import json

import os

# File to store results

DATA\_FILE = "student\_grades.json"

def load\_data():

"""Load data from the JSON file."""

if os.path.exists(DATA\_FILE):

with open(DATA\_FILE, 'r') as file:

return json.load(file)

return {}

def save\_data(data):

"""Save data to the JSON file."""

with open(DATA\_FILE, 'w') as file:

json.dump(data, file, indent=4)

def input\_validation(prompt, data\_type=float, condition=None):

"""Validate input based on type and condition."""

while True:

try:

value = data\_type(input(prompt))

if condition and not condition(value):

raise ValueError

return value

except ValueError:

print("Invalid input. Please try again.")

def calculate\_weighted\_average(marks, weights):

"""Calculate the weighted average."""

total\_weighted\_score = sum(m \* w for m, w in zip(marks, weights))

total\_weights = sum(weights)

return total\_weighted\_score / total\_weights

def display\_statistics(results):

"""Display statistics for all students."""

print("\nOverall Statistics:")

if not results:

print("No data available.")

return

total\_students = len(results)

total\_avg = sum(student['weighted\_average'] for student in results.values()) / total\_students

print(f"Total Students: {total\_students}")

print(f"Average Grade: {total\_avg:.2f}")

def main():

print("=== Student Grade Calculator ===")

data = load\_data()

student\_name = input("Enter student name: ")

subjects = int(input\_validation("Enter the number of subjects: ", int, lambda x: x > 0))

marks = []

weights = []

for i in range(subjects):

print(f"\nSubject {i + 1}:")

mark = input\_validation("Enter mark (0-100): ", float, lambda x: 0 <= x <= 100)

weight = input\_validation("Enter weight (0-1): ", float, lambda x: 0 <= x <= 1)

marks.append(mark)

weights.append(weight)

weighted\_average = calculate\_weighted\_average(marks, weights)

grade = None

if weighted\_average >= 90:

grade = "A"

elif weighted\_average >= 80:

grade = "B"

elif weighted\_average >= 70:

grade = "C"

elif weighted\_average >= 60:

grade = "D"

else:

grade = "F"

print("\nFinal Results:")

print(f"Student Name: {student\_name}")

print(f"Weighted Average: {weighted\_average:.2f}")

print(f"Grade: {grade}")

# Store the result

data[student\_name] = {

"marks": marks,

"weights": weights,

"weighted\_average": weighted\_average,

"grade": grade,

}

save\_data(data)

# Display statistics

display\_statistics(data)

if \_\_name\_\_ == "\_\_main\_\_":

main()