exercise-bank

Typst Package

Exercise Management & Banking System

A comprehensive solution for creating, organizing, and filtering exercises
Version 0.3.0
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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 fallback and append modes
- Draft mode for work-in-progress documents
- Multiple solution display modes
- 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:0.3.0": 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. Solution Display Modes

Control how and where solutions appear using `solution-mode`.

3.1. Inline (Default)

Solutions appear immediately after each exercise:

Code

```
#exo-setup(solution-mode: "inline")

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

Preview

Exercise 1	Solve $x + 3 = 7$.
Solution 1	$x = 4$

3.2. No Solutions

Hide all solutions (for student worksheets):

Code

```
#exo-setup(solution-mode: "none")

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

Preview

Exercise 1	Solve $x + 3 = 7$.

3.3. Solutions at End of Section

Collect solutions and display them later:

Code

```
#exo-setup(solution-mode: "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 |

3.4. Solutions Only

Show only solutions (for answer keys):

Code

```
#exo-setup(solution-mode: "only")

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

Preview

| Solution 1 | Only this solution is shown |

4. Corrections (Teacher Version)

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

4.1. Exercise with Correction

Code

```
#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. Fallback to Correction

When `fallback-to-correction` is enabled, corrections are shown when solutions are missing:

Code

```
#exo-setup(fallback-to-correction: true)

#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)

4.3. Appending Solutions to Corrections

Combine corrections with solutions using custom formatting:

Code

```
#exo-setup(
  append-solution-to-correction: true,
  solution-in-correction-style: (
    weight: "bold",
    fill: rgb("#1565c0"),
  ),
)

#exo(
  exercise: [Solve $x^2 = 9$.],
  correction: [
    Look for values where x squared equals 9.
    Don't forget both positive and negative roots.
  ],
  solution: [$x = 3$ or $x = -3$],
)
```

Preview

Exercise 1 Solve $x^2 = 9$.

Correction 1 Look for values where x squared equals 9. Don't forget both positive and negative roots.

$x = 3$ or $x = -3$

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 $x + 5 = 12$ |

| **Solution 1** | *[To be written]* |

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 $x + 5 = 12$ |

| **Solution 1** |

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

| Exercise 1 | Solve $x^2 - 5x + 6 = 0$. |

| Solution 1 | $x = 2$ or $x = 3$ |

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")
```

6.4. Including Exercises from External Files

For larger projects, organize exercises in separate files and import them as needed.

File structure:

```
project/
├── main.typ
├── exercises/
│      ├── algebra.typ
│      ├── geometry.typ
│      └── calculus.typ
```

exercises/algebra.typ:

```
#import "@local/exercise-bank:0.3.0": exo-define

#exo-define(
  id: "alg-linear-1",
  exercise: [Solve $2x + 5 = 13$.],
  topic: "linear-equations",
  level: "1M",
  solution: [$x = 4$],
)

#exo-define(
  id: "alg-linear-2",
  exercise: [Solve $3x - 7 = 2x + 4$.],
  topic: "linear-equations",
  level: "1M",
  solution: [$x = 11$],
)

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

main.typ:

```
#import "@local/exercise-bank:0.3.0": *

// Import exercise definitions (registers them in the bank)
#include "exercises/algebra.typ"
#include "exercises/geometry.typ"

// Now use them anywhere in your document
= Linear Equations
#exo-select(topic: "linear-equations")

= Quadratics
#exo-select(topic: "quadratics")

// Or pick specific exercises
= Mixed Review
#exo-show("alg-linear-1")
#exo-show("alg-quadratic-1")
```

Tips:
- Use #include (not #import) to execute the file and register exercises
- Exercise IDs must be unique across all included files

- Exercises are registered globally, so include order doesn't matter for display

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

| **Solution 1** | Detailed solution here |

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(
  solution-mode: "inline",
  exercise-label: "Exercise",
  solution-label: "Solution",
  correction-label: "Correction",
  counter-reset: "section",
  show-id: false,
  show-competencies: false,
  fallback-to-correction: false,
  append-solution-to-correction: false,
  draft-mode: false,
  badge-style: "box",        // "box", "circled", "filled-circle", "pill", "tag"
  badge-color: black,        // Color for badge
)
```

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"`

9.3. Localization

Change labels for different languages:

Code

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

// German
#exo-setup(
  exercise-label: "Aufgabe",
  solution-label: "Lösung",
)
```

Preview

French: Exercice, Solution
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"
```

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 $x + 3 = 7$

```
#exo-setup(badge-style: "header-card", badge-color: rgb("#3b82f6"))
#exo(exercise: [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
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

Content & Behavior:

Parameter	Type	Default	Description
solution-mode	string	"inline"	"inline", "end-section", "end-chapter", "none", "only"
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
`show-metadata`	bool	false	Show metadata
`fallback-to-correction`	bool	false	Show correction when solution missing
`append-solution-to-correction`	bool	false	Append solution to correction
`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 (auto = computed from label)
`label-extra`	length	1cm	Extra space for labels to extend into left margin

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