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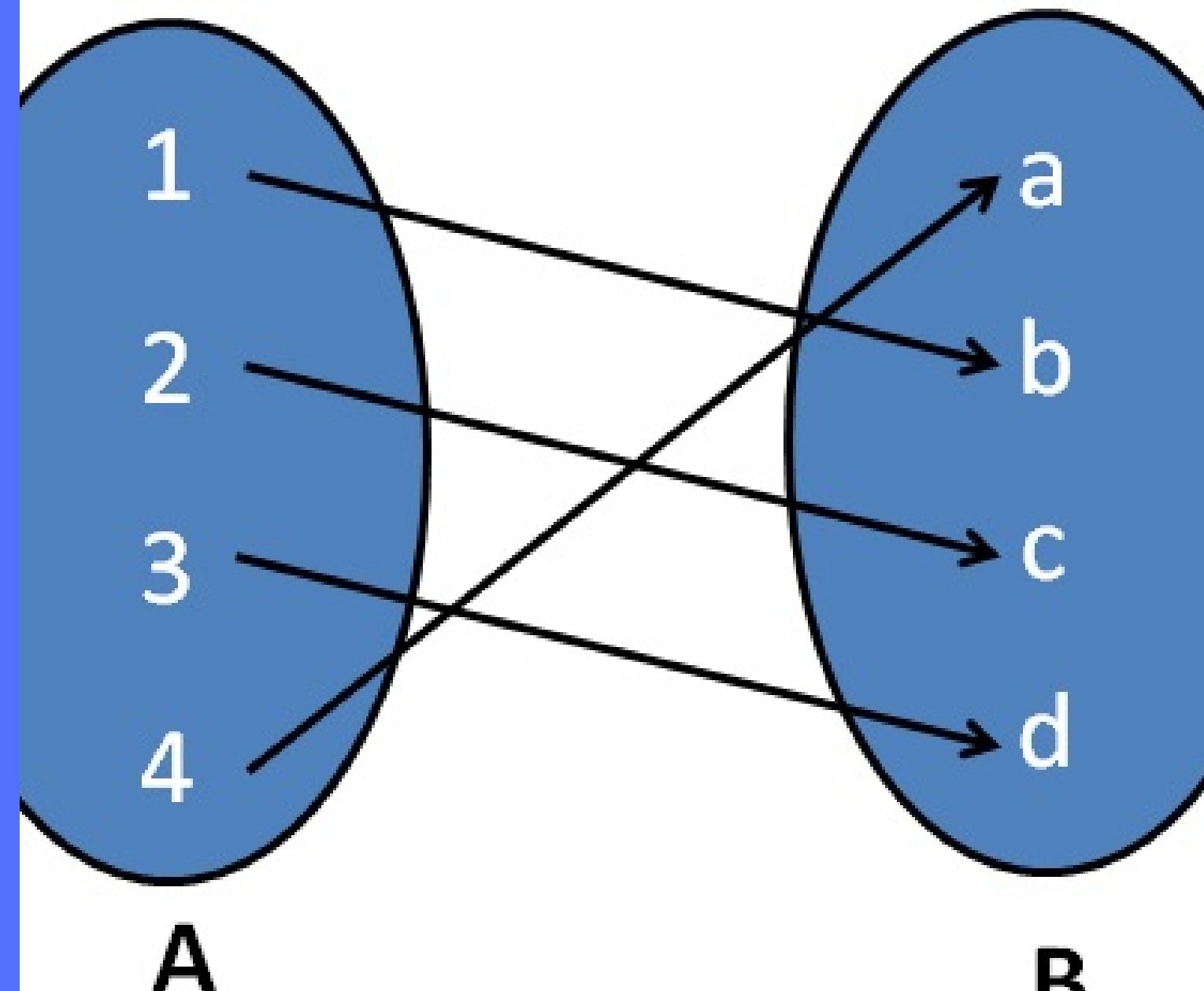
**3RD SEM
DMSEL**

CALCULATION OF NO. OF ONTO FUNCTIONS

INTRODUCTION

WHAT IS AN ONTO FUNCTION?





teacho

DEFINITION

A SURJECTIVE (ONTO) FUNCTION IS A FUNCTION F SUCH THAT EVERY ELEMENT Y CAN BE MAPPED FROM ELEMENT X SO THAT $F(X) = Y$.

- Range = Co-Domain
- *Every element of the function's codomain is the image of atleast one element of its domain.*

CODE

PYTHON PROGRAM EXPLANATION



1

FUNCTION DEFINITION

The code defines a function that generates all onto functions from a finite set S to another finite set T .

2

CUSTOMIZATION

`permutations` generates all permutations of T of length n if `repeated` is `False`, and `product` generates all possible combinations of length n of T if `repeated` is `True`.

3

RETURN VALUE

The function returns the total number of onto functions and a list of all the mappings. An example usage prompts the user for whether to allow repeated elements in the mappings and prints the results.

```
from itertools import permutations, product

def calculate_onto_functions(S, T, repeated=False):

    # Calculate the number of onto functions from S to T
    n = len(S)
    m = len(T)
    num_onto = m ** n

    # List all of the onto functions from S to T
    onto = []
    if not repeated:
        for t in permutations(T, n):
            onto.append(dict(zip(S, t)))
    else:
        for t in product(T, repeat=n):
            onto.append(dict(zip(S, t)))

    return num_onto, onto

# Example usage
S = {1, 2, 3}
T = {'a', 'b', 'c', 'd'}

repeated = input(
    "Allow repeated elements in the onto functions? (y/n): ")
repeated = repeated.lower() == 'y'

num_onto, onto = calculate_onto_functions(S, T, repeated)

print("Number of onto functions from S to T:", num_onto)

# Display all of the onto functions
print("All of the onto functions from S to T:")
for f in onto:
    print(f)
```

OUTPUT

WITH REPEATED = FALSE

```
Allow repeated elements in the onto functions? (y/n): n
Number of onto functions from S to T: 64
All of the onto functions from S to T:
{1: 'd', 2: 'b', 3: 'a'}
{1: 'd', 2: 'b', 3: 'c'}
{1: 'd', 2: 'a', 3: 'b'}
{1: 'd', 2: 'a', 3: 'c'}
{1: 'd', 2: 'c', 3: 'b'}
{1: 'd', 2: 'c', 3: 'a'}
{1: 'b', 2: 'd', 3: 'a'}
{1: 'b', 2: 'd', 3: 'c'}
{1: 'b', 2: 'a', 3: 'd'}
{1: 'b', 2: 'a', 3: 'c'}
{1: 'b', 2: 'c', 3: 'd'}
{1: 'b', 2: 'c', 3: 'a'}
{1: 'a', 2: 'd', 3: 'b'}
{1: 'a', 2: 'd', 3: 'c'}
{1: 'a', 2: 'b', 3: 'd'}
{1: 'a', 2: 'b', 3: 'c'}
{1: 'a', 2: 'c', 3: 'd'}
{1: 'a', 2: 'c', 3: 'b'}
{1: 'c', 2: 'd', 3: 'b'}
{1: 'c', 2: 'd', 3: 'a'}
{1: 'c', 2: 'b', 3: 'd'}
{1: 'c', 2: 'b', 3: 'a'}
{1: 'c', 2: 'a', 3: 'd'}
{1: 'c', 2: 'a', 3: 'b'}
```

WITH REPEATED = TRUE

```
{1: 'c', 2: 'c', 3: 'c'}
{1: 'c', 2: 'c', 3: 'd'}
{1: 'c', 2: 'c', 3: 'b'}
{1: 'c', 2: 'c', 3: 'a'}
{1: 'c', 2: 'd', 3: 'c'}
{1: 'c', 2: 'd', 3: 'd'}
{1: 'c', 2: 'd', 3: 'b'}
{1: 'c', 2: 'd', 3: 'a'}
{1: 'c', 2: 'b', 3: 'c'}
{1: 'c', 2: 'b', 3: 'd'}
{1: 'c', 2: 'b', 3: 'a'}
{1: 'c', 2: 'a', 3: 'c'}
{1: 'c', 2: 'a', 3: 'd'}
{1: 'c', 2: 'a', 3: 'b'}
{1: 'd', 2: 'c', 3: 'c'}
{1: 'd', 2: 'c', 3: 'd'}
{1: 'd', 2: 'c', 3: 'b'}
{1: 'd', 2: 'c', 3: 'a'}
{1: 'd', 2: 'd', 3: 'c'}
{1: 'd', 2: 'd', 3: 'd'}
{1: 'd', 2: 'd', 3: 'b'}
{1: 'd', 2: 'd', 3: 'a'}
{1: 'd', 2: 'b', 3: 'c'}
{1: 'd', 2: 'b', 3: 'd'}
{1: 'd', 2: 'b', 3: 'a'}
{1: 'd', 2: 'a', 3: 'c'}
{1: 'd', 2: 'a', 3: 'd'}
{1: 'd', 2: 'a', 3: 'b'}
{1: 'b', 2: 'c', 3: 'c'}
{1: 'b', 2: 'c', 3: 'd'}
{1: 'b', 2: 'c', 3: 'b'}
{1: 'b', 2: 'c', 3: 'a'}
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{1: 'b', 2: 'd', 3: 'd'}
{1: 'b', 2: 'd', 3: 'b'}
{1: 'b', 2: 'd', 3: 'a'}
{1: 'b', 2: 'b', 3: 'c'}
{1: 'b', 2: 'b', 3: 'd'}
{1: 'b', 2: 'b', 3: 'a'}
{1: 'b', 2: 'a', 3: 'c'}
{1: 'b', 2: 'a', 3: 'd'}
{1: 'b', 2: 'a', 3: 'b'}
{1: 'a', 2: 'c', 3: 'c'}
{1: 'a', 2: 'c', 3: 'd'}
{1: 'a', 2: 'c', 3: 'b'}
{1: 'a', 2: 'c', 3: 'a'}
{1: 'a', 2: 'd', 3: 'c'}
{1: 'a', 2: 'd', 3: 'd'}
{1: 'a', 2: 'd', 3: 'b'}
{1: 'a', 2: 'd', 3: 'a'}
{1: 'a', 2: 'b', 3: 'c'}
{1: 'a', 2: 'b', 3: 'd'}
{1: 'a', 2: 'b', 3: 'a'}
{1: 'a', 2: 'a', 3: 'c'}
{1: 'a', 2: 'a', 3: 'd'}
{1: 'a', 2: 'a', 3: 'b'}
```

CODEBASE LINK

$x^3 + x^2 + y^3 + z^3 + xyz - 6 = 0$

 $\sin x \cdot \cos x$
 $\sin x$
 $\cos x$
 $\mathbf{x}_2 = \begin{pmatrix} -\lambda \\ \beta \\ -\delta \end{pmatrix}$
 $\sum_{i=0}^n (P_2(x_i) - y_i)^2$
 $\int \int \int_M z dx dy dz = \int_0^{\pi} \left(\int_0^2 \left(\int_{\frac{1}{2}}^1 n r dr \right) dn \right) dp$
 $2 \arctan x - x = 0, I = (1, 10)$
 $\int_{-\pi/2}^{\pi/2} \sin^4 x \cdot \cos^3 x dx$
 $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$
 $\frac{\partial z}{\partial x} = 2, \frac{\partial z}{\partial y} = 0, \vec{n} = (F_x, F_y, F_z)$
 $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 0$
 $\sin^2 x = 2 \sin x \cdot \cos x$

 $|Z| = \sqrt{a^2 + b^2}$
 $\frac{\partial f}{\partial x} = 16 - x^2 + 16y^2 - 4z > 0$
 $\int 3x^2 + 16y^2 dx \lim_{n \rightarrow +\infty} \left(1 + \frac{3}{n}\right)^n$
 $g' \text{ of } f = \left(\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y} \right)$
 $Y_{i+1} = Y_i + b \cdot K_2$
 $B = \begin{pmatrix} 2 & 1 & -1 & 0 \\ 3 & 0 & -1 & 2 \end{pmatrix}$
 $\sum_{i=0}^n (P_2(x_i) - y_i)^2$
 $\operatorname{tg} 2x = \frac{2 \operatorname{tg} x}{1 - \operatorname{tg}^2 x}$
 $\operatorname{tg} x = \frac{\sin x}{\cos x}$
 $\lambda x - y + z = 1$
 $x + \lambda y + z = \lambda$
 $x + y + \lambda z = \lambda^2$
 $\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} = \frac{c}{\sin \gamma}$
 $y = \sqrt[3]{x+1}, x = \operatorname{tg} t$
 $\operatorname{tg} x = \frac{\sin x}{\cos x}$
 $\operatorname{tg} x \cdot \operatorname{cotg} x = 1$
 $\operatorname{tg} \frac{x}{2} = \frac{1 - \cos x}{\sin x} = \frac{\sin x}{1 + \cos x}$
 $F_z = 2xyz - 1 = 1$
 $\mathbf{x}_1 = \begin{pmatrix} 2p \\ -p \\ 0 \end{pmatrix}$
 $y = x^3$
 $y = x^2$
 $(1+e^x) yy' = e^x$
 $y(1) = 1$
 $\cos 2x = \cos^2 x - \sin^2 x$
 $A+B+C=8$
 $-3A-7B+2C=-10,3$
 $-18A+6B-3C=15$
 $\operatorname{tg}^2 x + \operatorname{cotg}^2 x = 1$
 $\int_R(x, y) \frac{s}{(x+y)^2} dx$
 $\frac{\sin x}{x} \leq \frac{x}{x} = 1$
 $\lambda_2 = i\sqrt{14}$
 $e^x - xy^2 = e, A[0; e; 1]$
 $\lim_{x \rightarrow 0} \frac{e^{2x}-1}{5x} = \frac{2}{5}$
 $|x| + |\beta| \neq 0, |\gamma| \neq 0$
 $\frac{2x}{x^2 + 2y^2} = 2$
 $z = \frac{1}{x} \arcsin \frac{\sqrt{2}}{2}$
 $\eta_1 = \lambda_1^2 - 3\lambda_1 + 1 \neq 0$
 $\sin(x+y) = \sin x \cos y + \cos x \sin y$
 $y' - \frac{\sqrt{y}}{x+2} = 0, y(0) = 1$
 $A = \begin{pmatrix} x, 1+x^2, 1 \\ y, 1+y^2, 1 \\ z, 1+z^2, 1 \end{pmatrix}, x=0, y=1, z=2$
 $A = [1; 0; 3]$
 $\cos \rho = \frac{(1, 0), (\frac{1}{2\sqrt{3}}, \frac{1}{4\sqrt{3}})}{\sqrt{\frac{1}{12} + \frac{1}{48}}}$
 $b^2 = c \cdot c_6$
 $a^2 = c \cdot c_8$

Hardvan/DMS-EL-Onto-Function

Contribute to Hardvan/DMS-EL-Onto-Functions development by creating an account on GitHub.



[HTTPS://GITHUB.COM/HARDVAN/DMS-EL-ONTO-FUNCTIONS](https://github.com/hardvan/dms-el-onto-functions)



THANK YOU