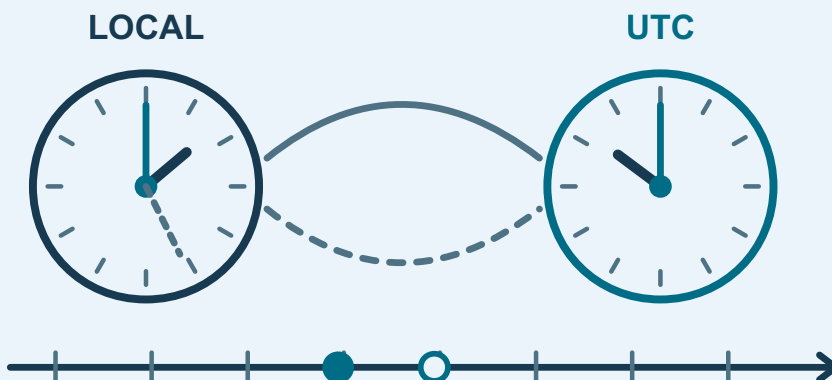




PYTHON AND DATA WORKFLOWS

Work Reliably with Dates and Time Zones

Resolve local appointments, reject clock gaps and measure elapsed time on an explicit timeline



Sanjaay Gowda T S

FREE SAMPLE / INTRODUCTION + CHAPTER 1 / EDITION 1.0.0

sanjaaygowdatai.com

About this free sample

Work Reliably with Dates and Time Zones

Sanjaay Gowda T S

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This first edition was prepared with AI assistance. The case studies are fictional teaching examples. Any measured outputs come from the supplied examples, not production customer data. The teaching scope, assumptions and limitations are explained in the chapters. Independent human technical, editorial and assistive-technology reader review is pending. Automated tests and accessibility checks do not establish certification or suitability for every use.

Run examples in a separate working folder using the supplied synthetic data. Review inputs and calculations before adapting the techniques to real operations. Model software, service access, subscriptions, ongoing updates and consulting are not included.

Author website: sanjaaygowdats.ai

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This free sample contains the introduction and Chapter 1 only. The closing link opens the complete guide. The companion project and worked solutions are supplied with the complete ebook.

Start here

Dates and times become unreliable when a program treats several different meanings as the same kind of value. A business date is not an instant. A local clock reading is not necessarily unique. A duration measured on a clock face is not always elapsed time. This book gives each meaning a contract and builds a small program that exposes ambiguity instead of guessing.

The fictional case is Linden Studio, which records sessions at studios in different time zones. Every session identity and appointment is invented. The program normalizes local session endpoints, measures elapsed seconds and groups sessions by a reporting day. It does not schedule real appointments, calculate wages or establish legal time records.

The companion uses Python `datetime` and `zoneinfo`. It requires Python 3.10 or later and an available IANA time-zone database. Some systems provide that database through the operating system; others need the separately distributed `tzdata` package. The program uses standard-library APIs, but it cannot resolve named zones without the underlying data [R1]. Use a supported Python version for actual work.

```
python main.py --input example-input.json
python -m unittest discover -s tests -v
```

The fixture includes a spring clock change, an autumn repeated hour, a nonexistent local time and a session whose reporting day differs from its local start date. Read the accepted and rejected results before changing the code. The spring session has 120 wall-clock minutes but only 3,600 elapsed seconds. The repeated-hour session uses explicit fold choices and lasts 5,400 elapsed seconds.

The nine chapters distinguish temporal types, resolve local readings, calculate on a UTC timeline and preserve evidence needed for later review. Exercises focus on boundaries that ordinary midday examples miss. The program is deliberately strict about input shape and leaves unsupported scheduling and historical-policy questions visible.

1. Name the time you mean

Three meanings need three contracts

A calendar date such as September 1 can identify a business day without specifying an instant. A local reading such as September 1 at 00:15 needs a zone to identify an instant, and may need more information during a repeated hour. An instant can be represented on a UTC timeline and compared with another instant for elapsed duration.

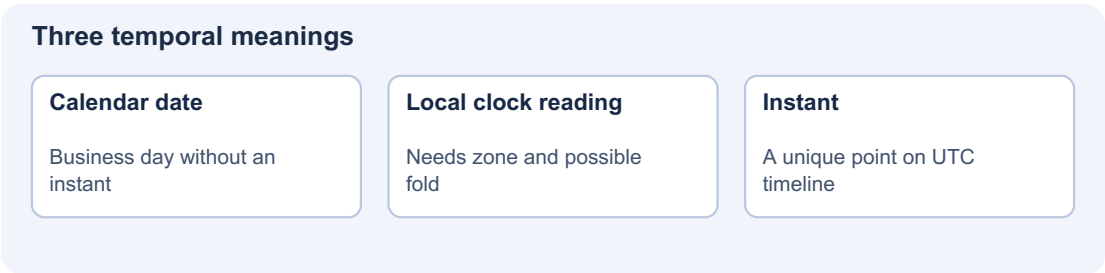


Figure 1. A calendar date, a local clock reading and an instant require different evidence.

Python distinguishes naive datetime values from aware values carrying time-zone information [R2]. The lesson uses a naive value only as an intermediate local clock reading. It does not call that reading UTC or let the machine's local zone silently interpret it. Named zone and possible fold are supplied separately.

Value	Example meaning	Missing evidence
Date	Studio business day	No instant intended
Local reading	Appointment clock time	Zone and possible fold
UTC instant	Unique session endpoint	Original local intent may be absent

Worked case: midnight changes the date

L104 begins at 00:15 in Asia/Kolkata on September 1. In UTC it is still August 31. Neither date is inherently wrong. The correct date depends on whether the report groups by local studio day or by UTC day. The input explicitly chooses UTC as the reporting zone, so the fixture belongs to August 31 in that report.

Exercise: classify source fields

Classify birthday, invoice business date, sensor event timestamp and tomorrow's studio opening time. State which values should remain dates, which need an instant and which express recurring local intent. Explain why adding midnight UTC to every date does not preserve all these meanings.

Meaning worksheet: intent can outlive interpretation

Consider a studio booking made months in advance. The customer intended nine in the morning at a named local studio. Saving only its initially calculated UTC instant loses that local intention if the jurisdiction later changes its clock rules. For a completed session, preserving the observed instant may be the primary requirement. For a future appointment, preserving local intent and reviewing its resolution may be more appropriate. The storage model should retain enough information for both questions instead of assuming one representation can replace the other.

Date-only records have a similar trap. A birthday is not a midnight event in an arbitrary zone. Serializing it as midnight UTC and displaying it elsewhere can move the visible date backward. Keep date-only fields distinct in schemas and user interfaces. When a downstream system insists on a timestamp, document the encoding convention and prevent consumers from treating the encoded instant as the original business meaning. A type conversion can be technically valid while changing the question a field answers. Naming the temporal meaning first is the most useful defense against that class of error.

Continue with the full guide

This free sample ends after the introduction and Chapter 1. The complete guide contains nine teaching chapters, worked exercise solutions, primary references and a separate Python companion project. The full PDF, reflowable EPUB and project files are supplied together.

Use the complete guide to work through the remaining exercises and inspect the supplied examples. The companion code and fictional data are separately MIT licensed; the complete ebook has the single-reader terms described on its product page.

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Primary references

1. **[R1] Python zoneinfo**

<https://docs.python.org/3.10/library/zoneinfo.html>

IANA named zones and database availability

2. **[R2] Python datetime**

<https://docs.python.org/3.10/library/datetime.html>

Naive/aware values, conversions and arithmetic