Algebra 1A

Unit 06
Sections 4.1, 4.3-4.6

 GUIDED NOTES

NAME __________________________________________

Teacher __________________________

Period ______________
Section 4-1: The Coordinate Plane

Notes

Coordinate Plane:

Example 1: Write the ordered pair for each point.

a) point A

b) point B

Example 2: Write ordered pairs for points A, B, C, and D. Name the quadrant in which each point is located.

<table>
<thead>
<tr>
<th>Point</th>
<th>Ordered Pair</th>
<th>Quadrant</th>
</tr>
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<tbody>
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</table>

Example 3: Write ordered pairs for points A, B, C, and D. Name the quadrant in which each point is located.

<table>
<thead>
<tr>
<th>Point</th>
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</tbody>
</table>
Example 4: Plot each point on the coordinate plane.

a) A (3, 1)  
b) B (-2, 0)  
c) C (2, -5)  
d) R (-4, 1)  
e) S (0, -5)  
f) T (-3, -2)

Example 5: Latitude and longitude lines form a system of coordinates to designate location on Earth. Latitude lines run north and south and are the second coordinate of the ordered pairs. Longitude lines run each and west and are the first coordinate of the ordered pairs.

a) Name the city at (+40°, 105°).  
b) Name the city at about (+33°, 80°).  
c) Estimate the latitude and longitude of Washington, DC.  
d) Estimate the latitude and longitude of Las Vegas.
Section 4-3: Relations

Notes – Part A

Represent Relations:

Ordered Pairs: Table: Graph: Mapping:

Example 1: Express the relation \{(4, 3), (-2, -1), (-3, 2), (2, 4), (0, -4)\} as a table, a graph and a mapping.
**Example 2:** Express the relation \{((0, -3), (-3, 4), (3, 2), (-2, -2), (-1, 4))\} as a table, a graph and a mapping.
Section 4-3: Relations

Represent Relations:

Domain:

Range:

Example 1: Determine the domain and range.

a)

b) \{(-4, 1), (3, -5), (4, 5), (-5, 1)\}

c)

d)

\[
\begin{align*}
\begin{array}{c|c}
 x & y \\
\hline
 0 & 9 \\
-8 & 3 \\
 2 & -6 \\
 1 & 4 \\
\end{array}
\end{align*}
\]
Inverse Relations:

Inverse:

**Example 2:** Express the relation shown in the mapping as a set of ordered pairs. Then write the inverse of the relation.

![Mapping Diagram]

**Example 3:** Express the relation shown in the graph as a set of ordered pairs. Then write the inverse of the relation.

![Barry Bonds' Batting Graph]

**Example 4:** Express the relation shown in the table as a set of ordered pairs. Then write the inverse of the relation.

<table>
<thead>
<tr>
<th>Time (A.M.)</th>
<th>Number of Meteors</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>
Section 4-4: Equations as Relations

Notes – Part A

Solve Equations:

Equation in Two Variables:

Solution:

Example 1: Find the solution set for \( y = 7 + 3x \), given the replacement set 
\[ \{(-5, 0), (-3, -2), (2, 13), 4, 19) \}. \] Show all work.

Example 2: Find the solution set for \( y = 2x + 3 \), given the replacement set 
\[ \{(-2, -1), (-1, 3), (0, 4), (3, 9) \}. \] Show all work.
Example 3: Find the solution set of the equation, given the replacement set. Show all work.

\[ 3x - 2y = 6; \{(\text{-2, 3)}, (0, 1), (0, -3), (2, 0)\} \]

Example 4: Find the solution set of the equation, given the replacement set. Show all work.

\[ 2x = 5 - y; \{(1, 3), (2, 1), (3, 2), (4, 3)\} \]
Section 4-4: Equations as Relations

Notes – Part B

Graph Solution Sets:

Example 1: Solve \( d = 8 - c \) if the domain is \{-2, 0, 3, 5, 8\}. Graph the solution set. Show all work.

Example 2: Solve \( 9x + 3y = 15 \) if the domain is \{0, 1, 2, 3\}. Graph the solution set. Show all work.
**Example 3:** Solve $4x + 2y = 10$ if the domain is $\{-1, 0, 2, 4\}$. Graph the solution set. Show all work.

**Example 4:** Solve $x - y = 8$ if the domain is $\{-4, -2, 0, 2, 4\}$. Graph the solution set. Show all work.
Section 4-5: Graphing Linear Equations
Notes – Part A

Identify Linear Equations:

Linear Equations:

Standard Form:

Example #1: Determine whether each equation is a linear equation. Explain why or why not.

a) \( 5x + 3y = z + 2 \)

b) \( \frac{3}{4}x = y + 8 \)

c) \( 3x - 6y = 27 \)

d) \( \frac{2}{5}x = -7 \)

e) \( y = 5 - 2x \)

f) \( 2xy - 5y = 6 \)

g) \( 3x + 9y = 15 \)

h) \( \frac{1}{3}y = -1 \)
Example #2: Write each linear equation in standard form. Show all work.

a) \( y = 5 - 2x \)

b) \( 7x + y + 3 = y \)

c) \( \frac{3}{4}x = y + 8 \)

d) \( \frac{1}{3}y = -1 \)

e) \( 8x - 3y = 6 - 4x \)

f) \( \frac{2}{5}x = -7 \)
Section 4-5: Graphing Linear Equations
Notes – Part B

Graph Linear Equations:

**Example 1:** Graphing by Making a Table

Graph \( x + 2y = 6 \). Show all work.

**Example 2:** Graph \( \frac{1}{2}y - x = 1 \). Show all work.
**Example 3:** Graph Using Intercepts

Graph $3x - y = 4$. Show all work.

**Example 4:** Graph $3x + 2y = 9$. Show all work.
Section 4-6: Functions
Notes – Part A

Identify Functions:

Functions:

Vertical Line Test:

Example 1: Determine whether each relation is a function. Explain why or why not.

a)  

\[
\begin{array}{c|c}
X & Y \\
-2 & -8 \\
0 & 0 \\
2 & 8 \\
4 & 16 \\
\end{array}
\]

b)  

\[
\begin{array}{c|c}
x & y \\
-7 & -12 \\
-4 & -9 \\
2 & -3 \\
5 & 0 \\
\end{array}
\]

c)  \{(-5, 2), (-2, 5), (0, 7), (0, 9)\}

d)
Section 4-6: Functions
Notes – Part B

Function Values:

Function Notation:

Example 1: If \( f(x) = 3x - 4 \), find each value. Show all work.

a) \( f(4) \)

b) \( f(-5) \)

c) \( f(2 - x) \)

Example 2: If \( f(x) = 2x + 5 \), find each value. Show all work.

a) \( f(-2) \)

b) \( f(1) + 5 \)

c) \( f(x + 3) \)
Example 3: If $k(m) = m^2 - 4m + 5$, find each value. Show all work.

a) $k(-3)$

b) $k(6z)$

c) $-4[k(y)]$

Example 4: If $h(z) = z^2 + 3z - 4$, find each value. Show all work.

a) $h(-4)$

b) $h(5a)$

c) $2[h(g)]$

Example 5: If $<x> = -3x^2 + x - 1$, then $<-5> = ???$  Show all work.

Example 6: If $<x> = x^2 - 4x + 2$, then $<3> = ???$  Show all work.
Skills Practice

The Coordinate Plane

Write the ordered pair for each point shown at the right. Name the quadrant in which the point is located.

1. A  2. B

3. C  4. D

5. E  6. F

Write the ordered pair for each point shown at the right. Name the quadrant in which the point is located.

7. G  8. H


11. L  12. M

Plot each point on the coordinate plane at the right.

13. M(2, 4)  14. N(−3, −3)

15. P(2, −2)  16. Q(0, 3)

17. R(4, 1)  18. S(−4, 1)

Plot each point on the coordinate plane at the right.

19. T(4, 0)  20. U(−3, 2)

21. W(−2, −3)  22. X(2, 2)

23. Y(−3, −2)  24. Z(3, −3)
Write the ordered pair for each point shown at the right. Name the quadrant in which the point is located.

1. A  
2. B  
3. C  
4. D  
5. E  
6. F  
7. G  
8. H  
9. I  
10. J  
11. K  
12. L

Plot each point on the coordinate plane at the right.

13. M(−3, 3)  
14. N(3, −2)  
15. P(5, 1)  
16. Q(−4, −3)  
17. R(0, 5)  
18. S(−1, −2)  
19. T(−5, 1)  
20. V(1, −5)  
21. W(2, 0)  
22. X(−2, −4)  
23. Y(4, 4)  
24. Z(−1, 2)

25. CHESS  Letters and numbers are used to show the positions of chess pieces and to describe their moves. For example, in the diagram at the right, a white pawn is located at f5. Name the positions of each of the remaining chess pieces.

ARCHAEOLOGY For Exercises 26 and 27, use the grid at the right that shows the location of arrowheads excavated at a midden—a place where people in the past dumped trash, food remains, and other discarded items.

26. Write the coordinates of each arrowhead.

27. Suppose an archaeologist discovers two other arrowheads located at (1, 2) and (3, 3). Draw an arrowhead at each of these locations on the grid.
Reading to Learn Mathematics

The Coordinate Plane

Pre-Activity  How do archaeologists use coordinate systems?
Read the introduction to Lesson 4-1 at the top of page 192 in your textbook.
What do the terms grid system, grid, and coordinate system mean to you?

Reading the Lesson

1. Use the coordinate plane shown at the right.
   a. Label the origin $O$.
   b. Label the $y$-axis $y$.
   c. Label the $x$-axis $x$.

2. Explain why the coordinates of the origin are $(0, 0)$.

3. Use the ordered pair $(-2, 3)$.
   a. Explain how to identify the $x$- and $y$-coordinates.

   b. Name the $x$- and $y$-coordinates.

   c. Describe the steps you would use to locate the point for $(-2, 3)$ on the coordinate plane.

4. What does the term quadrant mean?

Helping You Remember

5. Explain how the way the axes are labeled on the coordinate plane can help you remember how to plot the point for an ordered pair.
Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

1. \([-1, -1), (1, 1), (2, 1), (3, 2)\]

2. \([0, 4), (-4, -4), (-2, 3), (4, 0)\]

3. \([3, -2), (1, 0), (-2, 4), (3, 1)\]

Express the relation shown in each table, mapping, or graph as a set of ordered pairs. Then write the inverse of the relation.

4. 

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-5</td>
</tr>
<tr>
<td>-4</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>-2</td>
</tr>
</tbody>
</table>

5. 

6. 

4-3 Practice

Relations

Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

1. \{(4, 3), (-1, 4), (3, -2), (2, 3), (-2, 1)\}

Express the relation shown in each table, mapping, or graph as a set of ordered pairs. Then write the inverse of the relation.

2. 3. 4.

BASEBALL For Exercises 5 and 6, use the graph that shows the batting average for Barry Bonds of the San Francisco Giants. Source: www.sportsillustrated.cnn.com

5. Find the domain and estimate the range.

6. Which seasons did Bonds have the lowest and highest batting averages?

METEORS For Exercises 7 and 8, use the table that shows the number of meteors Ann observed each hour during a meteor shower.

7. What are the domain and range?

8. Graph the relation.
Find the solution set for each equation, given the replacement set.

1. \(y = 3x - 1\); \((2, 5), (-2, 7), (0, -1), (1, 1)\)
2. \(y = 2x + 4\); \((-1, -2), (-3, 2), (1, 6), (-2, 8)\)
3. \(y = 7 - 2x\); \((3, 1), (4, -1), (5, -3), (-1, 5)\)
4. \(-3x + y = 2\); \((-3, 7), (-2, -4), (-1, -1), (3, 11)\)

Solve each equation if the domain is \(-2, -1, 0, 2, 5\).

5. \(y = x + 4\)
6. \(y = 3x - 2\)
7. \(y = 2x + 1\)
8. \(x = y + 2\)
9. \(x = 3 - y\)
10. \(2x + y = 4\)
11. \(2x - y = 7\)
12. \(4x + 2y = 6\)

Solve each equation for the given domain. Graph the solution set.

13. \(y = 2x + 5\) for \(x = \{-5, -4, -2, -1, 0\}\)
14. \(y = 2x - 3\) for \(x = \{-1, 1, 2, 3, 4\}\)
15. \(2x + y = 1\) for \(x = \{-2, -1, 0, 2, 3\}\)
16. \(2x - 2y = 6\) for \(x = \{-3, -1, 3, 4, 6\}\)
Find the solution set for each equation, given the replacement set.

1. \( y = 2 - 5x; \{(3, 12), (-3, -17), (2, -8), (-1, 7)\} \)

2. \( 3x - 2y = -1; \{(-1, 1), (-2, -2.5), (-1, -1.5), (0, 0.5)\} \)

**Solve each equation if the domain is \{-2, -1, 2, 3, 5\}.**

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

4. \( x = 8 - y \)

5. \( 4x + 2y = 10 \)

6. \( 3x - 6y = 12 \)

7. \( 2x + 4y = 16 \)

8. \( x - \frac{1}{2}y = 6 \)

**Solve each equation for the given domain. Graph the solution set.**

9. \( 2x - 4y = 8 \) for \( x = \{-4, -3, -2, 2, 5\} \)

10. \( \frac{1}{2}x + y = 1 \) for \( x = \{-4, -3, -2, 0, 4\} \)

**EARTH SCIENCE** For Exercises 11 and 12, use the following information.

Earth moves at a rate of 30 kilometers per second around the Sun. The equation \( d = 30t \) relates the distance \( d \) in kilometers Earth moves to time \( t \) in seconds.

11. Find the set of ordered pairs when \( t = \{10, 20, 30, 45, 70\} \).

12. Graph the set of ordered pairs.

**GEOMETRY** For Exercises 13–15, use the following information.

The equation for the area of a triangle is \( A = \frac{1}{2}bh \). Suppose the area of triangle \( DEF \) is 30 square inches.

13. Solve the equation for \( h \).

14. State the independent and dependent variables.

15. Choose 5 values for \( b \) and find the corresponding values for \( h \).
4-5 Skills Practice

Graphing Linear Equations

Determine whether each equation is a linear equation. If so, write the equation in standard form.

1. \( xy = 6 \)  
2. \( y = 2 - 3x \)  
3. \( 5x = y - 4 \)

4. \( y = 2x + 5 \)  
5. \( y = -7 + 6x \)  
6. \( y = 3x^2 + 1 \)

7. \( y - 4 = 0 \)  
8. \( 5x + 6y = 3x + 2 \)  
9. \( \frac{1}{2}y = 1 \)

Graph each equation.

10. \( y = 4 \)  
11. \( y = 3x \)  
12. \( y = x + 4 \)

13. \( y = x - 2 \)  
14. \( y = 4 - x \)  
15. \( y = 4 - 2x \)

16. \( x - y = 3 \)  
17. \( 10x = -5y \)  
18. \( 4x = 2y + 6 \)
4-5 Practice
Graphing Linear Equations

Determine whether each equation is a linear equation. If so, write the equation in standard form.

1. \(4xy + 2y = 9\)  
2. \(8x - 3y = 6 - 4x\)  
3. \(7x + y + 3 = y\)

4. \(5 - 2y = 3x\)  
5. \(4y + x = 9x\)  
6. \(a + \frac{1}{5}b = 2\)

7. \(6x = 2y\)  
8. \(\frac{x}{4} - \frac{y}{3} = 1\)  
9. \(\frac{5}{x} - \frac{2}{y} = 7\)

Graph each equation.

10. \(\frac{1}{2}x - y = 2\)  
11. \(5x - 2y = 7\)  
12. \(1.5x + 3y = 9\)

COMMUNICATIONS For Exercises 13–15, use the following information.
A telephone company charges $4.95 per month for long distance calls plus $0.05 per minute. The monthly cost \(c\) of long distance calls can be described by the equation \(c = 0.05m + 4.95\), where \(m\) is the number of minutes.

13. Find the \(y\)-intercept of the graph of the equation.

14. Graph the equation.

15. If you talk 140 minutes, what is the monthly cost for long distance?

MARINE BIOLOGY For Exercises 16 and 17, use the following information.
Killer whales usually swim at a rate of 3.2–9.7 kilometers per hour, though they can travel up to 48.4 kilometers per hour. Suppose a migrating killer whale is swimming at an average rate of 4.5 kilometers per hour. The distance \(d\) the whale has traveled in \(t\) hours can be predicted by the equation \(d = 4.5t\).

16. Graph the equation.

17. Use the graph to predict the time it takes the killer whale to travel 30 kilometers.
4-6 Skills Practice

Functions

Determine whether each relation is a function.

1. X | Y
   -6 | 4
   -2 | 1
    1 | -3
    3 | -5

2. X | Y
   5 | 4
   2 | 1
   0 | -3
-3 | -2

3. X | Y
   4 | 2
   6 | -1
   7 | 3

4. x | y
   4 | -5
   -1 | -10
   0 | -9
   1 | -7
   9 | 1

5. x | y
   2 | 7
   5 | -3
   3 | 5
   -4 | -2
   5 | 2

6. x | y
   3 | 7
   -1 | 1
   1 | 0
   3 | 5
   7 | 3

7. {(2, 5), (4, -2), (3, 3), (5, 4), (-2, 5)}

8. {(6, -1), (-4, 2), (5, 2), (4, 6), (6, 5)}

9. y = 2x - 5

10. y = 11

11. [Graph]

12. [Graph]

13. [Graph]

If f(x) = 3x + 2 and g(x) = x² - x, find each value.

14. f(4)

15. f(8)

16. f(-2)

17. g(2)

18. g(-3)

19. g(-6)

20. f(2) + 1

21. f(1) - 1

22. g(2) - 2

23. g(-1) + 4

24. f(x + 1)

25. g(3b)
Determine whether each relation is a function.

1. \{(1, 4), (2, -2), (3, -6), (-6, 3), (-3, 6)\} 
2. \begin{array}{c|c}
 x & y \\
\hline
1 & -5 \\
-4 & 3 \\
7 & 6 \\
1 & -2 \\
\end{array}
3. 

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

6. \(x = -2\) 
7. \(y = 2\)

If \(f(x) = 2x - 6\) and \(g(x) = x - 2x^2\), find each value.

8. \(f(2)\) 
9. \(f\left(-\frac{1}{2}\right)\) 
10. \(g(-1)\)
11. \(g\left(-\frac{1}{3}\right)\) 
12. \(f(7) - 9\) 
13. \(g(-3) + 13\)
14. \(f(h + 9)\) 
15. \(g(3y)\) 
16. \(2[g(b) + 1]\)

WAGES For Exercises 17 and 18, use the following information.
Martin earns $7.50 per hour proofreading ads at a local newspaper. His weekly wage \(w\) can be described by the equation \(w = 7.5h\), where \(h\) is the number of hours worked.

17. Write the equation in functional notation.
18. Find \(f(15)\), \(f(20)\), and \(f(25)\).

ELECTRICITY For Exercises 19–21, use the following information.
The table shows the relationship between resistance \(R\) and current \(I\) in a circuit.

<table>
<thead>
<tr>
<th>Resistance (ohms)</th>
<th>120</th>
<th>80</th>
<th>48</th>
<th>6</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (amperes)</td>
<td>0.1</td>
<td>0.15</td>
<td>0.25</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>


20. If the relation can be represented by the equation \(IR = 12\), rewrite the equation in functional notation so that the resistance \(R\) is a function of the current \(I\).

21. What is the resistance in a circuit when the current is 0.5 ampere?