

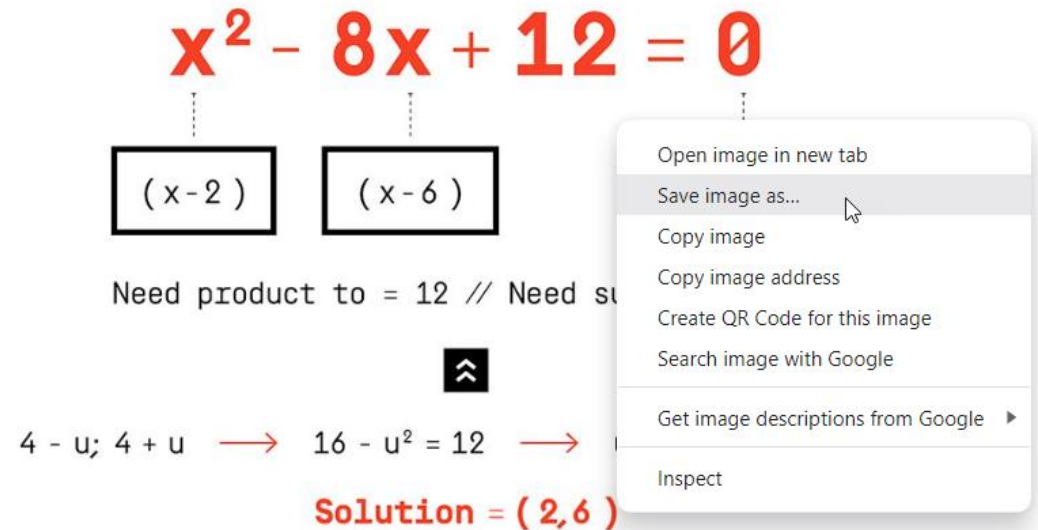
Math Equations and Symbols in an online learning environment

Dr.Pongrapee Kaewsaiha

How can we add equations and symbols on a website?

1. Add as a raster graphic image (JPG/PNG)

- Use a screen capture method.
- Does not require specific skills.
- Image will be blur if zoomed in too much.
- Text cannot be selected.
- Screen reader cannot read it unless the alt text is added.



The image shows a screenshot of a website with a quadratic equation $x^2 - 8x + 12 = 0$ displayed in red text. Below the equation, two factors are shown in black boxes: $(x-2)$ and $(x-6)$. A context menu is open over the equation, listing options such as "Open image in new tab", "Save image as...", "Copy image", "Copy image address", "Create QR Code for this image", "Search image with Google", "Get image descriptions from Google", and "Inspect". Below the equation, there is a small black square icon with a white upward-pointing arrow. Further down, the text "Need product to = 12 // Need s" is visible, followed by the equation $4 - u; 4 + u \rightarrow 16 - u^2 = 12 \rightarrow$ and the solution $\text{Solution} = (2, 6)$.

Example: <https://www.popularmechanics.com/>

2. Add as a vector graphic image (SVG/PDF)

- Image can be zoomed in without being pixelated.
- Require vector graphic skills.
- Text cannot be selected.
- Screen reader cannot read it unless the alt text is added.

The roots x can be found by completing the square,

$$\begin{aligned}x^2 + \frac{b}{a}x &= -\frac{c}{a} \\ \left(x + \frac{b}{2a}\right)^2 &= -\frac{c}{a} + \frac{b^2}{4a^2} = \frac{b^2 - 4ac}{4a^2} \\ x + \frac{b}{2a} &= \frac{\pm\sqrt{b^2 - 4ac}}{2a}.\end{aligned}$$

Solving for x then gives

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Example: <https://mathworld.wolfram.com>

3. Use fonts, symbols, superscript, and subscript

- Text can be zoomed in without being pixelated.
- Does not require specific skills.
- Selected equation will be pasted as a plain text.
- Screen reader will read it as a plain text.

Examples of Quadratics

Beneath are the illustrations of quadratic equations of the form ($ax^2 + bx + c = 0$)

- $x^2 - x - 9 = 0$
- $5x^2 - 2x - 6 = 0$
- $3x^2 + 4x + 8 = 0$
- $-x^2 + 6x + 12 = 0$

Example: <https://byjus.com>

4. Upload a Word .docx file

- Use Equation or MathType
- Text can be zoomed in without being pixelated.
- Does not require specific skills.
- Screen reader will read the equation properly.
- **Compatibility issues:**
 - Must open Word to view content.
 - Mobile users often don't have Word.

Example #1:

$$2x^2 - x = 3$$

$$2x^2 - x - 3 = 0$$

$$(2x - 3)(x + 1) = 0$$

$$2x - 3 = 0 \text{ or } x + 1 = 0$$

$$x = \frac{3}{2} \text{ or } x = -1$$

Example: <https://www.siprep.org>

5. Use a web-compatible (accessible) math, such as LaTeX

- High compatibility across platforms.
- Text can be zoomed in without being pixelated.
- Screen reader will read the equation properly.
- Require specific skills.

$$ax^2 + bx + c = 0$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \frac{b^2}{4a^2} = \frac{b^2 - 4ac}{4a^2}$$

$$x + \frac{b}{2a} = \frac{\pm\sqrt{b^2 - 4ac}}{2a}$$

Example: <https://davenport.libguides.com>