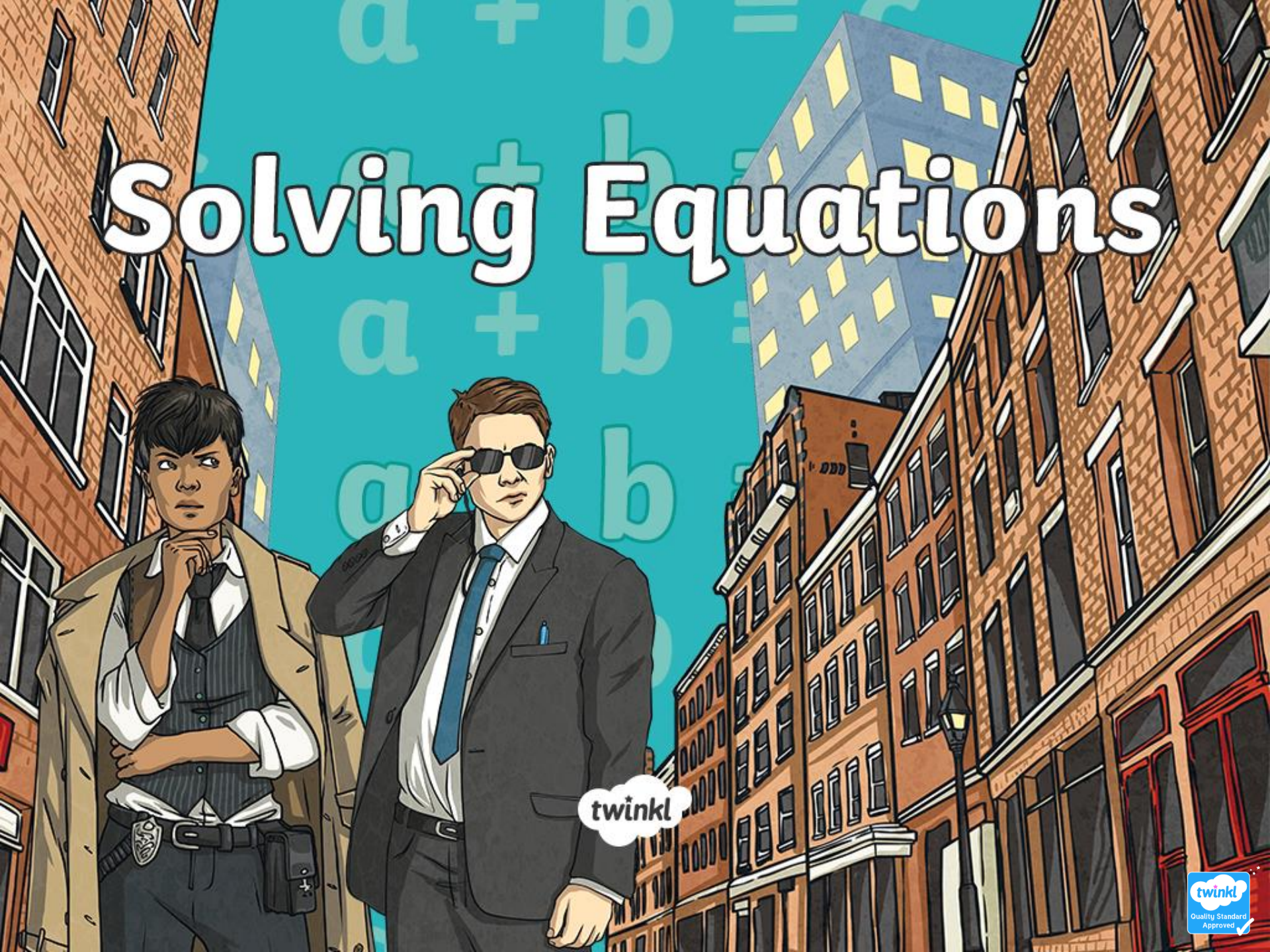


Solving Equations



twinkl

Aim

- I can solve one-step and two-step missing number equations using inverse operations.

Success Criteria

- I can write multiplication correctly in algebraic expressions.
- I can use concrete and pictorial methods to solve one-step and two-step equations.
- I can solve equations by using inverse operations on each side.

One-Step Number Riddle Match-Up



Match the word problems to the correct representation.



?	?	?
18		

I think of a number and triple it.
The answer is 18.



3	?
18	

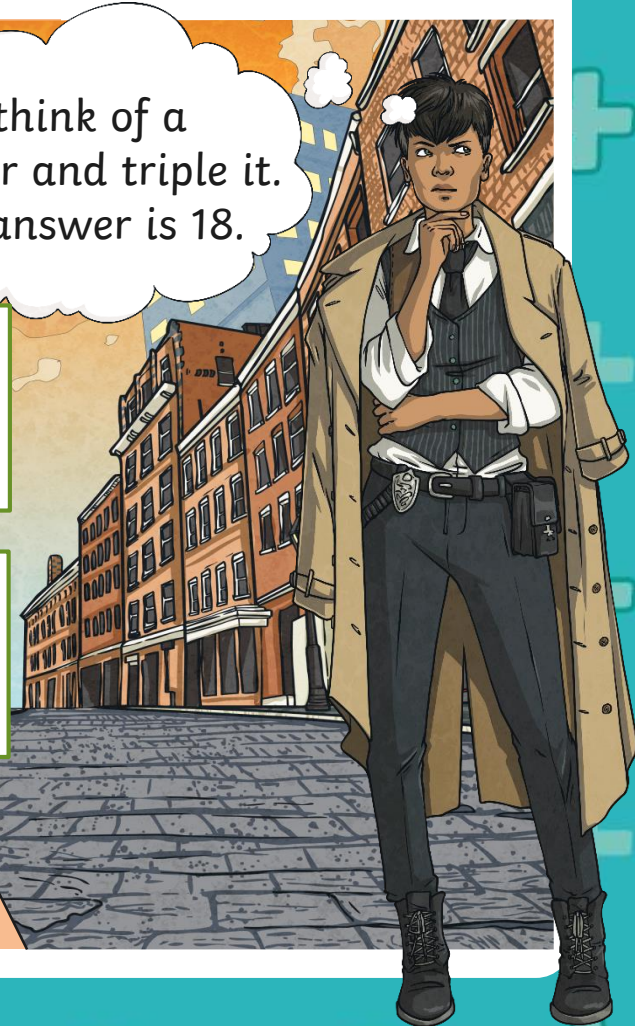
I think of a number and add 3.
The answer is 18.



?	3	3	3
18			

I think of a number and add 9.
The answer is 18.

Extra Challenge: Write a number riddle to explain what the two other bar models represent.



One-Step Number Riddle Match-Up



Match the word problems to the correct representation.



?	?	?	?	?
23				

I think of a number and multiply it by 5.
The answer is 23.



5	?
23	

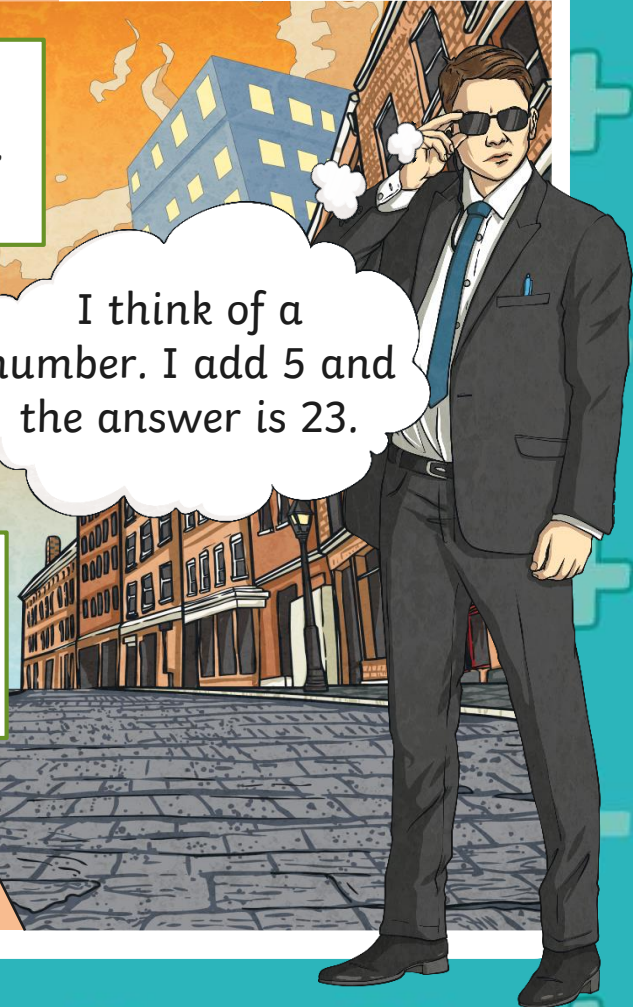
I think of a number. I add 5 and the answer is 23.



?	5	5	5	5
23				

I think of a number and add 20.
The answer is 23.

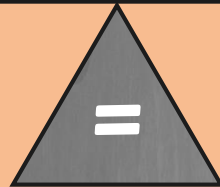
Extra Challenge: Write a number riddle to explain what the two other bar models represent.



Solving One-Step Equations



An equation is a number statement that uses the = sign, showing that one side of the equation equals the other side.



equation ✓



Solving One-Step Equations



In algebra, missing numbers in equations are represented by letters. Any letter can be used, but often the letter x is chosen. An algebraic x is written to look different to a normal letter 'x' to avoid confusion with multiplication.

$x + 5$ 9

=

We call this a one-step equation as there is one operation in the expression $x + 5$, which is 'add five'.

Solving One-Step Equations



To find the value of x , we can use inverse operations to isolate the unknown so it is on its own on one side of the equation.

Here the operation in the expression is 'add 5'. The inverse operation is 'subtract 5'. We must do this inverse operation to both sides of the equation.

The diagram shows a balance scale with two pans. The left pan contains a box with a question mark and five yellow circles, each containing '+1'. Below the pan is a box labeled $x + 5$ and a green circle with -5 . The right pan contains nine yellow circles, each containing '+1'. Below the pan is a box labeled 9 and a green circle with -5 . A central fulcrum has an equals sign. To the right, a man in a suit and sunglasses is thinking, with a speech bubble above him that says $x = 4$.

Solving One-Step Equations



The multiplication sign is not used in algebra to avoid confusing it with the algebraic x used to show a missing number. Instead, the number you are multiplying by is put before the letter, so $2x$ means 'x multiplied by 2'.

The operation in this expression is 'multiply by 3'. The inverse operation is 'divide by 3'. We must do this inverse operation to both sides of the equation.

The diagram shows a balance scale with two pans. The left pan contains three boxes, each with a question mark, representing the expression $3x$. Below this pan is a box labeled $3x$ and a green circle containing $\div 3$. The right pan contains 15 yellow circles, each with a $+1$, representing the number 15. Below this pan is a box labeled 15 and a green circle containing $\div 3$. In the center of the scale is a triangle containing an equals sign. To the right of the scale, a woman in a suit and sunglasses has a speech bubble that says $x = 5$.

Solving Two-Step Equations



Here is a two-step equation.

- In the expression $2x + 4$, there are two operations, 'multiply by 2' and 'add 4'.
- We look at the operation separate to the letter first, which is 'add 4'.
- The inverse operation is 'subtract 4'. We do this first, to both sides of the equation.

The diagram shows a balance scale with two pans. The left pan contains two blocks labeled '?' and four yellow circles labeled '+1'. Below the pan is a box with $2x + 4$ and a green circle with -4 . The right pan contains ten yellow circles labeled '+1'. Below the pan is a box with 10 and a green circle with -4 . A fulcrum with an '=' sign is in the center. To the right, a man in a suit and sunglasses is thinking, with a speech bubble containing $2x = 6$.

Solving Two-Step Equations



- The second operation is 'multiply by 2'. The inverse operation is 'divide by 2'.
- We do this to both sides of the equation.

The diagram shows a balance scale with two pans. The left pan contains two orange blocks, each with a question mark. Below the left pan is a box containing the expression $2x + 4$ and a green circle containing $\div 2$. The right pan contains six yellow circles, each containing a plus sign and the number 1. Below the right pan is a box containing the number 10 and a green circle containing $\div 2$. A central fulcrum is marked with an equals sign. To the right of the scale, a man in a suit and sunglasses is shown in a thinking pose, with a speech bubble above him containing the equation $x = 3$.

Solving Two-Step Equations



Here is a two-step equation.

- In the expression $3x - 5$, there are two operations, 'multiply by 3' and 'subtract 5'.
- We look at the operation separate to the letter first, which is 'subtract 5'.
- The inverse operation is 'add 5'. We do this first, to both sides of the equation.

The diagram shows a balance scale with two pans. The left pan contains three orange blocks labeled with question marks, three pink circles labeled '-1', and a box containing $3x - 5$. The right pan contains a grid of 21 yellow circles, each labeled '+1', and a box containing 13 . Below the scale, a green circle with '+5' is shown on both sides of the equation. A speech bubble above a woman in a suit says $3x = 18$.

We represent the subtract 5 using negative numbers. When the inverse operation is completed, $-5 + 5 = 0$ so the operations cancel each other out.

Solving Two-Step Equations



- The second operation is 'multiply by 3'.
- The inverse operation is 'divide by 3'. We now do this to both sides of the equation.

$3x = 18$

$x = 6$

Solving Two-Step Equations



Here is a two-step equation that uses brackets.

- In the expression $2(x - 3)$, there are two operations, 'multiply by 2' and 'subtract 3'.
- We look at the operation separate to the letter first, which in this case is 'multiply by 2' because that is outside the brackets.
- The inverse operation is 'divide by 2'. We do this first, to both sides of the equation.

$2(x - 3) = 8$

$(x - 3) = 4$

We represent the 'subtract 3' using negative numbers.

Solving Two-Step Equations



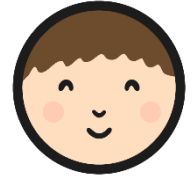
- The second operation is 'subtract 3'.
- The inverse operation is 'add 3'. We now do this to both sides of the equation.

$(x - 3) + 3 = 4 + 3$

$x = 7$

When the inverse operation is completed, $-3 + 3 = 0$ so the operations cancel each other out.

Solving Equations



Three worksheets for solving equations are displayed, each with a grid for working out the value of x .

Worksheet 1: Solving Equations
I can solve one-step and two-step missing number equations using inverse operations.

1. Use the diagrams to help you work out the value of x . Show your working out.

a) $x + 12 = 19$ b) $x - 3 = 18$ c) $20 = 4x$

Each problem includes a diagram of a balance scale with weights and a grid for showing the steps to solve the equation.

Worksheet 2: Solving Equations
I can solve one-step and two-step missing number equations using inverse operations.

1. Use the diagrams to help you work out the value of x . Show your working out.

a) $2x + 10 = 26$ b) $3x + 9 = 30$

Each problem includes a diagram of a balance scale with weights and a grid for showing the steps to solve the equation.

Worksheet 3: Solving Equations
I can solve one-step and two-step missing number equations using inverse operations.

1. Use the diagrams to help you work out the value of x . Show your working out.

a) $x + 12 = 19$ b) $x - 3 = 18$ c) $20 = 4x$

Each problem includes a diagram of a balance scale with weights and a grid for showing the steps to solve the equation.

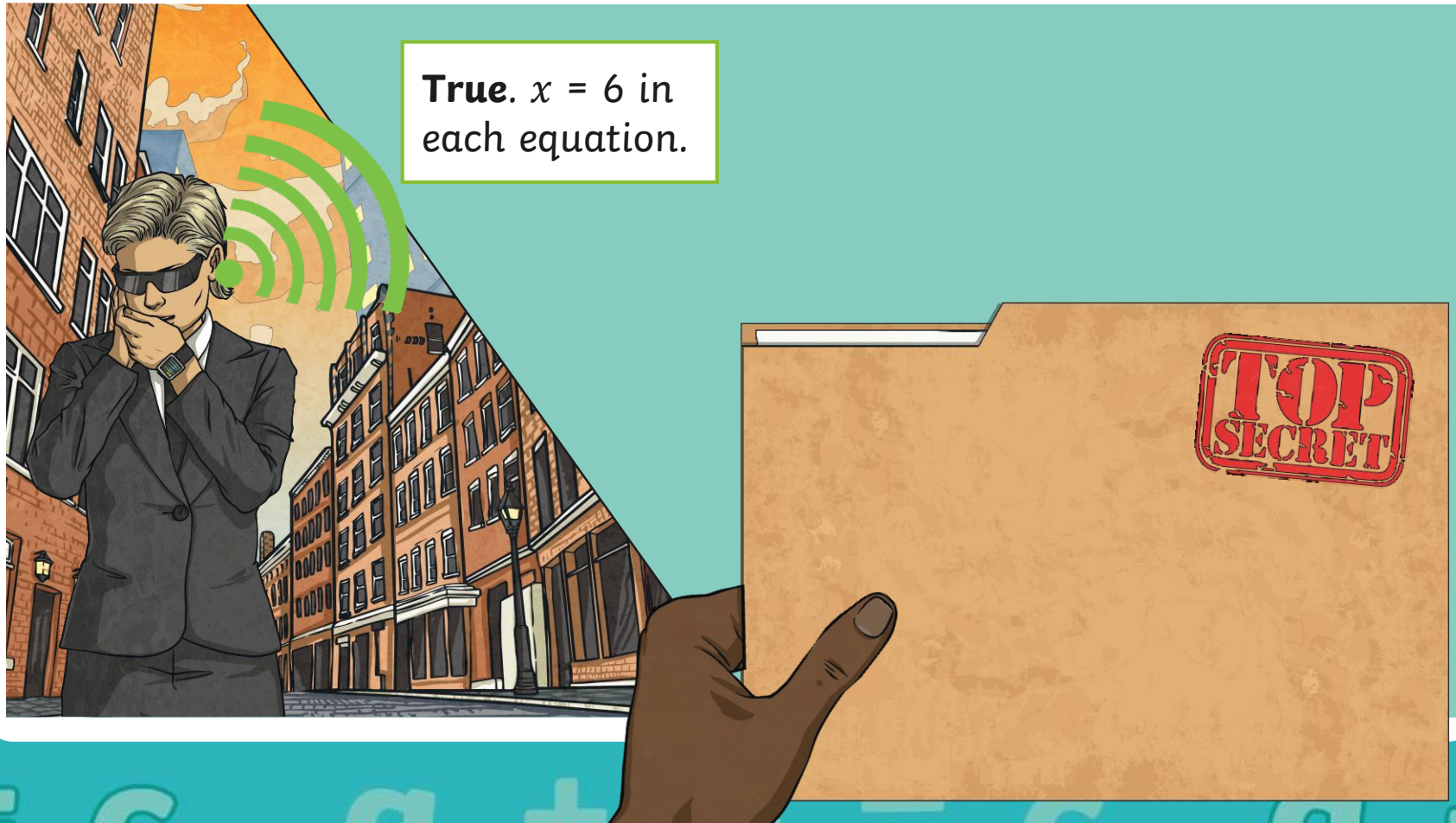




Prove it!

The value of x is the same in all three equations. True or false?

Explain your answer.



Aim



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