Using MathJax and its Accessibility Features

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MathJax

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Read along at:
MathJax is a JavaScript library for rendering Mathematics in all browsers.

- Can take \( \LaTeX \), AsciiMath, and MathML as input.
- Generates browser output, e.g. HTML/CSS, SVG.
- Standard Maths rendering solution for: stackexchange, wordpress blogs, mediawiki, etc.

MathJax is the de facto rendering solution of (nearly) all Mathematics on the web (35 million unique daily rendering requests via CDN).

http://www.mathjax.org
Using MathJax

- Use it directly from CDN
- Configure according to the need of your web document
- Local installations possible
- Detailed documentation available at: http://docs.mathjax.org
- Large user community and support
Configuring MathJax: CDN

- Load directly from Content Distribution Network
  - Include single line script tag into web document
  - Example with broad, standard configuration

```html
<script src='https://cdn.mathjax.org/mathjax/latest/MathJax.js?config=TeX-AMS-MML_HTMLorMML'></script>
```
Local configurations to customise for your web content
  - Allows for fine-grained control of MathJax’s behaviour
  - Needs to be added BEFORE the CDN call
  - Example for including inline \LaTeX\ formulas:

```html
<script type="text/x-mathjax-config">
MathJax.Hub.Config({
  tex2jax: {
    inlineMath: [['$','$'], ['\( ','\)']]  
  }
});
</script>
```
MathJax’s Assistive Technology Extension

- Inbuilt and optional accessibility features
- Selectable in context menu since MathJax v2.7

More details at:
https://www.mathjax.org/
mathjax-accessibility-extensions-v1-now-available/
MathJax’s AT Features

- Magnification
- Responsive Equations and Abstraction
- Highlighting
- Interactive Exploration
- Speech Generation
Magnification

- Zoom feature for single math expression
- Magnification up to 500%
- Option selectable in context menu
- Customisable trigger via mouse and keyboard actions
Responsive design enhances reflow and readability of math documents

Automatic reflow for simplifying layout, adapting to form factor of display and magnification

Intelligent linebreaking by exploiting semantic enrichment
  - Don’t break in the middle of an expression

Chunking: Abstracting over large elements
  - collapsing mathematically meaningful sub-expressions
Interactive Exploration

“Walkers” allow to interactively dive into mathematical expression

Synchronised highlighting together with aural rendering

Use `<shift><space>` to explore expressions

Simple navigation model using arrow keys

Different types of walkers: syntactic, semantic

Interactive collapse and expansion of sub-expressions
Speech strings are computed with Speech Rule Engine (SRE)

- Currently uses the MathSpeak rules: verbose, brief, superbrief
  - special summarisations for collapsed parts
  - Other rule sets and localisations in the future

- WAI-ARIA and CSS to implement interactive exploration
  - Speech output by updating ARIA live regions
  - Colour/contrast changes by rewriting CSS properties

- Speech strings can be precomputed or generated on the fly

- Works for all renderers MathJax provides
Exercise

1. Build a web document for the quadratic formula:

\[
  x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}
\]

2. Include basic MathJax configuration, e.g. take it from https://www.mathjax.org/#docs

3. Experiment with the MathJax accessibility extension
   1. Load it from sub menu
   2. Use `<shift><space>` to explore expressions
   3. Experiment with NVDA screen reader

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\[
<\text{html}>
  <\text{head}>
    \ldots \text{MathJax script tag goes here} \ldots
  </\text{head}>

  <\text{body}>
    \ldots \text{Quadratic equation goes here} \ldots
  </\text{body}>
</\text{html}>
\]
After loading the explorer extension, you will see that subtitles are still greyed out in the sub-menu.

4 Switch sub-titles on programmatically in your page

1 Add a configuration option for MathJax
2 Make sure to add it BEFORE the call to CDN

```javascript
menuSettings: {
  'Assistive-subtitle': true
}
```
<script type="text/x-mathjax-config">
MathJax.Hub.Config({
  menuSettings: {
    'Assistive-subtitle': true
  }
});
</script>
For other demonstrations and experimental tools follow the links at
https://github.com/mathjax/MathJax-a11y
<html>
<head>
<script src='https://cdn.mathjax.org/mathjax/latest/MathJax.js?config=TeX-AMS-MML_HTMLorMML'></script>
</head>
<body>
\[
  x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]
</body>
</html>
Solution 1 advanced

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
<body>
<h1>Quadratic Equation</h1>
\[
\left[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \right]
\]
</body> </html>