# Answers: Using the quadratic formula

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#### Summary

Answers to questions relating to the guide on using the quadratic formula.

*These are the answers to Questions: Using the quadratic formula.*

**Please attempt the questions before reading these answers!**

## Answers

### Q1

1.1. The two roots of $x^2 - 7x + 6 = 0$ are $x = 1$ and $x = 6$.

1.2. The two roots of $x^2 + 14x + 45 = 0$ are $x = -9$ and $x = -5$.

1.3. The two roots of $x^2 - 4x + 13 = 0$ are $x = 2 - 3i$ and $x = 2 + 3i$.

1.4. The two roots of $x^2 - x - 56 = 0$ are $x = -7$ and $x = 8$.

1.5. The one distinct root of $s^2 + 4s + 4 = 0$ is $x = -2$.

1.6. The two roots of $t^2 + 4t - 4 = 0$ are $t = -2 - 2\sqrt{2}$ and $t = -2 + 2\sqrt{2}$

1.7. The two roots of $m^2 - 144 = 0$ are $m = -12$ and $m = 12$.

1.8. The two roots of $5c^2 - 25 + 30 = 0$ are $c = -1$ and $c = 1$.

1.9. The two roots of $2n^2 + n + 1 = 0$ are $n = \dfrac{-1 - i\sqrt{7}}{4}$ and $n = \dfrac{-1 + i\sqrt{7}}{4}$

1.10. The two roots of $-3c^2 + 9c - 1 = 0$ are $c = \frac{3}{2} - \frac{\sqrt{69}}{6}$ and $c = \frac{3}{2} + \frac{\sqrt{69}}{6}$.

1.11. The two roots of $\frac{x^2}{2} - \frac{7x}{2} + 3 = 0$ are $x = 1$ and $x = 6$.

1.12. The one distinct root of $e^{2x} - 4e^x + 4 = 0$ is $e^x = 2$, giving $x = \ln(2)$ as a solution.

1.13. The two roots of $-9s^2 + 3s - 1 = 0$ are $s = \dfrac{1 - i\sqrt{3}}{6}$ and $s = \dfrac{1 + i\sqrt{3}}{6}$.

1.14. The two roots of $2e^{6x} + e^{3x} + 1 = 0$ are $e^{3x} = \dfrac{-1 - i\sqrt{7}}{4}$ and $e^{3x} = \dfrac{-1 + i\sqrt{7}}{4}$, and so there are no real solutions for $x$.

1.15. The one distinct root of $\cos^2(x) + 4\cos(x) - 4 = 0$ is $\cos(x) = 2$, and so there are no real solutions for $x$ as $-1 \leq \cos(x) \leq 1$ for all real $x$.

1.16. The two distinct roots of $8m^2 - 4m - 1 = 0$ are $m = \dfrac{1-\sqrt{3}}{4}$ and $m = \dfrac{1+\sqrt{3}}{4}$

### Q2

In Questions: Introduction to quadratic equations, you saw that the following expressions are all quadratic equations in disguise. Solve these for the variable indicated.

2.1. The two roots of $x = 1/x - 1$ are $x = \dfrac{-1-\sqrt{5}}{2}$ and $x = \dfrac{-1+\sqrt{5}}{2}$.

2.2. The two roots of $(y-1)(y-4) = -(y+2)(y+3)$ are $y = -i\sqrt{5}$ and $y = i\sqrt{5}$.

2.3. The one distinct root of $4m(m+1) + 6 = 5$ is $m = -1/2$.

2.4. The two roots of $(t-1)(t+1) = -2$ are $t = -i$ and $t = i$.

2.5. The two roots of $\frac{x-1}{x-2} = 5x$ are $x = \dfrac{11-\sqrt{101}}{10}$ and $x = \dfrac{11+\sqrt{101}}{10}$.

2.6. The two solutions in $e^x$ for $\frac{e^x - e^{-x}}{2} = 1$ are $e^x = 1 - \sqrt{2}$ and $e^x = 1 + \sqrt{2}$. Of these, $x = \ln(1+\sqrt{2})$ is a valid solution in $x$, as $e^x$ cannot be negative.

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## Version history and licensing

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