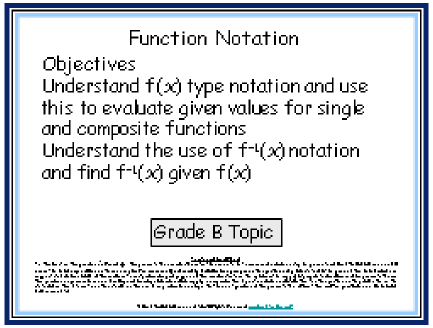
<u>Function Notation - PDF Copy</u>

The presentation contains the slides below with the objective of enabling students to: **i. Understand f(x) type notation and use this to evaluate given values for single and composite functions ii. Understand the use of inverse function notation and find the inverse of a function given in f(x) notation.** The explanation begins with of y = 2x + 1 notation compared to f(x) = 2x + 1 and then goes on to evaluating given functions and finding inverses.



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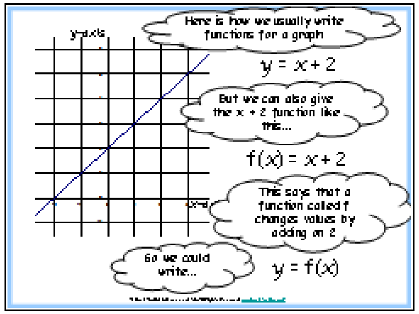

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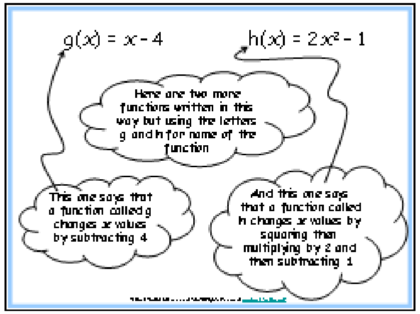

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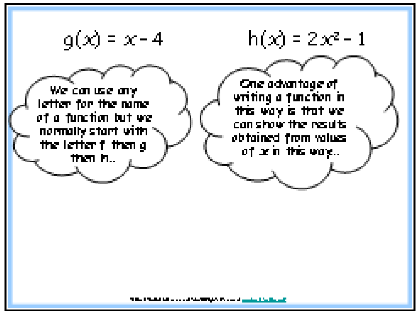

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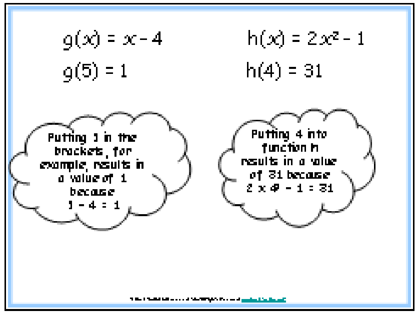

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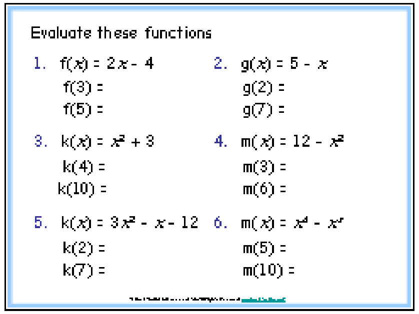

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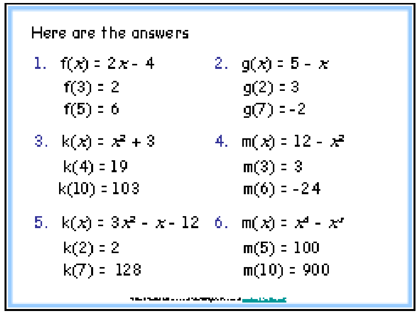

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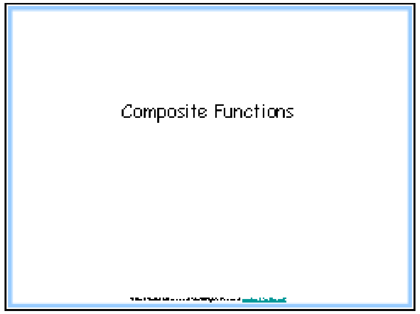

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Continued

Here we have two functions, if we put the value 3 into function f and then put this value into function g, the combined result is...

$f(x) = x + 1$ $g(x) = x^2$

$f(3) = x + 1$ $g(4) = 4^2$

$f(3) = 4$ $g(4) = 16$

Using brackets, we can write this in this way..

$g(f(3)) = 16$

Evaluate 3 in function f...

...then put this value into function g

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Here we have two functions, if we put the value 3 into function f and then put this value into function g, the combined result is...

$f(x) = x + 1$ $g(x) = x^2$

$f(3) = x + 1$ $g(4) = 4^2$

$f(3) = 4$ $g(4) = 16$

The brackets are look rather clumsy and it can be written as...

$g(f(3)) = 16$

$gf(3) = 16$

...which is evaluated in exactly the same way function f followed by function g

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Given that $f(x) = x^2$ and $g(x) = 2x + 1$, evaluate a. fg(3) and b. gf(3)

Here is one for you to try

a. $fg(3) = f(g(3))$ | $gf(3) = f(g(3))$

First find g(3) | First find f(3)

$g(3) = 2 \times 3 + 1$ | $f(3) = 3^2$

$g(3) = 7$ | $f(3) = 9$

Now put 7 into g | Now put 7 into g

$f(7) = 7^2$ | $g(7) = 2 \times 9 + 1$

$f(7) = 49$ | $g(7) = 19$

$fg(3) = 49$ | $gf(3) = 19$

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Given that $f(x) = x - 1$, $g(x) = x^2$, $h(x) = (x + 3)^2$ and $m(x) = 2x + 1$ evaluate these composite functions

1. fg(3)
2. gf(3)
3. fh(5)
4. hf(5)
5. gh(3)
6. hg(3)
7. mh(2)
8. fm(10)

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Given that $f(x) = x - 1$, $g(x) = x^2$, $h(x) = (x + 3)^2$ and $m(x) = 2x + 1$ evaluate these composite functions

1. fg(3) = 8
2. gf(3) = 4
3. fh(5) = 63
4. hf(5) = 49
5. gh(3) = 1296
6. hg(3) = 144
7. mh(2) = 51
8. fm(10) = 20

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Inverse Functions

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Another advantage of this type of notation is that gives us a way of writing inverse functions. Here is an example of how the inverse of function f would be written...

The function f changes x values by adding on 3

$f(x) = x + 3$

The inverse of + 3 is - 3

$f^{-1}(x) = x - 3$

We write the inverse function of f like this...

The small -1 says that it is the inverse of function f

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In more complicated functions, it may help to find the inverse by writing down the operations of the function like this...

$f(x) = 2x - 5$

Function f does this to x value..

× 2 → - 5

The inverses of these two operations are

÷ 2 ← + 5

So the inverse of function f is...

$f^{-1}(x) = \frac{(x + 5)}{2}$

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Remember that you can always check your answer. Here is an example...

$f(x) = 5(x + 1)^2 \rightarrow f^{-1}(x) = \sqrt{(x/5)} - 1$ ✓

We think that the inverse is...

But is this correct?

Put a simple value of x into f. We've used 3

$f(3) = 80$

Put this into f^{-1} If this results in 3, the f^{-1} is correct

$f^{-1}(80) = 3$

It's is 3, so f^{-1} is correct

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Remember that you can always check your answer. Here is an example...

$f(x) = 5(x + 1)^2 \rightarrow f^{-1}(x) = (\sqrt{(x - 1)})/5$ ✗

Here is an example of how this shows that f^{-1} is incorrect

Put a simple value of x into f. We've used 3

$f(3) = 80$

Put this into f^{-1} If this results in 3, the f^{-1} is correct

$f^{-1}(80) = 1.77...$

It's not 3, so f^{-1} is incorrect

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Try to complete the inverse functions...

1. $f(x) = x - 2 \rightarrow f^{-1}(x)$
2. $g(x) = 3x \rightarrow g^{-1}(x)$
3. $h(x) = 2x - 1 \rightarrow h^{-1}(x)$
4. $m(x) = x^2 \rightarrow m^{-1}(x)$
5. $n(x) = (x + 3)^2 \rightarrow n^{-1}(x)$
6. $p(x) = 4x^2 - 3 \rightarrow p^{-1}(x)$
7. $q(x) = (3x + 2)^2 \rightarrow q^{-1}(x)$
8. $r(x) = \sqrt{(x + 3)} \rightarrow r^{-1}(x)$

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Try to complete the inverse functions...

1. $f(x) = x - 2 \rightarrow f^{-1}(x) = x - 2$
2. $g(x) = 3x \rightarrow g^{-1}(x) = x/3$
3. $h(x) = 2x - 1 \rightarrow h^{-1}(x) = (x + 1)/2$
4. $m(x) = x^2 \rightarrow m^{-1}(x) = \sqrt{x}$
5. $n(x) = (x + 3)^2 \rightarrow n^{-1}(x) = \sqrt{x} - 3$
6. $p(x) = 4x^2 - 3 \rightarrow p^{-1}(x) = (\sqrt{(x + 3)})/4$
7. $q(x) = (3x + 2)^2 \rightarrow q^{-1}(x) = \sqrt{((x - 2)/3)}$
8. $r(x) = \sqrt{(x + 3)} \rightarrow r^{-1}(x) = x^2 - 3$

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