Determine the Inverse of a Situation or Equation

We have already looked at writing inverses from a table of values, and graphing inverses. You can also write the inverse of a situation or of an equation, by doing the **opposite operation** in the **opposite order**.

EXAMPLES

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|  | 1st  |  | 2nd  |  | 2nd  |  | 1st  |
| The inverse of: | ***close*** *the door* | & | ***put the key in*** *the lock* | is: | ***take the key out*** *of the lock* | & | ***open*** *the door* |

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|  | 1st  |  | 2nd  |  | 2nd  |  | 1st  |
| The inverse of: | ***buy*** *a car* | & | ***answer*** *your phone* | is: | ***hang up*** *your phone* | & | ***sell*** *a car* |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1st  |  | 2nd  |  | 2nd  |  | 1st  |
| The inverse of: | ***multiply*** *by 5* | & | ***subtract*** *2* | is: | ***add*** *2* | & | ***divide*** *by 5* |

 $ 5x-2$ $ \frac{x+2}{5}$

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1st  |  | 2nd  |  | 2nd  |  | 1st  |
| The inverse of: | ***add*** *7* | & | ***multiply by*** *-8* | is: | ***divide*** *by -8* | & | ***subtract*** *7* |

 $ -8\left(x+7\right)$ $ \frac{x}{-8}-7$

**For each situation, write the inverse.**

1. The inverse of: “*turn on the TV and then sit down*” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. The inverse of: “*login to your email and then send a message* ” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. The inverse of: “*pick up your sister from school and then put on a jacket* ” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4. The inverse of: “*multiply by ½ and then subtract 7*” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 $\frac{1}{2}x-7$

5. The inverse of: “*square it and then multiply by 9* ” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 $ 9x^{2}$

6. The inverse of: “*subtract 11 and then multiply by 4* ” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 $4\left(x-11\right)$

7. The inverse of: “*multiply by 6 and then add 1* ” is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 $6x+1$

**There are two ways to determine the inverse of an equation:**

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| **Method 1:** Use words to change it (like you did above). | **Method 2:** Switch *x* and *y* in the equation (because they are inverses of each other), and then solve for *y*. |
| How: Write the equation in words, find the inverse, and then re-write the equation.EXAMPLE: Determine the inverse of: $$y=2x-4$$**In words:** *To find y, multiply by 2 and then subtract 4.***Inverse in words:** *To find y, add 4 and then divide by 2***Inverse as an equation:** $$ **Check the result:**If I did it correctly, plugging the new equation into the *x* of the old one will make $y=x…$$y=2x-4\rightarrow y=2\left(\frac{x+4}{2}\right)-4$ $$y=\left(x+4\right)-4$$$y=x$ It’s correct! | How: Re-write the equation with *x* in *y’*s place and *y* in *x*’s. Then, use your operations to make it “$y=$”.EXAMPLE: Determine the inverse of: $$y=2x-4$$**Invert variables:** $ x=2y-4$**Solve for *y*:** $ x+4=2y-4+4$$$ x+4=2y$$$$ \frac{x+4}{2} =\frac{2y}{2}$$$$ \frac{x+4}{2}=y$$**Flip the equation:** $$**Check:** $y=2x-4\rightarrow y=2\left(\frac{x+4}{2}\right)-4=$ $\left(x+4\right)-4=x$$y=x$ It’s correct! |

**Determine the inverse of each equation (use the method you prefer), and check if plugging one equation into the other will create** $y=x$**.**

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| 8. $y=2x+5$Check by plugging the new one in for *x* in the old one:$$y=2( )+5$$ | 9. $y=x^{2}-4$Check: $y=\left( \right)^{2}-4$ | $$10. y=\frac{x-1}{5}$$Check: $y=$ |
| 11. $y=-5x+3$ | 12. $ y=\sqrt{x+3}$ | $$13. y=\frac{x}{2}+7$$Check:$$y=$$ |
| 14. $y=4x-2$ | 15. $y=\left(x+5\right)^{2}$ | $$16. y=\frac{x+5}{3}$$ |
| $$17. y=\frac{1}{3}x+8$$ | 18. $y=-3x^{2}$ | $$19. y=\frac{x}{-4}-8$$ |