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**EXPLANATION**

Linear transformation T: U V is a function that carries element of the vector space U(domain) to vector space V(co-domain) and which has 2 properties:

Additive property: T(U1 + U2) = T(U1) + T(U2)

Multiplicative property: T(αU) = αT(U)

In linear transformation, the ovals represents the vector spaces and a small dot inside the ovals represents the vectors. The oval on the left represents the domain and that on the right represents the codomain. To convey that the linear transformation associates a certain input with a certain output we draw an arrow from the input to the output. In the linear transformation a vector space can have more elements than the other vector space and we also see that it is possible for one or more inputs not to be associated with any output. And it is also possible for one or more inputs to be associated with one output and it is also possible for all inputs to be associated with all outputs and the number of elements in both ovals to be equal.

**EXAMPLES**

1. T(X) = QX

T(X) = 2 -3 5 8

-1 4 1 3

6 8 2 1

T(X) = 8 2 + 3 -3 + 1 5

-1 4 1

6 8 2

T(X) = 16 + -9 + 5

-8 12 1

48 24 2

T(X) = 12

5

74

Hence, transformation of 8 gives 12

3 5

1. 74
2. Considering the 2 vector spaces F and Y below. Where F is the domain containing 8 elements and Y is the codomain containing 6.

**F Y**

**B . . 9**

**Z . . 1**

**U . . 4**

**W . . C**

**A . . T**

**P**  **. . H**

**I .**

**J .**

**Domain Codomain**

**T : F Y**

T(B) = T(A) = 4

T(Z) = C

T(U) = 9

T(W) = 1

T(P) = T

1. Transform 6 elements in W to 4 elements in Q. Where W is the domain containing 7 elements and Q is the codomain containing 4 elements.

**W Q**

**T . . 8**

**9 . . X**

**U . . 4**

**M . . 3**

**R .**

**7 .**

**0 .**

**Domain Codomain**

**T : W Q**

T(T) = T(R) = 4

T(9) = 3

T(U) = T(7) = 8

T(M) = X

1. T(X) = AX

T(X) = 3 0 1 a

4 6 5 b

7 1 1 c

T(X) = a 3 + b 0 + c 1

4 6 5

7 1 1

T(X) = 3a + 0b + c

4a 6b 5c

7a b c

T(X) = 3a + 0b + c

4a + 6b + 5c

7a + b + c

Hence, transformation of a gives 3a + 0b + c

b 4a + 6b + 5c

c 7a + b + c

1. T(X) = BX

T(X) = 3 0 1 1

4 6 5 2

7 1 1 3

T(X) = 1 3 + 2 0 + 3 1

4 6 5

7 1 1

T(X) = 3 + 0 + 3

4 12 15

7 2 3

T(X) = 6

31

12

Hence, transformation of 1 gives 6

2 31

3 12