$\qquad$
$\qquad$

## Study Guide and Intervention

## Elimination Using Multiplication

Elimination Using Multiplication Some systems of equations cannot be solved simply by adding or subtracting the equations. In such cases, one or both equations must first be multiplied by a number before the system can be solved by elimination.

## Example 1 Use elimination to solve

the system of equations.
$x+10 y=3$
$4 x+5 y=5$
If you multiply the second equation by -2 , you can eliminate the $y$ terms.

$$
\begin{aligned}
x+10 y & =3 \\
(+)-8 x-10 y & =-10 \\
\hline-7 x & =-7 \\
\frac{-7 x}{-7} & =\frac{-7}{-7} \\
x & =1
\end{aligned}
$$

Substitute 1 for $x$ in either equation.

$$
\begin{aligned}
1+10 y & =3 \\
1+10 y-1 & =3-1 \\
10 y & =2 \\
\frac{10 y}{10} & =\frac{2}{10} \\
y & =\frac{1}{5}
\end{aligned}
$$

The solution is $\left(1, \frac{1}{5}\right)$.

## Example 2 Use elimination to solve

 the system of equations.$3 x-2 y=-7$
$2 x-5 y=10$
If you multiply the first equation by 2 and the second equation by -3 , you can eliminate the $x$ terms.

$$
\begin{aligned}
6 x-4 y & =-14 \\
(+)-6 x+15 y & =-30 \\
\hline 11 y & =-44 \\
\frac{11 y}{11} & =\frac{-44}{11} \\
y & =-4
\end{aligned}
$$

Substitute -4 for $y$ in either equation.

$$
\begin{aligned}
3 x-2(-4) & =-7 \\
3 x+8 & =-7 \\
3 x+8-8 & =-7-8 \\
3 x & =-15 \\
\frac{3 x}{3} & =\frac{-15}{3} \\
x & =-5
\end{aligned}
$$

The solution is $(-5,-4)$.

## Exercises

Use elimination to solve each system of equations.

1. $2 x+3 y=6$ $x+2 y=5$
2. $2 m+3 n=4$
$-m+2 n=5$
3. $3 a-b=2$
4. $4 x+5 y=6$
$6 x-7 y=-20$
5. $4 c-3 d=22$
6. $3 x-4 y=-4$
$x+3 y=-10$
7. $4 s-t=9$ $5 s+2 t=8$
8. $4 a-3 b=-8$
$2 a+2 b=3$
9. $2 x+2 y=5$
$4 x-4 y=10$
10. $\begin{aligned} 6 x-4 y & =-8 \\ 4 x+2 y & =-3\end{aligned}$
11. $\begin{array}{r}4 x+2 y=-5 \\ -2 x-4 y=1\end{array}$
12. $2 x+y=3.5$
$-x+2 y=2.5$
13. GARDENING The length of Sally's garden is 4 meters greater than 3 times the width. The perimeter of her garden is 72 meters. What are the dimensions of Sally's garden?
14. Anita is $4 \frac{1}{2}$ years older than Basilio. Three times Anita's age added to six times Basilio's age is 36 . How old are Anita and Basilio?
$\qquad$ PERIOD $\qquad$

## Study Guide and Intervention (continued)

## Elimination Using Multiplication

Determine the Best Method The methods to use for solving systems of linear equations are summarized in the table below.

| Method | The Best Time to Use |
| :--- | :--- |
| Graphing | to estimate the solution, since graphing usually does not give an exact solution |
| Substitution | if one of the variables in either equation has a coefficient of 1 or -1 |
| Elimination Using Addition | if one of the variables has opposite coefficients in the two equations |
| Elimination Using Subtraction | if one of the variables has the same coefficient in the two equations |
| Elimination Using Multiplication | if none of the coefficients are 1 or -1 and neither of the variables can be <br> eliminated by simply adding or subtracting the equations |

## Example

Determine the best method to solve the system of equations. Then solve the system.
$6 x+2 y=20$
$-2 x+4 y=-16$
Since the coefficients of $x$ will be additive inverses of each other if you multiply the second equation by 3 , use elimination.

| $\begin{aligned} & 6 x+2 y=20 \\ &(+)-6 x+12 y=-48 \\ & \hline \end{aligned}$ | Multiply the second equation by 3 . | $6 x+2(-2)=20$ | Substitute -2 for $y$ in either equation. |
| :---: | :---: | :---: | :---: |
| $14 y=-28$ | Add the two equations. $x$ is eliminated. | $6 x-4=20$ | Simplify. |
| $\frac{14 y}{14}=\frac{-28}{14}$ |  | $\begin{aligned} 6 x-4+4 & =20+4 \\ 6 x & =24\end{aligned}$ | Add 4 to each side. |
| $\frac{14}{}=\frac{14}{14}$ | Divide each side by 14. | $6 x=24$ | Simplify. |
| $y=-2$ | Simplify. | $\frac{6 x}{6}=\frac{24}{6}$ | Divide each side by 6 . |
|  |  | $x=4$ | Simplify. |

The solution is $(4,-2)$.

## Exercises

Determine the best method to solve each system of equations. Then solve the system.

1. $x+2 y=3$
2. $m+6 n=-8$
3. $a-b=6$
$x+y=1$
$m=2 n+8$
$a=2 b+7$
4. $4 x+y=15$
$-x-3 y=-12$
5. $4 x=2 y-10$
$x+2 y=5$
6. $3 c-d=14$
$c-d=2$
7. $x+2 y=-9$
$y=4 x$
8. $x=-2 y$
$4 x+4 y=-10$
9. $\begin{aligned} 2 s-3 t & =42 \\ 3 s+2 t & =24\end{aligned}$
10. $4 a-4 b=-10$
$2 a+4 b=-2$
11. $4 x+10 y=-6$
$-2 x-10 y=2$
12. $2 x=y-38$
