Exercises - Section 4: Lecture 12 – Creating Subscripted Variables – Questions - Part 3

For each of the following descriptions, create the necessary notation and Python code for the data and/or variables.

DESCRIPTION	MATH	GUROBIPY
1. The height of each person (data)		
2. The weight of each person (data)		
3. The height and weight of each person (data)		
4. The height of each person at each age (ages 1, 2, 3, …) (data)		
5. The distance between every pair of the largest 50 cities in the United States (data)		
6. Cost per share of each investment (data)		
7. Amount of money invested in each investment (data)		
8. Amount of money invested in each investment (variable)		
9. Number of sweatshirts purchased (variable) if size is the only important attribute		
10. Number of sweatshirts purchased of each color (variable)		
11. Number of sweatshirts purchased of each color and size (variable), if both attributes are important (for example,		

12. An airline wants to hire flight attendants who live in each city. The airline will then assign each flight attendant to a daily schedule that allows the flight attendant to return home each evening. Specify notation and Python code for (1) data showing the minimum number of flight attendants the airline needs to hire in each city, (2) a variable for the number of flight attendants the airline will hire in each city, and (3) a constraint to require the airline to hire enough flight attendants in each city.		
13. An airline wants to hire flight attendants who prefer to work on each aircraft type (Boeing 747, Airbus A380, etc.). The airline will then assign each flight attendant to a daily schedule that allows the flight attendant to work on the preferred aircraft. Specify notation and Python code for (1) data showing the minimum number of flight attendants the airline needs to hire for each aircraft type, (2) a variable for the number of flight attendants the airline will hire for each aircraft type, and (3) a constraint to require the airline to hire enough flight attendants for each aircraft type.		

14. An airline wants to hire flight attendants who live in each city and who prefer to work on each aircraft type that the airline operates in that city. The airline will then assign each flight attendant to a daily schedule that allows the flight attendant to work on the preferred aircraft and return home each evening. Specify notation and Python code for (1) data showing the minimum number of flight attendants the airline needs to hire in each city for each aircraft type, (2) a variable for the number of flight attendants the airline will hire in each city for each aircraft type, and (3) a constraint to require the airline to hire enough flight attendants in each city for each aircraft type.		
15. Cost of hiring a flight attendant in each city (data; can be different from city to city because the cost of living in each city is different)		
16. Cost of hiring a flight attendant who prefers each aircraft type, in each city		
17. Total cost of hiring all flight attendants, assuming cost differs both by aircraft type and by home city		
18. Total cost of hiring all flight attendants, if only city is taken into account for hiring and cost		
19. Total cost of hiring all flight attendants, if both city and aircraft type are important for hiring but cost depends only on home city		

20. Total cost of hiring all flight attendants, if both city and aircraft type are important for hiring, and cost depends on both city and aircraft type		

In the next set of exercises, think about which parts of the description are relevant, and write the math and gurobipy code including only relevant factors. Different people might have slightly different answers here depending on how you envision the situation; the important thing is to get used to thinking about what features might be relevant, just like one might consider in determining features to use in a data science model.

DESCRIPTION	**MATH**	**GUROBIPY**
21. Cost of hiring a flight attendant who prefers each aircraft type and does or doesn't speak Spanish, in each city (assume all three factors are relevant)		
22. Cost of hiring a flight attendant who prefers each aircraft type and does or doesn't speak Spanish, in each city, if Spanish-speaking ability is not relevant for any costs or constraints or decisions in the model		
23. Cost of hiring a flight attendant who prefers each aircraft type, has each hair color, is each different height, speaks or doesn't speak Ancient Greek, and does or doesn't have a pet dog, in each city		
24. Cost of hiring a flight attendant who prefers each aircraft type, wants to work each different number of hours per week (from 30 to 60), has each hair color, does or doesn't have a pet dog, speaks or doesn't speak Spanish (relevant), in each city		

NOTES: