## Warm Up

Isolate for x in the following equations.

$y = x + 3$ $y = x^2 - 4$ $y = 2(x-2)^2$

$y - 3 = x$ $y + 4 = x^2$ $\frac{y}{2} = \frac{2(x-2)^2}{2}$

$\sqrt{y+4} = x$ $\frac{y}{2} = (x-2)^2$

$\sqrt{\frac{y}{2}} = x - 2$

$2 + \sqrt{\frac{y}{2}} = x$

# Inverse Relations

## Lesson objectives

- I know how to find the inverse equation of a function
- I know how to find the domain and range of the inverse from the original function

1.1

Lesson objectives | Teachers' notes | Lesson notes

Nelson Page 46 #s 2ace, 3, 6bdf, 9, 10 & 17

## Inverse Function

The reverse of the original function - it undoes what the original function has done.

Example:
If the function is putting on your socks, then your shoes, what would the inverse function be?

Shoes off, then socks off

## Inverse Functions - Equation

Example: Write out the steps you would use to evaluate the following function for a given value of x. $y = 3\sqrt{x-2}+4$

Inverse operations in reverse order:

subtract 4

divide by 3

square both sides

add 2

$\frac{y-4}{3} = \frac{3\sqrt{x-2}}{3}$

$\frac{y-4}{3} = \sqrt{x-2}$

$\left(\frac{y-4}{3}\right)^2 = x-2$

$\left(\frac{y-4}{3}\right)^2 + 2 = x$

## Inverse Functions - Equation

To determine the inverse equation we need to isolate for the independent variable and then switch the variables.

The inverse function is represented by: $f^{-1}(x)$

which is different from: $\left[f(x)\right]^{-1}$

## Inverse Function - Graphs and Ordered Pairs

In terms of the graph and ordered pairs the reverse of the original is found by simply switching the x and y values.

The graph of the inverse is the reflection of the graph of y = f(x) in the line y = x.

$f(x)$ = (domain, range)

$f^{-1}(x)$ = (range, domain)

They switch!

**Example:**
Determine the inverse function.

a) $f(x)=\frac{3}{4}x+2$

$y=\frac{3}{4}x+2$

$\Rightarrow x=\frac{3}{4}y+2$

$x-2=\frac{3}{4}y$

$\frac{4(x-2)}{3}=\frac{3y}{3}$

$f^{-1}(x)=\frac{4(x-2)}{3}$

b) $g(x)=-2\sqrt{x+3}-4$

$y=-2\sqrt{x+3}-4$

$\Rightarrow x=-2\sqrt{y+3}-4$

$\frac{x+4}{-2}=\frac{-2\sqrt{y+3}}{-2}$

$\frac{x+4}{-2}=\sqrt{y+3}$

$\left(\frac{x+4}{-2}\right)^2=y+3$

$\left(\frac{x+4}{-2}\right)^2-3=y$

$f^{-1}(x)=\left(\frac{x+4}{-2}\right)^2-3$

$f^{-1}(x)=\frac{(x+4)^2}{4}-3$

**Example:**
Determine the inverse relation for each ordered pair.

a) {(-2,3),(0,4),(2,5),(4,6)}

$\{(3,-2),(4,0),(5,2),(6,4)\}$

b) {(2,5),(2,-1),(3,1),(5,1)}

$\{(5,2),(-1,2),(1,3),(1,5)\}$