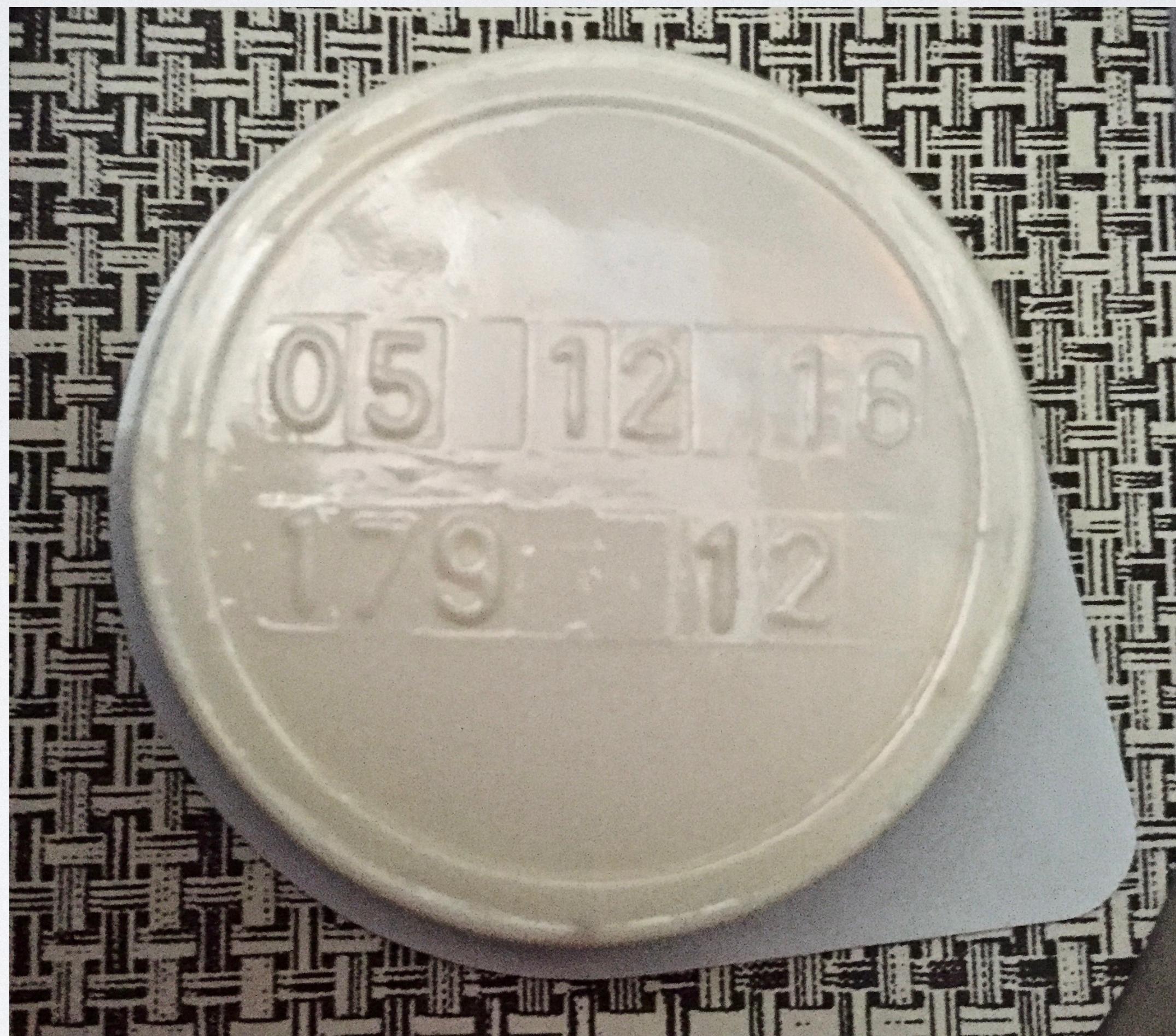


Localization, Internationalization, and Accessibility

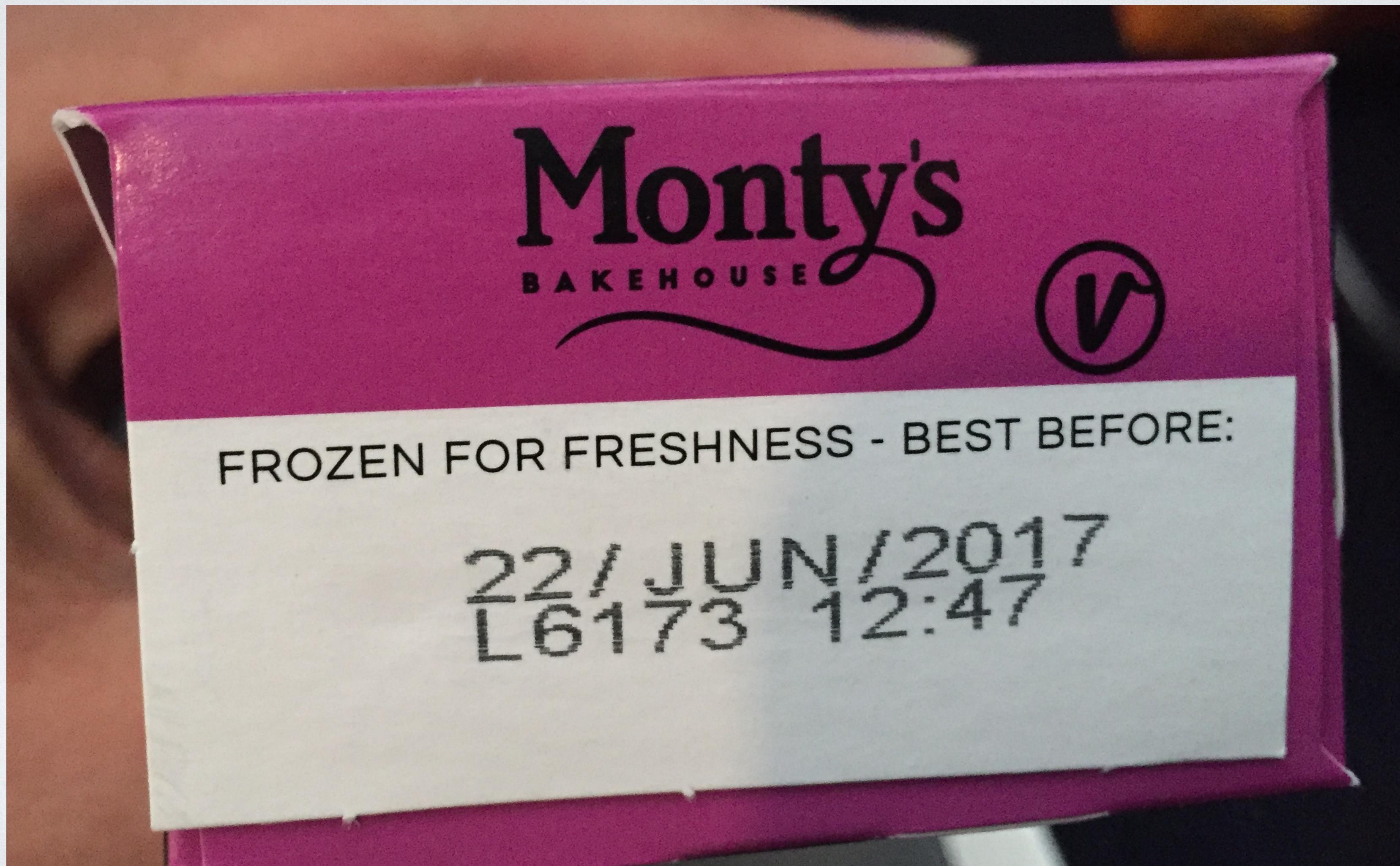
Making software that works for everyone

You are on an airplane. It is September 2016.
Eat?



05 | 2 | 16
| 79 | 12

Still September 2016. Eat?



Definitions

- i18n (internationalization): modification of a software or related technologies so that a software can potentially handle multiple languages, customs, and so on in the world.
- L10n (localization): implementation of a specific language for already-internationalized software.
- G11n (globalization): both i18n and L10n.
- Ally (accessibility): making software suitable for people with disabilities

Today

- Requirements can be hard to elicit
- I will prove this to you via tricky examples from an important domain.
- Sometimes you need exactly the right example to reveal a requirement. “Normal” examples hide the requirements.
- As a software engineer, you should know about these specific issues.

Two Messages Today

- Requirements analysis can require detailed domain knowledge.
- Internationalization is hard but important, and specific domain knowledge is helpful.

A Proposal

- Scope: an email system
- Functional requirement: The system shall support use by all users on Earth.

Requirements

- Tell me what I need to do.

Translation

- Look up all the strings in a table. Easy, right?

MessageFormat 2

```
.input {$count :number}  
.match $count  
0 {{ No items. }}  
one {{ 1 item. }}  
* {{ ${count} items. }}
```

Note how Polish has more than two plural categories:

```
.input {$count :number}  
.match $count  
one {{Masz ${count} tydzień.}}  
few {{Masz ${count} tygodnie.}}  
many {{Masz ${count} tygodni.}}  
other {{Masz ${count} tygodnia.}}  
* {{Masz ${count} tygodnia.}}
```

Unicode

- You're not using ASCII, are you? 😬

Characters

- Proposed requirement: “When a key is pressed on the keyboard, the character is inserted into the text buffer.”
- In which languages is this the right requirement?
- And what language is this document in, anyway?
 - Spellchecking...

1 PingFang TC Regular

旦 0 1 2

旦

1 日

2 曰

3 是

4 時

5 最

6 開

7 明

8 間

9 晚

晚

- Type “a”...

Chinese

Capitalization

- “Users shall be able to make strings ALL-CAPS.”
- Not every language uses capitalization.
- Some languages have special word-final character forms (e.g. Hebrew).
- What properties does the `capitalize` operation have?
- Convert to all-caps: straße. STRASSE or STRAßE

Which One Is Back?



Let's Make a Table.

A	B	C	D
λ	β	ν	
			1
			2
			3
			4

A Clock

- Clocks always go clockwise
- Even though sundials go counterclockwise in the southern hemisphere!



- Sundial in Perth, Australia



Back to Dates.

- Requirement: ISO 8601 dates?
- Unambiguous, yes.

Japanese Dates

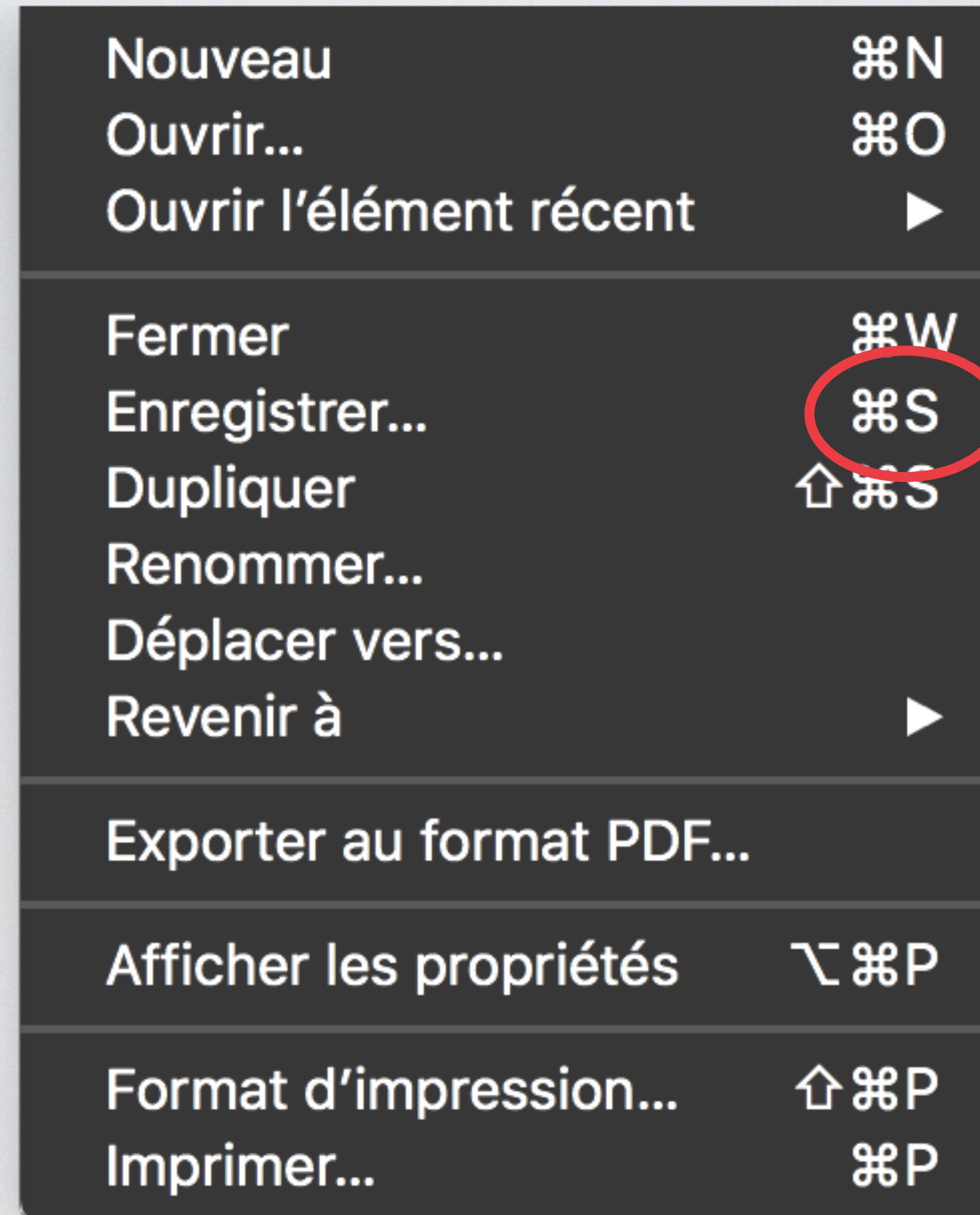
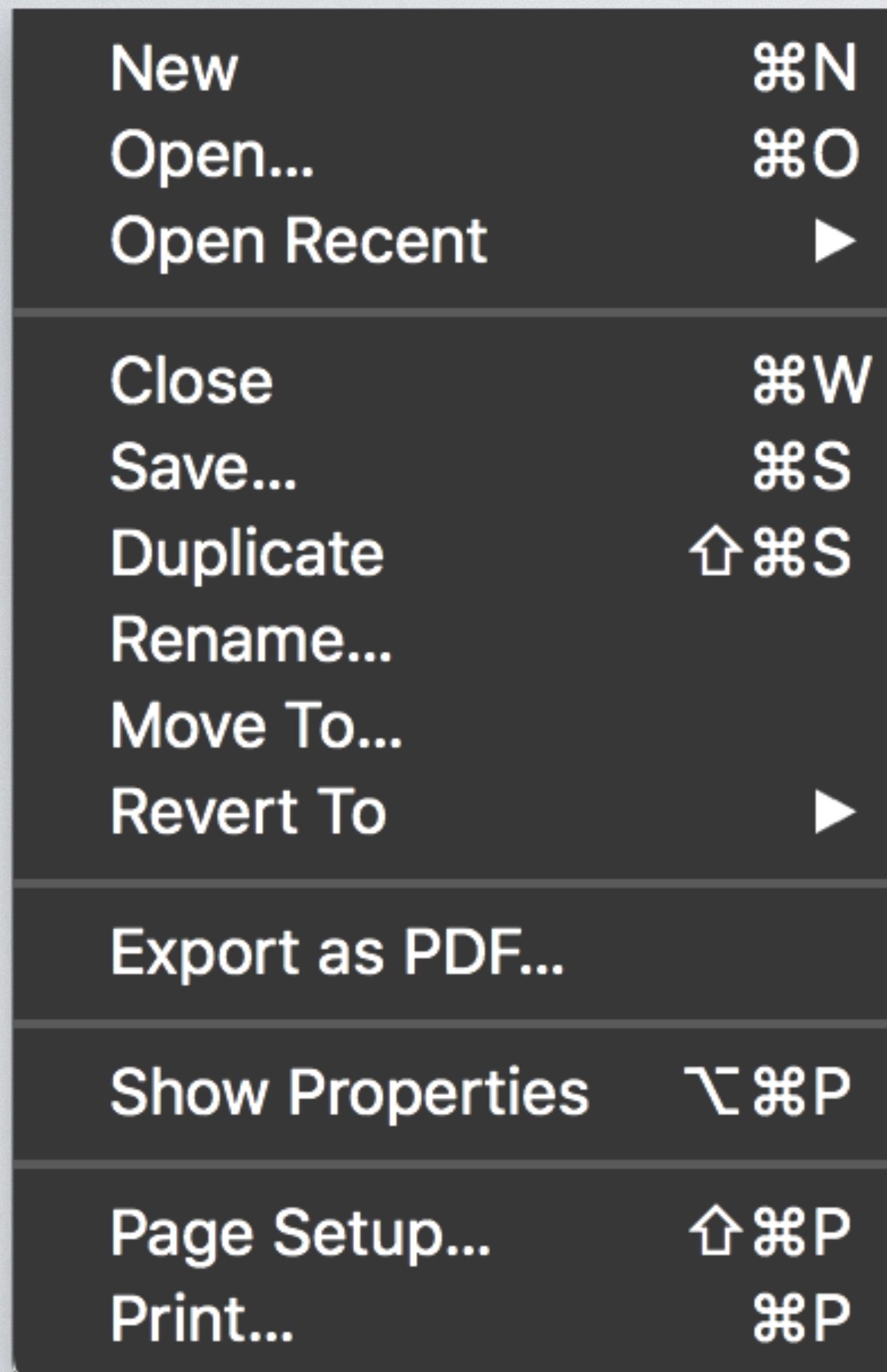
- 平成20年12月31日 = Heisei-20 year, Dec. 31 (Wed)
- Equivalently, 平20/12/31
- Also, 2008年12月31日
- Emperor Hirohito died January 8, 1989.
- How do you write 100 years from now in the Imperial calendar?

Decimal Formats

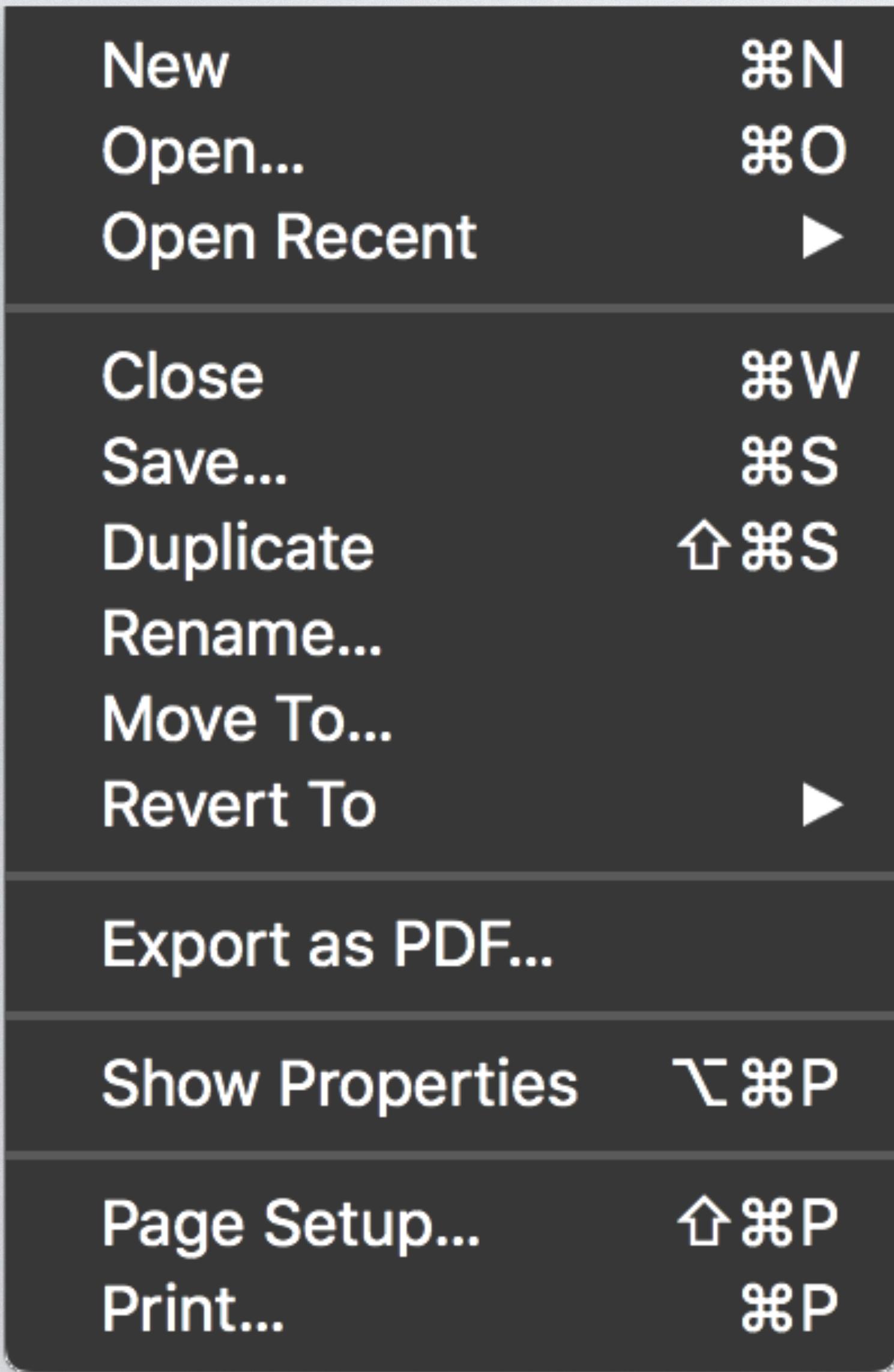
- $3,1415926535\ldots = \pi$ if you are in parts of Europe.
- $3.000 = 10^3$

Keyboard Shortcuts

- Only work if you can type the characters...
- “Save” in French is “Enregistrer”



**"Since when
does
'enregistrer'
start with
'S'???" —
French
users.**



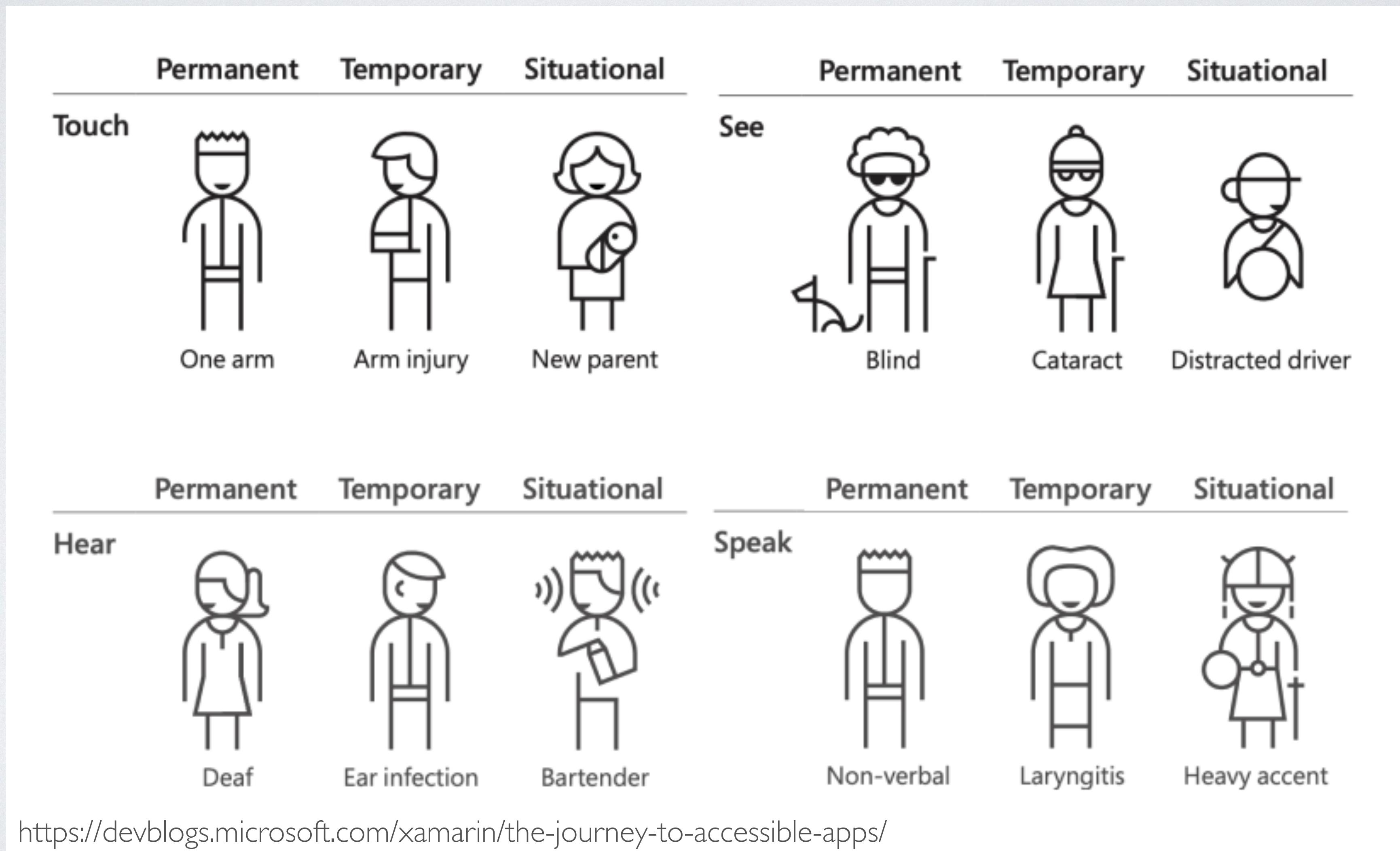
Time Zones

- What requirements are there for handling global times?

Culture



Accessibility



Accessibility Advice

- High contrast; don't rely on color (1/12 of men are color blind)
- Enable keyboard-only use
- Make clickable areas large
- Linear layout (for screen readers)
- Test! Can you use the app with a screen reader?

Color Blindness

Normal



Red-Green Color Blind



For Web Sites

- Structure and organize with headers
- Use descriptive link text (not "click here for information about...")
- Use real text rather than images when possible
- Alternative text for images

AI | Y for Websites

- Use semantic HTML
 - Screen readers need to know meanings
 - What is a div or a span? No idea. Instead use h1, p, button, etc.
- Web Content Accessibility Guidelines (<https://www.w3.org/WAI/standards-guidelines/wcag/>)
- See WAI-ARIA (<https://www.w3.org/WAI/standards-guidelines/aria/>)
 - Authoring Practices Guide: <https://www.w3.org/WAI/ARIA/apg/>

Physical Disabilities

- Dexterity limitations (e.g. hand tremors)
- Inability to use keyboard/mouse
 - Control with tongue or blinking (e.g. quadriplegics)
 - Voice control
- Inability to use pointing devices (keyboard OK)

Conclusions

- Requirements affect costs
- But determining requirements can require extensive domain knowledge
- Internationalization domain knowledge is important