Material Requirement Planning

1. Problem Statement:

Generate material requirement plan (MRP) to manufacture 200 bicycles.

2. Definition:

- **MRP – Material Requirement Plan** – How much of each part (component) going to be required to manufacture a finished product (200 bicycles in this case)
- **BoM – Bill of Material** – Like a recipe, this is a list of all the components, sub-assemblies to make an end product. This will give you a ratio of each part with respect to the Finished Good. So In this case how many seats, frames, brake sets etc are going to be required to manufacture 1 bicycle.

  e.g in BoM, it says 1 seat is requires for 1 bicycle. So the BoM ratio is 1 seat divided by 1 bicycles = 1

  Calculate ratio for each of the parts with this method and finally multiply each part's ration with the total bicycle requirement i.e 200. This will generate the total required quantity of each part.

  A bill of materials or product structure is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts, and the quantities of each needed to make an end product.
- **On Hand Inventory** – This is the quantity of each part which is already available. It's not necessary that there will be some stock of each part. Whatever inventory is available for any part will be called as On Hand Inventory
- **Inventory Net off** – After generating the material requirement from BoM, it has to be compared with on hand inventory. If there is any inventory for any part, that has to be subtracted from the BoM quantity to generate the final to be procured quantity.

  e.g through BoM explosion we know for 200 bicycles, we need 200 seats. On hand inventory is 50. So Inventory net off (200-50) will have to be done to calculate 150 as a to be procured quantity.

3. Input:

3.1 Bill of Material:

To assemble a bicycle following items are required.

First Level – to assemble a Bicycle

1 seat, 1 frame, 2 brake sets, 1 handlebar, 2 wheels, 2 tires, 1 chain, 1 crank set, 2 pedals are required.

Second Level – to assemble a Brake set

Each brake set assembly requires 1 brake paddle, 1 brake cable, 1 set of Lever, and 2 brake Shoes.

1.2 On Hand Inventory:

For each material there is some availability of stock as given in table below.

Item	Stock
Seats	50
Frames	80
Brake sets	25
Brake paddles	100
Brake cables	75
Levers	60
Brake Shoes	150
Handlebars	100
Wheels	60
Tires	80
Chains	100
Crank set	50
Paddles	150

4. What is expected:

You are expected to **write a detailed JAVA code** to;

Logical/Functional

a) Do BoM explosion to arrive at the total requirement of each part to manufacture a total of 200 bicycles. Take no of bicycles as input instead of fix value of 200.

b) Do inventory net off considering the on hand inventory from the table above and calculate the final required quantity which is to be purchased from outside.

Coding/Technical

a) Use of proper data structures and exception handling.
b) Application of OOPS concept.
c) Follow coding standards, proper comments in code which explains the points from functional expectation.
d) More generic solution then considering hardcoded input data sets.