

# Using the quadratic formula: answers

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## Summary

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

*Before attempting these questions, it is recommended that you read (Guide: Using the quadratic formula).*

## 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  $n = \frac{-1 - i\sqrt{7}}{4}$  and  $n = \frac{-1 + i\sqrt{7}}{4}$ .
- 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  $s = \frac{1 - i\sqrt{3}}{6}$  and  $s = \frac{1 + i\sqrt{3}}{6}$ .
- 1.14. The two roots of  $2e^{6x} + e^{3x} + 1 = 0$  are  $e^{3x} = \frac{-1 - i\sqrt{7}}{4}$  and  $e^{3x} = \frac{-1 + i\sqrt{7}}{4}$ , 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  $m = \frac{1 - \sqrt{3}}{4}$  and  $m = \frac{1 + \sqrt{3}}{4}$

## 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  $x = \frac{-1 - \sqrt{5}}{2}$  and  $x = \frac{-1 + \sqrt{5}}{2}$ .

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  $x = \frac{11 - \sqrt{101}}{10}$  and  $x = \frac{11 + \sqrt{101}}{10}$ .

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.