

# Utility Functions Comparison



Fill in the blanks. A(n) \_\_\_\_ utility function gives us a number, and a(n) \_\_\_\_ utility function just gives us a ranking.

- A. cardinal; ordinal
- B. ordinal; cardinal



The correct answer is:

## A. cardinal; ordinal

- A **cardinal** utility function assigns specific numerical values to utility, reflecting the level of satisfaction and allowing for comparisons of the magnitude of preferences (e.g., utility of 10 is twice as satisfying as a utility of 5).
- An **ordinal** utility function provides a ranking of preferences but does not indicate the magnitude of differences between those preferences (e.g., A is preferred to B, but how much it is preferred is not specified).



True or False? "Bundle A gives me 100 utils", this is an ordinal utility function.



## False.

The statement "Bundle A gives me 100 utils" refers to a specific numerical value assigned to the utility of a bundle, which is a characteristic of a **cardinal utility function**. An **ordinal utility function** would only indicate that Bundle A is preferred over or equal to another bundle without assigning specific numerical values.



Which utility function is unit-free?

- A. Cardinal utility function.
- B. Ordinal utility function.
- C. Both of them.
- D. Neither of them.



The correct answer is:

## B. Ordinal utility function.

An **ordinal utility function** is unit-free because it only ranks preferences and does not depend on the specific numerical values assigned to utility. Any monotonic transformation (e.g., multiplying by a positive constant or applying an increasing function) of the utility numbers will still preserve the ranking.

In contrast, a **cardinal utility function** is not unit-free, as the specific numerical values (or units) matter for measuring the magnitude of utility differences or levels.



From all the problems and solutions above, please extract all the core concepts behind them. Include some humor in your explanation.



Here's a breakdown of the core concepts from the problems above, with a sprinkle of humor to keep things lively:

### Cardinal vs. Ordinal Utility

- **Core Concept:** Cardinal utility gives you numbers (100 utils? You must be in Disneyland), while ordinal utility just ranks your preferences (Disneyland beats grocery shopping, no contest). Think of it as the difference between "I love pizza 3 times more than salad" vs. "Pizza > Salad."
- **Humor:** Cardinal utility is like your overzealous friend who assigns Yelp stars to everything—"That sandwich was a solid 4.2 out of 5!" Ordinal utility just says, "I liked it, but I'd eat tacos first."

### Unit-Free Utility

- **Core Concept:** Ordinal utility is unit-free because it cares about rankings, not numbers. Cardinal utility, however, is like a teenager's playlist: every detail matters.
- **Humor:** Ordinal utility doesn't care if you measure happiness in utils, tacos, or "likes." It's chill. Cardinal utility is more like your math teacher—it needs precision or it's not playing.

### True or False Questions

- **Core Concept:** Be careful with statements! If numbers are involved ("100 utils"), it's probably about cardinal utility. Ordinal utility doesn't do math—it just vibes with ranks.
- **Humor:** If someone says, "This cake gave me 200 utils," they're not using ordinal utility—they're using *cake logic*. (We get it, though—cake is life.)

### General Takeaway

- **Utility Theory:** Economics loves to measure how much you like stuff, but whether it uses a ruler (cardinal) or just points fingers (ordinal) depends on the situation.
- **Humor:** In the world of utility, it's either about the numbers or "the feels." Think of cardinal utility as the nerdy sibling with a calculator and ordinal utility as the artsy one painting the vibes.

Utility theory may sound serious, but at its core, it's just about how we decide between tacos, movies, and cake—and honestly, who doesn't like that? 😊



To reinforce the understanding, please generate some similar problems and show the solutions.



Sure! Here are some similar problems to reinforce your understanding of cardinal and ordinal utility, along with their solutions:

### Problem 1: Cardinal vs. Ordinal Utility

You have three options for dinner: pizza, sushi, and burgers. A utility function assigns the following values:

- Pizza: 20
- Sushi: 30
- Burgers: 15

If you are using an **ordinal utility function**, which of the following statements is true?

- A. Sushi is twice as good as burgers.
- B. You prefer sushi over pizza.
- C. You prefer pizza and sushi equally.
- D. The numbers indicate how much more you enjoy each meal.

**Solution:** The correct answer is **B. You prefer sushi over pizza.**

- An ordinal utility function only ranks preferences, so we can conclude  $\text{sushi} > \text{pizza} > \text{burgers}$ . It does **not** tell us how much better one option is than another (so A and D are false). There's also no evidence of equal preference (C is false).

### Problem 2: True or False?

Statement: "Bundle A gives me 50 utils, and Bundle B gives me 100 utils. Therefore, Bundle B is twice as good as Bundle A."

Is this **True** or **False** for ordinal utility?

**Solution:**

The correct answer is **False**.

- An ordinal utility function does not care about numbers or magnitudes. It only tells us that Bundle B is preferred over Bundle A. The specific utility values are irrelevant.

### Problem 3: Unit-Free Utility

Which of the following is an example of a **unit-free utility function**?

- A. "Chocolate cake gives me 10 utils, and vanilla cake gives me 5 utils."
- B. "I like chocolate cake more than vanilla cake, and I like strawberry cake the least."
- C. "Chocolate cake is 3 times more satisfying than vanilla cake."
- D. "Eating any cake makes me equally happy."

### Solution:

The correct answer is **B. "I like chocolate cake more than vanilla cake, and I like strawberry cake the least."**

- Ordinal utility is unit-free and only provides a ranking: chocolate > vanilla > strawberry.
- Statements like A and C involve specific numbers, which are about cardinal utility. Statement D isn't even a ranking—it's a tie!

## Problem 4: Cardinal Utility in Action

Suppose a cardinal utility function assigns the following values:

- Watching TV: 40 utils
- Reading a book: 60 utils
- Playing video games: 100 utils

If you had to spend your entire weekend doing only one of these activities, which one would maximize your satisfaction, and by how much?

### Solution:

The correct answer is **Playing video games, which gives 100 utils.**

- Cardinal utility tells us the exact level of satisfaction. Since 100 is greater than both 60 and 40, video games maximize satisfaction.
- The "how much" part depends on comparisons: video games give 40 more utils than reading and 60 more utils than watching TV.

## Problem 5: Transformations of Utility

Consider the utility function  $U(X) = 3X + 2$ , where  $X$  is the amount of chocolate you eat. If this utility function is transformed into  $U'(X) = X + 1$ , which type of utility does this represent?

- A. Cardinal utility
- B. Ordinal utility
- C. Neither

### Solution:

The correct answer is **B. Ordinal utility.**

- The transformation  $U(X) \rightarrow U'(X)$  preserves the ranking of preferences (the chocolate lover still prefers more  $X$ ), but the actual magnitude of satisfaction changes. This is characteristic of ordinal utility.

## Problem 6: Spot the Error

You are told: "Utility for consuming ice cream is 50 utils, and utility for consuming a smoothie is 100 utils. Therefore, the smoothie provides twice as much satisfaction." Is this correct for cardinal utility?

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**Solution:**

The correct answer is **Yes, this is correct for cardinal utility.**

- Cardinal utility allows for numerical comparisons, so if a smoothie is assigned 100 utils and ice cream 50 utils, you can validly say the smoothie provides twice the satisfaction of ice cream.
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Enjoy solving these problems! Think of them as the "chocolate and cake" of economics—they're surprisingly fun to tackle. 🍫📚