AOS4 - Smartphone purchase

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Your parents have decided to buy you a new smartphone, and ask you to choose among a list they have prepared for you. Unfortunately for you, you tend to be **very thorough** when choosing your smartphone, but cannot actually change the list without your parents' approval.

Stuck with a fixed list, you resolve yourself to make the best decision according to your tastes. Fortunately, you have been studying multi-criteria decision-making (MCDM), what a coincidence!

After consulting with your parents, they give you the following guidelines:

1. 'The price cannot exceed 1000.00 €'
2. 'The camera or chipset should not influence your decision'
3. 'It is preferable if you give a ranking, rather than a choice'

After searching for the products' details online, you compile the information into table 1

Solution: This exercise should be solved in class, as practice for MCDM. The familiar context enables students to compare their own reasoning to the studied decision rules, and facilitates reviewing taken decisions. The questions let students identify the types of criteria (order/type), apply Pareto Dominance, lexicographic/WS criteria, and further identify the different elicitation scenarios. The evaluation matrix does not include technical details to reduce the amount of assumed technical knowledge.

1. (a) According to your preferences, and only using the criteria contained in table 1, make a decision and list your top 3 choices.
   (b) For each criterion, answer the following questions, and compare your answers in group:
      (i) What objective have you chosen, *e.g.* max, min?
      (ii) If you cannot choose an objective, how did you order the values?
      (iii) Are there criteria that are 'not important'?

Solution: Introductory question, familiarize with the context and the data. Identify subjective aspects of the criteria, types of criteria, etc.

For part (a), the idea is to introduce the data to the student, and make sure he has gone through the table. Any preferences the student has can serve for further reasoning. Why did they prefer certain criteria to others? Which objectives did they choose for each criterion?

In part (b), criteria are studied more in depth and is directly following the previous line of thought, but explicitly.

A suggested solution is the following:

(a) Google Pixel 7 Pro, Samsung Galaxy A52s 5G, Nothing Phone (1)

(b) (a) (Brand) Google, Samsung, OnePlus, Nothing, ~~Apple/Xiaomi/Asus/Huawei/Motorola~~
(b) (Release Date) No preference
(c) (Dimensions) No preference
(d) (5G) No preference
(e) (Display Type) All the values indicated are identical
(f) (Display Size) Maximum
(g) (Operating System) Android, ~~iOS/EMUI~~
(h) (Jack) No preference
(i) (Battery capacity) Maximize
(j) (Price) Minimize

2. Using the criteria that you identified as relevant, try and apply Pareto Dominance to make a decision.

Solution: Practice question for Pareto Dominance. Results might vary from individual to individual. The TA may instead choose a fixed list of interesting criteria, e.g. 5G, jack, display size, operating system, battery capacity, and price.

Using brand, display size, operating system, battery capacity and price:

Name Objective	Brand Ordered	Display Size Maximize	Operating System Ordered	Battery capacity Maximize	Price Minimize
Google Pixel 7 Pro	Google	6.7 ”	Android	5000 mA h	812.00 €
Samsung Galaxy A52s 5G	Samsung	6.5 ”	Android	4500 mA h	349.99 €
Samsung Galaxy S22 Ultra 5G	Samsung	6.8 ”	Android	5000 mA h	928.00 €
OnePlus 10 Pro	OnePlus	6.7 ”	Android	5000 mA h	724.99 €
Nothing Phone (1)	Nothing	6.55 ”	Android	4500 mA h	399.00 €
Asus Zenfone 9	~~Asus~~	5.9 ”	Android	4300 mA h	743.89 €
Asus ROG Phone 6D Ultimate	~~Asus~~	6.78 ”	Android	6000 mA h	1399.00 €
Huawei Mate 50 Pro	~~Huawei~~	6.74 ”	~~EMUI~~	4700 mA h	1154.99 €
Xiaomi 11T Pro	~~Xiaomi~~	6.67 ”	Android	5000 mA h	412.99 €
Xiaomi 12 Pro	~~Xiaomi~~	6.73 ”	Android	4600 mA h	758.00 €
Motorola Moto X40	~~Motorola~~	6.7 ”	Android	4600 mA h	465.79 €
Apple iPhone 13 Pro Max	~~Apple~~	6.7 ”	~~iOS~~	4352 mA h	1379.00 €

3. **Solution:**

4. **Solution:**

5. **Solution:**

6. **Solution:**

Table 1: Smartphones details

Name	Brand	Release Date	Dimensions	Weight	5G	Display Type	Display Size	Operating System	3.5 mm Jack	Battery capacity	Price
Samsung Galaxy A52s 5G	Samsung	1st September 2021	159.9 mm × 75.1 mm × 8.4 mm	189 g	Yes	OLED	6.5 ”	Android	Yes	4500 mA h	349.99 €
Apple iPhone 13 Pro Max	Apple	24th September 2021	160.8 mm × 78.1 mm × 7.7 mm	240 g	Yes	OLED	6.7 ”	iOS	No	4352 mA h	1379.00 €
Xiaomi 11T Pro	Xiaomi	5th October 2021	164.1 mm × 76.9 mm × 8.8 mm	204 g	Yes	OLED	6.67 ”	Android	No	5000 mA h	412.99 €
Xiaomi 12 Pro	Xiaomi	31st December 2021	163.6 mm × 74.6 mm × 8.2 mm	204 g	Yes	OLED	6.73 ”	Android	No	4600 mA h	758.00 €
Asus Zenfone 9	Asus	15th September 2022	146.5 mm × 68.1 mm × 9.1 mm	169 g	Yes	OLED	5.9 ”	Android	Yes	4300 mA h	743.89 €
OnePlus 10 Pro	OnePlus	13th January 2022	163 mm × 73.9 mm × 8.6 mm	201 g	Yes	OLED	6.7 ”	Android	No	5000 mA h	724.99 €
Nothing Phone (1)	Nothing	16th June 2022	159.2 mm × 75.8 mm × 8.3 mm	193.5 g	Yes	OLED	6.55 ”	Android	No	4500 mA h	399.00 €
Google Pixel 7 Pro	Google	13th October 2022	162.9 mm × 76.6 mm × 8.9 mm	212 g	Yes	OLED	6.7 ”	Android	No	5000 mA h	812.00 €
Asus ROG Phone 6D Ultimate	Asus	7th October 2022	173 mm × 77 mm × 10.4 mm	247 g	Yes	OLED	6.78 ”	Android	Yes	6000 mA h	1399.00 €
Huawei Mate 50 Pro	Huawei	28th September 2022	162.1 mm × 75.5 mm × 8.5 mm	205 g	No	OLED	6.74 ”	EMUI	No	4700 mA h	1154.99 €
Samsung Galaxy S22 Ultra 5G	Samsung	25th February 2022	163.3 mm × 77.9 mm × 8.9 mm	228 g	Yes	OLED	6.8 ”	Android	No	5000 mA h	928.00 €
Motorola Moto X40	Motorola	22nd December 2022	161.2 mm × 74 mm × 8.6 mm	199 g	Yes	OLED	6.7 ”	Android	No	4600 mA h	465.79 €