import pandas as pd

import numpy as np

# Simulated dataset: product ID, length (mm), width (mm), weight (g)

np.random.seed(42)

data = {

'product\_id': range(1, 21),

'length\_mm': np.random.normal(100, 2, 20), # Target: 100mm ± 2mm

'width\_mm': np.random.normal(50, 1, 20), # Target: 50mm ± 1mm

'weight\_g': np.random.normal(200, 5, 20), # Target: 200g ± 5g

}

df = pd.DataFrame(data)

# Define quality control tolerances

tolerances = {

'length\_mm': (98, 102),

'width\_mm': (49, 51),

'weight\_g': (195, 205),

}

# Function to check if a row is within tolerance

def check\_tolerances(row, tolerances):

for col, (low, high) in tolerances.items():

if not (low <= row[col] <= high):

return False

return True

# Apply quality control check

df['is\_pass'] = df.apply(lambda row: check\_tolerances(row, tolerances), axis=1)

# Separate passed and failed products

passed = df[df['is\_pass']]

failed = df[~df['is\_pass']]

# Output results

print("✅ Passed Items:")

print(passed[['product\_id', 'length\_mm', 'width\_mm', 'weight\_g']])

print("\n❌ Failed Items:")

print(failed[['product\_id', 'length\_mm', 'width\_mm', 'weight\_g']])