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Taking square root of both sides

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

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Adding 2 to both sides

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

Taking square root of both sides

$$|x| = \sqrt{x^2} = \sqrt{2}$$

Solving the polynomial $x^2 - 2 = 0$:

Adding 2 to both sides

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

Taking square root of both sides

$$|x| = \sqrt{x^2} = \sqrt{2}$$
$$x = \pm\sqrt{2}$$