

# Math Miscellani

James & Patrick

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## **Abstract**

This note reviews tips and tricks and selected problems to prepare for middle school math competitions. Written for personal use. Please report typos and errors over at <https://github.com/ptoche/Math/tree/master/mathcounts>.

**Problem 1**

Simplify  $\sqrt{\sqrt{9} - \sqrt{8}}$ .

**Problem 2**

If  $x$  satisfies  $x^2 + \frac{1}{x^2} = \sqrt{2}$ , evaluate  $x^{2024} - \frac{1}{x^{2024}}$ .

**Problem 3**

Solve for  $x \in \mathbb{R}$ , where  $x^2 - x^3 = 12$ .

**Problem 4**

Solve for  $x \in \mathbb{R}$ , where  $3^x - 2^x = 65$ .

**Problem 5**

Solve for  $x \in \mathbb{R}$ , where  $16^x + 20^x = 25^x$ .