Algebra Chapter 7 Test – Review with Answer Key

Use the graph at the right to determine whether each system has no solution, one solution, or infinitely many solutions.

1. \( y = -x \)
   \( x + y = 3 \)

2. \( x - 2y = -3 \)
   \( 4x + y = 6 \)

Graph each system of equations. Then determine whether the system has no solution, one solution, or infinitely many solutions. If the system has one solution, name it.

3. \( y = -x + 4 \)
   \( y = x - 4 \)

4. \( 2x - y = -3 \)
   \( 6x - 3y = -9 \)

5. \( x + y = -2 \)
   \( x + y = 3 \)

Use substitution to solve each system of equations. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions.

6. \( y = 3x \)
   \( x + y = 4 \)

7. \( 5x - y = 10 \)
   \( 7x - 2y = 11 \)

8. \( x - 6y = 4 \)
   \( 3x - 18y = 4 \)

9. \( x - 5y = 10 \)
   \( 2x - 10y = 20 \)

Use elimination to solve each system of equations.

10. \( x + 4y = -8 \)
    \( x - 4y = -8 \)

11. \( 2x + 5y = 3 \)
    \( -x + 3y = -7 \)

12. \( 2x - 5y = -16 \)
    \( -2x + 3y = 12 \)

13. \( 2x + 5y = 9 \)
    \( 2x - y = 13 \)

14. \( 2x - 3y = 1 \)
    \( 5x + 4y = 14 \)

15. \( x - 3y = 10 \)
    \( x + 2y = 15 \)

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

16. \( x = 2y - 1 \)
    \( 3x + y = 11 \)

17. \( 5x - y = 17 \)
    \( 3x - y = 13 \)
Algebra Chapter 7 Test – Review with Answer Key

For Questions 18 and 19, solve each system of inequalities by graphing.

18. \( y < x - 1 \)  
   \( y \leq 2x + 1 \)  
   Skip

19. \( x + y \geq 2 \)  
   \( 2x - y < 1 \)  
   Skip

20. The sum of two numbers is 17 and their difference is 29. What are the two numbers?

21. Adult tickets for the school musical sold for $3.50 and student tickets sold for $2.50. Three hundred twenty-one tickets were sold altogether for $937.50. How many of each kind of ticket were sold?

22. Ayana has $2.35 in nickels and dimes. If she has 33 coins in all, find the number of nickels and dimes.

23. The largest county in the state of New York is 1769 square miles larger than the smallest county in the same state. The size of the largest county is 64 times the size of the smallest county plus five square miles. How large is the smallest county in the state of New York?

For Questions 24 and 25, use the following information.

The Martinez Company manufactures two types of industrial fans, standard and economy. These items are built using machines and manual labor. The table gives the time requirements at each type of workstation for each type of fan.

<table>
<thead>
<tr>
<th></th>
<th>Hours per Standard Fan</th>
<th>Hours per Economy Fan</th>
<th>Total Available Hours Each Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machines</td>
<td>3</td>
<td>3</td>
<td>1500</td>
</tr>
<tr>
<td>Manual Labor</td>
<td>2</td>
<td>1</td>
<td>800</td>
</tr>
</tbody>
</table>

24. Make a graph showing the number of standard fans and the number of economy fans that can be made in a week.

25. List three possible solutions.

Bonus Mavis is 5 years older than her brother. Five years ago she was 2 times older than her brother. How old is each now?

You can try this.
Use the graph at the right to determine whether each system has no solution, one solution, or infinitely many solutions.

1. $y = -x$
   $x + y = 3$

   parallel lines:

2. $x - 2y = -3$
   $4x + y = 6$

   intersecting lines

Graph each system of equations. Then determine whether the system has no solution, one solution, or infinitely many solutions. If the system has one solution, name it.

3. $y = -x + 4$
   $y = x - 4$

   one solution: $(4, 0)$

4. $2x - y = -3$
   $6x - 3y = -9$

   infinitely many solutions

   same line!

5. $x + y = -2$
   $x + y = 3$

   parallel lines

   no solution

Use substitution to solve each system of equations. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions.

6. $y = 3x$
   $x + y = 4$

7. $5x - y = 10$
   $7x - 2y = 11$

8. $x - 6y = 4$
   $3x - 18y = 4$

9. $x - 5y = 10$
   $2x - 10y = 20$

Use elimination to solve each system of equations.

10. $x + 4y = -8$
    $x - 4y = -8$

11. $2x + 5y = 3$
    $-x + 3y = -7$

12. $2x - 5y = -16$
    $-2x + 3y = 12$

13. $2x + 5y = 9$
    $2x + y = 13$

14. $2x - 3y = 1$
    $5x + 4y = 14$

15. $x - 3y = 10$
    $x + 2y = 15$

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

16. $x = 2y - 1$
    $3x + y = 11$

17. $5x - y = 17$
    $3x - y = 13$
Algebra Chapter 7 Test – Review with Answer Key

For Questions 18 and 19, solve each system of inequalities by graphing.

18. \( y < x - 1 \)
   \( y \leq 2x + 1 \)
   \( \text{Skip} \)

19. \( x + y \geq 2 \)
   \( 2x - y < 1 \)
   \( \text{Skip} \)

20. The sum of two numbers is 17 and their difference is 29. What are the two numbers?
   \( (23, -6) \)

21. Adult tickets for the school musical sold for \$3.50 and student tickets sold for \$2.50. Three hundred twenty-one tickets were sold altogether for \$937.50. How many of each kind of ticket were sold?
   \( (90, 231) \)

22. Ayana has \$2.35 in nickels and dimes. If she has 33 coins in all, find the number of nickels and dimes.
   \( (19, 14) \)

23. The largest county in the state of New York is 1769 square miles larger than the smallest county in the same state. The size of the largest county is 64 times the size of the smallest county plus five square miles. How large is the smallest county in the state of New York?
   \( \text{Skip} \)

For Questions 24 and 25, use the following information.

The Martinez Company manufactures two types of industrial fans, standard and economy. These items are built using machines and manual labor. The table gives the time requirements at each type of workstation for each type of fan.

<table>
<thead>
<tr>
<th></th>
<th>Hours per Standard Fan</th>
<th>Hours per Economy Fan</th>
<th>Total Available Hours Each Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machines</td>
<td>3 ( x )</td>
<td>3 ( y )</td>
<td>1500</td>
</tr>
<tr>
<td>Manual Labor</td>
<td>2 ( x )</td>
<td>1 ( y )</td>
<td>800</td>
</tr>
</tbody>
</table>

24. Make a graph showing the number of standard fans and the number of economy fans that can be made in a week.

25. List three possible solutions.

Bonus: Mavis is 5 years older than her brother. Five years ago she was 2 times older than her brother. How old is each now?

B: \[ \text{Mavis} = 15 \]

\[ \text{Brother} = 10 \]

\( \text{Skip} \)
1. The equations are parallel lines, which do not intersect. If the lines do not intersect, there is no solution.

2. The equations intersect at one point.

3. \[ y = -x + 4 \quad \text{← y-intercept is 4 (starting point)} \]
   \[ \text{slope is } -1 \quad \text{→ down 1, right 1} \]
   \[ y = x - 4 \quad \text{← y-intercept is -4 (starting point)} \]
   \[ \text{slope is 1 \quad \text{→ up 1, right 1}} \]
   The lines intersect at one point (4, 0).

4. \[ 2x - y = -3 \]
   \[ -2x \quad -2x \]
   \[ -y = -2x - 3 \]
   \[ -1(-y = -2x - 3) \]
   \[ y = 2x + 3 \quad \text{← y-intercept is -3} \]
   \[ \text{slope is 2 \quad \text{→ up 1, right 1}} \]

   \[ 6x - 3y = -9 \]
   \[ -6x \quad -6x \]
   \[ -3y = -6x - 9 \]
   \[ \frac{-3}{-3} \]
   \[ y = 2x + 3 \quad \text{← y-intercept is 3} \]
   \[ \text{slope is 2 \quad \text{→ up 1, right 1}} \]

   [Same line: Infinite solution]
5. \[ x + y = -2 \]
   
   \[ \frac{-x}{-x} \]
   
   \[ y = -x - 2 \]
   \( \leftarrow \) \( y \)-intercept is \(-2\)
   
   slope is \(-1\) \( \leftarrow \) down \( \frac{1}{4} \) right \( 1 \)

\[ x + y = 3 \]

\[ \frac{-x}{-x} \]

\[ y = -x + 3 \]
\( \leftarrow \) y-intercept is \(3\)

slope is \(-1\)

Same slope means parallel lines

No solution

6. \[ y = 3x \]

\[ x + y = 4 \]

\[ \frac{x + 3x}{4x} = 4 \]

\[ \frac{4x}{4} = 4 \]

\[ x = 1 \]

\[ y = 3(1) \]

Solution: \( (1, 3) \)
7. \[5x - y = 10 \rightarrow \text{rearrange} \quad 5x - y = 10\]
\[
\begin{align*}
7x - 2y &= 11 \\
7x - 2(5x - 10) &= 11 \\
7x - 10x + 20 &= 11 \\
-x + 20 &= 11 \\
-x &= -9 \\
-x &= -9 \\
-x &= -3 \\
-x &= 3 \\
7x - 2y &= 11 \\
\frac{-y}{-1} &= \frac{-5x + 10}{-1} \\
y &= 5x - 10 \\
y &= 5(3) - 10 \\
y &= 15 - 10 \\
y &= 5 \\
\text{solution: } (3, 5)
\end{align*}
\]

8. \[x - 6y = 4 \rightarrow \text{rearrange} \quad x - 6y = 4\]
\[
\begin{align*}
3x - 18y &= 4 \\
3(6y + 4) - 18y &= 4 \\
18y + 12 - 18y &= 4 \\
12 &= 4 \\
\text{not true! no solution}
\end{align*}
\]
9. \( x - 5y = 10 \rightarrow \text{rearrange} \quad x - 5y = 10 \)

\[ 2x - 10y = 20 \]
\[ 2x - 10y = 20 \]
\[ 2(x + 10) - 10y = 20 \]
\[ 10y + 20 - 10y = 20 \]
\[ 20 = 20 \]

true...\[ \text{infinitely many solutions} \]

10. \( x + 4y = -8 \)

\[ \frac{+ x - 4y = -8}{2x = -16} \]
\[ \frac{2x = -16}{2 \quad \frac{-16}{2}} \]
\[ \text{solution: } (-8, 0) \]

Now solve for \( y \):

\[ x + 4y = -8 \]
\[ -8 + 4y = -8 \]
\[ +8 \quad +8 \]

\[ \frac{4y = 0}{4 \quad \frac{0}{4}} \]
\[ y = 0 \]
11. \[2x + 5y = 3\]  \[2(-x + 3y = -7)\] \[\frac{2x + 5y = 3}{-2x + 6y = -14}\]

\[\uparrow\text{multiply by 2}\]

\[11y = -11\]

\[y = -1\]

Now solve for \(x\):

\[2x + 5y = 3\]
\[2x + 5(-1) = 3\]
\[2x - 5 = 3\]
\[+5 + 5\]
\[2x = 8\]
\[\frac{2x}{2} = 4\]

Solution: \((4, -1)\)

12. \[2x - 5y = -16\]
\[+2x + 3y = 12\]
\[-2y = -4\]
\[y = 2\]

Solution: \((-3, 2)\)

Now solve for \(x\):

\[2x - 5y = -16\]
\[2x - 5(2) = -16\]
\[2x - 10 = -16\]
\[+10 + 10\]
\[2x = -6\]
\[\frac{2x}{2} = -3\]

\(x = -3\)
13. \[ 2x + 5y = 9 \]
   \[ (2x + y = 13) \]
   \[ \frac{4y}{4} = -4 \]
   \[ y = -1 \]
   \[ \text{Solution: } (7, -1) \]

Now solve for \( x \):
\[ 2x + 5y = 9 \]
\[ 2x + 5(-1) = 9 \]
\[ 2x - 5 = 9 \]
\[ 2x = 14 \]
\[ x = 7 \]

14. \[ 5(2x - 3y = 1) \]
\[ -2(5x + 4y = 14) \]
\[ 10x - 15y = 5 \]
\[ -10x - 8y = -28 \]
\[ -23y = -23 \]
\[ y = 1 \]

Now solve for \( x \):
\[ 5x + 4y = 14 \]
\[ 5x + 4(1) = 14 \]
\[ 5x + 4 = 14 \]
\[ 5x = 10 \]
\[ x = 2 \]

\[ \text{Solution: } (2, 1) \]

\[ \text{You can use any of the 4 equations.} \]
15. \[ \frac{x}{-3} \cdot y = 10 \]
\[ -(x + 2y = 15) \]
\[ -5y = -5 \]
\[ y = 1 \]

Now solve for \( x \):
\[ x + 2y = 15 \]
\[ x + 2(1) = 15 \]
\[ x + 2 = 15 \]
\[ x = 13 \]

Solution: \((13, 1)\)

16. \[ x = 2y - 1 \]
\[ 3x + y = 11 \]

Use substitution!

\[ 3x + y = 11 \]
\[ 3(2y - 1) + y = 11 \]
\[ 6y - 3 + y = 11 \]
\[ 7y - 3 = 11 \]
\[ +3 +3 \]
\[ 7y = 14 \]
\[ \frac{7y}{7} \]
\[ y = 2 \]

Now solve for \( x \):
\[ x = 2y - 1 \]
\[ x = 2(2) - 1 \]
\[ x = 4 - 1 \]
\[ x = 3 \]

Solution: \((3, 2)\)
17. \[5x - y = 17\] 
   \[-(3x - y = 13)\]
   \[2x = 4\]
   \[x = 2\]

   Solution: \((2, -7)\)

Now solve for \(y\):

\[5x - y = 17\]  
\[5(2) - y = 17\]  
\[10 - y = 17\]  
\[-10\]
\[-\frac{y}{-1} = -7\]
\[y = -7\]

20. \[x + y = 17\]  
   \[x - x = 29\]
   \[2x = 46\]
   \[x = 23\]

   Solution: \((23, -6)\)

Now solve for \(y\):

\[x + y = 17\]
\[23 + y = 17\]
\[-23\]
\[y = -6\]
21. Let adult tickets \( \rightarrow X \)  
student tickets \( \rightarrow Y \)

\[
3.50X + 2.50Y = 937.50 \\
-2.50(X + Y) = 321
\]

\[
3.50X + 2.50Y = 937.50 \\
+ \quad -2.50X - 2.50Y = -802.50
\]

\[
1.50X = 135
\]

\[
\frac{1.50X}{1.50} = \frac{135}{1.50}
\]

\[
x = 90
\]

\[
x + y = 321
\]

\[
90 + y = 321
\]

\[
-90 - 90
\]

\[
y = 231
\]

Solution: \((90, 231)\)

90 adult

231 student
22. Let \( x \) be nickels
   \( y \) be dimes

\[
0.05x + 0.10y = 2.35
-0.05(x + y) = 3.3
\]

\[
0.05x + 0.10y = 2.35
-0.05x - 0.05y = -1.65
\]

\[
0.05y = 0.70
\]

\[
0.05y = 0.70
0.05
0.05
\]

\[y = 14\]

\[
x + y = 3.3
x + 14 = 3.3
-14 -14
\]

\[x = 19\]

Solution: \((19, 14)\)
19 nickels
14 dimes

Bonus:

\[
M = 5 + B
M - 5 = 2(B - 5)
5 + B - 5 = 2B - 10
B = 2B - 10
-2B -2B
-10 = -10
\]

\[B = 10\]