Lesson 12-1

Example 1 Graph an Inverse Variation

AREA **The length of a rectangle with a certain area varies inversely as the width. The equation *lw* = 64 can be used to represent a rectangle with an area of 64 feet squared. Complete the table and draw a graph of the relation.**

***w* (feet)**	4	8	12	16	20	24	28	32
***l* (feet)**								

Solve for $w = 4$.

$lw = 64$ Original equation

$l(4) = 64$ Replace w with 4.

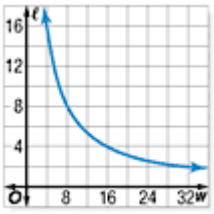
$l = \frac{64}{4}$ Divide each side by 4.

$= 16$ Simplify.

Solve the equation for the other values of w.

***w* (feet)**	4	8	12	16	20	24	28	32
***l* (feet)**	16	8	5.3	4	3.2	2.7	2.3	2

Next, graph the ordered pairs: (4, 16), (8, 8), (12, 5.3), (16, 4), (20, 3.2), (24, 2.7), (28, 2.3), and (32, 2).



The graph of an inverse variation is not a straight line like the graph of a direct variation. As the width w increases, the length l of the rectangle with the same area decreases.

Example 2 Graph an Inverse Variation

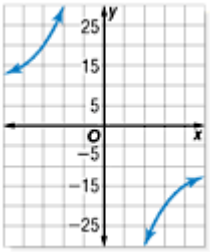
Graph an inverse variation in which *y* varies inversely as *x* and *y* = -1.5 when *x* = 40

Solve for k.

$xy = k$ Inverse variation equation

$(40)(-1.5) = k$ $x = 40$, $y = -1.5$

$-60 = k$ The constant of variation is -60.



Choose values for x and y whose product is -60.

x	*y*
-5	12
-4	15
-3	20
-2	30
0	undefined
2	-30
3	-20
4	-15
5	-12

Example 3 Solve for x

If y varies inversely as x and $y = 16$ when $x = -10$, find x when $y = -8$.

Let $x_1 = -10$, $y_1 = 16$, and $y_2 = -8$. Solve for x_2.

Method 1 Use the product rule.

$x_1 y_1 = x_2 y_2$ Product rule for inverse variations.

$(-10)(16) = (x_2)(-8)$ $x_1 = -10$, $y_1 = 16$, and $y_2 = -8$

$\frac{-160}{-8} = x_2$ Divide each side by –8.

$20 = x_2$ Simplify.

Method 2 Use a proportion.

$\frac{x_1}{x_2} = \frac{y_2}{y_1}$ Proportion for inverse variations

$\frac{-10}{x_2} = \frac{-8}{16}$ $x_1 = -10$, $y_1 = 16$, and $y_2 = -8$

$-160 = -8 x_2$ Cross multiply.

$20 = x_2$ Divide each side by –8.

Both methods show that $x = 20$ when $y = -8$.

Example 4 Solve for y

If y varies inversely as x and $y = 21$ when $x = 4$, find y when $x = -7$.

Use the product rule.

$x_1 y_1 = x_2 y_2$ Product rule for inverse variations.

$4 \cdot 21 = -7 y_2$ $x_1 = 4$, $y_1 = 21$, and $x_2 = -7$

$\frac{84}{-7} = y_2$ Divide each side by –7.

$-12 = y_2$ Simplify

Thus, $y = -12$ when $x = -7$.

Example 5 Use Inverse Variation to Solve a Problem

When two people balance on a seesaw, their distances from the center are inversely proportional to their weights. If a 54 pound child sits 4 feet from the center, how far should a 36 pound child sit from the center to make the seesaw balance?

Let $w_1 = 54$, $d_1 = 4$, and $w_2 = 36$. Solve for d_2.

$w_1 d_1 = w_2 d_2$ Original equation

$54 \cdot 4 = 36 d_2$ $w_1 = 54$, $d_1 = 4$, and $w_2 = 36$

$\frac{216}{36} = d_2$ Divide each side by 36.

$6 = d_2$ Simplify.

The 36 pound child should sit 6 feet from the center.