THE MATHEMATICAL ASSOCIATION	**Lesson Plan:** Year 7 Equations, formulae and identities.	**Time**: 1 hour
	Title Finding equivalent expressions.	

Outline

In this lesson the Intel/MA *Number line tool* is used to introduce the idea of a variable leading to the construction of algebraic expressions.

In the main activity, students substitute values into some given expressions as a strategy for identifying which expressions they think might **always** be equivalent.

During the plenary, the *Number line tool* is used to confirm the equivalence of expressions such as n X n and n^2 and explore how n^2 varies as n is dragged along the number line.

This lesson plan accompanies the Teachers' TV programme for Secondary Mathematics "Developing the use of ICT in Maths" which features a teacher from Tanbridge House School, Horsham using the Number line tool for the first time with his Year 7 class.

Learning objectives	Suggest extensions to problems by asking 'What if...?'; begin to generalise and to understand the significance of a counter-example. **Use letter symbols to represent unknown numbers or variables**; know the meanings of the words *term, expression* and *equation.* Use simple formulae from mathematics and other subjects; substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.
Resources:	*Number Line Tool displayed through a data projector onto a screen or interactive whiteboard.*

Activities

Time	Activity	Key questions to ask
10 minutes	Launch the *Number line Tool* and create a number line from 0 to 20 and 1 d.p. Spend a few minutes inviting the pupils to describe in detail what they see. Focus their attention on the markings and the flag which marks the point *n*. Invite a pupil to drag the point *n* along the line to a position between two marked numbers. Invite pupils to drag *n* to different positions and estimate its value.	▪ What do you estimate the value of *n* to be?
40 minutes	Using the same number line, drag the point *n* to an integer value. Describe a relationship such as "I have a number that is always going to be 3 more than the value of n." Discuss the pupils responses, leading to the correct expression and move *n* to various positions on the line. Introduce a different type of expression such as *2n* and invite pupils to drag *n* to a new position and evaluate the value of *2n*.	▪ How might we write that? ▪ What will the value of n + 3 be?

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	Open the Options box and define $a = 2n$. Invite a pupil to drag the point n along the line and observe how the values change. Use the Show and Hide buttons to reveal the exact values of n and a. Explain to pupils that their task is to substitute the give numbers into each of the expressions and look for expressions that appear to always give the same values. When they have used the given numbers, invite pupils to decide upon their own values for n.	
10 minutes	Using the Number line tool, open a new number line (0 to 20 or -10 to 10). Invite a pupil to define a equal to the first expression and b equal to the second expression. (When these appear on the screen, as n = 0, neither will be visible.) Discuss how, the values of a and b remain equal no matter where the point is dragged. You can show this either by revealing the vaues of a and b or by switching each function off in the **Options** window. Finally define $a = 2n$ and $b = n^2$. Encourage pupils to explain their reasoning.	▪ Has anyone found any pairs that they think are equivalent? ▪ Where are a and b? ▪ What do we have to do to be able to see them? (drag n along the number line.) ▪ When might n^2 be the same as 2n? We are looking for a place where they may have the same value although the expressions are not equivalent? ▪ and where else?

Finding Equivalent Algebraic Expressions

substitution values ↓	The expressions					
	$2n$	n^2	n^2-1	$n+n$	$(n+1)x(n-1)$	$n \times n$
$n = 2$						
$n = 3$						
$n =$						
$n =$						
$n =$						
$n =$						