exercise-bank

Typst Package

Exercise Management & Banking System

A comprehensive solution for creating, organizing, and filtering exercises
Version 0.4.0
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Contents

1. Introduction

`exercise-bank` is a Typst package for creating and managing exercises with solutions, metadata, filtering, and exercise banks. Perfect for teachers, textbook authors, and educational content creators.

1.1. Features

- Exercises with inline or deferred solutions
- Teacher corrections with flexible display modes
- Draft mode for work-in-progress documents
- Multiple display control options (what, where, which content)
- Metadata support (topic, level, author, competencies)
- Exercise banks: define once, display anywhere
- Powerful filtering by any criteria
- Automatic numbering with reset options
- Customizable labels (localization support)

1.2. Installation

Import the package in your Typst document:

```
#import "@local/exercise-bank:0.4.0": exo, exo-setup
```

1.3. Quick Start

Code

```
#exo(
  exercise: [Solve the equation $2x + 5 = 13$.]
)
```

Preview

> **Exercise 1** Solve the equation $2x + 5 = 13$.

2. Basic Usage

2.1. Simple Exercise

Code

```
#exo(
  exercise: [Calculate $3 + 4 times 2$.]
)
```

Preview

> **Exercise 1** Calculate $3 + 4 \times 2$.

2.2. Exercise with Solution

Code

```
#exo(
  exercise: [Calculate $3 + 4 times 2$.],
  solution: [$3 + 4 times 2 = 3 + 8 = 11$],
)
```

Preview

> **Exercise 1** Calculate $3 + 4 \times 2$.
>
> **Solution 1** $3 + 4 \times 2 = 3 + 8 = 11$

2.3. Multiple Exercises

Exercises are automatically numbered:

Code

```
#exo(exercise: [Simplify $x^2 + 2x + 1$.])
#exo(exercise: [Factor $x^2 - 4$.])
#exo(exercise: [Solve $2x - 6 = 0$.])
```

Preview

> **Exercise 1** Simplify $x^2 + 2x + 1$.
>
> **Exercise 2** Factor $x^2 - 4$.
>
> **Exercise 3** Solve $2x - 6 = 0$.

3. Display Control

The package uses three parameters to control display behavior.

3.1. `show` - What to Display

Controls what content is displayed:

- `"both"` (default) - Show exercises and solutions/corrections
- `"ex"` - Show only exercises
- `"sol"` - Show only solutions/corrections

Code

```
#exo-setup(display: "ex")  // Exercises only

#exo(
  exercise: [Solve $x + 3 = 7$.],
  solution: [$x = 4$],  // Hidden
)
```

Preview

> **Exercise 1** Solve $x + 3 = 7$.

3.2. `corrDisplay` - Which Content to Show

Controls whether to show solutions or corrections:

- `"solution"` (default) - Show solution content
- `"correction"` - Show correction content
- `"mixed"` - Default to solution, but use correction for exercises with `showCorr: true`

Code

```
#exo-setup(corrDisplay: "correction")

#exo(
  exercise: [Simplify $2x + 3x$.],
  correction: [
    $2x + 3x = 5x$
    (Combine like terms)
  ],
)
```

Preview

> **Exercise 1** Simplify $2x + 3x$.
>
> **Correction 1** $2x + 3x = 5x$ (Combine like terms)

3.3. `corrLoc` - Where to Display

Controls where solutions/corrections appear:

- `"after"` (default) - Immediately after each exercise
- `"pagebreak"` - With a page break between
- `"end-section"` - Collected at section end
- `"end-chapter"` - Collected at chapter end

Code

```
#exo-setup(corrLoc: "end-section")

#exo(exercise: [Exercise 1], solution: [Answer 1])
#exo(exercise: [Exercise 2], solution: [Answer 2])

#exo-print-solutions()  // Print collected solutions
```

Preview

Exercise 1 Exercise 1

Exercise 2 Exercise 2

Solutions

Solution 1 Answer 1

Solution 2 Answer 2

4. Corrections (Teacher Version)

Corrections are detailed solutions for teachers, including pedagogical notes and teaching tips.

4.1. Exercise with Correction

Code

```
#exo-setup(corrDisplay: "correction")

#exo(
  exercise: [Solve $x^2 = 9$.],
  correction: [
    *Teacher notes:*
    $x = plus.minus 3$

    Common mistake: forgetting the negative root.
  ],
)
```

Preview

> **Exercise 1** Solve $x^2 = 9$.

4.2. Solutions Only (Answer Key)

Show only solutions for student answer keys:

Code

```
#exo-setup(display: "sol")

#exo(
  exercise: [This is hidden],
  solution: [Only this solution is shown],
)
```

Preview

> **Solution 1** Only this solution is shown

4.3. The `solInCorr` Flag

When `corrDisplay: "correction"`, both correction AND solution are shown by default. Use `solInCorr: true` on an exercise to indicate the solution is already embedded in the correction (avoiding duplication):

Code

```
#exo-setup(corrDisplay: "correction")

// Without solInCorr: both correction and solution shown
#exo(
  exercise: [Problem A],
  correction: [Teacher notes only],
  solution: [$x = 5$],
)

// With solInCorr: only correction shown
#exo(
  exercise: [Problem B],
  correction: [
    *Solution:* $x = 3$

    _Teaching tip: Watch for sign errors._
  ],
  solution: [$x = 3$],
  solInCorr: true,  // Solution already in correction
)
```

Preview

> Exercise 1 Problem A
>
> Exercise 2 Problem B

4.4. Mixed Display Mode

Use corrDisplay: "mixed" to default to solutions while showing corrections for specific exercises:

Code

```
#exo-setup(corrDisplay: "mixed")

#exo(
  exercise: [Simple problem],
  solution: [Quick answer],
  correction: [Detailed explanation],
)

#exo(
  exercise: [Complex problem],
  solution: [Answer],
  correction: [Step-by-step solution],
  showCorr: true,  // Shows correction
)
```

Preview

> Exercise 1 Simple problem
>
> Exercise 2 Complex problem

5. Draft Mode

Show placeholders for incomplete exercises during document preparation.

5.1. With Draft Mode ON

Code

```
#exo-setup(
  draft-mode: true,
  solution-placeholder: [_[To be written]_],
)

#exo(
  exercise: [Solve $x + 5 = 12$],
  solution: [],  // Empty - shows placeholder
)
```

Preview

> **Exercise 1** Solve $x + 5 = 12$

5.2. With Draft Mode OFF (Default)

Empty solutions show minimal space without placeholders:

Code

```
#exo-setup(draft-mode: false)

#exo(
  exercise: [Solve $x + 5 = 12$],
  solution: [],  // Empty - no placeholder
)
```

Preview

> **Exercise 1** Solve $x + 5 = 12$

6. Exercise Banks

Define exercises once, display them anywhere. Perfect for creating reusable exercise collections.

6.1. Defining Bank Exercises

Use `exo-define` to register exercises without displaying them:

```
#exo-define(
  id: "quad-1",
  exercise: [Solve $x^2 - 5x + 6 = 0$.],
  topic: "quadratics",
  level: "1M",
  solution: [$x = 2$ or $x = 3$],
)

#exo-define(
  id: "geom-1",
  exercise: [Find the area of a circle with radius 5.],
  topic: "geometry",
  level: "1M",
  solution: [$A = 25pi$],
)
```

6.2. Displaying Bank Exercises

Use `exo-show` to display a specific exercise:

Code

```
#exo-show("quad-1")
```

Preview

> $\boxed{\textbf{Exercise 1}}$ Solve $x^2 - 5x + 6 = 0$.

6.3. Selecting Multiple Exercises

Use `exo-select` with filters:

```
// All quadratics exercises
#exo-select(topic: "quadratics")

// Level 1M exercises only
#exo-select(level: "1M")

// Multiple topics
#exo-select(topics: ("quadratics", "geometry"))

// Limit count
#exo-select(topic: "algebra", max: 5)

// Custom filter
#exo-select(where: ex => ex.metadata.level == "hard")
```

7. Metadata and Filtering

7.1. Adding Metadata

Tag exercises for organization and filtering:

```
#exo(
  exercise: [Solve $x + 1 = 5$.],
  topic: "algebra",
  level: "easy",
  authors: ("Prof. Smith",),
)
```

7.2. Filtering Exercises

Display only exercises matching criteria:

```
#exo-filter(topic: "algebra")
#exo-filter(level: "easy")
#exo-filter(topic: "algebra", level: "hard")
```

8. Competency Tags

Tag exercises with competencies and display them visually.

Code

```
#exo-setup(show-competencies: true)

#exo-define(
  id: "comp-ex",
  exercise: [Solve and explain your reasoning.],
  competencies: ("C1.1", "C2.3", "C4.1"),
  solution: [Detailed solution here],
)

#exo-show("comp-ex")
```

Preview

| **Exercise 1** | Solve and explain your reasoning. |

C1.1 C2.3 C4.1

8.1. Filter by Competency

```
#exo-select(competency: "C1.1")
#exo-select(competencies: ("C1.1", "C2.3"))
```

9. Configuration

9.1. Global Setup

Use `exo-setup` to configure defaults:

```
#exo-setup(
  // Display control
  display: "both",              // "ex", "sol", "both"
  corrDisplay: "solution",      // "solution", "correction", "mixed"
  corrLoc: "after",             // "after", "pagebreak", "end-section", "end-chapter"
  // Labels
  exercise-label: "Exercise",
  solution-label: "Solution",
  correction-label: "Correction",
  // Counter behavior
  counter-reset: "section",     // "section", "chapter", "global"
  // Display options
  show-id: false,
  show-competencies: false,
  // Draft mode
  draft-mode: false,
  // Badge styling
  badge-style: "box",
  badge-color: black,
)
```

9.2. Badge Styles

Change the visual style of exercise badges:

```
// Circled number (no label text)
#exo-setup(badge-style: "circled")

// Filled circle with white number
#exo-setup(badge-style: "filled-circle", badge-color: rgb("#2563eb"))

// Pill-shaped badge
#exo-setup(badge-style: "pill")

// Arrow tag
#exo-setup(badge-style: "tag", badge-color: rgb("#1e40af"))
```

Available styles: `"box"` (default), `"circled"`, `"filled-circle"`, `"pill"`, `"tag"`, `"border-accent"`, `"underline"`, `"rounded-box"`, `"header-card"`

9.3. Localization

Change labels for different languages:

Code

```
// French
#exo-setup(
  exercise-label: "Exercice",
  solution-label: "Solution",
  correction-label: "Corrigé",
)
```

Preview

French: Exercice, Solution, Corrigé
German: Aufgabe, Lösung
Spanish: Ejercicio, Solución

9.4. Counter Reset Options

Control when numbering resets:

```
#exo-setup(counter-reset: "section")  // Reset each section
#exo-setup(counter-reset: "chapter")  // Reset each chapter
#exo-setup(counter-reset: "global")   // Never reset
```

Use hooks to trigger resets:

```
= New Section
#exo-section-start()  // Resets if counter-reset: "section"

= New Chapter
#exo-chapter-start()  // Resets if counter-reset: "chapter"
```

9.5. Advanced Exercises

Mark exercises as advanced to display a visual cue before the label. The default symbol is *.

Code

```
#exo(
  exercise: [A challenging problem.],
  advanced: true,
)
```

Preview

| * Exercise 1 | A challenging problem.

Customize the symbol:

Code

```
#exo-setup(advanced-symbol: sym.dagger)
#exo(
  exercise: [Advanced with dagger.],
  advanced: true,
)
```

Preview

| † Exercise 1 | Advanced with dagger.

Disable with `advanced-symbol: none`.

10. Visual Styles

Set the badge style with `exo-setup(badge-style: "...")`.

10.1. Box (Default)

Code

```
#exo-setup(badge-style: "box")
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

| Exercise 1 | Solve $x + 3 = 7$

10.2. Circled

Code

```
#exo-setup(badge-style: "circled")
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

(1) Solve $x + 3 = 7$

10.3. Filled Circle

Code

```
#exo-setup(
  badge-style: "filled-circle",
  badge-color: rgb("#2563eb"),
)
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

(1) Solve $x + 3 = 7$

10.4. Pill

Code

```
#exo-setup(badge-style: "pill")
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

(Exercise 1) Solve $x + 3 = 7$

10.5. Tag

Code

```
#exo-setup(
  badge-style: "tag",
  badge-color: rgb("#1e40af"),
)
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

Exercise 1 Solve $x + 3 = 7$

10.6. Border Accent

Code

```
#exo-setup(
  badge-style: "border-accent",
  badge-color: rgb("#3b82f6"),
)
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

Exercise 1

Solve $x + 3 = 7$

10.7. Underline

Code

```
#exo-setup(badge-style: "underline")
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

Exercise 1

Solve $x + 3 = 7$

10.8. Rounded Box

Code

```
#exo-setup(badge-style: "rounded-box")
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

Exercise 1

Solve $x + 3 = 7$

10.9. Header Card

Code

```
#exo-setup(badge-style: "header-card", badge-color: rgb("#3b82f6"))
#exo(exercise: [Solve $x + 3 = 7$])
```

Preview

Exercise 1

Solve $x + 3 = 7$

11. Parameter Reference

11.1. `exo` Function

Parameter	Type	Default	Description
exercise	content	none	Exercise content (required)
solution	content	none	Solution content
correction	content	none	Correction for teachers
id	string	auto	Unique exercise ID
solInCorr	bool	false	If true, solution is already in correction (don't show both)
showCorr	bool	false	If true, show correction in "mixed" mode
topic	string	none	Topic metadata
level	string	none	Difficulty level
authors	array	()	Author names

11.2. `exo-define` Function

Same as `exo`, plus:

Parameter	Type	Default	Description
competencies	array	()	Competency tags
points	number	none	Points (for exam mode)

11.3. `exo-select` Function

Parameter	Type	Default	Description
topic	string	none	Filter by topic
level	string	none	Filter by level
author	string	none	Filter by author
competency	string	none	Filter by competency
topics	array	none	Filter by any topic
levels	array	none	Filter by any level
competencies	array	none	Filter by any competency
where	function	none	Custom filter function
renumber	bool	true	Renumber sequentially
max	int	none	Maximum exercises

11.4. `exo-setup` Function

Display Control:

Parameter	Type	Default	Description
show	string	"both"	"ex", "sol", "both"
corrDisplay	string	"solution"	"solution", "correction", "mixed"

corrLoc	string	"after"	"after", "pagebreak", "end-section", "end-chapter"
exercise-label	string	"Exercise"	Label for exercises
solution-label	string	"Solution"	Label for solutions
correction-label	string	"Correction"	Label for corrections
counter-reset	string	"section"	"section", "chapter", "global"
show-id	bool	false	Show exercise IDs
show-competencies	bool	false	Show competency tags
draft-mode	bool	false	Show placeholders for empty content
solution-placeholder	content	*To be completed*	Placeholder text
correction-placeholder	content	*To be completed*	Placeholder text

Visual Styling:

Parameter	Type	Default	Description
badge-style	string	"box"	Style: "box", "circled", "filled-circle", "pill", "tag", "border-accent", "underline", "rounded-box", "header-card"
badge-color	color	black	Color for exercise badges
solution-color	color	green	Color for solution badges
correction-color	color	green	Color for correction badges
label-font-size	length	12pt	Font size for badge labels
margin-position	length/auto	auto	Width reserved for badge column
label-extra	length	1cm	Extra space for labels in margin

Spacing:

Parameter	Type	Default	Description
exercise-above	length	0.8em	Space above exercise boxes
exercise-below	length	0.8em	Space below exercise boxes
solution-above	length	0.8em	Space above solution boxes
solution-below	length	0.8em	Space below solution boxes
correction-above	length	0.8em	Space above correction boxes
correction-below	length	0.8em	Space below correction boxes
advanced-symbol	content/none	"*"	Symbol before label for advanced exercises

12. Utility Functions

Function	Description
exo-reset-counter()	Reset exercise numbering to 0
exo-clear-registry()	Clear all registered exercises
exo-section-start()	Call at section start (triggers reset if configured)
exo-chapter-start()	Call at chapter start (triggers reset if configured)
exo-print-solutions()	Print collected solutions (for end-section/chapter modes)
exo-count(topic: ..)	Count exercises matching criteria
exo-show("id")	Display exercise by ID
exo-show-many("a", "b")	Display multiple exercises by ID
exo-filter(topic: ..)	Filter and display matching exercises