

Reverse Calculations including using Number Machines – iNA5

The inverse means doing the opposite or doing the reverse. The inverse takes you back to where you started. The opposite of (or inverse of), opening the door is closing the door. Mathematically the inverse of:

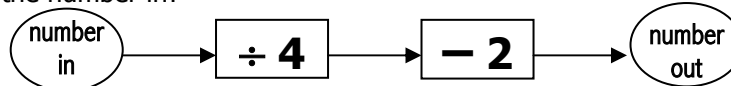
$$\begin{array}{l} \times \text{ is } \div \text{ and } \div \text{ is } \times \\ + \text{ is } - \text{ and } - \text{ is } + \end{array}$$

Number Machines

Example

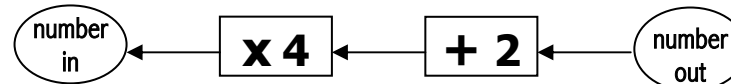
If the number out is 8 what is the number in?

Solution



The inverse of $\div 4$ is $\times 4$. The inverse of -2 is $+2$.

The reverse number machine would be...

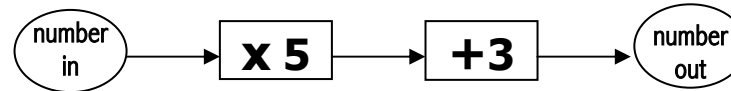


So working with the reverse number machine, $8+2 = 10$; $10 \times 4 = 40$. So the number in is 40.

Check by going forwards, $40 \div 4 = 10$; $10 - 2 = 8$ as required.

Your Turn!!

(a) The following shows a number machine. Write down the reverse number machine and if the number out is 118, find the number in.



Simple Numerical Questions using Inverses

Example

Jackie is a locksmith. She charges customers a £55 call out charge and charges an additional £22.50 for every hour she works. She is called out by Amrid and charges him £145. How many hours did she work for?

Note: Sometimes you can solve problems like this by trial and error - clever guessing until you find the answer - but sometimes you also need to know how to solve problems like these by reversing the calculations.

Solution by reversing the calculations

The model for charging is $55 + (\text{number of hours worked}) \times 22.50$

In algebra it could be $55 + 22.50x$ (but more of this later...)

To reverse you need to -55 and then $\div 22.50$.

So $145 - 55 = 90$, $90 \div 22.50 = 4$ hours.

Your Turn!!

b) A skip company charges £120 for delivering the skip and £15 per metre depending on the length of the skip. The skip company charges John £270 for a skip. Showing your **calculation**, find the length of the skip.

Place Value Questions using Inverses

$3 \times 4 = 12$ can be written backwards as $12 \div 3 = 4$, or $12 \div 4 = 3$.

These divisions can also be written as, $\frac{12}{3} = 4$ or $\frac{12}{4} = 3$.

Example

Given that $256 \times 125 = 32000$, find $3200 \div 2.56$.

Solution

Adjust the multiplication sum so that it includes the numbers 2.56 and 3200

$256 \times 125 = 32000$, so $2.56 \times 125 = 320$ - The decimal point of the **2.56** has moved two left, so drop 2 noughts

so $2.56 \times 1250 = 3200$ - We need **3200** which has an extra nought compared to 320, so add a nought to 125

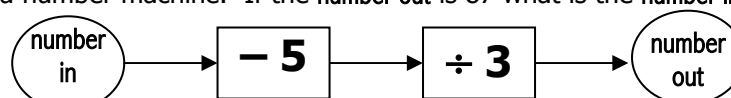
so $3200 \div 2.56 = 1250$ - The multiplication sum has been written backwards as a division sum

Your Turn!!

(c) Given that $12 \times 999 = 11988$, find i) $11988 \div 1.2$ ii) $11.988 \div 12$

RAPID 'ACID' TEST – Blank out the page above before answering these!

1. The following shows a number machine. If the number out is 87 what is the number in?



2. John mends computers and charges £15.75 for the **first hour** plus £10.50 for each additional hour. John charged Caroline £131.25. How many **total** hours, including the first, did John work for Caroline?

3. Given that $123 \times 789 = 97047$, find $9704.7 \div 789$.