

exercise-bank

Typst Package

Exercise Management & Banking System

A comprehensive solution for creating, organizing, and filtering exercises

Version 0.3.0

Nathan Scheinmann

Contents

1. Introduction	4
1.1. Features	4
1.2. Installation	4
1.3. Quick Start	4
2. Basic Usage	5
2.1. Simple Exercise	5
2.2. Exercise with Solution	5
2.3. Multiple Exercises	5
3. Solution Display Modes	6
3.1. Inline (Default)	6
3.2. No Solutions	6
3.3. Solutions at End of Section	6
3.4. Solutions Only	7
4. Corrections (Teacher Version)	8
4.1. Exercise with Correction	8
4.2. Fallback to Correction	8
4.3. Appending Solutions to Corrections	8
5. Draft Mode	10
5.1. With Draft Mode ON	10
5.2. With Draft Mode OFF (Default)	10
6. Exercise Banks	11
6.1. Defining Bank Exercises	11
6.2. Displaying Bank Exercises	11
6.3. Selecting Multiple Exercises	11
6.4. Including Exercises from External Files	11
7. Metadata and Filtering	14
7.1. Adding Metadata	14
7.2. Filtering Exercises	14
8. Competency Tags	15
8.1. Filter by Competency	15
9. Configuration	16
9.1. Global Setup	16
9.2. Badge Styles	16
9.3. Localization	16
9.4. Counter Reset Options	16
9.5. Spacing Control	17
10. Visual Styles	17
10.1. Box (Default)	17
10.2. Circled	17
10.3. Filled Circle	18
10.4. Pill	18
10.5. Tag	18
10.6. Border Accent	18
10.7. Underline	18
10.8. Rounded Box	19
10.9. Header Card	19
11. Parameter Reference	20
11.1. <code>exo</code> Function	20
11.2. <code>exo-define</code> Function	20
11.3. <code>exo-select</code> Function	20
11.4. <code>exo-setup</code> Function	20

12. Utility Functions	22
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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:*  
     $x = \text{plus.minus } 3$   
  
    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: [ $A = 25\pi$ ],  
)
```

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"
```

9.5. Spacing Control

Control vertical spacing before and after exercises, solutions, and corrections independently:

```
// Compact layout
#exo-setup(
  exercise-above: 0.5em,
  exercise-below: 0.5em,
  solution-above: 0.3em,
  solution-below: 0.3em,
)

// More space between exercises (e.g., for exams)
#exo-setup(
  exercise-above: 1.5em,
  exercise-below: 1em,
)

// Different spacing for corrections
#exo-setup(
  correction-above: 1em,
  correction-below: 0.5em,
)
```

The default spacing is 0.8em for all box types.

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
<code>exercise</code>	content	none	Exercise content (required)
<code>solution</code>	content	none	Solution content
<code>correction</code>	content	none	Correction for teachers
<code>id</code>	string	auto	Unique exercise ID
<code>topic</code>	string	none	Topic metadata
<code>level</code>	string	none	Difficulty level
<code>authors</code>	array	()	Author names

11.2. `exo-define` Function

Same as `exo`, plus:

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

11.3. `exo-select` Function

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

11.4. `exo-setup` Function

Content & Behavior:

Parameter	Type	Default	Description
<code>solution-mode</code>	string	“inline”	“inline”, “end-section”, “end-chapter”, “none”, “only”
<code>exercise-label</code>	string	“Exercise”	Label for exercises
<code>solution-label</code>	string	“Solution”	Label for solutions
<code>correction-label</code>	string	“Correction”	Label for corrections
<code>counter-reset</code>	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	<i>To be completed</i>	Placeholder text
correction-placeholder	content	<i>To be completed</i>	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

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

12. Utility Functions

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