# The Formula (& Opportunity To Practise Completing Square (& Opportunity To See The Power Of The Discriminant))

The first thing to work out is the discriminant, $b^2-4ac$. Students find it helpful to write it with a bracket: $b^2-(4ac)$. This helps with the case $16-(-8)=24$. It is also worth remembering that

- If $b^2-4ac>0$ then there exists two distinct roots.
- If $b^2-4ac=0$ then there exists one repeated root.
- If $b^2-4ac<0$ then there exists no real roots.
- If $b^2-4ac$ is a perfect square (e.g. 64) then the quadratic factorises.

Also remember that the first thing you do with any quadratic is get it equal to zero!

## Questions

1. Use the formula to solve $2x^2+x=3$. $\boxed{x=1 \text{ or } x=-3/2}$
2. Check your answer to the above question by factorisation.
3. Use the formula to solve $3x^2-3x=36$. $\boxed{x=4 \text{ or } x=-3}$
4. Check your answer to the above by completing the square and solving.
5. Use the formula to solve $x^2+8x+5=0$. $\boxed{x=-4\pm\sqrt{11}}$
6. Use the formula to solve $x^2+2x=4$. $\boxed{x=-1\pm\sqrt{5}}$
7. Use the formula to solve $x^2-5x=19$. $\boxed{x=\frac{5}{2}\pm\frac{\sqrt{101}}{2}}$
8. Use the formula to solve $(x-2)^2=5$. $\boxed{x=2\pm\sqrt{5}}$
9. Check the above answer by solution using completing the square; it's almost done for you!
10. Use the formula to solve $(2x+1)^2=\frac{3}{4}$. $\boxed{x=-\frac{1}{2}\pm\frac{\sqrt{3}}{4}}$
11. Check the above answer by solution using completing the square; it's almost done for you!
12. Use the formula to solve $2x^2+4x=1$. $\boxed{x=-1\pm\frac{\sqrt{6}}{2}}$
13. Check the above answer by solution using completing the square.
14. Use the formula to solve $3x^2=2x-1$. $\boxed{\text{No solutions}}$
15. Use the formula to solve $\frac{1}{x+1}=x-3$. $\boxed{x=1\pm\sqrt{5}}$
16. Use the formula to solve $\frac{3}{x+1}=2x-1$. $\boxed{x=-\frac{1}{4}\pm\frac{\sqrt{33}}{4}}$
17. Use the formula to solve $\frac{1}{x-3}+\frac{3}{2x+1}=1$. $\boxed{x=\frac{5}{2}\pm\frac{\sqrt{15}}{2}}$
18. Solve $(x-1)(2x+3)(7x-1)=0$. $\boxed{x=1 \text{ or } x=-3/2 \text{ or } x=1/7}$
19. Solve $(2x+1)(2x^2+3x-2)=0$. $\boxed{x=\pm 1/2 \text{ or } x=-2}$
20. Solve $(4x^2-5x+1)(x^2-6x-7)=0$. $\boxed{x=\pm 1 \text{ or } x=1/4 \text{ or } x=7}$

21. Find the value of $k$ for which $2x^2 + 3x + k = 0$ has only one root. $\boxed{k = 9/8}$

22. Find the range of values of $k$ for which $4x^2 + kx + 1 = 0$ has no roots. $\boxed{-4 < k < 4}$

23. The curve $y = 2x^2 + 3x + 1$ has $y = 7x + k$ as a tangent. Using a method involving discriminants, find the value of $k$. $\boxed{k = -1}$