The `neoschool` Class

Version: 1.1.2 — Author: Razik Ikhlef

https://apps.edulatex.xyz

razik.ikhlef@csilyon.fr

Abstract

The `neoschool` class provides secondary school teachers with a toolkit to design their educational materials (assessments, course handouts, exercise sheets with their solutions, etc.). To meet various needs, it offers thirty-six predefined color themes, a wide range of class options for layout and typography, specialized environments, dedicated commands, and different preformatted header styles for each document type. It loads several dozen commonly used LaTeX packages (see list below), which significantly lightens the preamble and avoids package conflicts as much as possible. Multilingual, it supports English, French, and German.

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1 Loaded Packages

The following packages are automatically loaded by the `neoschool` class.

`adforn`
`adjustbox`
`algpseudocode`
`amsmath`
`babel`
`bookmark`
`calc`
`changepage`
`cuted`
`environ`
`fancyvrb`
`fontawesome5`
`forest`
`iftex`
`ifthen`
`kvoptions`
`lastpage`
`listings`
`marginnote`
`microtype`
`minted`
`multicol`
`nccmath`
`needspace`
`pdftexcmds`
`pgffor`
`pgfplots`
`pifont`
`qrcode`
`scrlayer-scrpage`
`setspace`
`silence`
`siunitx`
`tabularray`
`tasks`
`tcolorbox`
`textcase`
`tikz`
`tikzpagenodes`
`tikzsymbols`
`ulem`
`xcolor`
`xhfill`
`xkeyval`
`xsim`
`xstring`

Compiling with `pdflatex` loads the `fontenc` (with `T1` option), `inputenc` (with `utf8` option), `newpxtext`, and `newpxmath` packages. Compiling with `lualatex` makes the `fontspec`,

`luacas`, `lua-ul`, and `luacolor` packages available and applies the `TeX Gyre PagellaX` and `TeX Gyre Heros` fonts in addition to `newpxmath`. The **graphics** option loads the `graphicx` and `wrapfig` packages. The **faketext** option (formerly `draft`) loads the `blindtext` and `lipsum` packages. The **mathastext** option loads the `mathastext` package.

The **math** option loads the `annotate-equations`, `bm`, `breqn`, `cancel`, `mathrsfs`, `ncccomma`, `numprint`, `tdsfrmath` (with `suite` and `taupe` options), `tkz-euclide`, `witharrows`, and `xlop` packages. The **notes=*length*** option displays boxed notes (`todonotes`) in the margins, alternating between the left and right, and defines their width. It loads the `todonotes` package.

The **apmep** option, which allows direct compilation of past papers from the French association of the same name, defines a set of mathematical commands and loads the `esvect`, `fourier-orns`, `numprint` (with `np` option), `pstricks` (and many packages from the `pstricks` ecosystem), `tabularx`, `textcomp`, `tkz-tab`, and `enumitem` packages. The **mathics** option enables computer algebra (CAS) via `mathics` (an open-source alternative to `mathematica`) and loads the `asymptote` and `latexalpha2` packages.

2 Configuration Options

2.1 Language

- **english, french, german**: Activates translations and typesetting conventions for each language. These options affect the titles of theorems and environments, typography, and mathematical conventions.
- **nofrenchlist**: Disables French-style lists (reverting to standard bullet points instead of dashes).
- **frenchlistaspar**: Treats list items as paragraphs in French (adding terminal punctuation and initial capitalization).
- **frenchmath**: Applies French mathematical conventions (upright uppercase and Greek letters in math mode).

2.2 Global Appearance

2.2.1 Predefined Themes

The **theme** = `theme-name` option sets the document's color theme. The available themes are: `classic` (default theme), `abyss`, `aether`, `atlantic`, `autumn`, `blossom`, `botanical`, `burgundy`, `coral`, `cyprus`, `day`, `deepocean`, `duo`, `eagle`, `earth`, `foresthues`, `frost`, `glacier`, `goldensummer`, `graphite`, `heather`, `heritage`, `kassio`, `magma`, `modern`, `neon`, `nordic`, `purplebliss`, `retrocafe`, `saffronsky`, `scribe`, `sepia`, `summer`, `twilight`, `winkle`, and `midnight` (dark theme).

```
1 \documentclass[theme=retrocafe]{neoschool}
```

2.2.2 Color Modes

These options modify how the theme's colors are applied.

- **unicolor**: Uses a single color (based on the main title color) for all environments, with variations in transparency.
- **examcolor**: Remaps practical and admonition colors (exercises, activities, info, warnings) to the main theoretical color (`definitionColor`). This creates a more uniform, two-tone palette suitable for exams.
- **print**: Converts all colors to grayscale for printing.

2.2.3 Color Customization

Allows overriding the chosen theme's colors.

- **globalcolor** = `color`: Main text color.
- **titlecolor** = `color` or **titlehexcolor** = `hex code`: Main title color.
- **headcolor** = `color`: Section headings (`\section`) color.
- **subcolor** = `color`: Subsection headings (`\subsection`) color.
- **subsubcolor** = `color`: Subsubsection headings (`\subsubsection`) color.
- **headfootcolor** = `color`: Header and footer text color.

2.2.4 Display Options

- **nothmframe**: Removes frames from theorem and exercise environments.
- **nothmback**: Removes background colors from theorem and exercise environments.
- **nocodeframe**: Removes frames from code blocks.
- **nocodeback**: Removes background colors from code blocks.
- **nocodenum**: Disables line numbering in code blocks.
- **noadframe**: (Default) Disables frames for admonition boxes (note, info, etc.).
- **noadback**: (Default) Disables background colors for admonition boxes.
- **adframe**: Re-enables frames for admonition boxes.
- **adback**: Re-enables background colors for admonition boxes.
- **scale**: Harmonizes font scaling when compiling with `lualatex`.
- **inlinecodebox**: Displays inline code (`\texttt`) in a framed and colored box.

2.2.5 Box Corner Radius Options

These key-value options (`option=length`) let you customize the corner radius for different environments.

- **boxarc** = `length`: Radius for `neobox` and `answerframe` (default: `1mm`).
- **codeboxarc** = `length`: Radius for code boxes (default: `1mm`).
- **adboxarc** = `length`: Radius for admonitions (default: `2pt`).
- **sideboxarc** = `length`: Radius for `sidebyside` (default: `1pt`).
- **thmboxarc** = `length`: Radius for theorems (default: `1mm`).
- **exboxarc** = `length`: Radius for exercises (default: `1mm`).
- **pseudoboxarc** = `length`: Radius for `pseudocode` (default: `1mm`).

2.3 Abstract Customization

The `abstracttitle` option allows changing the title of the `abstract` environment.

```
\documentclass[abstracttitle=Summary]{neoschool}
```

2.4 Typography

- **sfbody**: Uses the sans serif font for the main body text.
- **sfall**: Uses the sans serif font for the entire document (headings, text, etc.).
- **boldlistlabels**: Bolds the labels of list items (e.g., **1.**, **a.**).
- **mathastext**: Uses the current text font for mathematics.
- **mainface** = `FontName`: Sets the main font (serif).
- **mainfaceoptions** = `options`: Options for the main font (e.g., `Scale=MatchLowercase`).
- **sansface** = `FontName`: Sets the sans serif font.
- **sansfaceoptions** = `options`: Options for the sans serif font.
- **monoface** = `FontName`: Sets the monospace font (for code).
- **monofaceoptions** = `options`: Options for the monospace font.
- **mathface** = `MathFontName`: Sets the math font.
- **mathfaceoptions** = `options`: Options for the math font (`pdflatex` only).
- **mathfacescale** = `factor`: Sets a scaling factor for the math font (useful with `lualatex` or `xelatex`).
- **facefamily** = `FamilyName`: Sets a complete font family (e.g., `fira`).
- **facefamilyoptions** = `options`: Options for the font family.

```
% Example with Fira Sans
\documentclass[
    facefamily=Fira Sans,
    facefamilyoptions={%
        sfdefault,
        lining
      },
    monoface=Fira Mono,
    monofaceoptions={Scale=0.85}
]{neoschool}
```

2.5 Page Layout

2.5.1 Margins and Spacing

- **margin** = `length`: Sets the width of the horizontal margins (default: `2cm`). Vertical margins are adjusted automatically.
- **notes** = `length`: Enables marginal notes (`todonotes`) and sets their width.
- **leftnotes**[=*length*]: Enables marginal notes (`todonotes`) only in the left margin and sets their width.
- **rightnotes**[=*length*]: Enables marginal notes (`todonotes`) only in the right margin and sets their width.
- **noindent**: Removes paragraph indentation.
- **indent** = `length`: Sets the indentation size (default: `1em`).
- **vspacing** = `factor`: Sets a compression/expansion factor for vertical spacing (paragraphs, lists, headings). Default: `1.0`. A value < 1 compresses, > 1 expands.

2.5.2 Output Options (N-Up Layout)

These options allow printing multiple logical pages on a single physical page.

- **2a5toa4**: Prints the same A5 page twice on one A4 landscape sheet.
- **2a4toa3**: Prints the same A4 page twice on one A3 landscape sheet.
- **4a5toa3**: Prints the same A5 page four times on one A3 sheet.
- **2toa3**: Prints 2 different A4 pages on one A3 landscape sheet.
- **bookleta5**: Creates an A5 booklet (A5 pages on folded A4 sheets).
- **bookleta4**: Creates an A4 booklet (A4 pages on folded A3 sheets).

2.5.3 Table of Contents

- **compacttoc**: Reduces spacing in the Table of Contents.
- **monotoc**: Uses the main text color (`globalcolor`) for the Table of Contents.
- **twocolumntoc**: Typesets the Table of Contents in two columns.

2.5.4 Headers and Footers

- **fullheader**: Enables a full header and footer (document type, title, level / date, institution, pagination). Used in conjunction with `\neoheader`.
- **headrule**: Adds a rule (line) below the header.
- **footrule**: Adds a rule above the footer.
- **headfootrule**: Adds both rules.
- **nofooter**: Completely removes the header and footer (`empty` style).
- **pageonlyfooter**: Displays only the page number centered at the bottom (`pagenum` style).

3 Document Styles

3.1 Title Styles (`\maketitle`)

These options radically change the appearance of the first page and title.

3.1.1 Exam Styles

Ideal for tests, quizzes, and mock exams.

- **exam**: Full style with a table for name, class, date, etc., and a grading strip. Requires `\neoheader`.
- **shortexam**: More compact style for exams, with essential information. Requires `\neoheader`.
- **mockexam**: Specific style for standardized mock exams, with a normalized cover page (French standard). Requires `\neoheader`.

```
\documentclass[exam]{neoschool}
\neoheader{
  type = Test \#1,
  school = Imaginary High School,
  level = Grade 12,
  duration = 2h,
  calculator = exam % or true/false
}
\title{Numerical Sequences}
\date{October 21, 2025}
\subject{Mathematics} % Optional
```

```
\begin{document}
\maketitle
...
\end{document}
```

3.1.2 Assessment Styles

Suitable for quizzes and short tests.

- **eval**: Standard style, information distributed in the corners. Requires `\neoheader`.
- **evalicons**: `eval` style with customizable icons via `\neoheader`.
- **evalgrade**: `eval` style with an added grading strip.
- **evaliconsgrade**: Combines `evalicons` and `evalgrade`.
- **shorteval**: Compact style on a single line at the top of the page. Requires `\neoheader`.

3.1.3 Bubble Styles

Visual effects for less formal documents.

- **bubbles**: Centered title on a background of colored bubbles.
- **topbubbles**: Bubbles confined to the top of the page, title below.
- **bottombubbles**: Bubbles confined to the bottom of the page, title above.

3.1.4 Other Title Styles

More classic or minimalist options.

- **titleornament**: Adds ornaments under the title.
- **titlerule**: Adds a small rule under the title.
- **titlemidrule**: Adds a centered rule of medium width under the title.
- **titlefullrule**: Adds a full-width rule under the title.
- **fancybox**: Title in a rotated colored banner at the top left.
- **onlytitleleft** / **onlytitle** / **onlytitleright**: Displays only the title, aligned left / center / right. Ignores author, date, etc.
- **shorttitle**: Compact style, title centered on one line at the top.
- **shortlesson**: Compact style for lesson sheets, with type, title, and level on one line. Requires `\neoheader`.

3.2 Header Configuration (`\neoheader`)

This command configures the information used by the `exam`, `eval`, `mockexam`, `shortlesson` styles and the `fullheader` option.

```
\neoheader{
  type = {Quiz},                % Document type
  school = {A. Turing College},  % Institution name
  academy = {Lyon},             % Academy name (for mockexam)
  level = {Grade 8},            % Class level
  duration = {20 minutes},      % Duration (for exam, mockexam)
  calculator = {false},         % Calculator: true / false / exam
  leftcontent = {\faFlask},     % Left icon (for evalicons)
  rightcontent = {\faCalculator} % Right icon (for evalicons)
  leftcontentfill = {true},     % (for evalicons, boolean)
  rightcontentfill = {true}     % (for evalicons, boolean)
}
```

3.3 Heading Formatting Options

These options control the appearance (font, weight, shape, alignment) of the document's various headings.

3.3.1 Global Styles

Apply by default to all headings (sections, theorems, exercises...).

- **headstyle** = `style` (`sffamily` default): Font family (e.g., `rmfamily`, `sffamily`).
- **headweight** = `weight` (`bfseries` default): Font weight (e.g., `mdseries`, `bfseries`, `sbseries` for semi-bold if available).
- **headshape** = `shape` (`scshape` default): Font shape (e.g., `upshape`, `itshape`, `scshape` for small caps).

3.3.2 Main Title Style (`\maketitle`)

Overrides global styles for the main title.

- **titlestyle** = `style` (inherits from `headstyle`).
- **titleweight** = `weight` (inherits from `headweight`).
- **titleshape** = `shape` (`upshape` default).
- **titlealign** = `alignment` (`center` default): `left`, `center`, `right`.

3.3.3 Section Style (`\section`)

Specific options for section headings.

- **sectionnumstyle** = `style` (`circle` default): Number appearance (`circle`, `box`, `dash`, `plain`).
- **sectiontextstyle** = `style` (`sc` default): Text case (`sc`, `upper`, `lower`).
- **sectionstyle** = `style` (`normal` default): Overall visual style (`ornaments`, `underline`, `normal`, `highlighted`, `shadedline`).
- **sectionalign** = `alignment` (`center` default): `left`, `center`, `right`.

3.3.4 Header and Footer Style

- **headfootstyle** = `style` (inherits from `titlestyle`): Font style for header and footer text.

3.3.5 Full Configuration Example

```
\documentclass[
    % Global style
    headstyle=sffamily,
    headweight=bfseries,
    headshape=scshape,
    % Main title
    titlestyle=rmfamily,
    titleweight=bfseries,
    titleshape=upshape,
    titlealign=left,
    % Sections
    sectionnumstyle=box,
    sectiontextstyle=upper,
    sectionstyle=underline,
    sectionalign=left,
    % Headers/Footers
    headfootstyle=sffamily
]{neoschool}
```

4 Content Layout

4.1 Absolute Object Positioning

The command `\positionobject{x}{y}{scale}{content}` places *content* at coordinates (x, y) from the top-left corner of the page, with a *scale* factor.

```
% Logo in the top right
\positionobject{15cm}{1cm}{0.5}{%
  \includegraphics[width=3cm]{logo.png}%
}
```

```
% Text at the bottom left
\positionobject{2cm}{25cm}{1.2}{%
  \textit{Important note}%
}
```

4.2 Two-Column Layout

The command `\splitcontent[w1][gap]{col1}{col2}` splits the horizontal space.

- *w1*: Width of the first column (default: 0.5 for 50%).
- *gap*: Gap between columns (default: 0.02 for 2%).
- *col1*, *col2*: Content of the columns.

```
\splitcontent[0.45][0.03]{%
  Column 1 content (40 %)
    \lipsum[1][1-2]
}{%
  Column 2 content (52 %)
    \lipsum[1][1-2]
}
```

Column 1 content (45 %)
Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis.

Column 2 content (52 %)
Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo.

4.3 Side-by-Side Layout (`sidebyside` environment)

Creates two side-by-side `tcolorbox` environments. Use `\tcblower` to switch from the left box to the right box. Accepts `tcolorbox` options.

```
\begin{sidebyside}[
  title=\centering
    Comparison,
]
  Pros
  \begin{itemize}
    \item Point 1
  \end{itemize}
\tcblower % Separates the
    two columns
  Cons
  \begin{itemize}
    \item Point A
  \end{itemize}
\end{sidebyside}
```

Comparison

Pros	Cons
• Point 1	• Point A

4.4 Text with Image

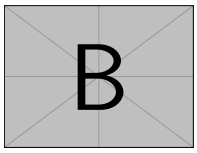
The command `\textwithimage[*]{w_img}{s_img}{text}{image_path}` combines text and an image.

- `*`: If present, places the image on the left (default is right).
- *w_img*: Relative width of the image (e.g., 0.3 for 30%).
- *s_img*: Scaling of the image within its box (e.g., 0.95).
- *text*: The text content.
- *image_path*: Path to the image file.

```
% Image on the right (30% width)
\textwithimage{0.3}{1}{%
  Description of the image
  that will be displayed on the
    right.
}{example-image-a} % dummy image
```

Description of the image that will be displayed on the right.


```
% Image on the left (40% width)
\textwithimage*{0.4}{0.9}{%
  Description to the right of the
    image.
}{example-image-b} % dummy image
```



Description to the right of the image.

4.5 QR Codes and Content

The command `\withqrcode[*][size]{url}{content}` integrates a QR code next to content.

- `*`: Places the QR code on the right (default is left).
- *size*: Size of the QR code (default: 2cm).
- *url*: URL or text to be encoded in the QR code.
- *content*: Text or other content to display next to it.

```
% QR code on the left (default 2cm)
\withqrcode{https://www.google.com}{
  Scan to visit Google.
}
```

Scan to visit Google.

```
% QR code on the right (3cm)
\withqrcode*[3cm]{https://en.
    wikipedia.org}{
  More information on Wikipedia.
}
```

More information on Wikipedia.

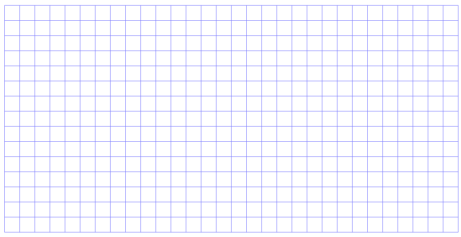
4.6 Grids and Rulings

4.6.1 Customizable Grids

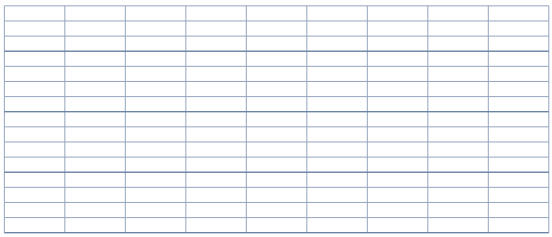
Commands to draw gridded areas.

- `\grid[color]{width}{height}`: Small-step grid (5mm x 5mm).
- `\customgrid[color][dx][dy]{width}{height}`: Grid with custom spacing (*dx*, *dy*).
- `\frenchgrid[color1][color2]{width}{height}`: French (Seyès) ruling. The starred version `\frenchgrid*` centers the grid horizontally.

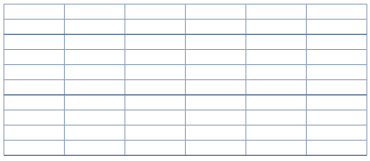
```
\customgrid[blue!50][2mm][2mm]{6cm
    }{3cm}
```



```
\frenchgrid{7.5cm}{3cm}
```



```
\frenchgrid*{5cm}{2cm} % centered
```



4.6.2 Automatic Fill

The command `\gridfill` fills the remaining vertical space on the page with a `customgrid` (5mm default). The starred version `\gridfill*` uses `frenchgrid`.

```
% Syntax: \gridfill[*][color][dx][dy]

% Fills with a blue 2mm x 2mm customgrid
\gridfill[blue][2mm][2mm]

% Fills with a (default) frenchgrid
\gridfill*
```

4.6.3 Full Page Backgrounds

Applies a background style to the current page.

- `\notebook`: Lined notebook style with a red margin.
- `\nbminorgrid`: Small-step (5mm) gridded background.
- `\nbmajorgrid`: Seyès-ruled background.

```
\nbminorgrid % Applies the fine grid to the whole page
```

4.7 Simple Boxes (`neobox`)

An environment for creating simple `tcolorbox`es, with or without a frame. Accepts `tcolorbox` options.

- `neobox`: Box with a frame.
- `neobox*`: Box with no visible frame (but a background is possible).

```
\begin{neobox}[
  title=Standard box
]
Content...
\end{neobox}
```

Standard box

Content...

```
\begin{neobox*}
Content without a visible frame...
\end{neobox*}
```

Content without a visible frame...

5 Exercises

Based on the `xsim` package.

5.1 `exercise` and `solution` Environments

5.1.1 Exercise Configuration

Options available in `\begin{exercise}[options]`.

- **points** = `number`: Number of points.
- **bonus-points** = `number`: Bonus points.
- **level** = `number`: Difficulty level (1 to 5, displayed as stars ★).
- **subtitle** = `text`: Subtitle or brief description.
- **icon** = `fa-icon-name`: FontAwesome icon (e.g., `pencil-alt`). Requires the `exerciseicons` class option.
- **topic** = `theme`: Topic/chapter (for future filtering/selection).
- **grade** = `class/level`: Class level (for filtering).
- **subject** = `subject`: Subject (for filtering).
- **ID** = `identifier`: Unique ID to reference the exercise (`\exercisenumber{id}`).
- **template** = `template-name`: Specific display template for this exercise (see list below). Overrides the global style.

```
\begin{exercise}[
  points=3,
  bonus-points=1,
  level=2,
  subtitle={Application},
  ID=calc01,
  template=sober-box
]
  Calculate $3 \times (5+2)$.
\end{exercise}

\begin{solution}
  $3 \times (5+2) = 3 \times 7 = 21$.

\end{solution}

See exercise \exercisenumber{calc01}.
```

Exercise 1 · [★★] · Application · (3 points) Calculate $3 \times (5 + 2)$.

Solution of exercise 1 $3 \times (5+2) = 3 \times 7 = 21$.

See exercise 1.

5.1.2 Global Options (`\xsimsetup`)

Place in the preamble to affect the entire document.

- **exercise/template** = `template-name`: Sets the default style for all exercises.

- **solution/template** = `sol-template-name`: Sets the default style for all solutions (e.g., `sol-inline`, `sol-block`, `sol-dotted`).
- **solution/print** = `true/false`: Globally shows or hides solutions. Can be overridden by the **answers** class option.

Other class options affecting exercises:

- **exercisestyle** = `template-name`: Sets the default display template for all exercises (e.g., `inline`, `box-hrule`, `elegant-box`). If unset, it defaults to the style defined by `theoremstyle`.
- **exerciseicons**: Enables icon display for all exercises.
- **answers** / **answersonly**: Displays solutions after each exercise / Displays only the solutions.
- **shuffle**: Shuffles answers randomly in `choices` and `checkboxes` environments.
- **sectionthmcounter**: Numbers exercises (and theorems) per section (e.g., Ex 1.1, Ex 1.2, Ex 2.1...).
- **sharedexcounter**: Makes exercises and theorems share the same counter (combined with `sharedthmcounter`).
- **blocksol**: Uses the `sol-block` template for solutions.

5.1.3 Exercise Templates (Display Styles)

Possible values for `template` (in `exercise` options or `xsimsetup`).

- **box**, **elegant-box**, **shaded-box**, **slanted-box**, **sober-box**, **classic-box**, **classy-box**: Various framed box styles with titles.
- **rect-box**, **rect-box-out**: Simple rectangular boxes, with or without an outline.
- **num-box**, **num-box-out**: Compact boxes displaying just the number.
- **ex-num-box**, **ex-num-box-out**: Like `num-box` but with "Ex." before the number.
- **box-hrule**, **box-hrule-out**, **box-hrule-in**: Title in a box followed by a horizontal rule.
- **boxed**, **boxed-out**: Title in a small box (filled or outline).
- **inline** (default if `amslikethm`): Simple inline style, like a paragraph.
- **section**: Style like a section heading.
- **terminal**: Style mimicking a terminal, with `>_` icon.
- **block**: Minimalist style with no box or decoration.
- **hrule**: Style with a simple horizontal rule under the title.
- **smart-box**: Simple box with a colored title.
- **minimal-ams**: Minimalist style, bold title without a box.
- **rule-ams**: Minimalist style with a title and horizontal rule.

```
\xsimsetup{exercise/template=box-
    hrule-out}
\begin{exercise}[points=2]
 Style box-hrule-out.
\end{exercise}
\xsimsetup{exercise/template=inline}
     % Revert to default
```

EXERCISE 2 ⟨⟨⟨ **2 POINTS**

Style box-hrule-out.

5.1.4 Multiple Choice Questions

Environments to be used inside an `exercise`.

- **choices** `(n)`: For single-answer MCQs. `\choice` for an answer, `\choice[\correct]` for the correct answer. *n* is the number of columns.
- **checkboxes** `(n)`: For multiple-answer MCQs. `\checkbox` for an answer, `\checkbox[\correct*]` for a correct answer. *n* is the number of columns.

```
\begin{exercise}[ID=qcm-deriv,
    points=1]
 What is the derivative of $f(x)=x
    ^2$?
\begin{choices}(2) % In 2 columns
  \choice[\correct] $x\mapsto 2x$
  \choice $x\mapsto x$
  \choice $x\mapsto x^2$
  \choice $x\mapsto 2$
 \end{choices}
\end{exercise}
```

EXERCISE 3 · (1 POINT) What is the derivative of $f(x) = x^2$?

- ○ $x \mapsto 2x$
- ○ $x \mapsto x$
- ○ $x \mapsto x^2$
- ○ $x \mapsto 2$

```
\begin{exercise}[ID=qcm-props, points
    =2]
 Check the true properties.
\begin{checkboxes}(1) % In 1 column
  \checkbox[\correct*] $1+1=2$
  \checkbox $\sqrt{2}$ is rational.
  \checkbox[\correct*] $0 \times 5 = 0$
 \end{checkboxes}
\end{exercise}
```

EXERCISE 4 · (2 POINTS) Check the true properties.

- ☐ $1 + 1 = 2$
- ☐ $\sqrt{2}$ is rational.
- ☐ $0 \times 5 = 0$

6 MATHEMATICAL ENVIRONMENTS (THEOREMS, DEFINITIONS, ETC.)

Based on `tcolorbox`.

6.1 Theorem Styles (Class Options)

These class options set the default appearance for all theorem-like environments.

- **classythm**, **soberthm**, **elegantthm**, **classicthm**, **slantedthm**, **shadedthm**, **boxedthm**: Various styles with boxes, colors, etc.
- **amslikethm** (default): Minimalist style similar to standard AMS environments.
- **theoremstyle** = `style-name`: Allows setting the theorem style by name (e.g., `elegant`, `amslike`, `shaded`). This is an alternative to using the boolean options above.

```
% Applies the \texttt{elegantthm} style to all math environments.
\documentclass[elegantthm]{neoschool}
```

6.2 Common Environment Options

Passed in square brackets: `\begin{theorem}[options]`.

- **title** = `text`: Custom title (e.g., `title=Pythagorean Theorem`).
- **label** = `name`: Label for referencing (`\ref`, `\nameref`).
- **colback** = `color`: Specific background color.
- **colframe** = `color`: Specific frame color.
- **coltitle** = `color`: Specific title color.
- **fonttitle** = `commands`: Formatting commands for the title (e.g., `fonttitle=\sffamily\bfseries`).

6.3 Numbering Options (Class Options)

- **sectionthmcounter**: Counters are relative to each section (e.g., Thm 1.1, Def 1.2, Thm 2.1...).
- **sharedthmcounter**: A single shared counter is used for all environments (Thm 1, Def 2, Lem 3...).
- **thmgroupcounter**: Groups theorem-like environments (theorem, lemma, corollary, proposition, property) under a single shared counter.

6.4 Available Mathematical Environments

- **theorem** (label prefix: `thm`)
- **lemma** (label prefix: `lem`)
- **corollary** (label prefix: `cor`)
- **conjecture** (label prefix: `conj`)
- **proposition** (label prefix: `propo`)
- **property** (label prefix: `prop`)

- **definition** (label prefix: `def`)
- **method** (label prefix: `meth`)
- **activity** (label prefix: `act`)
- **application** (label prefix: `appl`)
- **remark** (unnumbered)
- **remarks** (unnumbered, for multiple remarks)
- **example** (label prefix: `ex`)
- **examples** (unnumbered, for multiple examples)
- **proof**: Environment for proofs.

```
\begin{definition}[
  title=Prime Number,
  label=prime
]
A natural number is prime if it has
exactly two distinct divisors:
1 and itself.
\end{definition}

See Definition~\ref{def:prime}.
```

Definition 1 (Prime Number) A natural number is prime if it has exactly two distinct divisors: 1 and itself.

See Definition 1.

```
\begin{proof}
  The proof is trivial and is left
  as an exercise for the reader.
\end{proof}
```

Proof. The proof is trivial and is left as an exercise for the reader. □

7 Code Listings

Two systems are available via the **listings** (default) or **minted** class options.

7.1 The `listings` option

Uses the `listings` package. Syntax highlighting is defined by the chosen color theme.

7.1.1 `code` environment

Displays a code block.

```
\begin[options]{code}{language}[title][box-style]
... code ...
\end{code}
```

- `options`: `listings` options (e.g., `numbers=none`, `frame=single`).
- `language`: Code language (e.g., `python`, `latex`, `c++`...).
- `title`: Optional title for the box.
- `box-style`: `tcolorbox` style for the box (see below).
- `code*`: Variant without automatic listing numbering.

The `codestyle=[style]` class option (default `box-elegant`) sets the default box style for the entire document. The `[box-style]` parameter of the environment allows overriding this choice locally. Available box styles: `box-minimal`, `box-subtle`, `box-fancy`, `box-elegant`, `box-sober`, `box-academic`, `box-diagonal`, `box-bevel`, `box-corner`, `box-rounded`, `box-downhill`, `box-toptitle`, `box-bottomtitle`.

```
\begin{code}{python}[Square
    Function][box-minimal]
def square(x):
  """Calculates the square of x."""
  return x * x
\end{code}
```

Listing 28 — Square Function

```python
def square(x):
  """Calculates the square of x.
  """
  return x * x
```

7.1.2 Preconfigured Languages

`Python`, `Java`, `C++`, `JavaScript`, `SQL`, `LaTeX`, `Bash`, `Assembly`, `Lisp`, `JSON`, `YAML`, `TOML`, `CSV`, `Markdown`.

7.1.3 Additional Commands

- `\codeinline[lang]{code}`: Displays inline *code* with highlighting (*lang* is optional).
- `\codeinput[opt]{lang}{file}[title][style]`: Imports and displays code from a *file*.

```
The code \codeinline[python]{x = 5}
    initializes x.
```

The code `x = 5` initializes x.

7.2 Other Class Options for Code

- **codewidth** = `factor`: (Default: `1.0`) Sets the width of code blocks as a factor of `\linewidth`.
- **centeredcode**: Boolean option to center code blocks on the page.

7.3 The `minted` option

Uses the `minted` package, which requires Python and Pygments to be installed, as well as compilation with the `-shell-escape` flag. It provides richer syntax highlighting.

The `code`, `code*`, `\codeinline`, and `\codeinput` environments work similarly, but the options passed are those from `minted` (e.g., `linenos`, `highlightlines={2,3}`, `style=tango`). The box styles remain the same.

```
\documentclass[minted]{neoschool}
...
\usemintedstyle{friendly}
\begin{code}[linenos]{python}[
    Minted Example]
import math

def circle_area(radius):
  return math.pi * radius**2
\end{code}
```

Listing 30 — Minted Example

```
1 import math
2
3 def circle_area(radius):
4   return math.pi * radius**2
```

7.4 Algorithms and Pseudocode

The class provides a `pseudocode` environment based on `algpseudocode` and `tcolorbox` for displaying algorithms. It is automatically numbered and titled.

```
\begin{pseudocode}{Example Algorithm}

\Require $n \ge 0$
\Ensure $y = x^n$
\State $y \Gets 1$
\If{$n < 0$}
    \State $X \Gets 1/x$
    \State $N \Gets -n$
\Else
    \State $X \Gets x$
    \State $N \Gets n$
\EndIf
\While{$N \neq 0$}
    \If{$N$ is even}
        \State $X \Gets X \times X$
        \State $N \Gets N/2$
    \Else[$N$ is odd]
        \State $y \Gets y \times X$
        \State $N \Gets N-1$
    \EndIf
\EndWhile
\end{pseudocode}
```

Algorithm 1 — Example Algorithm

entrée $n \geq 0$
sortie $y = x^n$
  $y \leftarrow 1$
  si $n < 0$ **alors**
    $X \leftarrow 1/x$
    $N \leftarrow -n$
  sinon
    $X \leftarrow x$
    $N \leftarrow n$
  fin si
  tant que $N \neq 0$ **faire**
    si N is even **alors**
      $X \leftarrow X \times X$
      $N \leftarrow N/2$
    sinon[N is odd]
      $y \leftarrow y \times X$
      $N \leftarrow N - 1$
    fin si
  fin tant que

8 Notes and Annotations

8.1 Marginal Notes (`todonotes`)

Enabled by the `notes=length` class option.

- `\tdnote[options]{text}`: Creates a note in the margin. Notes alternate between the left and right sides. Options (`backgroundcolor`, `linecolor`, etc.) are from the `todonotes` package.
- `\boxnote[label]{text}` + `\tdmark[label]`: Allows placing a `tdnote` (`boxnote`) anchored at a specific location (`tdmark`), even inside environments where `todonotes` might fail. The *label* must be identical.

```
This is some text\tdnote{Important point!}.
\boxnote[thm-imp]{Don't forget this hypothesis.}
\begin{theorem}
  \tdmark[thm-imp] If $x>0$, then...
\end{theorem}
```

8.2 Admonitions

Colored boxes with icons to draw attention to specific points.

- `note`: General remarks (✎).
- `info`: Supplementary information (ℹ).

- `warning`: Warnings (⚠).
- **important**: Essential points (❗).
- **tip**: Advice, tips (💡).
- **reminder**: Key takeaways (🔖).
- **summary**: Summary, in short (📋).
- **toolbox**: Materials list, prerequisites (🛠).

Each environment accepts `[Optional Title][Optional Icon]`. The **inlineadmonition** class option (enabled by default) displays the title and content on the same line. To disable this behavior and force the content below the title, use the **blockadmonition** option.

```
\begin{warning}[Caution][\faSkull]
  Do not divide by zero!
\end{warning}

\begin{tip}
  Remember to factor first.
\end{tip}
```

CAUTION Do not divide by zero!

TIP Remember to factor first.

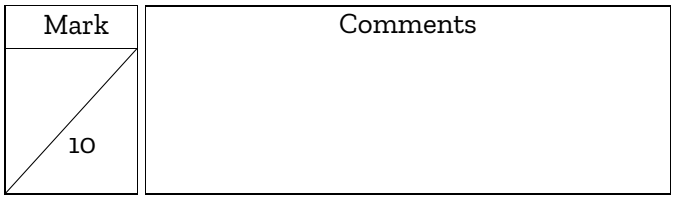
9 Grading and Answer Sheets

9.1 Grading Tools

- `\gradingstrip[total]`: Displays a strip for the grade and comments. Optional *total* overrides the total defined by the `totalpoints` class option (default: 20).
- `\mrk[*][comment]{pts}`: Displays (*pts* pt) or (*pts* pts) in the margin. `*` places it on the left, *comment* adds a comment.

```
\gradingstrip[10] % Graded
    out of 10

Question 1 \mrk*[Grading
    details here... lorem
    ipsum dolor sit amet
    ]{3}
```



Question 1

9.2 Answer Areas

- `\answerfield[width]{lines}`: Creates an answer area with a colored background, a height of *lines* text lines, and a *width* (default: `0.975\linewidth`).
- `\answerframe[width]{lines}[options]`: Creates a framed answer area, a height of *lines*, and a *width* (default: `\linewidth`).

- `\vardots[length]`: Draws a dotted line of *length* (default: `\linewidth`).

```
Answer: \answerfield[6cm]{1}
```

Answer:

```
Answer: \answerframe{1}
```

Answer:

```
Signature: \vardots[4cm]
```

Signature: .....

9.3 Checkmarks and Symbols

- `\cmark`: ✓ (green).
- `\xmark`: × (red).
- `\unchecked`: ☐ (for lists).
- `\done`: ☑ (for lists).
- `\wontfix`: ☒ (for lists).

```
\begin{itemize}
 \unchecked Task 1
 \done Task 2
 \wontfix Task 3
\end{itemize}
```

- ☐ Task 1
- ☑ Task 2
- ☒ Task 3

9.4 Competency-Based Assessment

`\competencies{Comp1\\Comp2...}`: Creates a table to assess competencies based on 4 mastery levels (with emojis).

```
\competencies{
  Mastering fractions \\
  Solving linear equations
     \\
  Calculating a derivative
}
```

Competencies				
Mastering fractions				
Solving linear equations				
Calculating a derivative				

10 Mathematical Commands and Special Tools

10.1 Mathematical Commands

10.1.1 Highlighting and Coloring

- `\mhl[color]{expr}`: Highlights the math expression *expr* with *color* (default: theme-specific color).
- `\mc[color]{expr}`: Colors the math expression *expr* with *color* (default: theme-specific color).
- `\mathbox<bg>[border]{content}`: Quickly boxes math *content* in a `tcolorbox`. The *background* color (default: white) and *border* color (default: theme-specific) are customizable.

```
$f(x) = \mhl[cyan!20]{x^2} + \mc[blue]{3x} - 1$
```

$f(x) = x^2 + 3x - 1$

```
$\mathbox{E=mc^2}$ % White bg, theme border

$\mathbox<yellow!20>[red]{a^2+b^2=c^2}$ % Custom
```

$E = mc^2$

$a^2 + b^2 = c^2$

10.1.2 APMEP Support

Commands available with the `apmep` class option.

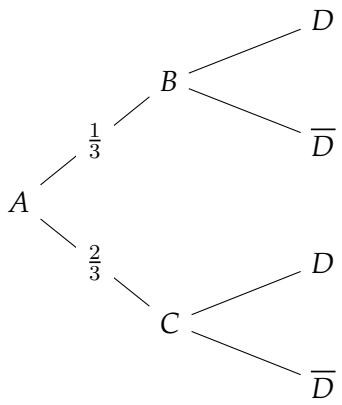
- Vectors: `\vectt{AB}`.
- Coordinate systems: `\Oij`, `\Oijk`, `\Ouv`.
- Symbols/Commands: `\euro` (€), `\cg` ([), `\cd` ([), `\pg` (≥), `\pp` (≤), `\barre{x}` ($\overline{x}$).

10.2 Special Tools

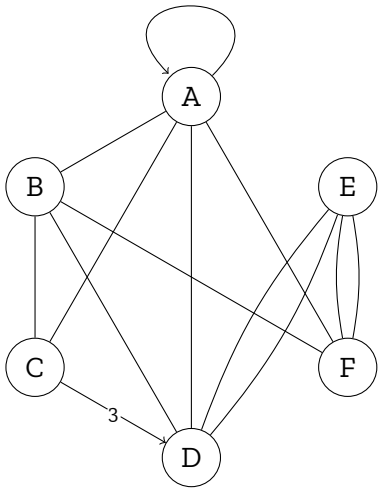
10.2.1 Trees and Graphs

- **Trees** (`neotree` environment): Uses `forest`. The syntax is that of `forest`, with options passed to the environment. The `w=val` option adds a weight to an edge.
- **Graphs** (`\neograph` command, `lualatex` required): Uses TikZ `graphs`. The syntax is that of TikZ for graphs.

```
\begin{neotree}[l=2cm, s sep=1cm]
  A [B, w=\frac{1}{3} [D] [\overline{D
    }]]
    [C, w=\frac{2}{3} [D] [\overline{D
    }]]
\end{neotree}
```




```
% Requires lualatex
\neograph{
  A -- {B, C, D, F},
  B -- {C, D, F},
  C -> ["3"] D,
  D -- [bend left=10] {E},
  E -- [bend left=10] {D},
  E -- [bend left=10] {F},
  F -- [bend left=10] {E},
  A -- [loop] A
}
```



10.2.2 Math Grid (`mathgrid`)

Environment to align blocks of equations (`align*`) in a grid.

- `\begin{mathgrid}{n}`: Starts a grid with *n* columns.
- `\neoline`: Starts a new row in the grid.
- `\neocol[span]{content}`: Adds a column containing *content* (an `align*` block). *span* (optional, default 1) indicates how many columns the content spans.

```
\begin{mathgrid}{2} % 2 columns
 \neoline % Row 1
 \neocol{ % Col 1
  A &= 1+1 \\  A &= 2
 }
 \neocol{ % Col 2
  B &= 3 \times 4 \\ B &= 12
 }
 \neoline % Row 2
 \neocol[2]{ % Single column (
    span=2)
  C &= A+B \\ C &= 2+12 \\ C &=
     14
 }
\end{mathgrid}
```

$$A = 1 + 1 \qquad B = 3 \times 4$$
$$A = 2 \qquad B = 12$$
$$C = A + B$$
$$C = 2 + 12$$
$$C = 14$$