def fn_objetivo(x): return x * np.sin(10 * 3.14 * x) + 1


resultado = minimize_scalar(
```

```
    lambda x: -fn_objetivo(x), bounds=(-1, 2), method='bounded')

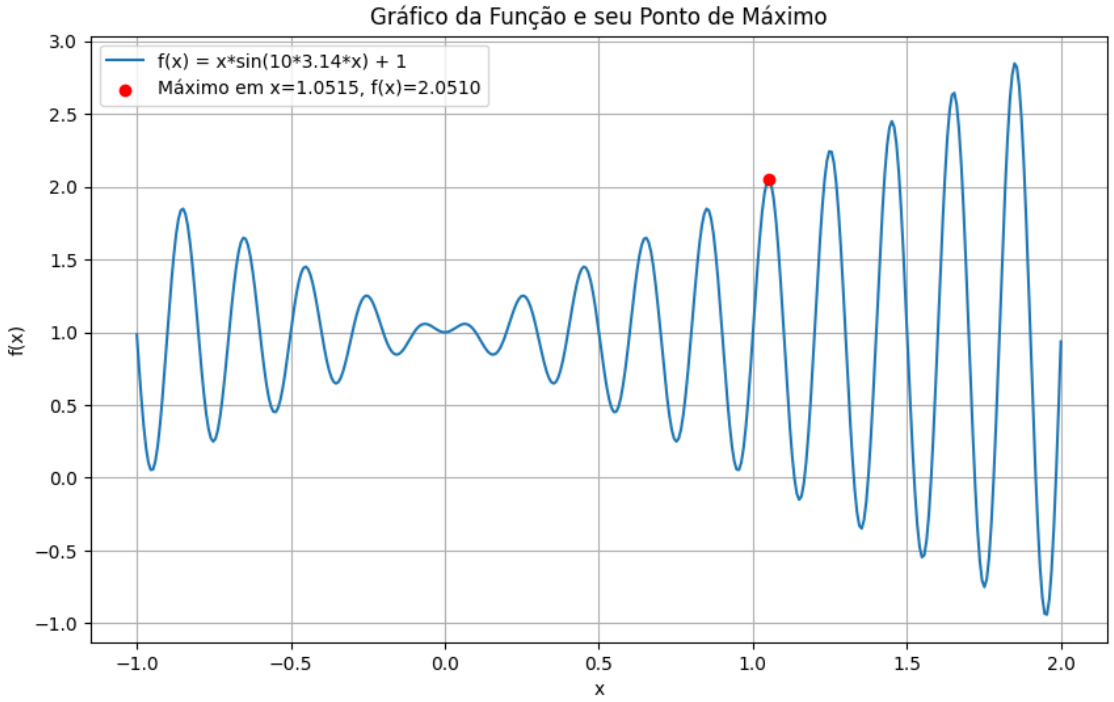
ponto_maximo = resultado.x
valor_maximo = fn_objetivo(ponto_maximo)

x = np.linspace(-1, 2, 400)
y = fn_objetivo(x)

plt.figure(figsize=(10, 6))
plt.plot(x, y, label='f(x) = x*sin(10*3.14*x) + 1')
plt.scatter(ponto_maximo, valor_maximo, color='red', zorder=5,
            label=f'Máximo em x={ponto_maximo:.4f}, f(x)={valor_maximo:.4f}')

plt.title('Gráfico da Função e seu Ponto de Máximo')
plt.xlabel('x')
plt.ylabel('f(x)')
plt.legend()
plt.grid(True)

plt.show()
```

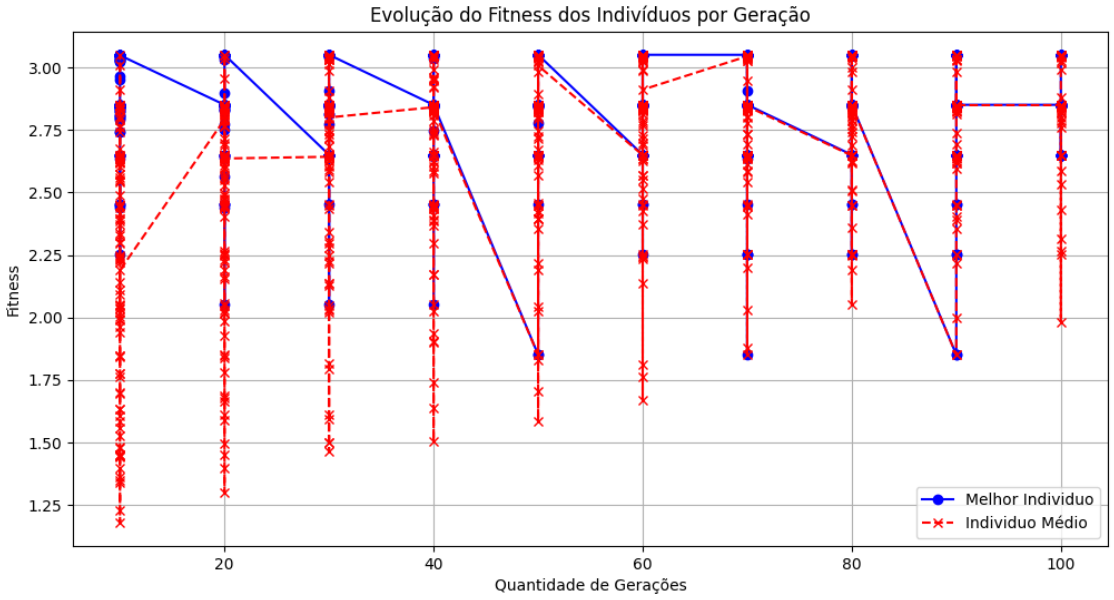


[74]:
```
import matplotlib.pyplot as plt

# Adjusting the plotting code to use the correct column names
```

```
plt.figure(figsize=(12, 6))
plt.plot(df['Quantidade Gerações'], df['Best Fitness'],
         label='Melhor Individuo', marker='o', linestyle='-', color='blue')
plt.plot(df['Quantidade Gerações'], df['Average Fitness'],
         label='Individuo Médio', marker='x', linestyle='--', color='red')

plt.title('Evolução do Fitness dos Indivíduos por Geração')
plt.xlabel('Quantidade de Gerações')
plt.ylabel('Fitness')
plt.legend()
plt.grid(True)
plt.show()
```



3 Problema 2

maximizar $f(x, y) = (1 - x)^2 + 100(y - x^2)^2$

sujeito a:
$(x - 1)^3 - y + 1 < 0$
$ x+y-2 0$
$-1.5 \leq x \leq 1.5$
$-0.5 \leq y \leq 2.5$

3.1 Gerando a população

[75]:
```
def new_exp(quant_pais: int = 100, quant_filhos: int = 100) -> Populacao:
    return Populacao(
        quant_pais=quant_pais,
        fn_objetivo=(lambda x, y: (1-x)**2 + 100*(y-x**2)**2),
        fabric_fn_mutacao=fabric_fn_mutacao,
        quant_parametros_fn_objetivo=2,
        is_minimization=True,
        lim_inf=[-1.5, -.5],
        lim_sup=[1.5, .5],
        quant_filhos=quant_filhos,
        constrains= [(lambda x, y: ((x-1)**3 -y + 1) <= 0), (lambda x, y: (x +␣
 ↪y - 2) <= 0)]
    )

results: List[Tuple[int, int, int, Tuple[Individuo, Individuo]]] = []
for quantidade_geracoes in range(10, 110, 10):
    for quant_pais in range(10, 110, 10):
        for quant_filhos in range(10, 110, 10):
            pop = new_exp(quant_pais, quant_filhos)  # Create the population
            # Evolve and get the best and average
            best, avg = evoluir(quantidade_geracoes, pop)
            # Append the results with the structure including the parameters
            results.append(
                (quantidade_geracoes, quant_pais, quant_filhos, (best, avg)))
```

3.2 Mostrando tabela solicitada

[83]:
```
from tabulate import tabulate

data = []

for entry in results:
    quantidade_geracoes, quant_pais, quant_filhos, (
        best_individuo, avg_individuo) = entry
    row = [
        quantidade_geracoes,  # Number of generations
        quant_pais,            # Number of parents
        quant_filhos,          # Number of children
        best_individuo.genotipo[0],  # list of parameters of the best individuo
        best_individuo.genotipo[1],  # list of parameters of the best individuo
        best_individuo.get_fenotipo(),  # f(x) of the best individuo
        avg_individuo.genotipo[0],   # list of parameters of the average␣
 ↪individuo
        avg_individuo.genotipo[1],   # list of parameters of the average␣
 ↪individuo
```

```
        avg_individuo.get_fenotipo(),   # f(x) of the average individuo
    ]
    data.append(row)

# Define headers for your new columns
headers = ["tmax", " ", " ", "best x", "best y",
           "best f(x,y)", "avg x","avg y", "avg f(x,y)"]

# Print the table using tabulate
table = tabulate(data,
                 headers=headers,
                 tablefmt="github",
                 floatfmt=".3f"
                 )
print(table)
```

```
|   tmax |     |     |   best x |   best y |   best f(x,y) |   avg x |   avg y |
avg f(x,y) |
|--------|-----|-----|----------|----------|---------------|---------|---------
|--------------|
|     10 |  10 |  10 |    0.643 |    0.413 |         0.128 |   0.657 |   0.346 |
0.851 |
|     10 |  10 |  20 |    0.636 |    0.411 |         0.136 |   0.433 |   0.200 |
0.336 |
|     10 |  10 |  30 |    0.870 |    0.752 |         0.019 |   0.686 |   0.478 |
0.105 |
|     10 |  10 |  40 |    0.601 |    0.348 |         0.177 |   0.329 |   0.110 |
0.450 |
|     10 |  10 |  50 |    0.273 |    0.066 |         0.536 |  -0.063 |  -0.029 |
1.240 |
|     10 |  10 |  60 |    0.613 |    0.385 |         0.159 |   0.299 |   0.096 |
0.496 |
|     10 |  10 |  70 |    0.799 |    0.643 |         0.043 |   0.641 |   0.414 |
0.130 |
|     10 |  10 |  80 |    0.681 |    0.456 |         0.108 |   0.385 |   0.175 |
0.451 |
|     10 |  10 |  90 |    0.855 |    0.736 |         0.024 |   0.702 |   0.482 |
0.101 |
|     10 |  10 | 100 |    0.880 |    0.781 |         0.020 |   0.721 |   0.510 |
0.088 |
|     10 |  20 |  10 |   -0.261 |    0.098 |         1.681 |  -0.224 |   0.351 |
10.541 |
|     10 |  20 |  20 |    0.001 |   -0.008 |         1.004 |  -0.006 |  -0.137 |
2.883 |
|     10 |  20 |  30 |    0.577 |    0.325 |         0.185 |   0.382 |   0.169 |
0.438 |
|     10 |  20 |  40 |    0.771 |    0.599 |         0.054 |   0.604 |   0.338 |
```

0.231 |
| 10 | 20 | 50 | 0.674 | 0.461 | 0.110 | 0.318 | 0.113 |
0.478 |
| 10 | 20 | 60 | 0.386 | 0.139 | 0.387 | 0.058 | 0.029 |
0.952 |
| 10 | 20 | 70 | 0.672 | 0.444 | 0.114 | 0.264 | 0.074 |
0.544 |
| 10 | 20 | 80 | 0.650 | 0.427 | 0.125 | 0.337 | 0.144 |
0.533 |
| 10 | 20 | 90 | 0.744 | 0.554 | 0.066 | 0.464 | 0.220 |
0.291 |
| 10 | 20 | 100 | 0.793 | 0.635 | 0.047 | 0.477 | 0.230 |
0.275 |
| 10 | 30 | 10 | 0.687 | 0.400 | 0.627 | -0.027 | -0.314 |
10.983 |
| 10 | 30 | 20 | 0.289 | 0.075 | 0.513 | -0.253 | 0.073 |
1.578 |
| 10 | 30 | 30 | 0.492 | 0.249 | 0.262 | 0.346 | 0.207 |
1.185 |
| 10 | 30 | 40 | 0.681 | 0.462 | 0.102 | 0.166 | 0.002 |
0.762 |
| 10 | 30 | 50 | 0.548 | 0.298 | 0.205 | 0.349 | 0.114 |
0.430 |
| 10 | 30 | 60 | 0.549 | 0.290 | 0.215 | 0.187 | 0.034 |
0.661 |
| 10 | 30 | 70 | 0.747 | 0.553 | 0.066 | 0.552 | 0.292 |
0.219 |
| 10 | 30 | 80 | 0.751 | 0.565 | 0.062 | 0.602 | 0.328 |
0.271 |
| 10 | 30 | 90 | 0.857 | 0.742 | 0.026 | 0.656 | 0.436 |
0.122 |
| 10 | 30 | 100 | 0.905 | 0.815 | 0.011 | 0.689 | 0.469 |
0.100 |
| 10 | 40 | 10 | 0.456 | 0.223 | 0.316 | 0.276 | -0.272 |
12.624 |
| 10 | 40 | 20 | 0.423 | 0.206 | 0.403 | -0.278 | 0.136 |
1.979 |
| 10 | 40 | 30 | 0.781 | 0.614 | 0.049 | 0.677 | 0.343 |
1.437 |
| 10 | 40 | 40 | 0.356 | 0.089 | 0.557 | 0.057 | -0.119 |
2.376 |
| 10 | 40 | 50 | 0.410 | 0.158 | 0.359 | 0.046 | -0.030 |
1.012 |
| 10 | 40 | 60 | 0.430 | 0.177 | 0.331 | 0.228 | 0.116 |
1.006 |
| 10 | 40 | 70 | 0.779 | 0.591 | 0.074 | 0.526 | 0.266 |
0.236 |
| 10 | 40 | 80 | 0.723 | 0.522 | 0.077 | 0.446 | 0.170 |

0.395 |
| 10 | 40 | 90 | 0.782 | 0.611 | 0.048 | 0.420 | 0.188 |
0.350 |
| 10 | 40 | 100 | 0.755 | 0.567 | 0.061 | 0.365 | 0.123 |
0.413 |
| 10 | 50 | 10 | -0.027 | -0.019 | 1.095 | 0.077 | 0.307 |
9.892 |
| 10 | 50 | 20 | 0.286 | 0.107 | 0.574 | -0.173 | 0.239 |
5.766 |
| 10 | 50 | 30 | 0.539 | 0.279 | 0.227 | 0.262 | 0.172 |
1.624 |
| 10 | 50 | 40 | 0.567 | 0.336 | 0.208 | 0.471 | 0.382 |
2.842 |
| 10 | 50 | 50 | 0.467 | 0.216 | 0.285 | -0.255 | 0.082 |
1.603 |
| 10 | 50 | 60 | 0.712 | 0.509 | 0.084 | -0.030 | 0.033 |
1.166 |
| 10 | 50 | 70 | 0.893 | 0.792 | 0.015 | 0.852 | 0.669 |
0.347 |
| 10 | 50 | 80 | 0.787 | 0.622 | 0.046 | 0.516 | 0.316 |
0.483 |
| 10 | 50 | 90 | 0.849 | 0.706 | 0.044 | 0.611 | 0.337 |
0.285 |
| 10 | 50 | 100 | 0.743 | 0.548 | 0.068 | 0.490 | 0.222 |
0.290 |
| 10 | 60 | 10 | 0.651 | 0.386 | 0.268 | 0.060 | 0.513 |
26.783 |
| 10 | 60 | 20 | 0.465 | 0.190 | 0.353 | -0.144 | 0.258 |
6.952 |
| 10 | 60 | 30 | 0.700 | 0.517 | 0.167 | -0.325 | -0.027 |
3.507 |
| 10 | 60 | 40 | 0.658 | 0.414 | 0.155 | -0.030 | 0.057 |
1.379 |
| 10 | 60 | 50 | 0.709 | 0.502 | 0.085 | 0.667 | 0.372 |
0.642 |
| 10 | 60 | 60 | 0.698 | 0.466 | 0.135 | 0.256 | 0.127 |
0.933 |
| 10 | 60 | 70 | 0.613 | 0.380 | 0.151 | 0.252 | 0.078 |
0.580 |
| 10 | 60 | 80 | 0.852 | 0.725 | 0.022 | 0.141 | 0.009 |
0.749 |
| 10 | 60 | 90 | 0.774 | 0.591 | 0.059 | 0.373 | 0.106 |
0.503 |
| 10 | 60 | 100 | 0.768 | 0.590 | 0.054 | 0.543 | 0.338 |
0.393 |
| 10 | 70 | 10 | -0.000 | 0.029 | 1.085 | -0.938 | 0.462 |
21.170 |
| 10 | 70 | 20 | 0.487 | 0.236 | 0.263 | -0.255 | -0.292 |

14.338 |
| 10 | 70 | 30 | 0.679 | 0.466 | 0.106 | -0.532 | 0.384 |
3.363 |
| 10 | 70 | 40 | 0.678 | 0.448 | 0.117 | 0.546 | 0.437 |
2.129 |
| 10 | 70 | 50 | 0.687 | 0.471 | 0.098 | -0.110 | 0.018 |
1.235 |
| 10 | 70 | 60 | 0.817 | 0.677 | 0.042 | 0.638 | 0.500 |
1.000 |
| 10 | 70 | 70 | 0.665 | 0.440 | 0.113 | 0.206 | -0.025 |
1.083 |
| 10 | 70 | 80 | 0.694 | 0.482 | 0.094 | 0.311 | 0.063 |
0.588 |
| 10 | 70 | 90 | 0.783 | 0.602 | 0.059 | 0.546 | 0.229 |
0.688 |
| 10 | 70 | 100 | 0.613 | 0.373 | 0.151 | 0.362 | 0.170 |
0.556 |
| 10 | 80 | 10 | 0.348 | 0.161 | 0.588 | -0.948 | 0.494 |
20.226 |
| 10 | 80 | 20 | 0.736 | 0.536 | 0.073 | 0.132 | -0.453 |
22.884 |
| 10 | 80 | 30 | 0.035 | 0.003 | 0.931 | 0.291 | -0.204 |
8.814 |
| 10 | 80 | 40 | 0.405 | 0.170 | 0.357 | -0.098 | -0.141 |
3.465 |
| 10 | 80 | 50 | 0.814 | 0.632 | 0.125 | 0.083 | -0.146 |
3.173 |
| 10 | 80 | 60 | 0.692 | 0.466 | 0.111 | -0.282 | 0.037 |
1.818 |
| 10 | 80 | 70 | 0.705 | 0.493 | 0.088 | 0.079 | -0.079 |
1.577 |
| 10 | 80 | 80 | 0.539 | 0.267 | 0.270 | -0.059 | 0.029 |
1.188 |
| 10 | 80 | 90 | 0.760 | 0.596 | 0.089 | 0.324 | 0.018 |
1.216 |
| 10 | 80 | 100 | 0.747 | 0.547 | 0.076 | 0.387 | 0.084 |
0.809 |
| 10 | 90 | 10 | 0.485 | 0.209 | 0.334 | -0.649 | -0.119 |
31.946 |
| 10 | 90 | 20 | 0.612 | 0.382 | 0.157 | -0.695 | 0.175 |
12.392 |
| 10 | 90 | 30 | 0.217 | 0.064 | 0.642 | 0.140 | -0.202 |
5.641 |
| 10 | 90 | 40 | 0.746 | 0.560 | 0.065 | -0.437 | 0.044 |
4.235 |
| 10 | 90 | 50 | 0.564 | 0.304 | 0.211 | -0.549 | 0.293 |
2.406 |
| 10 | 90 | 60 | 0.589 | 0.329 | 0.200 | -0.574 | 0.353 |

2.534 |
| 10 | 90 | 70 | 0.651 | 0.393 | 0.213 | -0.008 | 0.068 |
1.478 |
| 10 | 90 | 80 | 0.587 | 0.354 | 0.181 | -0.084 | 0.027 |
1.215 |
| 10 | 90 | 90 | 0.587 | 0.351 | 0.175 | -0.148 | 0.027 |
1.320 |
| 10 | 90 | 100 | 0.731 | 0.515 | 0.108 | 0.519 | 0.358 |
1.011 |
| 10 | 100 | 10 | -0.091 | -0.019 | 1.265 | 0.939 | 0.365 |
26.716 |
| 10 | 100 | 20 | 0.353 | 0.109 | 0.443 | 0.488 | -0.254 |
24.477 |
| 10 | 100 | 30 | 0.685 | 0.487 | 0.128 | -0.072 | -0.249 |
7.606 |
| 10 | 100 | 40 | 0.811 | 0.654 | 0.037 | -0.234 | -0.064 |
2.934 |
| 10 | 100 | 50 | 0.581 | 0.320 | 0.207 | -0.386 | 0.070 |
2.539 |
| 10 | 100 | 60 | 0.700 | 0.481 | 0.099 | -0.187 | -0.008 |
1.589 |
| 10 | 100 | 70 | 0.738 | 0.533 | 0.083 | -0.396 | 0.160 |
1.949 |
| 10 | 100 | 80 | 0.604 | 0.374 | 0.166 | 0.402 | 0.272 |
1.572 |
| 10 | 100 | 90 | 0.687 | 0.479 | 0.103 | 0.205 | 0.079 |
0.767 |
| 10 | 100 | 100 | 0.808 | 0.652 | 0.037 | 0.758 | 0.647 |
0.579 |
| 20 | 10 | 10 | 0.465 | 0.219 | 0.288 | 0.249 | 0.023 |
0.715 |
| 20 | 10 | 20 | 0.752 | 0.554 | 0.074 | 0.628 | 0.391 |
0.140 |
| 20 | 10 | 30 | 0.913 | 0.831 | 0.008 | 0.807 | 0.634 |
0.069 |
| 20 | 10 | 40 | 0.326 | 0.103 | 0.456 | -0.402 | 0.147 |
1.987 |
| 20 | 10 | 50 | 0.776 | 0.599 | 0.051 | 0.490 | 0.243 |
0.262 |
| 20 | 10 | 60 | 0.866 | 0.749 | 0.018 | 0.682 | 0.478 |
0.120 |
| 20 | 10 | 70 | 0.554 | 0.309 | 0.200 | 0.004 | 0.013 |
1.010 |
| 20 | 10 | 80 | 0.998 | 0.995 | 0.000 | 0.840 | 0.706 |
0.026 |
| 20 | 10 | 90 | 0.928 | 0.863 | 0.006 | 0.684 | 0.471 |
0.100 |
| 20 | 10 | 100 | 0.977 | 0.953 | 0.001 | 0.817 | 0.673 |

0.037 |
| 20 | 20 | 10 | 0.255 | 0.051 | 0.574 | -0.325 | 0.185 |
2.384 |
| 20 | 20 | 20 | 0.821 | 0.674 | 0.032 | 0.662 | 0.459 |
0.157 |
| 20 | 20 | 30 | 0.686 | 0.467 | 0.100 | 0.475 | 0.238 |
0.290 |
| 20 | 20 | 40 | 0.540 | 0.304 | 0.228 | 0.183 | 0.043 |
0.676 |
| 20 | 20 | 50 | 0.791 | 0.618 | 0.049 | 0.480 | 0.215 |
0.293 |
| 20 | 20 | 60 | 0.884 | 0.790 | 0.021 | 0.606 | 0.373 |
0.158 |
| 20 | 20 | 70 | 0.919 | 0.847 | 0.007 | 0.751 | 0.564 |
0.062 |
| 20 | 20 | 80 | 0.953 | 0.908 | 0.002 | 0.725 | 0.528 |
0.076 |
| 20 | 20 | 90 | 0.918 | 0.840 | 0.007 | 0.687 | 0.471 |
0.098 |
| 20 | 20 | 100 | 0.923 | 0.853 | 0.006 | 0.655 | 0.429 |
0.119 |
| 20 | 30 | 10 | 0.376 | 0.143 | 0.391 | 0.190 | 0.115 |
1.275 |
| 20 | 30 | 20 | 0.684 | 0.465 | 0.101 | 0.443 | 0.124 |
0.835 |
| 20 | 30 | 30 | 0.836 | 0.697 | 0.027 | 0.615 | 0.362 |
0.176 |
| 20 | 30 | 40 | 0.739 | 0.542 | 0.069 | 0.604 | 0.343 |
0.205 |
| 20 | 30 | 50 | 0.723 | 0.525 | 0.077 | 0.506 | 0.267 |
0.256 |
| 20 | 30 | 60 | 0.803 | 0.646 | 0.039 | 0.619 | 0.387 |
0.148 |
| 20 | 30 | 70 | 0.865 | 0.750 | 0.019 | 0.576 | 0.327 |
0.182 |
| 20 | 30 | 80 | 0.887 | 0.772 | 0.034 | 0.556 | 0.344 |
0.321 |
| 20 | 30 | 90 | 0.912 | 0.826 | 0.010 | 0.703 | 0.491 |
0.090 |
| 20 | 30 | 100 | 0.913 | 0.828 | 0.012 | 0.684 | 0.468 |
0.100 |
| 20 | 40 | 10 | 0.301 | 0.078 | 0.504 | -0.477 | 0.127 |
3.197 |
| 20 | 40 | 20 | 0.564 | 0.312 | 0.194 | 0.148 | -0.008 |
0.816 |
| 20 | 40 | 30 | 0.631 | 0.405 | 0.142 | 0.286 | 0.148 |
0.951 |
| 20 | 40 | 40 | 0.704 | 0.498 | 0.089 | 0.117 | 0.010 |

0.782 |
| 20 | 40 | 50 | 0.837 | 0.709 | 0.033 | 0.430 | 0.206 |
0.372 |
| 20 | 40 | 60 | 0.766 | 0.586 | 0.055 | 0.600 | 0.375 |
0.183 |
| 20 | 40 | 70 | 0.826 | 0.683 | 0.030 | 0.569 | 0.326 |
0.186 |
| 20 | 40 | 80 | 0.863 | 0.753 | 0.027 | 0.681 | 0.487 |
0.157 |
| 20 | 40 | 90 | 0.893 | 0.792 | 0.014 | 0.761 | 0.566 |
0.077 |
| 20 | 40 | 100 | 0.971 | 0.933 | 0.009 | 0.679 | 0.462 |
0.103 |
| 20 | 50 | 10 | 0.767 | 0.589 | 0.055 | -0.597 | 0.463 |
3.698 |
| 20 | 50 | 20 | 0.756 | 0.572 | 0.060 | -0.506 | 0.217 |
2.424 |
| 20 | 50 | 30 | 0.325 | 0.096 | 0.464 | -0.125 | 0.042 |
1.337 |
| 20 | 50 | 40 | 0.738 | 0.548 | 0.070 | 0.332 | 0.040 |
0.939 |
| 20 | 50 | 50 | 0.809 | 0.649 | 0.039 | 0.538 | 0.282 |
0.218 |
| 20 | 50 | 60 | 0.802 | 0.643 | 0.039 | 0.547 | 0.287 |
0.221 |
| 20 | 50 | 70 | 0.893 | 0.794 | 0.013 | 0.573 | 0.332 |
0.185 |
| 20 | 50 | 80 | 0.825 | 0.677 | 0.032 | 0.722 | 0.492 |
0.160 |
| 20 | 50 | 90 | 0.888 | 0.784 | 0.015 | 0.656 | 0.439 |
0.124 |
| 20 | 50 | 100 | 0.900 | 0.806 | 0.011 | 0.601 | 0.362 |
0.159 |
| 20 | 60 | 10 | 0.112 | 0.047 | 0.905 | -0.037 | -0.271 |
8.475 |
| 20 | 60 | 20 | 0.704 | 0.499 | 0.088 | 0.044 | 0.073 |
1.423 |
| 20 | 60 | 30 | 0.556 | 0.318 | 0.207 | -0.146 | 0.021 |
1.313 |
| 20 | 60 | 40 | 0.715 | 0.509 | 0.082 | 0.438 | 0.241 |
0.559 |
| 20 | 60 | 50 | 0.851 | 0.719 | 0.025 | 0.466 | 0.235 |
0.317 |
| 20 | 60 | 60 | 0.820 | 0.678 | 0.036 | 0.485 | 0.235 |
0.265 |
| 20 | 60 | 70 | 0.872 | 0.756 | 0.018 | 0.637 | 0.398 |
0.139 |
| 20 | 60 | 80 | 0.866 | 0.755 | 0.021 | 0.572 | 0.311 |

0.207 |
| 20 | 60 | 90 | 0.818 | 0.677 | 0.040 | 0.540 | 0.292 |
0.212 |
| 20 | 60 | 100 | 0.796 | 0.633 | 0.042 | 0.783 | 0.572 |
0.212 |
| 20 | 70 | 10 | 0.691 | 0.478 | 0.095 | 0.222 | -0.272 |
10.929 |
| 20 | 70 | 20 | 0.272 | 0.038 | 0.659 | -0.243 | 0.151 |
2.384 |
| 20 | 70 | 30 | 0.750 | 0.562 | 0.063 | 0.488 | 0.289 |
0.526 |
| 20 | 70 | 40 | 0.558 | 0.308 | 0.196 | 0.339 | 0.080 |
0.556 |
| 20 | 70 | 50 | 0.478 | 0.231 | 0.274 | 0.112 | 0.011 |
0.789 |
| 20 | 70 | 60 | 0.669 | 0.446 | 0.110 | 0.386 | 0.170 |
0.421 |
| 20 | 70 | 70 | 0.648 | 0.422 | 0.124 | 0.298 | 0.089 |
0.493 |
| 20 | 70 | 80 | 0.803 | 0.638 | 0.043 | 0.654 | 0.407 |
0.164 |
| 20 | 70 | 90 | 0.927 | 0.853 | 0.010 | 0.617 | 0.374 |
0.151 |
| 20 | 70 | 100 | 0.927 | 0.869 | 0.013 | 0.736 | 0.525 |
0.095 |
| 20 | 80 | 10 | 0.510 | 0.272 | 0.256 | 0.401 | 0.462 |
9.441 |
| 20 | 80 | 20 | 0.630 | 0.414 | 0.168 | 0.029 | 0.157 |
3.391 |
| 20 | 80 | 30 | 0.705 | 0.497 | 0.087 | -0.080 | -0.018 |
1.227 |
| 20 | 80 | 40 | 0.817 | 0.682 | 0.053 | 0.344 | 0.046 |
0.957 |
| 20 | 80 | 50 | 0.562 | 0.319 | 0.193 | 0.547 | 0.357 |
0.538 |
| 20 | 80 | 60 | 0.713 | 0.506 | 0.083 | 0.404 | 0.189 |
0.420 |
| 20 | 80 | 70 | 0.833 | 0.693 | 0.028 | 0.366 | 0.118 |
0.427 |
| 20 | 80 | 80 | 0.863 | 0.731 | 0.037 | 0.331 | 0.116 |
0.452 |
| 20 | 80 | 90 | 0.938 | 0.879 | 0.004 | 0.496 | 0.241 |
0.257 |
| 20 | 80 | 100 | 0.847 | 0.722 | 0.025 | 0.557 | 0.306 |
0.198 |
| 20 | 90 | 10 | 0.440 | 0.151 | 0.492 | -0.496 | -0.128 |
16.244 |
| 20 | 90 | 20 | 0.640 | 0.383 | 0.198 | -0.226 | -0.067 |

2.911 |
| 20 | 90 | 30 | 0.602 | 0.359 | 0.160 | -0.325 | 0.080 |
1.820 |
| 20 | 90 | 40 | 0.919 | 0.850 | 0.010 | 0.507 | 0.169 |
1.023 |
| 20 | 90 | 50 | 0.422 | 0.195 | 0.364 | 0.126 | 0.071 |
1.068 |
| 20 | 90 | 60 | 0.954 | 0.907 | 0.003 | 0.586 | 0.287 |
0.488 |
| 20 | 90 | 70 | 0.681 | 0.465 | 0.102 | 0.246 | 0.060 |
0.569 |
| 20 | 90 | 80 | 0.795 | 0.639 | 0.047 | 0.348 | 0.104 |
0.454 |
| 20 | 90 | 90 | 0.744 | 0.564 | 0.075 | 0.406 | 0.142 |
0.405 |
| 20 | 90 | 100 | 0.873 | 0.762 | 0.016 | 0.572 | 0.339 |
0.197 |
| 20 | 100 | 10 | 0.284 | 0.015 | 0.950 | -0.769 | 0.308 |
11.172 |
| 20 | 100 | 20 | 0.482 | 0.232 | 0.268 | 0.060 | 0.216 |
5.401 |
| 20 | 100 | 30 | 0.631 | 0.403 | 0.138 | 0.349 | 0.242 |
1.865 |
| 20 | 100 | 40 | 0.833 | 0.685 | 0.037 | 0.697 | 0.389 |
1.019 |
| 20 | 100 | 50 | 0.816 | 0.640 | 0.104 | 0.429 | 0.131 |
0.607 |
| 20 | 100 | 60 | 0.774 | 0.589 | 0.061 | 0.424 | 0.186 |
0.337 |
| 20 | 100 | 70 | 0.853 | 0.739 | 0.037 | 0.500 | 0.218 |
0.352 |
| 20 | 100 | 80 | 0.876 | 0.755 | 0.030 | 0.408 | 0.203 |
0.484 |
| 20 | 100 | 90 | 0.760 | 0.582 | 0.061 | 0.488 | 0.242 |
0.264 |
| 20 | 100 | 100 | 0.888 | 0.788 | 0.013 | 0.501 | 0.261 |
0.260 |
| 30 | 10 | 10 | 0.679 | 0.463 | 0.103 | 0.439 | 0.208 |
0.336 |
| 30 | 10 | 20 | 0.636 | 0.408 | 0.134 | 0.212 | 0.031 |
0.639 |
| 30 | 10 | 30 | 0.867 | 0.756 | 0.020 | 0.684 | 0.481 |
0.119 |
| 30 | 10 | 40 | 0.986 | 0.975 | 0.001 | 0.695 | 0.489 |
0.096 |
| 30 | 10 | 50 | 0.910 | 0.819 | 0.018 | 0.248 | 0.062 |
0.565 |
| 30 | 10 | 60 | 0.952 | 0.899 | 0.008 | 0.698 | 0.489 |

0.092 |
| 30 | 10 | 70 | 0.986 | 0.972 | 0.000 | 0.885 | 0.777 |
0.017 |
| 30 | 10 | 80 | 0.956 | 0.911 | 0.003 | 0.691 | 0.477 |
0.095 |
| 30 | 10 | 90 | 1.006 | 1.013 | 0.000 | 0.763 | 0.590 |
0.061 |
| 30 | 10 | 100 | 0.986 | 0.974 | 0.000 | 0.768 | 0.590 |
0.054 |
| 30 | 20 | 10 | 0.780 | 0.603 | 0.051 | 0.764 | 0.536 |
0.278 |
| 30 | 20 | 20 | 0.293 | 0.115 | 0.585 | -0.286 | 0.092 |
1.664 |
| 30 | 20 | 30 | 0.861 | 0.744 | 0.020 | 0.755 | 0.585 |
0.081 |
| 30 | 20 | 40 | 0.786 | 0.618 | 0.046 | 0.509 | 0.266 |
0.247 |
| 30 | 20 | 50 | 0.849 | 0.726 | 0.025 | 0.415 | 0.174 |
0.343 |
| 30 | 20 | 60 | 0.982 | 0.968 | 0.001 | 0.755 | 0.565 |
0.063 |
| 30 | 20 | 70 | 0.850 | 0.717 | 0.025 | 0.583 | 0.329 |
0.185 |
| 30 | 20 | 80 | 0.956 | 0.914 | 0.002 | 0.855 | 0.719 |
0.034 |
| 30 | 20 | 90 | 1.018 | 1.037 | 0.000 | 0.809 | 0.658 |
0.037 |
| 30 | 20 | 100 | 1.013 | 1.026 | 0.000 | 0.834 | 0.689 |
0.032 |
| 30 | 30 | 10 | 0.397 | 0.142 | 0.387 | -0.384 | 0.175 |
1.992 |
| 30 | 30 | 20 | 0.517 | 0.256 | 0.245 | 0.219 | 0.066 |
0.644 |
| 30 | 30 | 30 | 0.611 | 0.367 | 0.156 | 0.236 | 0.081 |
0.647 |
| 30 | 30 | 40 | 0.883 | 0.780 | 0.014 | 0.768 | 0.593 |
0.055 |
| 30 | 30 | 50 | 0.881 | 0.769 | 0.019 | 0.697 | 0.484 |
0.092 |
| 30 | 30 | 60 | 0.930 | 0.858 | 0.009 | 0.641 | 0.400 |
0.141 |
| 30 | 30 | 70 | 0.960 | 0.914 | 0.007 | 0.758 | 0.578 |
0.060 |
| 30 | 30 | 80 | 1.003 | 1.007 | 0.000 | 0.834 | 0.711 |
0.051 |
| 30 | 30 | 90 | 0.916 | 0.837 | 0.008 | 0.625 | 0.384 |
0.145 |
| 30 | 30 | 100 | 0.937 | 0.886 | 0.010 | 0.813 | 0.678 |

0.064 |
| 30 | 40 | 10 | 0.707 | 0.502 | 0.087 | 0.003 | 0.002 |
0.994 |
| 30 | 40 | 20 | 0.570 | 0.340 | 0.208 | 0.167 | 0.027 |
0.694 |
| 30 | 40 | 30 | 0.669 | 0.453 | 0.113 | 0.381 | 0.118 |
0.458 |
| 30 | 40 | 40 | 0.786 | 0.611 | 0.051 | 0.524 | 0.273 |
0.227 |
| 30 | 40 | 50 | 0.681 | 0.459 | 0.104 | 0.414 | 0.164 |
0.349 |
| 30 | 40 | 60 | 0.865 | 0.749 | 0.019 | 0.744 | 0.570 |
0.091 |
| 30 | 40 | 70 | 0.982 | 0.963 | 0.001 | 0.801 | 0.655 |
0.058 |
| 30 | 40 | 80 | 0.972 | 0.945 | 0.001 | 0.799 | 0.646 |
0.048 |
| 30 | 40 | 90 | 0.917 | 0.833 | 0.014 | 0.713 | 0.503 |
0.085 |
| 30 | 40 | 100 | 0.925 | 0.855 | 0.006 | 0.735 | 0.553 |
0.088 |
| 30 | 50 | 10 | 0.643 | 0.425 | 0.140 | -0.452 | 0.183 |
2.158 |
| 30 | 50 | 20 | 0.726 | 0.542 | 0.097 | 0.567 | 0.228 |
1.058 |
| 30 | 50 | 30 | 0.859 | 0.739 | 0.020 | 0.703 | 0.478 |
0.115 |
| 30 | 50 | 40 | 0.760 | 0.584 | 0.061 | 0.474 | 0.222 |
0.278 |
| 30 | 50 | 50 | 0.796 | 0.634 | 0.042 | 0.563 | 0.338 |
0.236 |
| 30 | 50 | 60 | 0.744 | 0.561 | 0.070 | 0.321 | 0.118 |
0.482 |
| 30 | 50 | 70 | 0.920 | 0.842 | 0.008 | 0.697 | 0.501 |
0.117 |
| 30 | 50 | 80 | 0.903 | 0.818 | 0.011 | 0.701 | 0.487 |
0.091 |
| 30 | 50 | 90 | 0.833 | 0.704 | 0.037 | 0.623 | 0.399 |
0.154 |
| 30 | 50 | 100 | 0.904 | 0.822 | 0.011 | 0.737 | 0.524 |
0.106 |
| 30 | 60 | 10 | 0.796 | 0.611 | 0.092 | -0.221 | 0.048 |
1.490 |
| 30 | 60 | 20 | 0.822 | 0.674 | 0.032 | 0.398 | 0.167 |
0.370 |
| 30 | 60 | 30 | 0.929 | 0.874 | 0.017 | 0.645 | 0.514 |
1.080 |
| 30 | 60 | 40 | 0.725 | 0.517 | 0.083 | 0.442 | 0.228 |

0.417 |
| 30 | 60 | 50 | 0.769 | 0.575 | 0.080 | 0.491 | 0.214 |
0.334 |
| 30 | 60 | 60 | 0.864 | 0.753 | 0.021 | 0.611 | 0.346 |
0.223 |
| 30 | 60 | 70 | 0.821 | 0.674 | 0.032 | 0.601 | 0.379 |
0.194 |
| 30 | 60 | 80 | 0.826 | 0.675 | 0.037 | 0.588 | 0.331 |
0.192 |
| 30 | 60 | 90 | 0.871 | 0.770 | 0.030 | 0.509 | 0.274 |
0.264 |
| 30 | 60 | 100 | 0.901 | 0.810 | 0.010 | 0.691 | 0.473 |
0.098 |
| 30 | 70 | 10 | 0.764 | 0.590 | 0.059 | 0.675 | 0.334 |
1.597 |
| 30 | 70 | 20 | 0.789 | 0.626 | 0.045 | 0.407 | 0.113 |
0.628 |
| 30 | 70 | 30 | 0.703 | 0.487 | 0.092 | 0.339 | 0.146 |
0.533 |
| 30 | 70 | 40 | 0.781 | 0.614 | 0.050 | 0.528 | 0.305 |
0.295 |
| 30 | 70 | 50 | 0.738 | 0.545 | 0.069 | 0.531 | 0.249 |
0.326 |
| 30 | 70 | 60 | 0.893 | 0.794 | 0.013 | 0.599 | 0.374 |
0.182 |
| 30 | 70 | 70 | 0.889 | 0.786 | 0.015 | 0.558 | 0.310 |
0.196 |
| 30 | 70 | 80 | 0.894 | 0.802 | 0.012 | 0.653 | 0.412 |
0.143 |
| 30 | 70 | 90 | 0.881 | 0.765 | 0.025 | 0.562 | 0.313 |
0.192 |
| 30 | 70 | 100 | 0.833 | 0.696 | 0.029 | 0.494 | 0.239 |
0.258 |
| 30 | 80 | 10 | 0.722 | 0.531 | 0.086 | 0.170 | -0.136 |
3.420 |
| 30 | 80 | 20 | 0.588 | 0.357 | 0.182 | -0.149 | 0.005 |
1.349 |
| 30 | 80 | 30 | 0.499 | 0.261 | 0.264 | 0.292 | 0.174 |
1.295 |
| 30 | 80 | 40 | 0.770 | 0.599 | 0.056 | 0.557 | 0.337 |
0.270 |
| 30 | 80 | 50 | 0.832 | 0.690 | 0.029 | 0.632 | 0.368 |
0.231 |
| 30 | 80 | 60 | 0.917 | 0.839 | 0.007 | 0.647 | 0.422 |
0.125 |
| 30 | 80 | 70 | 0.885 | 0.786 | 0.014 | 0.612 | 0.369 |
0.153 |
| 30 | 80 | 80 | 0.940 | 0.879 | 0.006 | 0.536 | 0.282 |

0.218 |
| 30 | 80 | 90 | 0.814 | 0.657 | 0.038 | 0.560 | 0.286 |
0.267 |
| 30 | 80 | 100 | 0.946 | 0.893 | 0.003 | 0.761 | 0.579 |
0.057 |
| 30 | 90 | 10 | 0.550 | 0.286 | 0.228 | -0.638 | 0.207 |
6.663 |
| 30 | 90 | 20 | 0.729 | 0.524 | 0.078 | -0.164 | 0.046 |
1.393 |
| 30 | 90 | 30 | 0.419 | 0.169 | 0.342 | 0.100 | -0.020 |
0.901 |
| 30 | 90 | 40 | 0.780 | 0.609 | 0.049 | 0.508 | 0.254 |
0.244 |
| 30 | 90 | 50 | 0.782 | 0.605 | 0.051 | 0.562 | 0.346 |
0.281 |
| 30 | 90 | 60 | 0.732 | 0.526 | 0.081 | 0.399 | 0.154 |
0.364 |
| 30 | 90 | 70 | 0.875 | 0.771 | 0.018 | 0.488 | 0.248 |
0.271 |
| 30 | 90 | 80 | 0.883 | 0.777 | 0.014 | 0.727 | 0.543 |
0.096 |
| 30 | 90 | 90 | 0.951 | 0.894 | 0.012 | 0.704 | 0.479 |
0.115 |
| 30 | 90 | 100 | 0.910 | 0.830 | 0.008 | 0.713 | 0.528 |
0.119 |
| 30 | 100 | 10 | 0.456 | 0.225 | 0.327 | -0.043 | -0.208 |
5.507 |
| 30 | 100 | 20 | 0.312 | 0.099 | 0.474 | -0.465 | 0.207 |
2.156 |
| 30 | 100 | 30 | 0.629 | 0.390 | 0.141 | -0.254 | 0.041 |
1.628 |
| 30 | 100 | 40 | 0.747 | 0.555 | 0.065 | 0.485 | 0.208 |
0.341 |
| 30 | 100 | 50 | 0.736 | 0.546 | 0.071 | 0.437 | 0.182 |
0.325 |
| 30 | 100 | 60 | 0.831 | 0.680 | 0.039 | 0.606 | 0.400 |
0.261 |
| 30 | 100 | 70 | 0.886 | 0.792 | 0.018 | 0.499 | 0.239 |
0.261 |
| 30 | 100 | 80 | 0.891 | 0.799 | 0.014 | 0.590 | 0.349 |
0.168 |
| 30 | 100 | 90 | 0.855 | 0.731 | 0.021 | 0.582 | 0.346 |
0.179 |
| 30 | 100 | 100 | 0.982 | 0.964 | 0.000 | 0.740 | 0.572 |
0.126 |
| 40 | 10 | 10 | 0.663 | 0.444 | 0.115 | 0.209 | 0.057 |
0.643 |
| 40 | 10 | 20 | 0.989 | 0.978 | 0.000 | 0.683 | 0.495 |

0.185 |
| 40 | 10 | 30 | 0.879 | 0.772 | 0.015 | 0.767 | 0.567 |
0.101 |
| 40 | 10 | 40 | 0.959 | 0.919 | 0.002 | 0.805 | 0.625 |
0.087 |
| 40 | 10 | 50 | 1.000 | 1.000 | 0.000 | 0.867 | 0.741 |
0.028 |
| 40 | 10 | 60 | 0.974 | 0.954 | 0.003 | 0.726 | 0.513 |
0.094 |
| 40 | 10 | 70 | 1.003 | 1.007 | 0.000 | 0.881 | 0.776 |
0.014 |
| 40 | 10 | 80 | 0.988 | 0.978 | 0.000 | 0.943 | 0.898 |
0.013 |
| 40 | 10 | 90 | 1.003 | 1.006 | 0.000 | 0.914 | 0.833 |
0.008 |
| 40 | 10 | 100 | 0.996 | 0.991 | 0.000 | 0.910 | 0.820 |
0.014 |
| 40 | 20 | 10 | 0.791 | 0.627 | 0.044 | 0.437 | 0.174 |
0.344 |
| 40 | 20 | 20 | 0.840 | 0.702 | 0.027 | 0.697 | 0.480 |
0.095 |
| 40 | 20 | 30 | 0.944 | 0.896 | 0.007 | 0.728 | 0.526 |
0.076 |
| 40 | 20 | 40 | 0.947 | 0.891 | 0.006 | 0.750 | 0.564 |
0.062 |
| 40 | 20 | 50 | 0.869 | 0.747 | 0.024 | 0.630 | 0.404 |
0.143 |
| 40 | 20 | 60 | 1.027 | 1.053 | 0.001 | 0.858 | 0.736 |
0.020 |
| 40 | 20 | 70 | 1.003 | 1.006 | 0.000 | 0.812 | 0.658 |
0.036 |
| 40 | 20 | 80 | 0.999 | 0.997 | 0.000 | 0.853 | 0.731 |
0.023 |
| 40 | 20 | 90 | 1.002 | 1.003 | 0.000 | 0.938 | 0.893 |
0.020 |
| 40 | 20 | 100 | 0.994 | 0.987 | 0.000 | 0.878 | 0.762 |
0.022 |
| 40 | 30 | 10 | 0.211 | 0.051 | 0.626 | -0.188 | 0.036 |
1.412 |
| 40 | 30 | 20 | 0.664 | 0.453 | 0.127 | 0.332 | 0.096 |
0.467 |
| 40 | 30 | 30 | 0.773 | 0.591 | 0.055 | 0.429 | 0.183 |
0.326 |
| 40 | 30 | 40 | 0.887 | 0.791 | 0.015 | 0.709 | 0.498 |
0.088 |
| 40 | 30 | 50 | 0.852 | 0.728 | 0.022 | 0.804 | 0.620 |
0.113 |
| 40 | 30 | 60 | 0.963 | 0.928 | 0.001 | 0.879 | 0.758 |

0.037 |
| 40 | 30 | 70 | 0.999 | 0.998 | 0.000 | 0.875 | 0.767 |
0.016 |
| 40 | 30 | 80 | 0.939 | 0.883 | 0.004 | 0.788 | 0.605 |
0.072 |
| 40 | 30 | 90 | 0.925 | 0.852 | 0.007 | 0.723 | 0.535 |
0.090 |
| 40 | 30 | 100 | 0.999 | 0.999 | 0.000 | 0.851 | 0.724 |
0.022 |
| 40 | 40 | 10 | 0.684 | 0.464 | 0.101 | 0.205 | 0.049 |
0.637 |
| 40 | 40 | 20 | 0.877 | 0.771 | 0.016 | 0.595 | 0.343 |
0.176 |
| 40 | 40 | 30 | 0.720 | 0.523 | 0.080 | 0.401 | 0.164 |
0.359 |
| 40 | 40 | 40 | 0.755 | 0.561 | 0.070 | 0.501 | 0.248 |
0.250 |
| 40 | 40 | 50 | 0.912 | 0.829 | 0.008 | 0.656 | 0.419 |
0.132 |
| 40 | 40 | 60 | 0.901 | 0.804 | 0.015 | 0.770 | 0.571 |
0.103 |
| 40 | 40 | 70 | 0.954 | 0.909 | 0.002 | 0.777 | 0.588 |
0.074 |
| 40 | 40 | 80 | 1.004 | 1.008 | 0.000 | 0.841 | 0.716 |
0.034 |
| 40 | 40 | 90 | 0.970 | 0.944 | 0.002 | 0.820 | 0.657 |
0.056 |
| 40 | 40 | 100 | 0.982 | 0.964 | 0.000 | 0.799 | 0.642 |
0.042 |
| 40 | 50 | 10 | 0.739 | 0.548 | 0.069 | -0.279 | 0.094 |
1.662 |
| 40 | 50 | 20 | 0.764 | 0.585 | 0.056 | 0.720 | 0.552 |
0.191 |
| 40 | 50 | 30 | 0.596 | 0.347 | 0.169 | 0.237 | 0.064 |
0.588 |
| 40 | 50 | 40 | 0.797 | 0.633 | 0.042 | 0.419 | 0.175 |
0.338 |
| 40 | 50 | 50 | 0.749 | 0.559 | 0.063 | 0.534 | 0.262 |
0.271 |
| 40 | 50 | 60 | 0.857 | 0.732 | 0.021 | 0.593 | 0.355 |
0.168 |
| 40 | 50 | 70 | 0.943 | 0.893 | 0.004 | 0.760 | 0.599 |
0.103 |
| 40 | 50 | 80 | 0.989 | 0.979 | 0.000 | 0.851 | 0.734 |
0.032 |
| 40 | 50 | 90 | 0.973 | 0.945 | 0.001 | 0.799 | 0.636 |
0.041 |
| 40 | 50 | 100 | 0.901 | 0.816 | 0.012 | 0.721 | 0.495 |

0.138 |
| 40 | 60 | 10 | 0.677 | 0.452 | 0.109 | 0.036 | -0.066 |
1.385 |
| 40 | 60 | 20 | 0.755 | 0.559 | 0.072 | 0.072 | -0.001 |
0.865 |
| 40 | 60 | 30 | 0.841 | 0.699 | 0.032 | 0.507 | 0.255 |
0.244 |
| 40 | 60 | 40 | 0.746 | 0.556 | 0.065 | 0.555 | 0.292 |
0.223 |
| 40 | 60 | 50 | 0.972 | 0.935 | 0.011 | 0.772 | 0.626 |
0.140 |
| 40 | 60 | 60 | 0.898 | 0.808 | 0.011 | 0.672 | 0.455 |
0.108 |
| 40 | 60 | 70 | 0.960 | 0.926 | 0.003 | 0.753 | 0.565 |
0.062 |
| 40 | 60 | 80 | 0.929 | 0.854 | 0.014 | 0.660 | 0.438 |
0.116 |
| 40 | 60 | 90 | 0.964 | 0.927 | 0.002 | 0.791 | 0.616 |
0.054 |
| 40 | 60 | 100 | 0.939 | 0.889 | 0.009 | 0.690 | 0.469 |
0.100 |
| 40 | 70 | 10 | 0.681 | 0.463 | 0.102 | 0.585 | 0.232 |
1.401 |
| 40 | 70 | 20 | 0.843 | 0.710 | 0.025 | 0.573 | 0.283 |
0.380 |
| 40 | 70 | 30 | 0.915 | 0.833 | 0.009 | 0.641 | 0.407 |
0.131 |
| 40 | 70 | 40 | 0.535 | 0.288 | 0.216 | 0.144 | 0.018 |
0.733 |
| 40 | 70 | 50 | 0.858 | 0.738 | 0.021 | 0.637 | 0.392 |
0.152 |
| 40 | 70 | 60 | 0.944 | 0.897 | 0.006 | 0.738 | 0.528 |
0.096 |
| 40 | 70 | 70 | 0.879 | 0.766 | 0.019 | 0.776 | 0.574 |
0.134 |
| 40 | 70 | 80 | 0.886 | 0.787 | 0.013 | 0.692 | 0.461 |
0.128 |
| 40 | 70 | 90 | 0.948 | 0.898 | 0.003 | 0.723 | 0.533 |
0.088 |
| 40 | 70 | 100 | 0.973 | 0.947 | 0.001 | 0.791 | 0.630 |
0.046 |
| 40 | 80 | 10 | 0.690 | 0.456 | 0.137 | -0.366 | 0.103 |
1.962 |
| 40 | 80 | 20 | 0.815 | 0.662 | 0.035 | 0.275 | 0.020 |
0.837 |
| 40 | 80 | 30 | 0.733 | 0.541 | 0.072 | 0.473 | 0.199 |
0.339 |
| 40 | 80 | 40 | 0.732 | 0.542 | 0.075 | 0.449 | 0.208 |

0.307 |
| 40 | 80 | 50 | 0.871 | 0.756 | 0.017 | 0.788 | 0.584 |
0.177 |
| 40 | 80 | 60 | 0.862 | 0.734 | 0.028 | 0.651 | 0.428 |
0.124 |
| 40 | 80 | 70 | 0.944 | 0.891 | 0.003 | 0.808 | 0.637 |
0.061 |
| 40 | 80 | 80 | 0.992 | 0.983 | 0.000 | 0.773 | 0.598 |
0.051 |
| 40 | 80 | 90 | 0.979 | 0.961 | 0.001 | 0.783 | 0.614 |
0.047 |
| 40 | 80 | 100 | 0.968 | 0.938 | 0.001 | 0.738 | 0.533 |
0.083 |
| 40 | 90 | 10 | 0.717 | 0.529 | 0.101 | -0.305 | 0.172 |
2.321 |
| 40 | 90 | 20 | 0.832 | 0.695 | 0.029 | 0.187 | 0.039 |
0.663 |
| 40 | 90 | 30 | 0.660 | 0.432 | 0.117 | 0.157 | -0.032 |
1.026 |
| 40 | 90 | 40 | 0.843 | 0.720 | 0.034 | 0.644 | 0.378 |
0.263 |
| 40 | 90 | 50 | 0.704 | 0.503 | 0.094 | 0.375 | 0.143 |
0.390 |
| 40 | 90 | 60 | 0.863 | 0.748 | 0.019 | 0.611 | 0.369 |
0.153 |
| 40 | 90 | 70 | 0.872 | 0.755 | 0.020 | 0.664 | 0.429 |
0.128 |
| 40 | 90 | 80 | 0.850 | 0.723 | 0.022 | 0.675 | 0.442 |
0.124 |
| 40 | 90 | 90 | 0.813 | 0.661 | 0.035 | 0.515 | 0.261 |
0.237 |
| 40 | 90 | 100 | 0.911 | 0.825 | 0.009 | 0.811 | 0.635 |
0.086 |
| 40 | 100 | 10 | 0.566 | 0.307 | 0.206 | 0.472 | 0.391 |
3.130 |
| 40 | 100 | 20 | 0.721 | 0.520 | 0.078 | 0.164 | -0.049 |
1.279 |
| 40 | 100 | 30 | 0.714 | 0.510 | 0.082 | -0.056 | -0.011 |
1.136 |
| 40 | 100 | 40 | 0.746 | 0.574 | 0.092 | 0.207 | 0.019 |
0.686 |
| 40 | 100 | 50 | 0.902 | 0.817 | 0.011 | 0.844 | 0.672 |
0.197 |
| 40 | 100 | 60 | 0.908 | 0.822 | 0.009 | 0.640 | 0.398 |
0.142 |
| 40 | 100 | 70 | 0.795 | 0.635 | 0.043 | 0.555 | 0.291 |
0.226 |
| 40 | 100 | 80 | 0.884 | 0.780 | 0.014 | 0.588 | 0.354 |

0.176 |
| 40 | 100 | 90 | 0.840 | 0.702 | 0.027 | 0.600 | 0.357 |
0.161 |
| 40 | 100 | 100 | 0.920 | 0.852 | 0.009 | 0.692 | 0.473 |
0.098 |
| 50 | 10 | 10 | 0.723 | 0.512 | 0.089 | 0.225 | 0.023 |
0.677 |
| 50 | 10 | 20 | 0.968 | 0.937 | 0.001 | 0.864 | 0.737 |
0.029 |
| 50 | 10 | 30 | 1.002 | 1.005 | 0.000 | 0.949 | 0.895 |
0.005 |
| 50 | 10 | 40 | 0.992 | 0.983 | 0.000 | 0.922 | 0.845 |
0.008 |
| 50 | 10 | 50 | 1.014 | 1.025 | 0.001 | 0.895 | 0.809 |
0.017 |
| 50 | 10 | 60 | 1.005 | 1.009 | 0.000 | 0.834 | 0.694 |
0.028 |
| 50 | 10 | 70 | 0.997 | 0.995 | 0.000 | 0.916 | 0.823 |
0.031 |
| 50 | 10 | 80 | 0.992 | 0.983 | 0.000 | 0.916 | 0.841 |
0.007 |
| 50 | 10 | 90 | 1.007 | 1.013 | 0.000 | 0.965 | 0.925 |
0.004 |
| 50 | 10 | 100 | 1.006 | 1.013 | 0.000 | 0.982 | 0.970 |
0.005 |
| 50 | 20 | 10 | 0.555 | 0.304 | 0.199 | 0.259 | 0.043 |
0.608 |
| 50 | 20 | 20 | 0.763 | 0.576 | 0.060 | 0.464 | 0.227 |
0.302 |
| 50 | 20 | 30 | 0.997 | 0.991 | 0.001 | 0.678 | 0.470 |
0.113 |
| 50 | 20 | 40 | 0.975 | 0.950 | 0.001 | 0.856 | 0.747 |
0.039 |
| 50 | 20 | 50 | 0.987 | 0.974 | 0.000 | 0.804 | 0.659 |
0.052 |
| 50 | 20 | 60 | 0.974 | 0.950 | 0.001 | 0.865 | 0.751 |
0.019 |
| 50 | 20 | 70 | 0.993 | 0.987 | 0.000 | 0.896 | 0.811 |
0.017 |
| 50 | 20 | 80 | 1.002 | 1.003 | 0.000 | 0.865 | 0.749 |
0.018 |
| 50 | 20 | 90 | 0.995 | 0.990 | 0.000 | 0.882 | 0.782 |
0.015 |
| 50 | 20 | 100 | 1.002 | 1.004 | 0.000 | 0.909 | 0.831 |
0.010 |
| 50 | 30 | 10 | 0.797 | 0.649 | 0.061 | 0.124 | -0.024 |
0.925 |
| 50 | 30 | 20 | 0.780 | 0.605 | 0.049 | 0.663 | 0.468 |

0.192 |
| 50 | 30 | 30 | 0.731 | 0.533 | 0.073 | 0.452 | 0.219 |
0.321 |
| 50 | 30 | 40 | 0.943 | 0.892 | 0.004 | 0.727 | 0.535 |
0.079 |
| 50 | 30 | 50 | 1.004 | 1.010 | 0.000 | 0.695 | 0.472 |
0.104 |
| 50 | 30 | 60 | 0.990 | 0.980 | 0.000 | 0.781 | 0.610 |
0.048 |
| 50 | 30 | 70 | 0.981 | 0.963 | 0.001 | 0.862 | 0.726 |
0.045 |
| 50 | 30 | 80 | 0.970 | 0.941 | 0.001 | 0.714 | 0.500 |
0.093 |
| 50 | 30 | 90 | 0.994 | 0.988 | 0.000 | 0.854 | 0.727 |
0.022 |
| 50 | 30 | 100 | 1.008 | 1.015 | 0.000 | 0.873 | 0.752 |
0.027 |
| 50 | 40 | 10 | 0.468 | 0.212 | 0.288 | 0.104 | 0.025 |
0.823 |
| 50 | 40 | 20 | 0.816 | 0.668 | 0.034 | 0.111 | -0.017 |
0.879 |
| 50 | 40 | 30 | 0.773 | 0.596 | 0.052 | 0.477 | 0.245 |
0.302 |
| 50 | 40 | 40 | 0.912 | 0.839 | 0.012 | 0.583 | 0.342 |
0.175 |
| 50 | 40 | 50 | 0.943 | 0.894 | 0.006 | 0.704 | 0.496 |
0.087 |
| 50 | 40 | 60 | 0.979 | 0.956 | 0.001 | 0.758 | 0.583 |
0.067 |
| 50 | 40 | 70 | 0.926 | 0.859 | 0.006 | 0.738 | 0.556 |
0.083 |
| 50 | 40 | 80 | 0.999 | 0.998 | 0.000 | 0.813 | 0.656 |
0.038 |
| 50 | 40 | 90 | 1.002 | 1.004 | 0.000 | 0.866 | 0.740 |
0.029 |
| 50 | 40 | 100 | 0.994 | 0.988 | 0.000 | 0.995 | 0.975 |
0.026 |
| 50 | 50 | 10 | 0.714 | 0.518 | 0.089 | 0.660 | 0.471 |
0.244 |
| 50 | 50 | 20 | 0.633 | 0.410 | 0.145 | 0.419 | 0.129 |
0.555 |
| 50 | 50 | 30 | 0.808 | 0.641 | 0.051 | 0.389 | 0.143 |
0.381 |
| 50 | 50 | 40 | 0.963 | 0.925 | 0.002 | 0.692 | 0.479 |
0.095 |
| 50 | 50 | 50 | 1.001 | 1.006 | 0.001 | 0.770 | 0.606 |
0.071 |
| 50 | 50 | 60 | 0.935 | 0.872 | 0.005 | 0.846 | 0.698 |

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0.056 |
|     50 |  50 |  70 |    0.915 |    0.833 |        0.010 |   0.805 |   0.623 |
0.097 |
|     50 |  50 |  80 |    0.972 |    0.945 |        0.001 |   0.776 |   0.602 |
0.050 |
|     50 |  50 |  90 |    0.977 |    0.954 |        0.001 |   0.838 |   0.685 |
0.056 |
|     50 |  50 | 100 |    1.006 |    1.014 |        0.000 |   0.795 |   0.636 |
0.043 |
|     50 |  60 |  10 |    0.550 |    0.290 |        0.217 |  -0.101 |  -0.050 |
1.580 |
|     50 |  60 |  20 |    0.789 |    0.612 |        0.057 |   0.439 |   0.211 |
0.349 |
|     50 |  60 |  30 |    0.925 |    0.853 |        0.006 |   0.826 |   0.648 |
0.152 |
|     50 |  60 |  40 |    0.873 |    0.767 |        0.020 |   0.594 |   0.363 |
0.177 |
|     50 |  60 |  50 |    0.894 |    0.808 |        0.019 |   0.689 |   0.496 |
0.140 |
|     50 |  60 |  60 |    0.880 |    0.770 |        0.016 |   0.607 |   0.350 |
0.190 |
|     50 |  60 |  70 |    0.927 |    0.855 |        0.007 |   0.752 |   0.545 |
0.103 |
|     50 |  60 |  80 |    0.954 |    0.911 |        0.002 |   0.797 |   0.638 |
0.042 |
|     50 |  60 |  90 |    0.990 |    0.979 |        0.000 |   0.727 |   0.538 |
0.084 |
|     50 |  60 | 100 |    1.000 |    1.000 |        0.000 |   0.858 |   0.728 |
0.027 |
|     50 |  70 |  10 |    0.383 |    0.130 |        0.407 |  -0.194 |   0.076 |
1.575 |
|     50 |  70 |  20 |    0.777 |    0.595 |        0.058 |   0.124 |   0.027 |
0.781 |
|     50 |  70 |  30 |    0.842 |    0.699 |        0.034 |   0.598 |   0.370 |
0.178 |
|     50 |  70 |  40 |    0.923 |    0.852 |        0.006 |   0.707 |   0.509 |
0.094 |
|     50 |  70 |  50 |    0.911 |    0.820 |        0.019 |   0.652 |   0.453 |
0.200 |
|     50 |  70 |  60 |    0.931 |    0.869 |        0.005 |   0.782 |   0.603 |
0.056 |
|     50 |  70 |  70 |    0.987 |    0.975 |        0.000 |   0.732 |   0.533 |
0.073 |
|     50 |  70 |  80 |    0.985 |    0.967 |        0.001 |   0.839 |   0.713 |
0.032 |
|     50 |  70 |  90 |    0.913 |    0.832 |        0.008 |   0.692 |   0.482 |
0.095 |
|     50 |  70 | 100 |    0.990 |    0.980 |        0.000 |   0.814 |   0.658 |
```

0.036 |
| 50 | 80 | 10 | 0.737 | 0.544 | 0.069 | 0.058 | -0.055 |
1.233 |
| 50 | 80 | 20 | 0.761 | 0.586 | 0.062 | 0.449 | 0.157 |
0.498 |
| 50 | 80 | 30 | 0.597 | 0.344 | 0.179 | 0.167 | 0.027 |
0.694 |
| 50 | 80 | 40 | 0.892 | 0.793 | 0.012 | 0.644 | 0.414 |
0.127 |
| 50 | 80 | 50 | 0.860 | 0.723 | 0.048 | 0.542 | 0.276 |
0.242 |
| 50 | 80 | 60 | 0.884 | 0.787 | 0.016 | 0.603 | 0.354 |
0.166 |
| 50 | 80 | 70 | 0.922 | 0.846 | 0.007 | 0.652 | 0.423 |
0.122 |
| 50 | 80 | 80 | 0.899 | 0.808 | 0.010 | 0.627 | 0.396 |
0.140 |
| 50 | 80 | 90 | 0.907 | 0.821 | 0.009 | 0.728 | 0.525 |
0.076 |
| 50 | 80 | 100 | 0.967 | 0.933 | 0.002 | 0.848 | 0.695 |
0.080 |
| 50 | 90 | 10 | 0.588 | 0.335 | 0.182 | -0.227 | -0.052 |
2.581 |
| 50 | 90 | 20 | 0.613 | 0.365 | 0.161 | 0.519 | 0.342 |
0.755 |
| 50 | 90 | 30 | 0.726 | 0.519 | 0.082 | 0.033 | -0.007 |
0.941 |
| 50 | 90 | 40 | 0.910 | 0.819 | 0.017 | 0.595 | 0.368 |
0.182 |
| 50 | 90 | 50 | 0.960 | 0.921 | 0.002 | 0.692 | 0.461 |
0.128 |
| 50 | 90 | 60 | 0.839 | 0.704 | 0.026 | 0.530 | 0.292 |
0.235 |
| 50 | 90 | 70 | 0.902 | 0.809 | 0.012 | 0.686 | 0.467 |
0.100 |
| 50 | 90 | 80 | 0.968 | 0.937 | 0.001 | 0.678 | 0.462 |
0.104 |
| 50 | 90 | 90 | 0.987 | 0.975 | 0.001 | 0.641 | 0.411 |
0.129 |
| 50 | 90 | 100 | 1.017 | 1.036 | 0.001 | 0.803 | 0.643 |
0.039 |
| 50 | 100 | 10 | 0.629 | 0.386 | 0.147 | -0.383 | 0.147 |
1.913 |
| 50 | 100 | 20 | 0.696 | 0.477 | 0.098 | 0.490 | 0.149 |
1.087 |
| 50 | 100 | 30 | 0.912 | 0.828 | 0.009 | 0.648 | 0.436 |
0.149 |
| 50 | 100 | 40 | 0.711 | 0.504 | 0.084 | 0.201 | 0.029 |

0.651 |
| 50 | 100 | 50 | 0.690 | 0.484 | 0.103 | 0.328 | 0.132 |
0.512 |
| 50 | 100 | 60 | 0.973 | 0.955 | 0.006 | 0.657 | 0.426 |
0.121 |
| 50 | 100 | 70 | 0.935 | 0.877 | 0.005 | 0.749 | 0.549 |
0.077 |
| 50 | 100 | 80 | 0.941 | 0.881 | 0.006 | 0.647 | 0.411 |
0.130 |
| 50 | 100 | 90 | 0.883 | 0.780 | 0.014 | 0.592 | 0.349 |
0.167 |
| 50 | 100 | 100 | 0.941 | 0.879 | 0.007 | 0.768 | 0.573 |
0.082 |
| 60 | 10 | 10 | 0.858 | 0.737 | 0.020 | 0.692 | 0.468 |
0.107 |
| 60 | 10 | 20 | 0.996 | 0.991 | 0.000 | 0.881 | 0.782 |
0.017 |
| 60 | 10 | 30 | 0.971 | 0.946 | 0.002 | 0.864 | 0.762 |
0.043 |
| 60 | 10 | 40 | 0.993 | 0.986 | 0.000 | 0.851 | 0.718 |
0.026 |
| 60 | 10 | 50 | 0.988 | 0.976 | 0.000 | 0.963 | 0.933 |
0.004 |
| 60 | 10 | 60 | 1.006 | 1.012 | 0.000 | 0.978 | 0.961 |
0.003 |
| 60 | 10 | 70 | 1.003 | 1.006 | 0.000 | 0.948 | 0.901 |
0.003 |
| 60 | 10 | 80 | 0.993 | 0.987 | 0.000 | 0.912 | 0.826 |
0.011 |
| 60 | 10 | 90 | 0.995 | 0.989 | 0.000 | 0.977 | 0.949 |
0.004 |
| 60 | 10 | 100 | 0.999 | 0.998 | 0.000 | 1.004 | 1.012 |
0.001 |
| 60 | 20 | 10 | 0.573 | 0.334 | 0.186 | 0.188 | 0.046 |
0.672 |
| 60 | 20 | 20 | 0.842 | 0.707 | 0.025 | 0.666 | 0.445 |
0.112 |
| 60 | 20 | 30 | 0.934 | 0.874 | 0.004 | 0.721 | 0.500 |
0.120 |
| 60 | 20 | 40 | 0.974 | 0.947 | 0.001 | 0.789 | 0.609 |
0.061 |
| 60 | 20 | 50 | 0.976 | 0.956 | 0.001 | 0.928 | 0.848 |
0.021 |
| 60 | 20 | 60 | 0.999 | 0.997 | 0.000 | 0.949 | 0.893 |
0.008 |
| 60 | 20 | 70 | 1.002 | 1.004 | 0.000 | 0.948 | 0.900 |
0.003 |
| 60 | 20 | 80 | 1.000 | 0.999 | 0.000 | 0.952 | 0.907 |

0.002 |
| 60 | 20 | 90 | 1.004 | 1.009 | 0.000 | 0.915 | 0.845 |
0.013 |
| 60 | 20 | 100 | 1.004 | 1.007 | 0.000 | 0.936 | 0.874 |
0.004 |
| 60 | 30 | 10 | 0.692 | 0.480 | 0.095 | 0.438 | 0.197 |
0.320 |
| 60 | 30 | 20 | 0.783 | 0.613 | 0.047 | 0.264 | 0.074 |
0.543 |
| 60 | 30 | 30 | 0.893 | 0.796 | 0.012 | 0.564 | 0.312 |
0.193 |
| 60 | 30 | 40 | 0.955 | 0.916 | 0.003 | 0.800 | 0.639 |
0.040 |
| 60 | 30 | 50 | 0.959 | 0.919 | 0.002 | 0.684 | 0.462 |
0.104 |
| 60 | 30 | 60 | 0.995 | 0.991 | 0.000 | 0.818 | 0.666 |
0.034 |
| 60 | 30 | 70 | 1.004 | 1.008 | 0.000 | 0.984 | 0.982 |
0.018 |
| 60 | 30 | 80 | 1.007 | 1.015 | 0.000 | 0.884 | 0.787 |
0.016 |
| 60 | 30 | 90 | 1.012 | 1.024 | 0.000 | 0.886 | 0.792 |
0.017 |
| 60 | 30 | 100 | 1.004 | 1.009 | 0.000 | 0.949 | 0.894 |
0.007 |
| 60 | 40 | 10 | 0.125 | 0.035 | 0.804 | -0.421 | 0.115 |
2.400 |
| 60 | 40 | 20 | 0.626 | 0.380 | 0.155 | 0.120 | -0.004 |
0.810 |
| 60 | 40 | 30 | 0.866 | 0.740 | 0.029 | 0.542 | 0.302 |
0.215 |
| 60 | 40 | 40 | 0.928 | 0.859 | 0.006 | 0.695 | 0.478 |
0.096 |
| 60 | 40 | 50 | 0.975 | 0.950 | 0.001 | 0.773 | 0.598 |
0.051 |
| 60 | 40 | 60 | 1.020 | 1.042 | 0.001 | 0.813 | 0.668 |
0.040 |
| 60 | 40 | 70 | 0.990 | 0.980 | 0.000 | 0.875 | 0.757 |
0.023 |
| 60 | 40 | 80 | 1.009 | 1.018 | 0.000 | 0.750 | 0.564 |
0.063 |
| 60 | 40 | 90 | 0.999 | 0.999 | 0.000 | 0.886 | 0.784 |
0.013 |
| 60 | 40 | 100 | 0.996 | 0.992 | 0.000 | 0.916 | 0.836 |
0.009 |
| 60 | 50 | 10 | 0.733 | 0.538 | 0.071 | 0.362 | 0.126 |
0.409 |
| 60 | 50 | 20 | 0.807 | 0.635 | 0.062 | 0.489 | 0.228 |

0.274 |
| 60 | 50 | 30 | 0.959 | 0.919 | 0.002 | 0.768 | 0.588 |
0.054 |
| 60 | 50 | 40 | 0.983 | 0.962 | 0.002 | 0.656 | 0.435 |
0.120 |
| 60 | 50 | 50 | 0.943 | 0.889 | 0.003 | 0.713 | 0.503 |
0.085 |
| 60 | 50 | 60 | 0.985 | 0.971 | 0.000 | 0.834 | 0.697 |
0.028 |
| 60 | 50 | 70 | 0.991 | 0.979 | 0.001 | 0.809 | 0.655 |
0.037 |
| 60 | 50 | 80 | 1.007 | 1.013 | 0.000 | 0.898 | 0.796 |
0.020 |
| 60 | 50 | 90 | 1.007 | 1.014 | 0.000 | 0.960 | 0.914 |
0.008 |
| 60 | 50 | 100 | 0.994 | 0.988 | 0.000 | 0.855 | 0.717 |
0.040 |
| 60 | 60 | 10 | 0.608 | 0.376 | 0.156 | -0.058 | -0.023 |
1.188 |
| 60 | 60 | 20 | 0.665 | 0.435 | 0.117 | 0.378 | 0.152 |
0.394 |
| 60 | 60 | 30 | 0.562 | 0.309 | 0.196 | 0.241 | 0.102 |
0.765 |
| 60 | 60 | 40 | 0.951 | 0.902 | 0.003 | 0.751 | 0.557 |
0.067 |
| 60 | 60 | 50 | 0.899 | 0.809 | 0.010 | 0.781 | 0.636 |
0.117 |
| 60 | 60 | 60 | 1.021 | 1.043 | 0.000 | 0.753 | 0.574 |
0.065 |
| 60 | 60 | 70 | 0.997 | 0.991 | 0.001 | 0.807 | 0.654 |
0.038 |
| 60 | 60 | 80 | 1.008 | 1.014 | 0.001 | 0.730 | 0.517 |
0.100 |
| 60 | 60 | 90 | 0.997 | 0.994 | 0.000 | 0.879 | 0.783 |
0.025 |
| 60 | 60 | 100 | 1.007 | 1.014 | 0.000 | 0.826 | 0.672 |
0.039 |
| 60 | 70 | 10 | 0.305 | 0.100 | 0.487 | 0.111 | -0.033 |
0.993 |
| 60 | 70 | 20 | 0.600 | 0.365 | 0.163 | 0.331 | 0.140 |
0.541 |
| 60 | 70 | 30 | 0.917 | 0.844 | 0.008 | 0.753 | 0.535 |
0.166 |
| 60 | 70 | 40 | 0.926 | 0.856 | 0.006 | 0.752 | 0.557 |
0.069 |
| 60 | 70 | 50 | 0.955 | 0.912 | 0.002 | 0.672 | 0.450 |
0.108 |
| 60 | 70 | 60 | 0.949 | 0.901 | 0.003 | 0.756 | 0.556 |

0.081 |
| 60 | 70 | 70 | 0.972 | 0.945 | 0.001 | 0.710 | 0.496 |
0.090 |
| 60 | 70 | 80 | 1.001 | 1.003 | 0.000 | 0.884 | 0.771 |
0.024 |
| 60 | 70 | 90 | 0.983 | 0.966 | 0.000 | 0.811 | 0.645 |
0.053 |
| 60 | 70 | 100 | 0.992 | 0.986 | 0.000 | 0.872 | 0.749 |
0.028 |
| 60 | 80 | 10 | 0.687 | 0.479 | 0.102 | -0.148 | 0.043 |
1.361 |
| 60 | 80 | 20 | 0.620 | 0.382 | 0.145 | 0.216 | 0.055 |
0.620 |
| 60 | 80 | 30 | 0.960 | 0.921 | 0.002 | 0.699 | 0.469 |
0.131 |
| 60 | 80 | 40 | 0.884 | 0.779 | 0.014 | 0.595 | 0.341 |
0.183 |
| 60 | 80 | 50 | 1.010 | 1.024 | 0.001 | 0.807 | 0.631 |
0.082 |
| 60 | 80 | 60 | 0.904 | 0.820 | 0.010 | 0.721 | 0.517 |
0.079 |
| 60 | 80 | 70 | 1.014 | 1.030 | 0.001 | 0.867 | 0.764 |
0.035 |
| 60 | 80 | 80 | 1.019 | 1.035 | 0.001 | 0.823 | 0.679 |
0.032 |
| 60 | 80 | 90 | 0.999 | 0.997 | 0.000 | 0.792 | 0.623 |
0.046 |
| 60 | 80 | 100 | 1.007 | 1.014 | 0.000 | 0.827 | 0.685 |
0.030 |
| 60 | 90 | 10 | 0.229 | 0.052 | 0.594 | -0.223 | -0.036 |
2.230 |
| 60 | 90 | 20 | 0.863 | 0.748 | 0.019 | 0.533 | 0.290 |
0.221 |
| 60 | 90 | 30 | 0.816 | 0.651 | 0.059 | 0.556 | 0.282 |
0.272 |
| 60 | 90 | 40 | 0.828 | 0.669 | 0.057 | 0.481 | 0.193 |
0.416 |
| 60 | 90 | 50 | 0.863 | 0.742 | 0.020 | 0.612 | 0.371 |
0.152 |
| 60 | 90 | 60 | 0.902 | 0.815 | 0.010 | 0.644 | 0.419 |
0.130 |
| 60 | 90 | 70 | 0.953 | 0.907 | 0.003 | 0.727 | 0.524 |
0.076 |
| 60 | 90 | 80 | 0.901 | 0.814 | 0.011 | 0.622 | 0.363 |
0.200 |
| 60 | 90 | 90 | 0.949 | 0.904 | 0.003 | 0.807 | 0.634 |
0.065 |
| 60 | 90 | 100 | 0.924 | 0.852 | 0.006 | 0.703 | 0.479 |

0.111 |
| 60 | 100 | 10 | 0.377 | 0.148 | 0.393 | -0.274 | 0.165 |
2.439 |
| 60 | 100 | 20 | 0.825 | 0.685 | 0.033 | 0.694 | 0.442 |
0.250 |
| 60 | 100 | 30 | 0.897 | 0.800 | 0.013 | 0.657 | 0.448 |
0.145 |
| 60 | 100 | 40 | 0.780 | 0.616 | 0.053 | 0.548 | 0.296 |
0.206 |
| 60 | 100 | 50 | 0.940 | 0.888 | 0.005 | 0.736 | 0.554 |
0.083 |
| 60 | 100 | 60 | 0.948 | 0.894 | 0.005 | 0.712 | 0.509 |
0.083 |
| 60 | 100 | 70 | 0.965 | 0.934 | 0.001 | 0.801 | 0.648 |
0.044 |
| 60 | 100 | 80 | 0.924 | 0.853 | 0.006 | 0.720 | 0.516 |
0.079 |
| 60 | 100 | 90 | 0.947 | 0.897 | 0.003 | 0.687 | 0.459 |
0.114 |
| 60 | 100 | 100 | 0.977 | 0.954 | 0.001 | 0.762 | 0.589 |
0.063 |
| 70 | 10 | 10 | 0.786 | 0.615 | 0.047 | 0.637 | 0.399 |
0.137 |
| 70 | 10 | 20 | 0.953 | 0.908 | 0.002 | 0.745 | 0.553 |
0.065 |
| 70 | 10 | 30 | 1.014 | 1.027 | 0.000 | 0.829 | 0.694 |
0.033 |
| 70 | 10 | 40 | 1.004 | 1.007 | 0.000 | 0.977 | 0.948 |
0.006 |
| 70 | 10 | 50 | 1.007 | 1.014 | 0.000 | 0.950 | 0.897 |
0.005 |
| 70 | 10 | 60 | 0.997 | 0.994 | 0.000 | 0.982 | 0.968 |
0.001 |
| 70 | 10 | 70 | 1.004 | 1.008 | 0.000 | 0.968 | 0.939 |
0.001 |
| 70 | 10 | 80 | 1.001 | 1.002 | 0.000 | 0.980 | 0.961 |
0.001 |
| 70 | 10 | 90 | 0.999 | 0.997 | 0.000 | 1.001 | 1.005 |
0.001 |
| 70 | 10 | 100 | 0.996 | 0.991 | 0.000 | 0.990 | 0.980 |
0.000 |
| 70 | 20 | 10 | 0.873 | 0.763 | 0.016 | 0.668 | 0.438 |
0.117 |
| 70 | 20 | 20 | 0.854 | 0.722 | 0.026 | 0.574 | 0.313 |
0.209 |
| 70 | 20 | 30 | 0.976 | 0.951 | 0.001 | 0.736 | 0.558 |
0.097 |
| 70 | 20 | 40 | 0.985 | 0.970 | 0.000 | 0.816 | 0.652 |

0.052 |
| 70 | 20 | 50 | 0.998 | 0.996 | 0.000 | 0.949 | 0.900 |
0.003 |
| 70 | 20 | 60 | 0.994 | 0.988 | 0.000 | 0.922 | 0.849 |
0.006 |
| 70 | 20 | 70 | 1.003 | 1.005 | 0.000 | 0.955 | 0.909 |
0.003 |
| 70 | 20 | 80 | 1.001 | 1.003 | 0.000 | 0.924 | 0.858 |
0.007 |
| 70 | 20 | 90 | 0.996 | 0.991 | 0.000 | 0.950 | 0.900 |
0.003 |
| 70 | 20 | 100 | 0.999 | 0.998 | 0.000 | 0.904 | 0.816 |
0.009 |
| 70 | 30 | 10 | 0.479 | 0.227 | 0.272 | 0.095 | 0.036 |
0.890 |
| 70 | 30 | 20 | 0.836 | 0.702 | 0.028 | 0.625 | 0.389 |
0.141 |
| 70 | 30 | 30 | 0.946 | 0.892 | 0.004 | 0.800 | 0.632 |
0.045 |
| 70 | 30 | 40 | 0.989 | 0.981 | 0.001 | 0.903 | 0.798 |
0.038 |
| 70 | 30 | 50 | 0.995 | 0.992 | 0.000 | 0.853 | 0.725 |
0.022 |
| 70 | 30 | 60 | 0.999 | 0.998 | 0.000 | 0.866 | 0.742 |
0.025 |
| 70 | 30 | 70 | 1.000 | 0.999 | 0.000 | 0.901 | 0.813 |
0.010 |
| 70 | 30 | 80 | 0.999 | 0.998 | 0.000 | 0.901 | 0.808 |
0.011 |
| 70 | 30 | 90 | 1.004 | 1.009 | 0.000 | 0.935 | 0.874 |
0.004 |
| 70 | 30 | 100 | 1.005 | 1.011 | 0.000 | 0.986 | 0.963 |
0.007 |
| 70 | 40 | 10 | 0.452 | 0.198 | 0.305 | 0.078 | -0.013 |
0.888 |
| 70 | 40 | 20 | 0.881 | 0.778 | 0.015 | 0.624 | 0.416 |
0.211 |
| 70 | 40 | 30 | 0.921 | 0.853 | 0.008 | 0.773 | 0.583 |
0.072 |
| 70 | 40 | 40 | 0.977 | 0.956 | 0.001 | 0.832 | 0.669 |
0.081 |
| 70 | 40 | 50 | 0.914 | 0.829 | 0.012 | 0.763 | 0.607 |
0.116 |
| 70 | 40 | 60 | 0.976 | 0.949 | 0.001 | 0.749 | 0.561 |
0.063 |
| 70 | 40 | 70 | 0.995 | 0.990 | 0.000 | 0.923 | 0.840 |
0.018 |
| 70 | 40 | 80 | 0.998 | 0.997 | 0.000 | 0.908 | 0.813 |

0.019 |
| 70 | 40 | 90 | 0.999 | 0.997 | 0.000 | 0.929 | 0.871 |
0.010 |
| 70 | 40 | 100 | 1.000 | 0.999 | 0.000 | 0.924 | 0.853 |
0.006 |
| 70 | 50 | 10 | 0.657 | 0.411 | 0.163 | 0.184 | 0.064 |
0.755 |
| 70 | 50 | 20 | 0.725 | 0.539 | 0.095 | 0.428 | 0.132 |
0.588 |
| 70 | 50 | 30 | 0.989 | 0.977 | 0.000 | 0.742 | 0.545 |
0.070 |
| 70 | 50 | 40 | 0.972 | 0.949 | 0.002 | 0.752 | 0.571 |
0.065 |
| 70 | 50 | 50 | 0.982 | 0.965 | 0.001 | 0.852 | 0.712 |
0.040 |
| 70 | 50 | 60 | 0.917 | 0.844 | 0.008 | 0.609 | 0.390 |
0.189 |
| 70 | 50 | 70 | 0.978 | 0.956 | 0.000 | 0.850 | 0.735 |
0.038 |
| 70 | 50 | 80 | 1.001 | 1.001 | 0.000 | 0.973 | 0.959 |
0.014 |
| 70 | 50 | 90 | 1.002 | 1.004 | 0.000 | 0.919 | 0.834 |
0.018 |
| 70 | 50 | 100 | 0.995 | 0.990 | 0.000 | 0.862 | 0.744 |
0.019 |
| 70 | 60 | 10 | 0.326 | 0.098 | 0.461 | 0.053 | 0.036 |
1.006 |
| 70 | 60 | 20 | 0.824 | 0.678 | 0.031 | 0.712 | 0.483 |
0.144 |
| 70 | 60 | 30 | 0.761 | 0.571 | 0.065 | 0.502 | 0.243 |
0.257 |
| 70 | 60 | 40 | 0.913 | 0.835 | 0.008 | 0.656 | 0.418 |
0.135 |
| 70 | 60 | 50 | 0.928 | 0.861 | 0.005 | 0.762 | 0.568 |
0.072 |
| 70 | 60 | 60 | 0.991 | 0.983 | 0.000 | 0.785 | 0.614 |
0.047 |
| 70 | 60 | 70 | 0.995 | 0.992 | 0.000 | 0.829 | 0.677 |
0.041 |
| 70 | 60 | 80 | 1.003 | 1.005 | 0.000 | 0.832 | 0.691 |
0.029 |
| 70 | 60 | 90 | 0.986 | 0.971 | 0.000 | 0.835 | 0.698 |
0.027 |
| 70 | 60 | 100 | 1.003 | 1.007 | 0.000 | 0.843 | 0.708 |
0.025 |
| 70 | 70 | 10 | 0.773 | 0.600 | 0.052 | 0.554 | 0.252 |
0.492 |
| 70 | 70 | 20 | 0.713 | 0.518 | 0.091 | 0.371 | 0.107 |

0.489 |
| 70 | 70 | 30 | 0.819 | 0.674 | 0.034 | 0.609 | 0.364 |
0.158 |
| 70 | 70 | 40 | 0.923 | 0.854 | 0.007 | 0.810 | 0.636 |
0.081 |
| 70 | 70 | 50 | 0.884 | 0.786 | 0.015 | 0.501 | 0.264 |
0.266 |
| 70 | 70 | 60 | 0.968 | 0.939 | 0.001 | 0.813 | 0.667 |
0.038 |
| 70 | 70 | 70 | 0.982 | 0.966 | 0.001 | 0.755 | 0.566 |
0.062 |
| 70 | 70 | 80 | 1.000 | 1.001 | 0.000 | 0.922 | 0.840 |
0.018 |
| 70 | 70 | 90 | 1.020 | 1.041 | 0.000 | 0.832 | 0.698 |
0.031 |
| 70 | 70 | 100 | 0.998 | 0.994 | 0.000 | 0.821 | 0.680 |
0.036 |
| 70 | 80 | 10 | 0.525 | 0.284 | 0.231 | 0.087 | 0.080 |
1.366 |
| 70 | 80 | 20 | 0.827 | 0.678 | 0.034 | 0.646 | 0.387 |
0.219 |
| 70 | 80 | 30 | 0.758 | 0.579 | 0.061 | 0.556 | 0.281 |
0.277 |
| 70 | 80 | 40 | 0.816 | 0.663 | 0.035 | 0.553 | 0.280 |
0.266 |
| 70 | 80 | 50 | 0.872 | 0.755 | 0.019 | 0.704 | 0.457 |
0.237 |
| 70 | 80 | 60 | 1.010 | 1.020 | 0.000 | 0.889 | 0.772 |
0.043 |
| 70 | 80 | 70 | 1.012 | 1.023 | 0.000 | 0.805 | 0.658 |
0.050 |
| 70 | 80 | 80 | 0.983 | 0.962 | 0.002 | 0.737 | 0.536 |
0.074 |
| 70 | 80 | 90 | 0.979 | 0.959 | 0.000 | 0.774 | 0.601 |
0.051 |
| 70 | 80 | 100 | 1.001 | 1.002 | 0.000 | 0.788 | 0.639 |
0.080 |
| 70 | 90 | 10 | 0.786 | 0.609 | 0.055 | -0.120 | 0.062 |
1.478 |
| 70 | 90 | 20 | 0.956 | 0.912 | 0.002 | 0.334 | 0.094 |
0.477 |
| 70 | 90 | 30 | 0.927 | 0.860 | 0.005 | 0.662 | 0.465 |
0.186 |
| 70 | 90 | 40 | 0.882 | 0.782 | 0.015 | 0.667 | 0.450 |
0.114 |
| 70 | 90 | 50 | 0.859 | 0.735 | 0.021 | 0.714 | 0.497 |
0.097 |
| 70 | 90 | 60 | 0.993 | 0.988 | 0.000 | 0.700 | 0.499 |

0.098 |
| 70 | 90 | 70 | 0.950 | 0.907 | 0.005 | 0.667 | 0.447 |
0.111 |
| 70 | 90 | 80 | 0.989 | 0.980 | 0.000 | 0.754 | 0.582 |
0.078 |
| 70 | 90 | 90 | 0.984 | 0.967 | 0.000 | 0.754 | 0.575 |
0.066 |
| 70 | 90 | 100 | 1.006 | 1.013 | 0.000 | 0.840 | 0.721 |
0.049 |
| 70 | 100 | 10 | 0.419 | 0.200 | 0.400 | 0.116 | 0.067 |
1.069 |
| 70 | 100 | 20 | 0.614 | 0.366 | 0.161 | 0.228 | 0.035 |
0.626 |
| 70 | 100 | 30 | 0.858 | 0.734 | 0.021 | 0.581 | 0.344 |
0.180 |
| 70 | 100 | 40 | 0.888 | 0.790 | 0.013 | 0.681 | 0.474 |
0.114 |
| 70 | 100 | 50 | 0.878 | 0.773 | 0.015 | 0.631 | 0.393 |
0.139 |
| 70 | 100 | 60 | 0.982 | 0.969 | 0.002 | 0.758 | 0.574 |
0.059 |
| 70 | 100 | 70 | 0.955 | 0.912 | 0.002 | 0.756 | 0.571 |
0.060 |
| 70 | 100 | 80 | 0.982 | 0.965 | 0.000 | 0.797 | 0.624 |
0.054 |
| 70 | 100 | 90 | 0.941 | 0.884 | 0.004 | 0.650 | 0.418 |
0.124 |
| 70 | 100 | 100 | 0.972 | 0.946 | 0.001 | 0.787 | 0.606 |
0.066 |
| 80 | 10 | 10 | 0.954 | 0.912 | 0.002 | 0.834 | 0.680 |
0.050 |
| 80 | 10 | 20 | 0.992 | 0.983 | 0.000 | 0.866 | 0.749 |
0.018 |
| 80 | 10 | 30 | 1.009 | 1.018 | 0.000 | 0.872 | 0.760 |
0.016 |
| 80 | 10 | 40 | 0.995 | 0.990 | 0.000 | 0.956 | 0.919 |
0.006 |
| 80 | 10 | 50 | 0.997 | 0.995 | 0.000 | 0.947 | 0.897 |
0.003 |
| 80 | 10 | 60 | 1.008 | 1.017 | 0.000 | 0.952 | 0.912 |
0.005 |
| 80 | 10 | 70 | 0.998 | 0.995 | 0.000 | 0.963 | 0.928 |
0.001 |
| 80 | 10 | 80 | 0.997 | 0.994 | 0.000 | 1.020 | 1.039 |
0.000 |
| 80 | 10 | 90 | 1.001 | 1.002 | 0.000 | 0.983 | 0.964 |
0.001 |
| 80 | 10 | 100 | 1.004 | 1.008 | 0.000 | 1.021 | 1.041 |

0.001 |
| 80 | 20 | 10 | 0.682 | 0.445 | 0.139 | 0.148 | 0.031 |
0.735 |
| 80 | 20 | 20 | 0.969 | 0.938 | 0.001 | 0.584 | 0.328 |
0.189 |
| 80 | 20 | 30 | 1.019 | 1.038 | 0.000 | 0.930 | 0.848 |
0.031 |
| 80 | 20 | 40 | 0.999 | 0.999 | 0.000 | 0.905 | 0.825 |
0.014 |
| 80 | 20 | 50 | 0.990 | 0.979 | 0.000 | 0.796 | 0.636 |
0.042 |
| 80 | 20 | 60 | 1.007 | 1.013 | 0.000 | 0.939 | 0.879 |
0.004 |
| 80 | 20 | 70 | 0.999 | 0.998 | 0.000 | 0.952 | 0.911 |
0.005 |
| 80 | 20 | 80 | 0.998 | 0.996 | 0.000 | 0.957 | 0.911 |
0.004 |
| 80 | 20 | 90 | 0.997 | 0.994 | 0.000 | 0.982 | 0.961 |
0.001 |
| 80 | 20 | 100 | 1.006 | 1.011 | 0.000 | 0.969 | 0.936 |
0.002 |
| 80 | 30 | 10 | 0.834 | 0.708 | 0.043 | 0.656 | 0.405 |
0.184 |
| 80 | 30 | 20 | 0.920 | 0.851 | 0.009 | 0.728 | 0.548 |
0.108 |
| 80 | 30 | 30 | 0.964 | 0.934 | 0.004 | 0.792 | 0.621 |
0.047 |
| 80 | 30 | 40 | 0.983 | 0.968 | 0.001 | 0.742 | 0.558 |
0.072 |
| 80 | 30 | 50 | 0.987 | 0.972 | 0.001 | 0.875 | 0.769 |
0.017 |
| 80 | 30 | 60 | 0.998 | 0.996 | 0.000 | 0.880 | 0.769 |
0.017 |
| 80 | 30 | 70 | 1.001 | 1.002 | 0.000 | 0.940 | 0.877 |
0.008 |
| 80 | 30 | 80 | 1.003 | 1.006 | 0.000 | 0.924 | 0.857 |
0.007 |
| 80 | 30 | 90 | 1.006 | 1.012 | 0.000 | 0.998 | 1.000 |
0.002 |
| 80 | 30 | 100 | 0.997 | 0.995 | 0.000 | 0.983 | 0.963 |
0.001 |
| 80 | 40 | 10 | 0.776 | 0.606 | 0.051 | 0.471 | 0.219 |
0.281 |
| 80 | 40 | 20 | 0.834 | 0.700 | 0.029 | 0.640 | 0.391 |
0.163 |
| 80 | 40 | 30 | 1.019 | 1.037 | 0.000 | 0.776 | 0.602 |
0.050 |
| 80 | 40 | 40 | 0.973 | 0.949 | 0.001 | 0.908 | 0.812 |

0.026 |
| 80 | 40 | 50 | 1.013 | 1.028 | 0.000 | 0.815 | 0.681 |
0.058 |
| 80 | 40 | 60 | 1.007 | 1.012 | 0.000 | 0.837 | 0.690 |
0.038 |
| 80 | 40 | 70 | 1.003 | 1.005 | 0.000 | 0.887 | 0.789 |
0.013 |
| 80 | 40 | 80 | 1.010 | 1.019 | 0.000 | 0.942 | 0.891 |
0.004 |
| 80 | 40 | 90 | 1.007 | 1.013 | 0.000 | 0.953 | 0.903 |
0.005 |
| 80 | 40 | 100 | 1.007 | 1.013 | 0.000 | 0.961 | 0.929 |
0.006 |
| 80 | 50 | 10 | 0.719 | 0.523 | 0.083 | 0.545 | 0.272 |
0.272 |
| 80 | 50 | 20 | 0.973 | 0.947 | 0.001 | 0.783 | 0.630 |
0.075 |
| 80 | 50 | 30 | 0.994 | 0.990 | 0.001 | 0.747 | 0.556 |
0.064 |
| 80 | 50 | 40 | 1.024 | 1.048 | 0.001 | 0.895 | 0.786 |
0.031 |
| 80 | 50 | 50 | 0.997 | 0.992 | 0.000 | 0.820 | 0.674 |
0.033 |
| 80 | 50 | 60 | 0.988 | 0.976 | 0.000 | 0.807 | 0.645 |
0.040 |
| 80 | 50 | 70 | 1.004 | 1.009 | 0.000 | 0.848 | 0.715 |
0.024 |
| 80 | 50 | 80 | 1.004 | 1.008 | 0.000 | 0.933 | 0.880 |
0.012 |
| 80 | 50 | 90 | 1.006 | 1.011 | 0.000 | 0.941 | 0.891 |
0.008 |
| 80 | 50 | 100 | 1.001 | 1.002 | 0.000 | 0.980 | 0.951 |
0.008 |
| 80 | 60 | 10 | 0.825 | 0.687 | 0.035 | 0.266 | 0.055 |
0.562 |
| 80 | 60 | 20 | 0.826 | 0.681 | 0.030 | 0.704 | 0.527 |
0.185 |
| 80 | 60 | 30 | 0.773 | 0.595 | 0.052 | 0.407 | 0.157 |
0.360 |
| 80 | 60 | 40 | 0.944 | 0.897 | 0.007 | 0.809 | 0.623 |
0.142 |
| 80 | 60 | 50 | 1.000 | 1.001 | 0.000 | 0.789 | 0.624 |
0.044 |
| 80 | 60 | 60 | 0.992 | 0.983 | 0.000 | 0.767 | 0.587 |
0.054 |
| 80 | 60 | 70 | 1.019 | 1.038 | 0.000 | 0.854 | 0.730 |
0.022 |
| 80 | 60 | 80 | 0.989 | 0.978 | 0.000 | 0.765 | 0.573 |

0.071 |
| 80 | 60 | 90 | 0.998 | 0.996 | 0.000 | 0.957 | 0.924 |
0.010 |
| 80 | 60 | 100 | 1.006 | 1.012 | 0.000 | 0.881 | 0.782 |
0.017 |
| 80 | 70 | 10 | 0.626 | 0.387 | 0.142 | 0.247 | 0.042 |
0.603 |
| 80 | 70 | 20 | 0.762 | 0.578 | 0.057 | 0.449 | 0.215 |
0.322 |
| 80 | 70 | 30 | 0.846 | 0.727 | 0.035 | 0.669 | 0.430 |
0.138 |
| 80 | 70 | 40 | 0.964 | 0.929 | 0.001 | 0.630 | 0.391 |
0.140 |
| 80 | 70 | 50 | 0.955 | 0.912 | 0.002 | 0.613 | 0.373 |
0.151 |
| 80 | 70 | 60 | 0.990 | 0.980 | 0.000 | 0.890 | 0.806 |
0.034 |
| 80 | 70 | 70 | 0.990 | 0.981 | 0.000 | 0.821 | 0.668 |
0.036 |
| 80 | 70 | 80 | 0.995 | 0.991 | 0.000 | 0.917 | 0.852 |
0.021 |
| 80 | 70 | 90 | 1.006 | 1.011 | 0.000 | 0.828 | 0.689 |
0.031 |
| 80 | 70 | 100 | 0.991 | 0.983 | 0.000 | 0.871 | 0.770 |
0.029 |
| 80 | 80 | 10 | 0.430 | 0.179 | 0.328 | 0.248 | 0.185 |
2.090 |
| 80 | 80 | 20 | 0.805 | 0.642 | 0.042 | 0.559 | 0.323 |
0.206 |
| 80 | 80 | 30 | 0.964 | 0.931 | 0.002 | 0.763 | 0.603 |
0.101 |
| 80 | 80 | 40 | 0.914 | 0.837 | 0.008 | 0.720 | 0.524 |
0.082 |
| 80 | 80 | 50 | 0.871 | 0.759 | 0.017 | 0.675 | 0.476 |
0.148 |
| 80 | 80 | 60 | 0.973 | 0.944 | 0.001 | 0.776 | 0.582 |
0.093 |
| 80 | 80 | 70 | 1.005 | 1.011 | 0.000 | 0.836 | 0.702 |
0.028 |
| 80 | 80 | 80 | 0.992 | 0.981 | 0.000 | 0.786 | 0.628 |
0.059 |
| 80 | 80 | 90 | 1.002 | 1.004 | 0.000 | 0.878 | 0.784 |
0.033 |
| 80 | 80 | 100 | 0.992 | 0.984 | 0.000 | 0.752 | 0.565 |
0.061 |
| 80 | 90 | 10 | 0.572 | 0.318 | 0.191 | -0.057 | 0.031 |
1.193 |
| 80 | 90 | 20 | 0.706 | 0.494 | 0.088 | 0.436 | 0.201 |

0.330 |
| 80 | 90 | 30 | 0.849 | 0.720 | 0.023 | 0.611 | 0.383 |
0.161 |
| 80 | 90 | 40 | 0.886 | 0.787 | 0.013 | 0.610 | 0.366 |
0.155 |
| 80 | 90 | 50 | 0.961 | 0.923 | 0.002 | 0.797 | 0.619 |
0.068 |
| 80 | 90 | 60 | 0.899 | 0.802 | 0.014 | 0.706 | 0.476 |
0.139 |
| 80 | 90 | 70 | 0.945 | 0.890 | 0.004 | 0.729 | 0.541 |
0.084 |
| 80 | 90 | 80 | 0.986 | 0.973 | 0.000 | 0.756 | 0.571 |
0.060 |
| 80 | 90 | 90 | 0.995 | 0.992 | 0.000 | 0.827 | 0.684 |
0.030 |
| 80 | 90 | 100 | 1.000 | 0.998 | 0.000 | 0.822 | 0.670 |
0.036 |
| 80 | 100 | 10 | 0.704 | 0.512 | 0.118 | -0.058 | 0.070 |
1.564 |
| 80 | 100 | 20 | 0.829 | 0.683 | 0.032 | 0.618 | 0.337 |
0.344 |
| 80 | 100 | 30 | 0.906 | 0.821 | 0.009 | 0.617 | 0.375 |
0.150 |
| 80 | 100 | 40 | 0.729 | 0.531 | 0.073 | 0.371 | 0.129 |
0.403 |
| 80 | 100 | 50 | 0.860 | 0.736 | 0.021 | 0.610 | 0.362 |
0.162 |
| 80 | 100 | 60 | 0.955 | 0.912 | 0.002 | 0.758 | 0.582 |
0.065 |
| 80 | 100 | 70 | 1.003 | 1.008 | 0.000 | 0.787 | 0.611 |
0.053 |
| 80 | 100 | 80 | 1.016 | 1.031 | 0.000 | 0.813 | 0.659 |
0.035 |
| 80 | 100 | 90 | 0.988 | 0.977 | 0.000 | 0.840 | 0.709 |
0.027 |
| 80 | 100 | 100 | 0.995 | 0.992 | 0.000 | 0.805 | 0.644 |
0.039 |
| 90 | 10 | 10 | 0.848 | 0.723 | 0.024 | 0.439 | 0.195 |
0.315 |
| 90 | 10 | 20 | 0.999 | 0.998 | 0.000 | 0.905 | 0.820 |
0.009 |
| 90 | 10 | 30 | 1.004 | 1.008 | 0.000 | 0.918 | 0.850 |
0.011 |
| 90 | 10 | 40 | 1.003 | 1.005 | 0.000 | 0.986 | 0.970 |
0.001 |
| 90 | 10 | 50 | 1.001 | 1.001 | 0.000 | 0.939 | 0.883 |
0.004 |
| 90 | 10 | 60 | 1.001 | 1.001 | 0.000 | 0.902 | 0.817 |

0.011 |
| 90 | 10 | 70 | 1.001 | 1.001 | 0.000 | 1.003 | 1.009 |
0.001 |
| 90 | 10 | 80 | 1.008 | 1.016 | 0.000 | 1.005 | 1.007 |
0.001 |
| 90 | 10 | 90 | 1.001 | 1.001 | 0.000 | 0.983 | 0.966 |
0.000 |
| 90 | 10 | 100 | 1.004 | 1.007 | 0.000 | 0.994 | 0.989 |
0.000 |
| 90 | 20 | 10 | 0.920 | 0.842 | 0.008 | 0.706 | 0.502 |
0.088 |
| 90 | 20 | 20 | 0.980 | 0.960 | 0.000 | 0.833 | 0.699 |
0.031 |
| 90 | 20 | 30 | 0.945 | 0.891 | 0.003 | 0.808 | 0.666 |
0.055 |
| 90 | 20 | 40 | 0.992 | 0.983 | 0.000 | 0.910 | 0.824 |
0.010 |
| 90 | 20 | 50 | 1.009 | 1.018 | 0.000 | 0.889 | 0.800 |
0.024 |
| 90 | 20 | 60 | 1.001 | 1.002 | 0.000 | 0.990 | 0.982 |
0.001 |
| 90 | 20 | 70 | 0.993 | 0.987 | 0.000 | 0.945 | 0.901 |
0.008 |
| 90 | 20 | 80 | 0.998 | 0.996 | 0.000 | 0.990 | 0.975 |
0.002 |
| 90 | 20 | 90 | 1.000 | 1.000 | 0.000 | 0.969 | 0.941 |
0.001 |
| 90 | 20 | 100 | 1.000 | 1.000 | 0.000 | 0.969 | 0.936 |
0.002 |
| 90 | 30 | 10 | 0.727 | 0.530 | 0.075 | 0.392 | 0.153 |
0.370 |
| 90 | 30 | 20 | 1.013 | 1.024 | 0.001 | 0.792 | 0.631 |
0.045 |
| 90 | 30 | 30 | 1.014 | 1.025 | 0.001 | 0.843 | 0.719 |
0.031 |
| 90 | 30 | 40 | 0.999 | 0.998 | 0.000 | 0.962 | 0.918 |
0.008 |
| 90 | 30 | 50 | 0.992 | 0.983 | 0.000 | 0.915 | 0.831 |
0.010 |
| 90 | 30 | 60 | 0.999 | 0.998 | 0.000 | 0.950 | 0.907 |
0.005 |
| 90 | 30 | 70 | 1.003 | 1.006 | 0.000 | 0.998 | 0.985 |
0.013 |
| 90 | 30 | 80 | 0.999 | 0.998 | 0.000 | 1.028 | 1.060 |
0.002 |
| 90 | 30 | 90 | 1.003 | 1.005 | 0.000 | 0.956 | 0.917 |
0.003 |
| 90 | 30 | 100 | 0.999 | 0.997 | 0.000 | 0.985 | 0.975 |

0.003 |
| 90 | 40 | 10 | 0.624 | 0.401 | 0.157 | 0.241 | 0.022 |
0.702 |
| 90 | 40 | 20 | 0.878 | 0.777 | 0.019 | 0.701 | 0.519 |
0.169 |
| 90 | 40 | 30 | 0.982 | 0.965 | 0.000 | 0.706 | 0.492 |
0.090 |
| 90 | 40 | 40 | 0.969 | 0.940 | 0.001 | 0.855 | 0.725 |
0.025 |
| 90 | 40 | 50 | 1.004 | 1.010 | 0.000 | 0.779 | 0.616 |
0.056 |
| 90 | 40 | 60 | 0.995 | 0.990 | 0.000 | 0.877 | 0.758 |
0.029 |
| 90 | 40 | 70 | 0.990 | 0.979 | 0.000 | 0.860 | 0.740 |
0.020 |
| 90 | 40 | 80 | 0.999 | 0.998 | 0.000 | 0.918 | 0.843 |
0.007 |
| 90 | 40 | 90 | 0.997 | 0.994 | 0.000 | 0.949 | 0.895 |
0.005 |
| 90 | 40 | 100 | 0.998 | 0.996 | 0.000 | 0.973 | 0.951 |
0.003 |
| 90 | 50 | 10 | 0.775 | 0.600 | 0.051 | 0.437 | 0.160 |
0.411 |
| 90 | 50 | 20 | 0.739 | 0.544 | 0.069 | 0.461 | 0.247 |
0.416 |
| 90 | 50 | 30 | 0.817 | 0.665 | 0.034 | 0.626 | 0.359 |
0.247 |
| 90 | 50 | 40 | 0.949 | 0.900 | 0.003 | 0.648 | 0.411 |
0.132 |
| 90 | 50 | 50 | 0.998 | 0.997 | 0.000 | 0.709 | 0.496 |
0.090 |
| 90 | 50 | 60 | 1.001 | 1.002 | 0.000 | 0.724 | 0.527 |
0.077 |
| 90 | 50 | 70 | 0.999 | 0.998 | 0.000 | 0.837 | 0.700 |
0.027 |
| 90 | 50 | 80 | 1.000 | 1.000 | 0.000 | 0.926 | 0.848 |
0.013 |
| 90 | 50 | 90 | 0.994 | 0.989 | 0.000 | 0.919 | 0.840 |
0.008 |
| 90 | 50 | 100 | 1.001 | 1.002 | 0.000 | 0.946 | 0.896 |
0.003 |
| 90 | 60 | 10 | 0.734 | 0.532 | 0.076 | 0.053 | 0.021 |
0.929 |
| 90 | 60 | 20 | 0.885 | 0.783 | 0.013 | 0.596 | 0.366 |
0.176 |
| 90 | 60 | 30 | 0.994 | 0.989 | 0.000 | 0.758 | 0.578 |
0.060 |
| 90 | 60 | 40 | 0.989 | 0.982 | 0.001 | 0.661 | 0.433 |

0.117 |
| 90 | 60 | 50 | 0.971 | 0.941 | 0.001 | 0.753 | 0.571 |
0.062 |
| 90 | 60 | 60 | 0.989 | 0.979 | 0.000 | 0.808 | 0.647 |
0.041 |
| 90 | 60 | 70 | 0.997 | 0.994 | 0.000 | 0.839 | 0.713 |
0.034 |
| 90 | 60 | 80 | 0.997 | 0.993 | 0.000 | 0.843 | 0.709 |
0.025 |
| 90 | 60 | 90 | 1.006 | 1.012 | 0.000 | 0.915 | 0.843 |
0.011 |
| 90 | 60 | 100 | 1.000 | 1.001 | 0.000 | 0.916 | 0.842 |
0.008 |
| 90 | 70 | 10 | 0.563 | 0.316 | 0.191 | 0.149 | 0.062 |
0.880 |
| 90 | 70 | 20 | 0.762 | 0.576 | 0.058 | 0.322 | 0.101 |
0.460 |
| 90 | 70 | 30 | 0.958 | 0.915 | 0.002 | 0.753 | 0.541 |
0.131 |
| 90 | 70 | 40 | 0.946 | 0.895 | 0.003 | 0.823 | 0.661 |
0.058 |
| 90 | 70 | 50 | 1.001 | 1.003 | 0.000 | 0.780 | 0.614 |
0.051 |
| 90 | 70 | 60 | 0.994 | 0.986 | 0.000 | 0.776 | 0.594 |
0.057 |
| 90 | 70 | 70 | 0.999 | 0.998 | 0.000 | 0.882 | 0.764 |
0.032 |
| 90 | 70 | 80 | 1.000 | 1.002 | 0.000 | 0.870 | 0.749 |
0.023 |
| 90 | 70 | 90 | 0.997 | 0.994 | 0.000 | 0.897 | 0.789 |
0.037 |
| 90 | 70 | 100 | 0.998 | 0.994 | 0.000 | 0.952 | 0.899 |
0.007 |
| 90 | 80 | 10 | 0.732 | 0.536 | 0.072 | 0.523 | 0.341 |
0.693 |
| 90 | 80 | 20 | 0.633 | 0.401 | 0.135 | 0.201 | -0.006 |
0.850 |
| 90 | 80 | 30 | 0.768 | 0.584 | 0.058 | 0.554 | 0.276 |
0.293 |
| 90 | 80 | 40 | 0.926 | 0.853 | 0.007 | 0.698 | 0.491 |
0.093 |
| 90 | 80 | 50 | 0.947 | 0.897 | 0.003 | 0.787 | 0.619 |
0.045 |
| 90 | 80 | 60 | 0.992 | 0.983 | 0.000 | 0.813 | 0.663 |
0.035 |
| 90 | 80 | 70 | 0.991 | 0.980 | 0.001 | 0.730 | 0.539 |
0.078 |
| 90 | 80 | 80 | 0.992 | 0.986 | 0.001 | 0.786 | 0.619 |

0.046 |
| 90 | 80 | 90 | 1.005 | 1.010 | 0.000 | 0.817 | 0.659 |
0.040 |
| 90 | 80 | 100 | 1.003 | 1.007 | 0.000 | 0.899 | 0.813 |
0.012 |
| 90 | 90 | 10 | 0.531 | 0.268 | 0.239 | -0.068 | 0.009 |
1.142 |
| 90 | 90 | 20 | 0.825 | 0.676 | 0.033 | 0.604 | 0.387 |
0.210 |
| 90 | 90 | 30 | 0.921 | 0.849 | 0.006 | 0.808 | 0.624 |
0.120 |
| 90 | 90 | 40 | 0.938 | 0.881 | 0.004 | 0.653 | 0.433 |
0.126 |
| 90 | 90 | 50 | 0.920 | 0.843 | 0.008 | 0.685 | 0.457 |
0.113 |
| 90 | 90 | 60 | 0.985 | 0.968 | 0.000 | 0.805 | 0.661 |
0.054 |
| 90 | 90 | 70 | 0.985 | 0.968 | 0.001 | 0.783 | 0.630 |
0.076 |
| 90 | 90 | 80 | 0.979 | 0.961 | 0.001 | 0.793 | 0.635 |
0.047 |
| 90 | 90 | 90 | 0.999 | 0.999 | 0.000 | 0.854 | 0.733 |
0.022 |
| 90 | 90 | 100 | 0.991 | 0.982 | 0.000 | 0.868 | 0.743 |
0.029 |
| 90 | 100 | 10 | 0.630 | 0.393 | 0.138 | 0.036 | 0.036 |
1.049 |
| 90 | 100 | 20 | 0.853 | 0.725 | 0.022 | 0.700 | 0.459 |
0.193 |
| 90 | 100 | 30 | 0.946 | 0.893 | 0.003 | 0.678 | 0.459 |
0.104 |
| 90 | 100 | 40 | 0.894 | 0.799 | 0.011 | 0.673 | 0.439 |
0.128 |
| 90 | 100 | 50 | 0.971 | 0.942 | 0.001 | 0.781 | 0.628 |
0.080 |
| 90 | 100 | 60 | 0.960 | 0.923 | 0.002 | 0.735 | 0.549 |
0.076 |
| 90 | 100 | 70 | 0.995 | 0.989 | 0.000 | 0.710 | 0.502 |
0.084 |
| 90 | 100 | 80 | 1.004 | 1.007 | 0.000 | 0.748 | 0.554 |
0.067 |
| 90 | 100 | 90 | 0.999 | 0.998 | 0.000 | 0.842 | 0.709 |
0.025 |
| 90 | 100 | 100 | 1.006 | 1.011 | 0.000 | 0.849 | 0.724 |
0.024 |
| 100 | 10 | 10 | 0.874 | 0.775 | 0.027 | 0.520 | 0.252 |
0.264 |
| 100 | 10 | 20 | 0.941 | 0.888 | 0.004 | 0.697 | 0.466 |

0.132 |
| 100 | 10 | 30 | 0.993 | 0.988 | 0.000 | 0.870 | 0.759 |
0.017 |
| 100 | 10 | 40 | 0.998 | 0.995 | 0.000 | 0.976 | 0.963 |
0.010 |
| 100 | 10 | 50 | 1.004 | 1.009 | 0.000 | 0.976 | 0.949 |
0.002 |
| 100 | 10 | 60 | 1.000 | 1.001 | 0.000 | 0.997 | 0.992 |
0.000 |
| 100 | 10 | 70 | 1.004 | 1.008 | 0.000 | 1.005 | 1.008 |
0.000 |
| 100 | 10 | 80 | 1.003 | 1.006 | 0.000 | 0.980 | 0.960 |
0.000 |
| 100 | 10 | 90 | 0.999 | 0.997 | 0.000 | 0.978 | 0.957 |
0.000 |
| 100 | 10 | 100 | 0.997 | 0.994 | 0.000 | 0.989 | 0.979 |
0.000 |
| 100 | 20 | 10 | 0.718 | 0.512 | 0.081 | -0.070 | 0.004 |
1.145 |
| 100 | 20 | 20 | 0.988 | 0.979 | 0.001 | 0.864 | 0.745 |
0.019 |
| 100 | 20 | 30 | 1.001 | 1.001 | 0.000 | 0.850 | 0.737 |
0.044 |
| 100 | 20 | 40 | 0.982 | 0.965 | 0.000 | 0.929 | 0.851 |
0.020 |
| 100 | 20 | 50 | 0.997 | 0.995 | 0.000 | 0.957 | 0.920 |
0.003 |
| 100 | 20 | 60 | 0.995 | 0.990 | 0.000 | 0.934 | 0.873 |
0.004 |
| 100 | 20 | 70 | 0.996 | 0.991 | 0.000 | 0.991 | 0.986 |
0.001 |
| 100 | 20 | 80 | 1.001 | 1.002 | 0.000 | 1.019 | 1.035 |
0.001 |
| 100 | 20 | 90 | 0.999 | 0.999 | 0.000 | 0.998 | 0.994 |
0.001 |
| 100 | 20 | 100 | 0.999 | 0.998 | 0.000 | 0.975 | 0.950 |
0.001 |
| 100 | 30 | 10 | 0.875 | 0.779 | 0.032 | 0.560 | 0.308 |
0.196 |
| 100 | 30 | 20 | 0.934 | 0.871 | 0.005 | 0.761 | 0.566 |
0.074 |
| 100 | 30 | 30 | 0.992 | 0.984 | 0.000 | 0.939 | 0.874 |
0.009 |
| 100 | 30 | 40 | 0.979 | 0.959 | 0.000 | 0.810 | 0.648 |
0.045 |
| 100 | 30 | 50 | 0.996 | 0.993 | 0.000 | 0.755 | 0.576 |
0.065 |
| 100 | 30 | 60 | 0.995 | 0.990 | 0.000 | 0.892 | 0.790 |

0.015 |
| 100 | 30 | 70 | 1.000 | 1.001 | 0.000 | 0.992 | 0.989 |
0.002 |
| 100 | 30 | 80 | 1.007 | 1.014 | 0.000 | 1.018 | 1.042 |
0.004 |
| 100 | 30 | 90 | 1.005 | 1.011 | 0.000 | 0.970 | 0.939 |
0.001 |
| 100 | 30 | 100 | 1.003 | 1.006 | 0.000 | 0.949 | 0.901 |
0.003 |
| 100 | 40 | 10 | 0.763 | 0.573 | 0.064 | 0.519 | 0.249 |
0.272 |
| 100 | 40 | 20 | 0.924 | 0.854 | 0.006 | 0.796 | 0.637 |
0.043 |
| 100 | 40 | 30 | 0.914 | 0.834 | 0.008 | 0.716 | 0.519 |
0.085 |
| 100 | 40 | 40 | 0.994 | 0.989 | 0.000 | 0.886 | 0.783 |
0.014 |
| 100 | 40 | 50 | 1.012 | 1.025 | 0.000 | 0.952 | 0.898 |
0.009 |
| 100 | 40 | 60 | 1.007 | 1.014 | 0.000 | 0.982 | 0.969 |
0.003 |
| 100 | 40 | 70 | 1.007 | 1.013 | 0.000 | 0.879 | 0.775 |
0.015 |
| 100 | 40 | 80 | 1.003 | 1.007 | 0.000 | 0.947 | 0.893 |
0.004 |
| 100 | 40 | 90 | 1.001 | 1.001 | 0.000 | 0.970 | 0.937 |
0.003 |
| 100 | 40 | 100 | 1.002 | 1.004 | 0.000 | 0.974 | 0.955 |
0.004 |
| 100 | 50 | 10 | 0.750 | 0.562 | 0.063 | 0.621 | 0.410 |
0.206 |
| 100 | 50 | 20 | 0.970 | 0.942 | 0.001 | 0.727 | 0.525 |
0.076 |
| 100 | 50 | 30 | 0.959 | 0.922 | 0.002 | 0.833 | 0.705 |
0.041 |
| 100 | 50 | 40 | 0.994 | 0.988 | 0.000 | 0.799 | 0.640 |
0.040 |
| 100 | 50 | 50 | 1.003 | 1.006 | 0.000 | 0.952 | 0.898 |
0.008 |
| 100 | 50 | 60 | 0.998 | 0.994 | 0.000 | 0.889 | 0.800 |
0.022 |
| 100 | 50 | 70 | 0.999 | 0.999 | 0.000 | 0.854 | 0.725 |
0.024 |
| 100 | 50 | 80 | 1.003 | 1.006 | 0.000 | 0.921 | 0.852 |
0.008 |
| 100 | 50 | 90 | 1.003 | 1.006 | 0.000 | 0.971 | 0.952 |
0.007 |
| 100 | 50 | 100 | 0.998 | 0.995 | 0.000 | 0.987 | 0.969 |

0.003 |
| 100 | 60 | 10 | 0.687 | 0.465 | 0.103 | 0.471 | 0.182 |
0.436 |
| 100 | 60 | 20 | 0.652 | 0.431 | 0.124 | 0.208 | 0.059 |
0.651 |
| 100 | 60 | 30 | 0.967 | 0.930 | 0.003 | 0.797 | 0.622 |
0.060 |
| 100 | 60 | 40 | 1.008 | 1.016 | 0.000 | 0.787 | 0.610 |
0.054 |
| 100 | 60 | 50 | 0.990 | 0.981 | 0.000 | 0.934 | 0.861 |
0.018 |
| 100 | 60 | 60 | 0.975 | 0.950 | 0.001 | 0.744 | 0.554 |
0.065 |
| 100 | 60 | 70 | 1.002 | 1.004 | 0.000 | 0.939 | 0.873 |
0.011 |
| 100 | 60 | 80 | 0.996 | 0.992 | 0.000 | 0.870 | 0.771 |
0.036 |
| 100 | 60 | 90 | 0.998 | 0.997 | 0.000 | 0.932 | 0.868 |
0.005 |
| 100 | 60 | 100 | 1.004 | 1.007 | 0.000 | 0.908 | 0.824 |
0.009 |
| 100 | 70 | 10 | 0.571 | 0.325 | 0.184 | 0.185 | 0.017 |
0.692 |
| 100 | 70 | 20 | 0.804 | 0.644 | 0.039 | 0.561 | 0.320 |
0.196 |
| 100 | 70 | 30 | 0.894 | 0.800 | 0.011 | 0.649 | 0.429 |
0.129 |
| 100 | 70 | 40 | 1.005 | 1.010 | 0.000 | 0.825 | 0.678 |
0.032 |
| 100 | 70 | 50 | 0.988 | 0.978 | 0.000 | 0.822 | 0.689 |
0.050 |
| 100 | 70 | 60 | 0.998 | 0.996 | 0.000 | 0.816 | 0.670 |
0.036 |
| 100 | 70 | 70 | 0.993 | 0.987 | 0.000 | 0.879 | 0.770 |
0.015 |
| 100 | 70 | 80 | 1.001 | 1.002 | 0.000 | 0.923 | 0.843 |
0.014 |
| 100 | 70 | 90 | 0.997 | 0.996 | 0.000 | 0.878 | 0.759 |
0.027 |
| 100 | 70 | 100 | 1.000 | 1.001 | 0.000 | 0.979 | 0.964 |
0.003 |
| 100 | 80 | 10 | 0.747 | 0.555 | 0.065 | 0.531 | 0.274 |
0.226 |
| 100 | 80 | 20 | 0.801 | 0.636 | 0.043 | 0.572 | 0.326 |
0.183 |
| 100 | 80 | 30 | 0.873 | 0.774 | 0.031 | 0.510 | 0.248 |
0.254 |
| 100 | 80 | 40 | 0.979 | 0.950 | 0.006 | 0.711 | 0.488 |

0.114 |
| 100 | 80 | 50 | 0.988 | 0.976 | 0.000 | 0.804 | 0.643 |
0.039 |
| 100 | 80 | 60 | 1.022 | 1.044 | 0.001 | 0.772 | 0.607 |
0.064 |
| 100 | 80 | 70 | 0.997 | 0.993 | 0.000 | 0.894 | 0.790 |
0.019 |
| 100 | 80 | 80 | 0.983 | 0.966 | 0.000 | 0.812 | 0.651 |
0.043 |
| 100 | 80 | 90 | 0.991 | 0.982 | 0.000 | 0.856 | 0.740 |
0.025 |
| 100 | 80 | 100 | 0.998 | 0.995 | 0.000 | 0.850 | 0.715 |
0.027 |
| 100 | 90 | 10 | 0.708 | 0.509 | 0.091 | 0.133 | 0.029 |
0.766 |
| 100 | 90 | 20 | 0.816 | 0.664 | 0.034 | 0.692 | 0.508 |
0.184 |
| 100 | 90 | 30 | 0.891 | 0.796 | 0.012 | 0.587 | 0.355 |
0.182 |
| 100 | 90 | 40 | 0.949 | 0.899 | 0.003 | 0.728 | 0.549 |
0.108 |
| 100 | 90 | 50 | 1.004 | 1.010 | 0.001 | 0.779 | 0.598 |
0.058 |
| 100 | 90 | 60 | 1.003 | 1.003 | 0.001 | 0.822 | 0.667 |
0.040 |
| 100 | 90 | 70 | 0.971 | 0.939 | 0.003 | 0.751 | 0.556 |
0.068 |
| 100 | 90 | 80 | 0.998 | 0.995 | 0.000 | 0.816 | 0.667 |
0.034 |
| 100 | 90 | 90 | 0.970 | 0.944 | 0.001 | 0.759 | 0.567 |
0.066 |
| 100 | 90 | 100 | 1.000 | 1.000 | 0.000 | 0.850 | 0.726 |
0.023 |
| 100 | 100 | 10 | 0.437 | 0.206 | 0.340 | 0.027 | -0.049 |
1.198 |
| 100 | 100 | 20 | 0.836 | 0.697 | 0.027 | 0.420 | 0.191 |
0.358 |
| 100 | 100 | 30 | 0.852 | 0.726 | 0.022 | 0.671 | 0.442 |
0.115 |
| 100 | 100 | 40 | 0.938 | 0.878 | 0.004 | 0.699 | 0.485 |
0.092 |
| 100 | 100 | 50 | 0.984 | 0.972 | 0.001 | 0.728 | 0.530 |
0.074 |
| 100 | 100 | 60 | 0.939 | 0.886 | 0.005 | 0.736 | 0.538 |
0.071 |
| 100 | 100 | 70 | 1.006 | 1.011 | 0.000 | 0.817 | 0.650 |
0.067 |
| 100 | 100 | 80 | 1.001 | 1.002 | 0.000 | 0.862 | 0.738 |

```
0.022 |
|    100 | 100 |  90 |    0.998 |    0.998 |         0.000 |   0.970 |   0.930 |
0.015 |
|    100 | 100 | 100 |    0.989 |    0.978 |         0.000 |   0.839 |   0.704 |
0.026 |
```

4 Plotando

4.1 Criando o data frame

[77]:
```
import pandas as pd

data = []

for (quantidade_geracoes, quant_pais, quant_filhos, (best_individuo,␣
 ↪avg_individuo)) in results:
    data.append({
        'Quantidade Gerações': quantidade_geracoes,
        'Quant Pais': quant_pais,
        'Quant Filhos': quant_filhos,
        # Assuming this is accessible and meaningful (e.g., a list or tuple of␣
 ↪parameters)
        'Best Genotipo': best_individuo.genotipo,
        'Best Fitness': best_individuo.get_fenotipo(),
        # Similarly, assuming this is a list or tuple
        'Average Genotipo': avg_individuo.genotipo,
        'Average Fitness': avg_individuo.get_fenotipo()
    })

df = pd.DataFrame(data)

df[['Best x', 'Best y']] = pd.DataFrame(
    df['Best Genotipo'].tolist(), index=df.index)

df[['Avg x', 'Avg y']] = pd.DataFrame(
    df['Average Genotipo'].tolist(), index=df.index)

df.drop(['Best Genotipo', 'Average Genotipo'], axis=1, inplace=True)

# Display the first few rows to verify
print(df.head())
```

```
   Quantidade Gerações  Quant Pais  Quant Filhos  Best Fitness  \
0                   10          10            10      0.127703
1                   10          10            20      0.135645
2                   10          10            30      0.019259
3                   10          10            40      0.176871
```

```
4                    10          10             50      0.535510

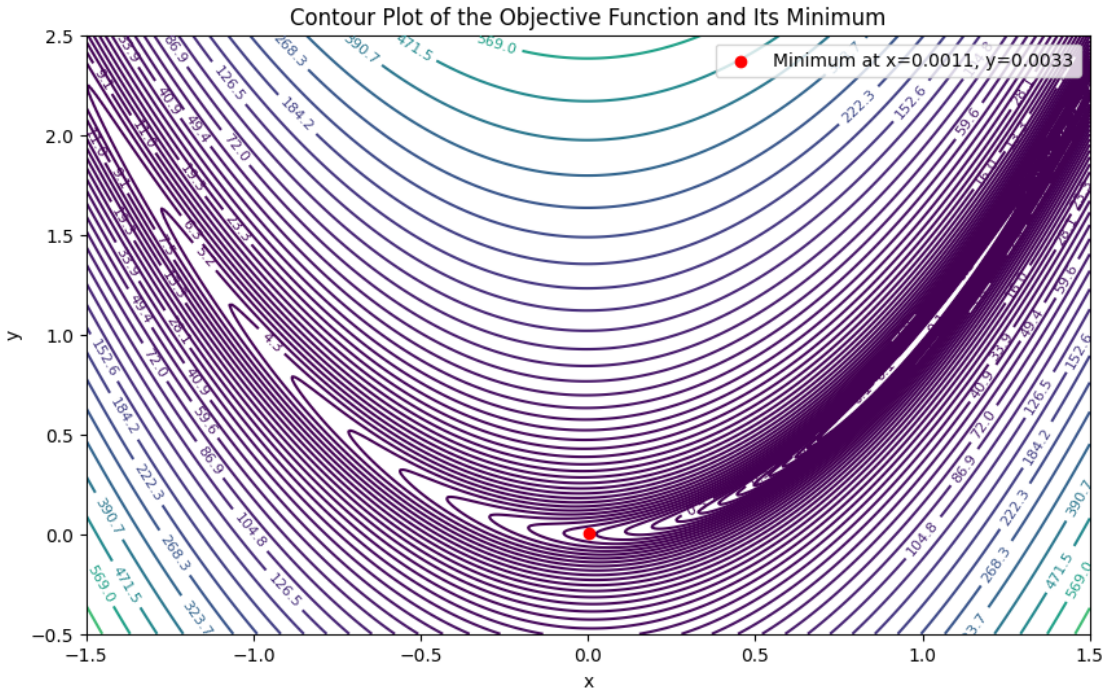
   Average Fitness    Best x    Best y     Avg x     Avg y
0         0.851476  0.642649  0.412824  0.656832  0.345771
1         0.335884  0.636384  0.410840  0.433178  0.199725
2         0.105215  0.869875  0.751860  0.685736  0.478267
3         0.450188  0.601180  0.348071  0.329159  0.109615
4         1.239609  0.272969  0.066184 -0.062630 -0.029308
```

4.2 Plotando o gráfico

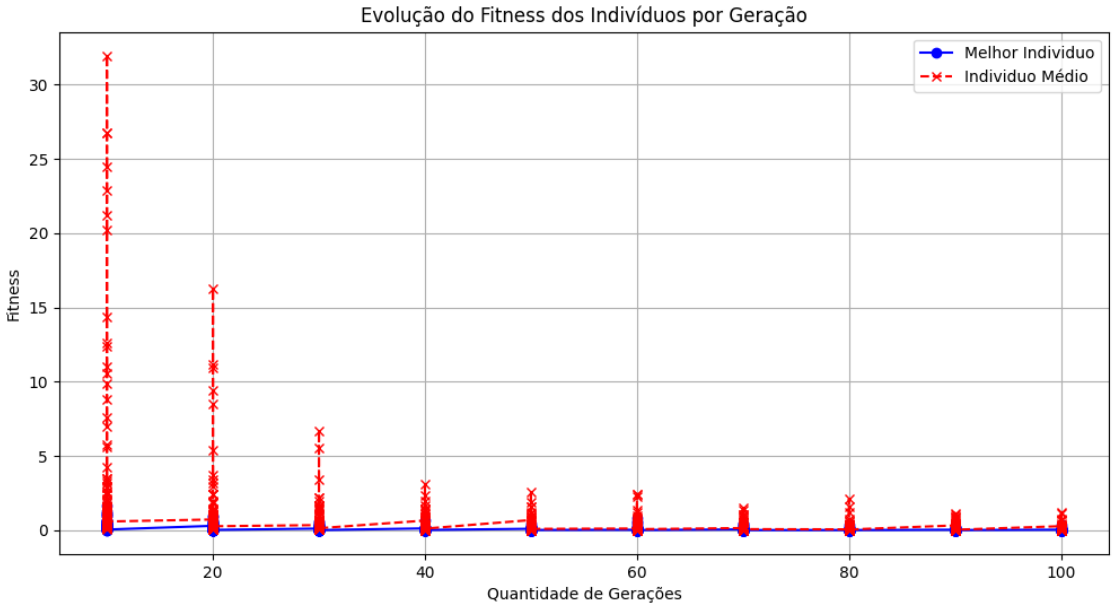
[78]:
```python
import numpy as np
import matplotlib.pyplot as plt
from scipy.optimize import minimize

def fn_objetivo(xy):
    x, y = xy
    return (1-x)**2 + 100*(y-x**2)**2

constraints = [
    {'type': 'ineq', 'fun': lambda xy: -((xy[0]-1)**3 - xy[1] + 1)},  # (x-1)^3 - y + 1 <= 0
    {'type': 'ineq', 'fun': lambda xy: -(xy[0] + xy[1] - 2)}  # x + y - 2 <= 0
]

bounds = [(-1.5, 1.5), (-0.5, 2.5)]

initial_guess = [0, 0]

resultado = minimize(fn_objetivo, initial_guess, method='SLSQP', bounds=bounds, constraints=constraints)

solution = resultado.x
valor_minimo = resultado.fun

print(f"Solution: x = {solution[0]:.4f}, y = {solution[1]:.4f}")
print(f"Minimum value of the objective function: {valor_minimo:.4f}")

x = np.linspace(-1.5, 1.5, 400)
y = np.linspace(-0.5, 2.5, 400)
X, Y = np.meshgrid(x, y)
Z = (1-X)**2 + 100*(Y-X**2)**2

plt.figure(figsize=(10, 6))
contours = plt.contour(X, Y, Z, levels=np.logspace(-1, 3, 50), cmap='viridis')
plt.clabel(contours, inline=True, fontsize=8)
```

```
plt.scatter(solution[0], solution[1], color='red', zorder=5, label=f"Minimum at␣
 ↪x={solution[0]:.4f}, y={solution[1]:.4f}")
plt.title('Contour Plot of the Objective Function and Its Minimum')
plt.xlabel('x')
plt.ylabel('y')
plt.legend()
plt.show()
```

```
Solution: x = 0.0011, y = 0.0033
Minimum value of the objective function: 0.9989
```



[79]:
```
# Plotting the evolution of fitness values across generations
plt.figure(figsize=(12, 6))
plt.plot(df['Quantidade Gerações'], df['Best Fitness'],
         label='Melhor Individuo', marker='o', linestyle='-', color='blue')
plt.plot(df['Quantidade Gerações'], df['Average Fitness'],
         label='Individuo Médio', marker='x', linestyle='--', color='red')

plt.title('Evolução do Fitness dos Indivíduos por Geração')
plt.xlabel('Quantidade de Gerações')
plt.ylabel('Fitness')
plt.legend()
plt.grid(True)
plt.show()
```


Evolução do Fitness dos Indivíduos por Geração
Melhor Individuo
Individuo Médio
Fitness
Quantidade de Gerações
0
5
10
15
20
25
30
20
40
60
80
100