

CIS 1100

Information Representation
& Data Visualization
(Lecture One)

Python
Fall 2024
University of Pennsylvania



Updates and Reminders

- Apply to be a TA by 11:59pm tonight
 - link is on Ed
 - no late days accepted :)
- HW9 Released on Course Website
 - Due Dec 9, but start early
 - No late days, no drops
 - (technically only the first part is on the website, but that's plenty and the other part will follow)
- Midterm 2 grades out early next week

Questions?

Information Representation

Basically, symbolism! What can it mean when I use *X* to represent something?

We'll talk about this in terms of:

- data types
- graphics & graphical markers (visual symbols)

Representation: Types

An `int` is a data type for integral (whole) numbers.

The typical interpretation of an `int` is a **quantity**: I have `10` eggs in my refrigerator, or there are `103` students in this class.

Divide **(C12)** in half vertically. On the left, write as many things as you can think of that an `int` can be used to represent. (Feel free to brainstorm with a partner.)

What Did You Come Up With?

2158983500 (which can have a few meanings...)

1100

-1

Representation: Types

A `str` is a data type for sequences of characters.

On the right side of (C12), list at least eight things that a `str` can represent.

Representation: Types

From examples that we've done in class:

- Names for people
- Titles (of songs, books, movies)
- Genres (of songs, books, movies)
- Types of cuisine (of restaurants)
- Line names for transit routes (e.g. "M4" bus)
- Histories about injuries/illnesses
- Place names
- **LISTS** of these things (lists of genres for a song, lists of transit routes serving a school)

Takeaway:

Programming is hard, not least because it's hard to keep straight what different variables & types are trying to *be!*

In Caesar:

- a "message" was both a list of ints and a string
 - a list of ints could be both a "cipher" and a "message"
- ➔ different meanings can be encoded with different types, and the same type can encode different meanings.

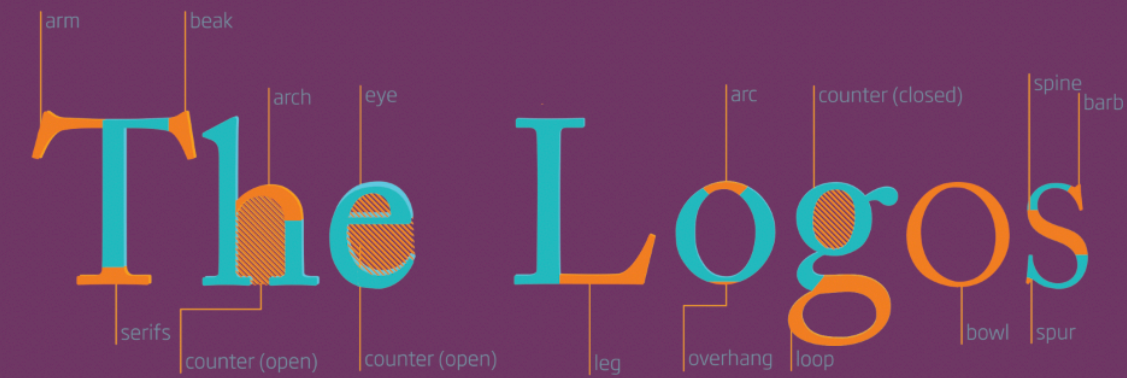
I will tell you a terrible secret: language is punishment. Language must encompass all things and in it all things must again transpire according to guilt and the degree of guilt. -- *Malina* by Ingeborg Bachmann

Representation in *Visual* Language

It's hard to be clear in programming languages. It's also hard to be clear in natural languages.

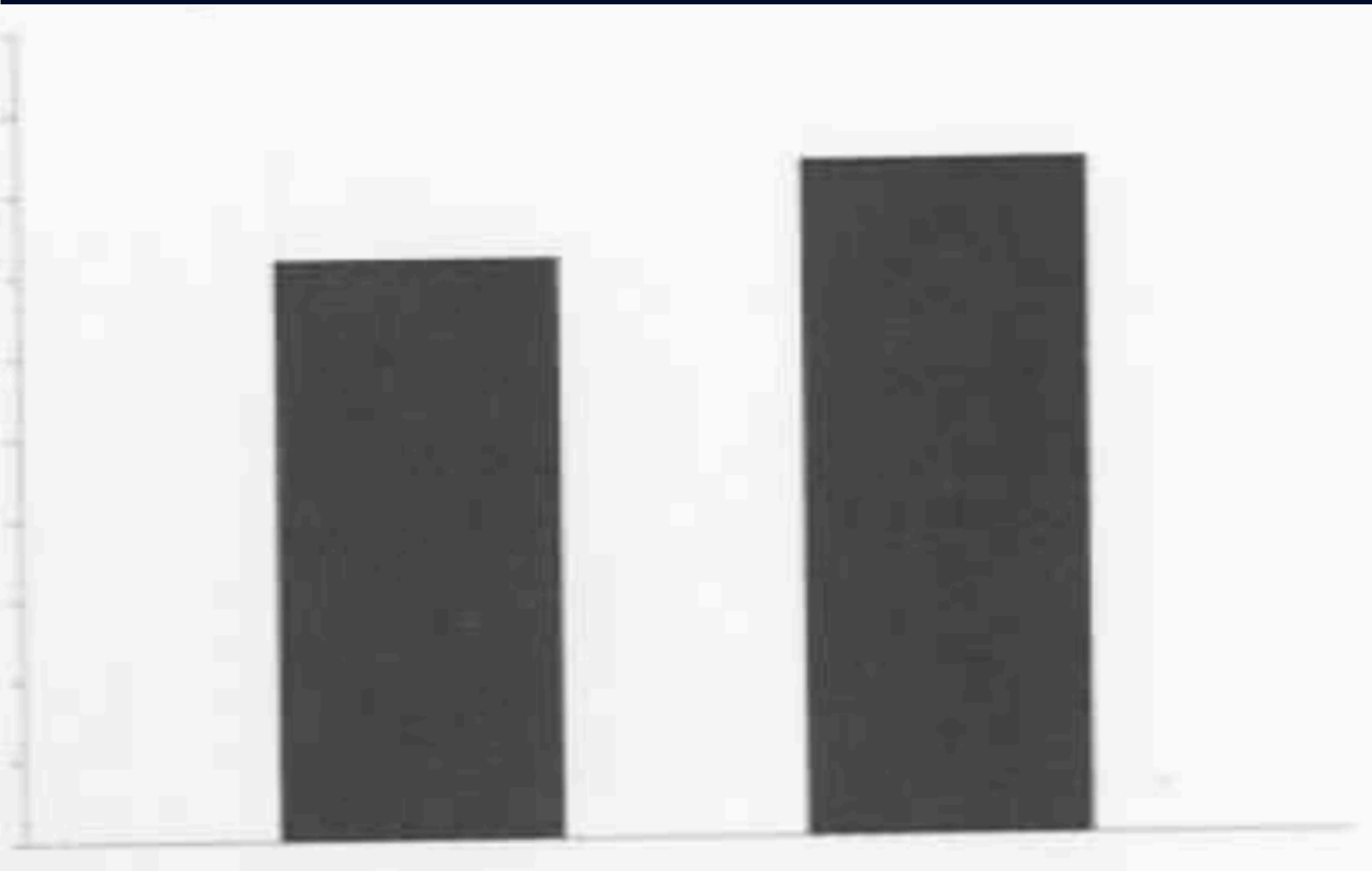
Let's talk about how it's **ALSO** hard to be clear when drawing pictures...

"Mark de Silva is high among the remnant few whose writing still justifies the writing of novels."
—Joshua Cohen, author of *The Netanyahus*

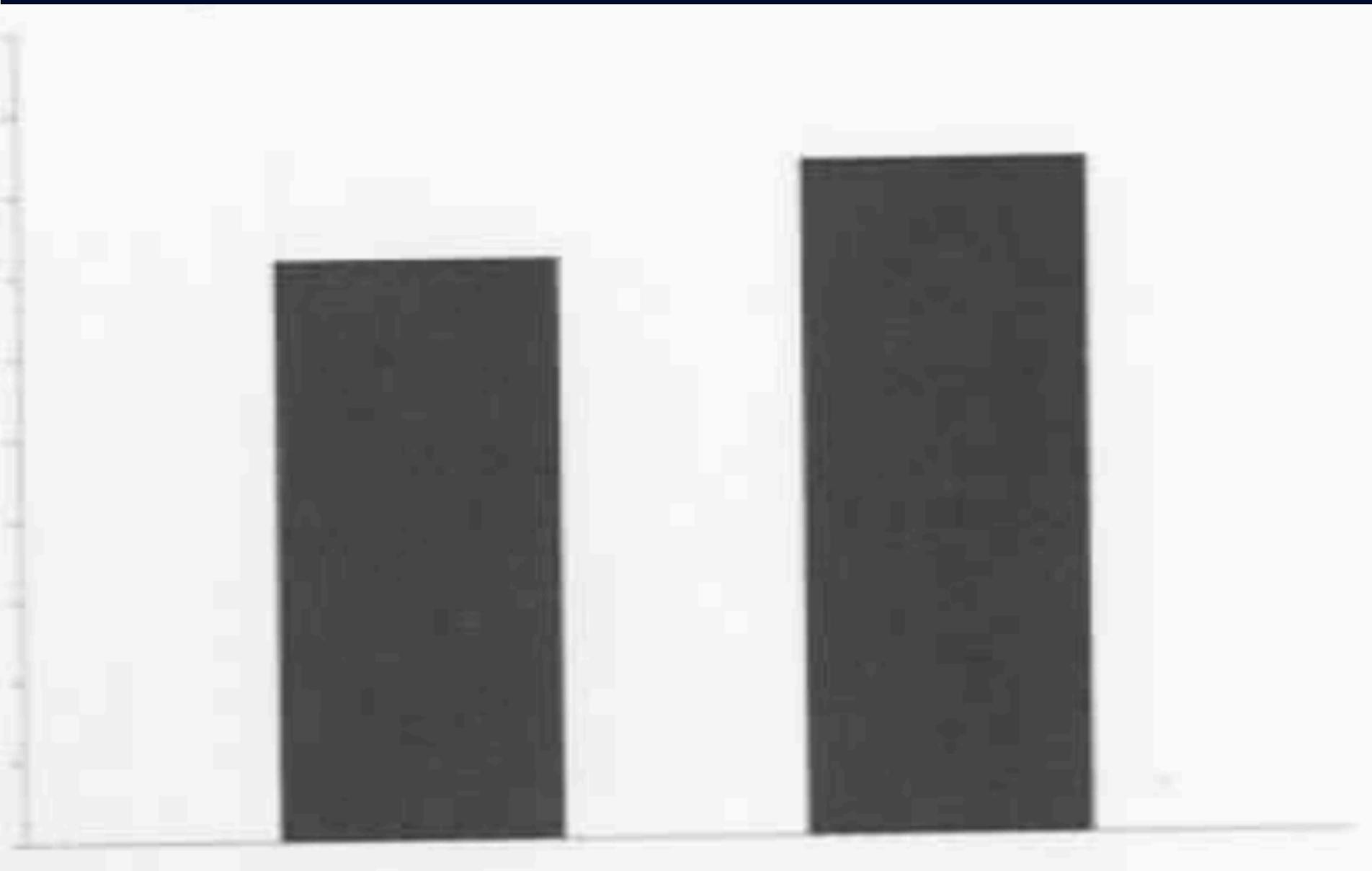


Exercise (L11)

Briefly: *When you look at the two dark rectangles below, what do you notice and what meanings come to mind?*

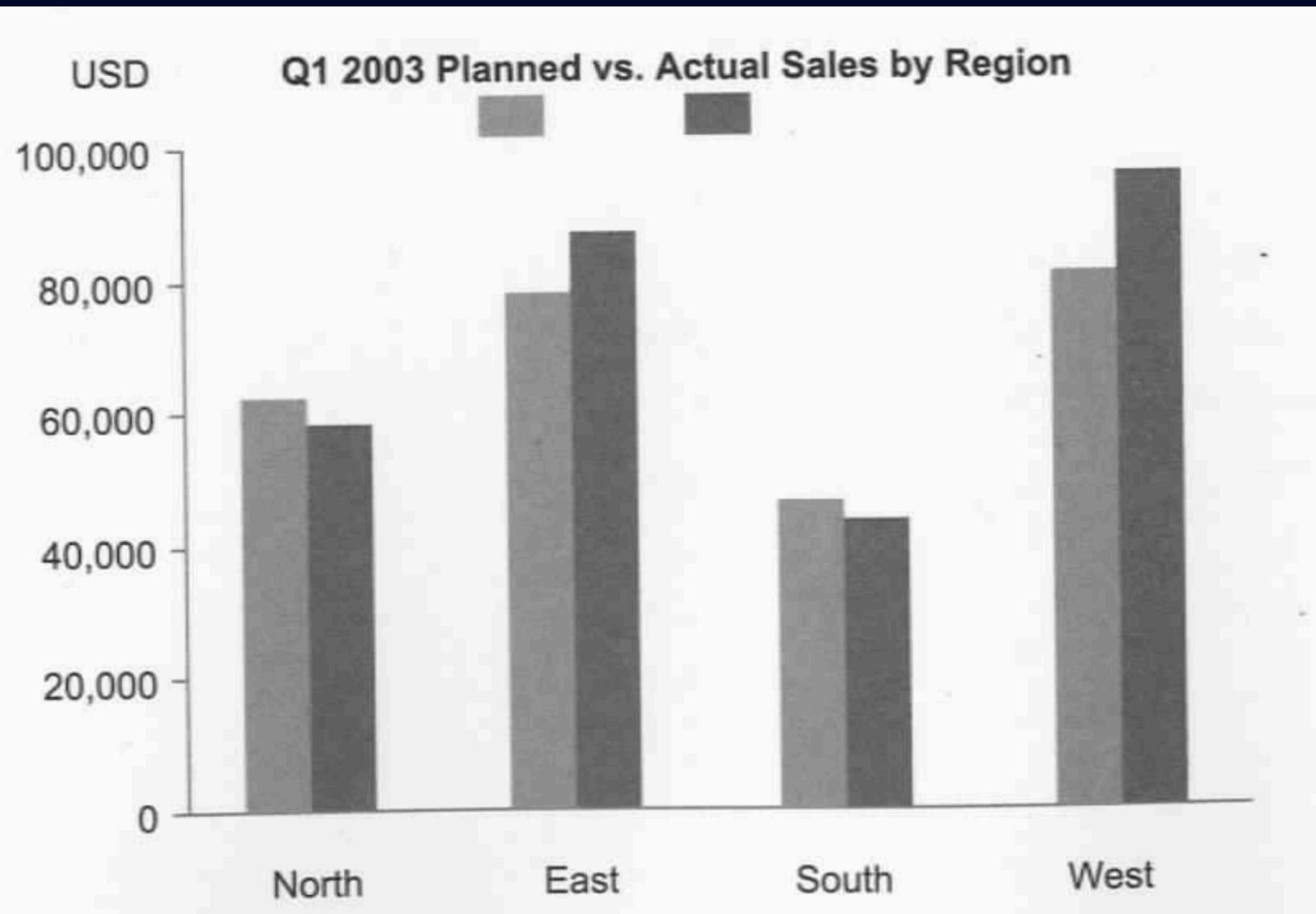


Bars



- heights, and differences between them
- weight (width) and contrast from the background
- position:
 - along the x-axis, separation
 - along the y-axis, alignment at the bottom

Exercise



In one or two words...

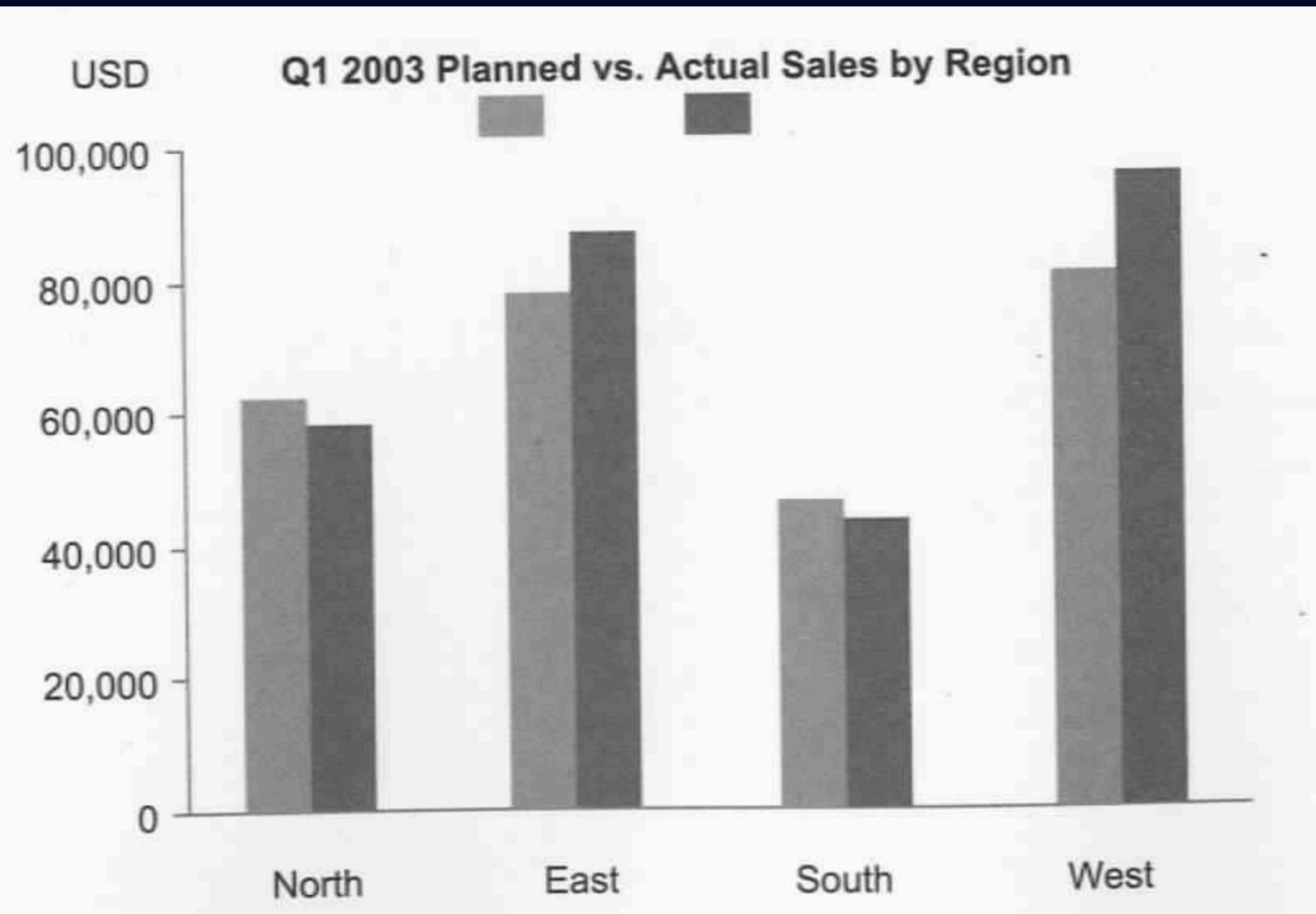
(S7) What does the height of a bar encode (represent)?

(S8) What does the width of a bar encode?

(S9) What does the x-position of a bar encode?

(S10) What does the color of a bar encode?

Exercise



```
pd.filled_rectangle(x, y, hw, hh)
```

Mark all that apply:

A: x, B: y, C: hw, D: hh, E: other

(M1) Which parameters are used to encode the height of a bar?

(M2) Which are used to encode the width?

(S9) Which are used to encode the x-pos?

(S10) Which are used to encode the height?

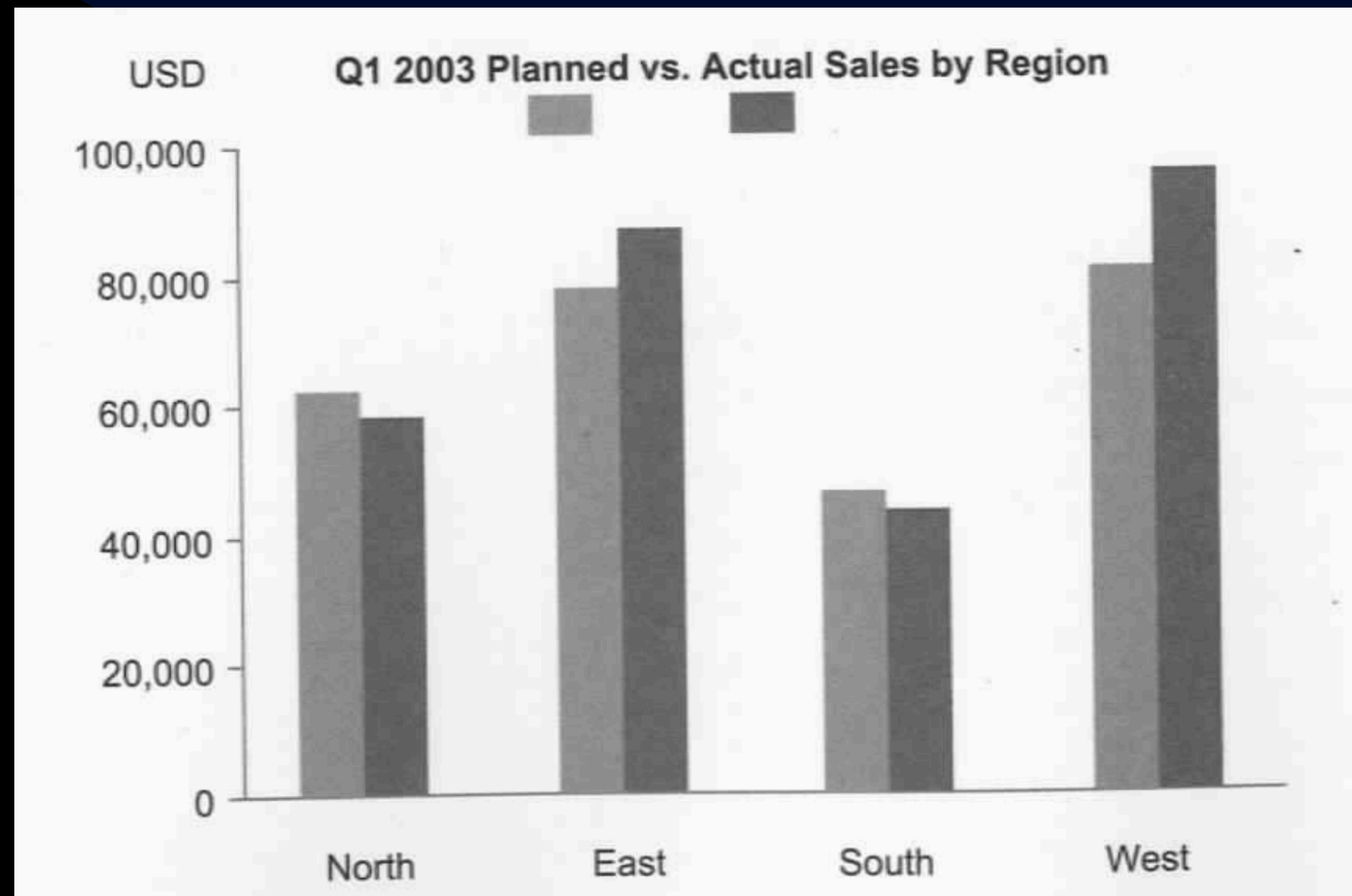
Can We Replicate a Bar Chart Together?

Dictionary of exam 1 average scores and final exam average scores:

```
scores_dict = {  
    "23fa": [80.97, 80.73],  
    "24sp": [76.73, 68.52],  
    "22fa": [71.98, 75.79],  
    "23sp": [78.61, 65.53],  
}
```



```
def paired_bar_chart(scores, x_min=0.1, x_max=0.9, y_min=0.1, y_max=0.9):  
    y_range = y_max - y_min  
    x_range = x_max - x_min  
    ...
```



`y_min` and `y_max` correspond to the y -coordinates for the y axis line and the maximum allowable height for a bar (at \$100k).

(L13) Can you write an expression to calculate the *half-height* of a bar in this chart?