Names (pair) _____ Date _____

The Discriminant and the Number of Solutions

1 IN PAIRS Share the work: **student A** solves the top three equations and **student B** the bottom three. Solve them using the formula and complete the table. In the column $b^2 - 4ac$, write the number you get under the square root.

	equation	$b^2 - 4ac$	solutions	number of solutions
student A	$x^2 - 6x + 8 = 0$			
	$x^2 - 6x + 9 = 0$			
	$x^2 - 6x + 10 = 0$			
student B	$2x^2 + 3x - 2 = 0$			
	$4x^2 - 4x + 1 = 0$			
	$x^2 + x + 1 = 0$			

2 IN PAIRS Compare your rows. What do you notice? How does the number under the square root decide how many solutions the equation has? Describe all three cases.

3 ON YOUR OWN Write one quadratic equation with two solutions, one with one solution and one with no real solutions. Check your examples.

two solutions:

one solution:

no solutions:

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Remember

The number $D = b^2 - 4ac$ is called the **discriminant** of the quadratic equation $ax^2 + bx + c = 0$ (Latin *discriminare*, to tell apart). If $D > 0$, the equation has **two different real solutions** $x_{1,2} = \frac{-b \pm \sqrt{D}}{2a}$. If $D = 0$, it has **one solution** $x = -\frac{b}{2a}$. If $D < 0$, it has **no real solutions**.

4 IN PAIRS Use the quadratic formula to explain why we get only one solution for $D = 0$ and none for $D < 0$.

5 IN PAIRS Do not solve. Work out the discriminant and find the number of solutions.

$x^2 + 5x + 7 = 0$

$D =$ ☐ solutions: ☐

$3x^2 - 2x - 5 = 0$

$D =$ ☐ solutions: ☐

$9x^2 + 12x + 4 = 0$

$D =$ ☐ solutions: ☐

$x^2 - 3 = 0$

$D =$ ☐ solutions: ☐

$2x^2 + x = 0$

$D =$ ☐ solutions: ☐

$-x^2 + 4x - 4 = 0$

$D =$ ☐ solutions: ☐

6 IN PAIRS Ivan says: *If a and c have opposite signs, the equation is sure to have two solutions.* Is he right? Explain.

★ ON YOUR OWN **Exit card.** Work out the discriminant and find the number of solutions: $2x^2 - 3x + 4 = 0$.