

2, 3, 5, 7, 11, 13, 17

Handwritten prime factorization of 2683296:

$$\begin{array}{r}
 1 \quad 2 \mid 2683296 \\
 2 \quad 2 \mid 1341648 \\
 3 \quad 2 \mid 670824 \\
 4 \quad 2 \mid 335412 \\
 5 \quad 2 \mid 167706 \\
 \quad 3 \mid 83853 \\
 \quad 3 \mid 27951 \\
 \quad 7 \mid 93217 \\
 \quad 11 \mid 1331 \\
 \quad 11 \mid 121 \\
 \quad 11 \mid 11
 \end{array}$$

A large bracket on the right side of the divisions indicates the entire process. A red scribble is at the bottom right of the factorization.

Handwritten prime factorization of 2683296:

$$\begin{aligned}
 & \sqrt{2683296} \\
 &= \sqrt{2^5 \cdot 3^2 \cdot 7 \cdot 11^3} \\
 &= \sqrt{2^{4+1} \cdot 3^2 \cdot 7 \cdot 11^{2+1}} \\
 &= \sqrt{2^4 \cdot 2^1 \cdot 3^2 \cdot 7 \cdot 11^2 \cdot 11^1} \\
 &= 2^{\frac{4}{2}} \cdot 3^{\frac{2}{2}} \cdot 11^{\frac{2}{2}} \sqrt{2 \cdot 7 \cdot 11} \\
 &= 2^2 \cdot 3 \cdot 11 \sqrt{154} \\
 &= 132 \sqrt{154}
 \end{aligned}$$

$$\left(\sqrt{2x+5}\right)^2 = \left(3 + \sqrt{x-2}\right)^2$$

$$2x+5 = 3^2 + 2 \cdot 3 \sqrt{x-2} + (\sqrt{x-2})^2$$

$$\begin{array}{r} 2x+5 = 9 + 6\sqrt{x-2} + x-2 \\ -2x-5 = \phantom{6\sqrt{x-2}} -2x-5 \end{array}$$

$$0 = 9 + 6\sqrt{x-2} - x - 7$$

$$6\sqrt{x-2} - x + 2 = 0$$

$$6\sqrt{x-2} = x-2$$

$$\left(6\sqrt{x-2}\right)^2 = (x-2)^2$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)(a-b) = a^2 - b^2$$

$$\sqrt{x-2} = \frac{1}{6}(x-2)$$

$$36(x-2) = \frac{1}{36}(x^2 - 4x + 4)$$

$$36(x-2) = x^2 - 4x + 4$$

$$36x - 72 = x^2 - 4x + 4$$

$$\underline{-36x + 72 = -36x + 72}$$

$$0 = x^2 - 40x + 76 = 0$$

$$(x-38)(x-2) = 0$$

$$x = 38 \text{ or } x = 2$$

Rationalize the denominator

$$\left(\frac{2-3\sqrt{5}}{7+2\sqrt{3}}\right)\left(\frac{7-2\sqrt{3}}{7-2\sqrt{3}}\right)$$

$$\frac{14 - 4\sqrt{3} - 21\sqrt{5} + 6\sqrt{15}}{7^2 - (2\sqrt{3})^2}$$

$$= \frac{\text{mess}}{49 - 2^2\sqrt{3}^2}$$

$$= \frac{\text{mess}}{49 - 12}$$

$$= \frac{14 - 4\sqrt{3} - 21\sqrt{5} + 6\sqrt{15}}{37}$$

Divide

$$\left(\frac{2-3i}{7+2i}\right)\left(\frac{7-2i}{7-2i}\right)$$

$$= \frac{14 - 4i - 21i + 6i^2}{7^2 + 2^2}$$

$$= \frac{14 - 25i - 6}{49 + 4} = \frac{8}{53} - \frac{25}{53}i$$

$$(a+b)(a-b) = a^2 - b^2$$

$$(a+bi)(a-bi) = a^2 - (bi)^2$$

$$= a^2 - b^2i^2$$

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

$$i^{-297} = i^{-296} \cdot i = (i^2)^{148} i = (-1)^{148} i = i$$

$$i^{-296} = (i^2)^{148} = (-1)^{148} = 1$$

$$i^{-295} = i^{-294} \cdot i^{-1} = (i^2)^{147} i^{-1} = (-1)^{147} i^{-1} = -i$$

$$\sqrt{3^2} = 3$$

$$= \sqrt{3} \sqrt{3} = 3$$

$$\sqrt[4]{3} = 3^{\frac{1}{4}}$$

$$\left(\sqrt[3]{-6x-1} \right)^3 = \left(\sqrt[3]{-2x-5} \right)^3$$

$$-6x-1 = -2x-5$$

$$\left(\frac{2+3\sqrt{2}}{5-7\sqrt{2}} \right) \left(\frac{5+7\sqrt{2}}{5+7\sqrt{2}} \right) = \frac{10 + 29\sqrt{2} + 42}{25 - 49 \cdot 2}$$

$$= \frac{52 + 29\sqrt{2}}{25 - 98}$$

$$= \frac{52 + 29\sqrt{2}}{-73}$$

$$= -\frac{52 + 29\sqrt{2}}{73}$$