

ITM107

Subsets, Functions, Relations, Matrices

SETS AND SETS OPERATIONS

- A set is a defined collection of objects: Elements or Members of the set
ie. $A = \{1,2,3,4\}$ - a set is just a collection of certain features, colours - but you give it a meaning.
- A set can also be **finite** (ie. $B = \{x,y,z\}$ and xyz could represent color, size and brand for example.
- A **infinite set**: You won't be able to add all the numbers, because it's infinite so you can add "..." as the rest of the set is obvious and natural
- EXAMPLE 1: $A = \{1,2,3,4,5\}$ expl: $\{x:x \text{ is a natural number less than } 6\}$
- EXAMPLE 2: $\{11,12,13,14,\dots\}$ expl: $b = \{x:x \text{ is a natural number greater than } 10\}$
- EXAMPLE 3: $\{C=3\}$ EXPLANATION C: $\{x:x=3\}$

Relation between two sets:

- Set can be equal and the order of the element does not matter. When you have no set - it means it is a part of everything

The universal U

You are essentially describing what is there in the sets

E meant **EQUAL**

U means **UNION**

All items are represented by "x"

C&D: 3

C&P: 10

D&P: 7

P/c/d 2

The universe has to clearly be defined otherwise you cannot calculate. ie. you take all the information all the details from the company then the division are a set apart of the set of the universe

Sets and subset

$A \supset \{1,2,3,4\}$ -- that is a set, within it is a sub set. There are 3 types of sets, finite, infinite and empty.

Finite: $\{1,3,4, 5\}$

Infinite: $\{1,2,3,4,\dots\}$

Empty: $\{\}$

U - UNION

UPSIDE DOWN U: INTERSECTION

RELATIONS & FUNCTIONS

Relation: a set of ordered pairs of real numbers. These ordered pairs may be determined from a table, a graph, an equation, or an inequality.

BEDMAS

BRACKETS, EXPONENTS, DIVISION, MULTIPLICATION, ADDITION, SUBTRACTION !

The domain is the set of inputs (raw material) for the machine,

- the rule describes how the input is to be processed,
- the values of the function are the outputs of the machine

$$t(20) = 6.35(20) + 4.65$$

Two distinct non vertical lines are parallel if and only if their slopes are equal

Line is perpendicular if the slopes are negative reciprocals of each other

EQUATION OF A LINE:

$$**Y = MX + B**$$

EQUATION OF SLOPE:

$$m = \frac{y - y_1}{x - x_1}$$

MATRICES

- Relation and function are not the same thing
- You cannot divide by 0 or square root a negative

Matrices:

m x n matrix has m rows and n columns

M x n is the size of the matrix

Row comes first and Columns comes second for an entry ex. (1 - 2)

$$C = \begin{bmatrix} 1 & 3 & 2 \\ 4 & 1 & 2 \end{bmatrix} \quad \text{C is a 2 x 3 matrix}$$

$$D = \begin{bmatrix} 1 & 4 \\ 2 & 1 \\ 3 & 0 \end{bmatrix} \quad \text{D is a 3 x 2 matrix}$$

Multiplying matrices

$$AB = [800 \quad 750 \quad 500] \begin{bmatrix} 30 \\ 20 \\ 10 \end{bmatrix} = [800 \cdot 30 + 750 \cdot 20 + 500 \cdot 10] = [\$44,000]$$

(Row matrix A) (B)

Product AB

	Steel	Wood	Plastic
Clarion	20	30	8
Brooks	22	25	15

	Western	Coastal
Steel	300	290
Wood	100	90
Plastic	145	180

$$AB = \begin{bmatrix} 20 & 30 & 8 \\ 22 & 25 & 15 \end{bmatrix} \begin{bmatrix} 300 & 290 \\ 100 & 90 \\ 145 & 180 \end{bmatrix}$$

$$= \begin{bmatrix} 20 \cdot 300 + 30 \cdot 100 + 8 \cdot 145 & 20 \cdot 290 + 30 \cdot 90 + 8 \cdot 180 \\ 22 \cdot 300 + 25 \cdot 100 + 15 \cdot 145 & 22 \cdot 290 + 25 \cdot 90 + 15 \cdot 180 \end{bmatrix}$$

$$= \begin{bmatrix} \text{Western} & \text{Coastal} \\ 10,160 & 9940 \\ 11,275 & 11,330 \end{bmatrix} \begin{array}{l} \text{Clarion} \\ \text{Brooks} \end{array}$$

(a) Write the 2 x 2 identity matrix $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(b) Given $A = \begin{bmatrix} 4 & -7 \\ 13 & 2 \end{bmatrix}$, show that $AI = IA = A$.

$$AI = \begin{bmatrix} 4 & -7 \\ 13 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 + 0 & 0 - 7 \\ 13 + 0 & 0 + 2 \end{bmatrix} = \begin{bmatrix} 4 & -7 \\ 13 & 2 \end{bmatrix}$$

$$IA = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 4 & -7 \\ 13 & 2 \end{bmatrix} = \begin{bmatrix} 4 & -7 \\ 13 & 2 \end{bmatrix}$$

$$AI = IA = A.$$