

Reverse the Rule

Read inverse values from function displays.

HIGH SCHOOL • HSF-BF.B.4c

CCSS.Math.Content.HSF-BF.B.4c "(+) Read values of an inverse function from a graph or a table, given that the function has an inverse."

NAME _____

DATE _____

Materials and setup

Pencil and straightedge. A discrete graph consists only of its solid dots. A drawn segment includes every point between its endpoints. Use the printed scale; inverse input is an original output.

THE BIG IDEA

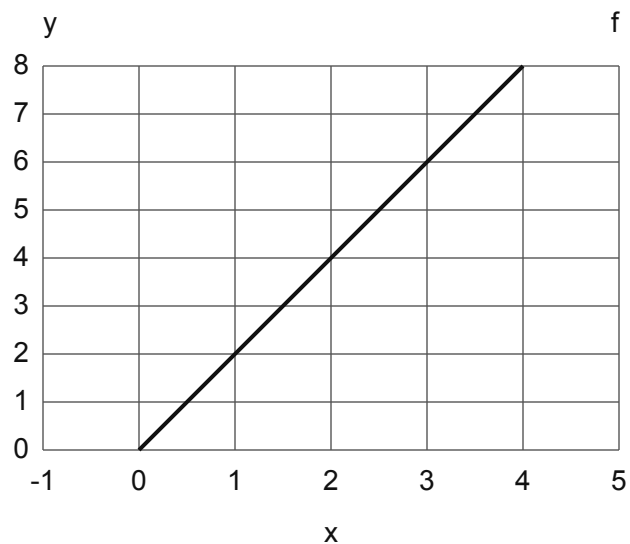
An inverse reverses an input-output pair: $f(a)=b$ means $f^{-1}(b)=a$. In a table, locate output b and read its input. On a graph, start at height b , move across to the graph, then read the x -coordinate. The notation f^{-1} means inverse, not the reciprocal $1/f$. All functions here are one-to-one on their stated domains.

WORKED EXAMPLE

Use the graph of f to read $f^{-1}(4)$.

1. Locate height $y = 4$ on the vertical axis.
2. Move horizontally to the graph: the point is $(2, 4)$.
3. Read the original input 2; reversing the pair gives $f^{-1}(4)=2$.

Answer: $f^{-1}(4) = 2$.

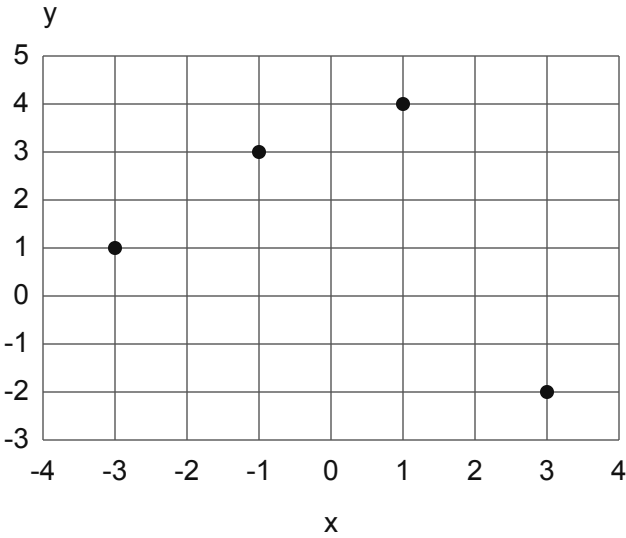


PRACTICE 4 problems

1 Use the table. Find $g^{-1}(12)$ and $g^{-1}(5)$. Write an original function equation that checks each answer.

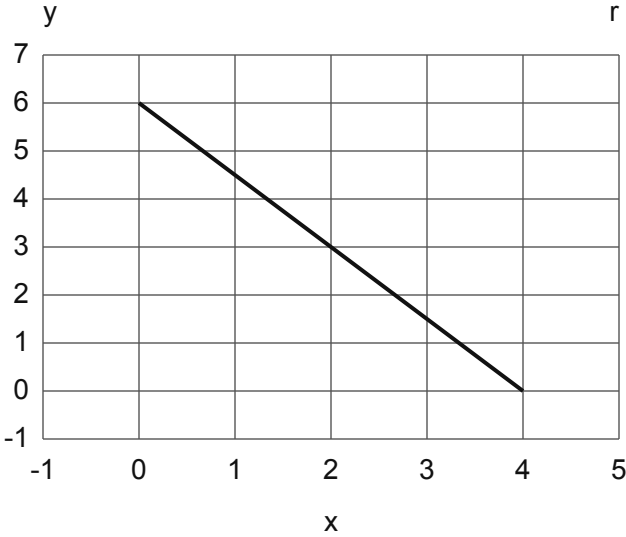
VALUES OF G	
x	g(x)
-3	12
2	5
6	14

2 The graph of h consists only of the four dots. Read $h^{-1}(3)$ and $h^{-1}(-2)$. Explain why the inverse gives x-coordinates.



3 Function r is the line segment shown, including both endpoints. Read $r^{-1}(6)$, $r^{-1}(3)$ and $r^{-1}(0)$.

ANSWER _____



- 4 Use the table to find $s^{-1}(0)$. A student answers $1/s(0)$. Explain the error; is $s(0)$ even given?

VALUES OF s

x	$s(x)$
-2	0
1	4
4	9
7	15

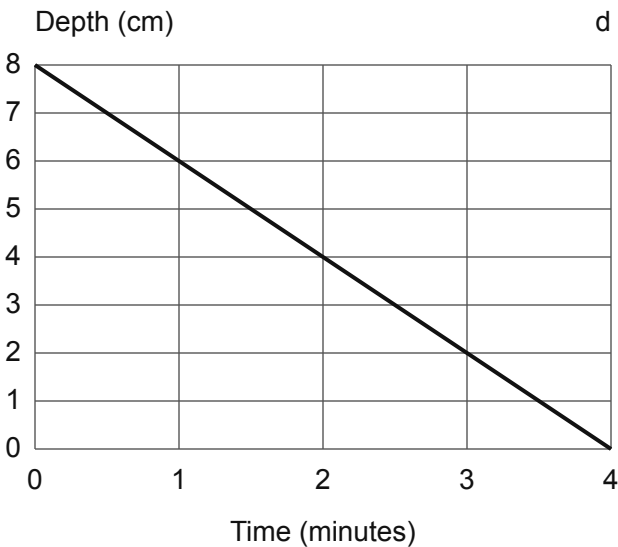
APPLY IT Show your work

- 1 A video editor measured a one-to-one function e mapping clip length to export time. Read $e^{-1}(38)$ from the table. State the answer with units and explain its meaning.

MEASURED EXPORT TIMES

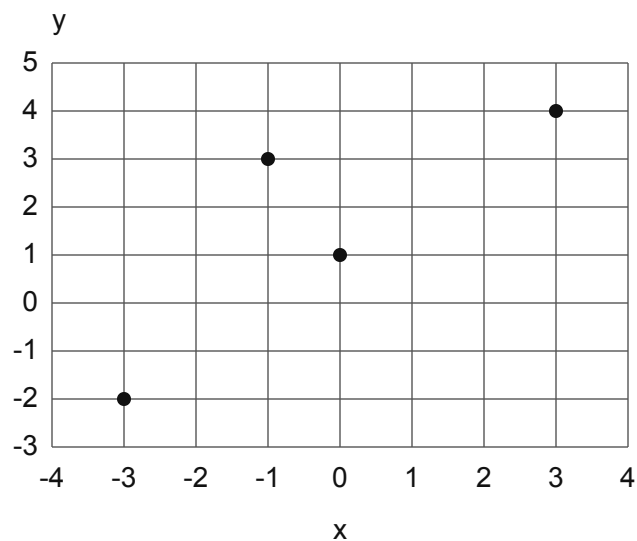
Clip length (s)	Export time (s)
14	31
18	38
24	47

- 2 The graph shows water depth $d(t)$ during a controlled tank drain from 0 to 4 minutes. Read $d^{-1}(4)$ and $d^{-1}(6)$. Explain what each inverse value measures.



CHALLENGE One step up

The graph consists only of these four points. Find $p^{-1}(1)$ and $p^{-1}(4)$. Is $p^{-1}(2)$ defined on this graph? Justify all three conclusions.



Accept values supported by the matching table row or graph point. For discrete graphs do not connect dots or invent intermediate pairs. The two segment graphs are continuous on their stated intervals. Require context units in applied inverse readings.

PRACTICE 1

$g^{-1}(12) = -3$ and $g^{-1}(5) = 2$, because $g(-3)=12$ and $g(2)=5$.

PRACTICE 2

$h^{-1}(3) = -1$ and $h^{-1}(-2) = 3$. Each inverse value is the original input paired with the requested height.

PRACTICE 3

$r^{-1}(6) = 0$; $r^{-1}(3) = 2$; $r^{-1}(0) = 4$.

PRACTICE 4

$s^{-1}(0) = -2$ since $s(-2)=0$. Inverse means reverse the pair, not take a reciprocal. $s(0)$ is not given.

APPLY IT 1

$e^{-1}(38) = 18$ seconds of clip length.

The 18-second clip has a 38-second export time. The inverse input is export time; its output is clip length.

APPLY IT 2

$d^{-1}(4) = 2$ minutes and $d^{-1}(6) = 1$ minute.

Depth 4 cm occurs at 2 minutes; depth 6 cm occurs at 1 minute. The inverse maps a depth to its unique elapsed time.

CHALLENGE

$p^{-1}(1) = 0$ and $p^{-1}(4) = 3$. $p^{-1}(2)$ is undefined because no plotted point has output 2; do not interpolate between isolated dots.