Chapter 1 Homework Problems

Lesson 1.1.1

1-4. Angelica is working with function machines. She has the two machines shown at right. She wants to put them in order so that the output of the first machine becomes the input of the second. She wants to use a beginning input of 6.

a. In what order must she put the machines to get a final output of 5?

b. Is it possible for her to find an input that will get a final output of \(-5\)? If so, show how she could do that. If not, explain why not.

1-5. Evaluate each absolute value expression. Review the Math Notes box in the lesson for the definition of absolute value.

a. \(|54|

b. \(-|7 \frac{2}{5}|

c. |3| - |-1|

d. |2.2 - 5.13|

1-6. Examine the tile pattern at right.

a. On your paper, sketch Figures 4 and 5.

b. How does the pattern grow? Explain how you know.

c. How many tiles will there be in Figure 0 (the figure before Figure 1)? Explain how you know.

1-7. Simplify each expression.

a. \(-42 + (-17)

b. \(8 - (-9)

c. 8(-9)

d. \(-42 \div (-7)

e. -2(-3)(-4)

f. \(-18 - 7

g. (-5)^2

h. \(-5^2

i. \sqrt{49}

1-8. For each equation below, find \(y\) if \(x = 2\).

a. \(y = 7 - |x|

b. \(y = x^2 - 1

c. \(y = \sqrt{x + 14}
Lesson 1.1.2 Day 1

1-13. Consider the situation described below.
   a. Meredith lives 24 blocks from her friend’s house. If she travels 1 block every minute, how many minutes will it take her to reach her friend’s house? What if she travels 2 blocks every minute? Show how you calculated each answer.

   b. Copy and complete the table below to represent the amount of time it would take Meredith to get to her friend’s house if she traveled at different rates.

<table>
<thead>
<tr>
<th>Speed (in blocks per minute)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Get to Her Friend’s House (in mins)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   c. What happens to the time it takes to get to her friend’s house as Meredith’s speed increases? Explain.

1-14. Evaluate each expression if \( r = -3 \), \( s = 4 \), and \( t = 7 \).
   a. \( r^2 + \sqrt{s} \)
   b. \( \frac{t-r}{s} \)
   c. \( 2s^2 + r - t \)
   d. \( 3(s - t)^2 \)

1-15. Finding and using a pattern is an important problem-solving skill you will use in algebra. The patterns in Diamond Problems will be used later in the course to solve other types of algebraic problems.

Look for a pattern in the first three diamonds below. For the fourth diamond, explain how you could find the missing numbers (?) if you know the two numbers (#).

Copy the Diamond Problems below onto your paper. Then use the pattern you discovered to complete each one.

1-16. What value(s) of \( x \) will make each equation below true?
   a. \( x + 5 = 5 \)
   b. \( 2x - 6 = 3x + 1 - x - 7 \)
   c. \( 3x + 1 = 43 \)
   d. \( 4x - 1 = 4x + 7 \)
Lesson 1.1.2 Day 2

1-17. Simplify each expression.
   a. \( \frac{2}{9} + \left( -\frac{1}{2} \right) \)  
   b. \( -\frac{6}{7} - \frac{3}{5} \)
   c. \( \frac{9}{10} \left( -\frac{2}{3} \right) \)  
   d. \( \frac{1}{4} + \frac{2}{7} \)

1-18. In December of 2003, the average price for a gallon of regular gas in the United States was $1.50.
   a. At that time, what did it cost to buy 12 gallons of gas?
   b. Gerald paid $12.60 for a tank of gas. How many gallons did he buy?
   c. At right is a graph of this situation. Predict how the line would change to represent the average cost of gas in December of 2005, when gas cost $2.20 per gallon on average.

1-19. Solve each linear equation. Check your solutions.
   a. \(-2x - 3 = 3\)  
   b. \(7 + 2x = 4x - 3\)  
   c. \(6x - 10 = -8 + 3x\)

1-20. Evaluate the expressions below for the given values.
   a. \(-2x^2 - 3x + 1\) for \(x = -3\)  
   b. \(8 - (3x - 2)^2\) for \(x = -2\)
   c. \(\frac{-3}{k+2}\) for \(k = -3\)  
   d. \(\frac{15m}{n+1} - m^2 + n\) for \(m = 1\) and \(n = 2\)

1-21. Copy and complete each of the Diamond Problems below. The pattern used in the Diamond Problems is shown at right.
   a. \[
   \begin{array}{c}
   15 \\
   8 \\
   \end{array}
   \]
   b. \[
   \begin{array}{c}
   3 \\
   1 \\
   \end{array}
   \]
   c. \[
   \begin{array}{c}
   10 \\
   5 \\
   \end{array}
   \]
   d. \[
   \begin{array}{c}
   \frac{1}{2} \\
   \frac{3}{3} \\
   \end{array}
   \]

1-22. Function Machines
   a. If an input of \(-9\) is put into each of the machines at right, what is each output?
   b. Eric wants to get an output of 0. Can he do this with each machine? If so, how? If not, why not?
Lesson 1.1.3

1-25. Freda Function has another quadratic function for you to investigate! Graph the equation \( y = x^2 + 3 \) and then answer the questions from problem 1-23 found below.
- How would you describe the shape of your parabola? For example, would you describe your parabola as opening up or down? Do the sides of the parabola ever go straight up or down (vertically)? Why or why not? Is there anything else special about its shape?
- Does your parabola have any lines of symmetry? That is, can you fold the graph of your parabola so that each side of the fold exactly matches the other? If so, where would the fold be? Do you think this works for all parabolas? Why or why not? For more information on lines of symmetry, see the Math Notes box at the end of this lesson.
- Are there any special points on your parabola? Which points do you think are important to know?
- Are there \( x \)- and \( y \)-intercepts? What are they? Are there any intercepts that you expected but do not exist for your parabola?
- Is there a highest (maximum) or lowest (minimum) point on the graph of your parabola? If so, where is it? This point is called a vertex.

1-26. Copy these Diamond Problems and use the pattern you discovered earlier, shown at right, to complete each of them. Some of these may be challenging!

```
a.  6  -11  
  b.  -1  -4  
  c.  -6  -2  
  d.  -8  -7  
```

1-27. Copy the figure at right onto your paper. Then draw any lines of symmetry.

1-28. Solve the equations below for \( x \) and check your solutions.
   a.  \(-3 + 2x = -x + 6\)
   b.  \(5 - 3x = x + 1\)
   c.  \(-2x = 4x + 9\)
   d.  \(4x + 3 = x\)

1-29. Mr. Guo is thinking of a number. When he takes the absolute value of his number, he gets 15. What could his number be? Is there more than one possible answer?
Lesson 1.2.1 Day 1

1-33. Copy these Diamond Problems and use the pattern you discovered earlier, shown at right, to complete each of them. Some of these may be challenging!

a. \[
\begin{array}{c}
\text{ } \\
\text{ } \\
\text{ } \\
-98 \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\end{array}
\]
b. \[
\begin{array}{c}
\frac{1}{2} \\
\text{ } \\
\frac{3}{2} \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\end{array}
\]
c. \[
\begin{array}{c}
\frac{1}{3} \\
\text{ } \\
-\frac{2}{3} \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\end{array}
\]
d. \[
\begin{array}{c}
\text{ } \\
\text{ } \\
\text{ } \\
-10 \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\text{ } \\
\end{array}
\]

1-34. Evaluate the following absolute value expressions.
   a. \(|-100| - 98\)
   b. \(5|2 - 8|\)
   c. \(|-13| + |0|\)
   d. \(14 - |-10 + 3|\)

1-35. The solution to the equation \(x^3 = 64\) is called the **cube root** of 64. The idea is similar to the idea of a square root, except that the value must be cubed (multiplied by itself three times) to become 64. One way to write the cube root of 64 is using the notation \(\sqrt[3]{64}\). Use this information to evaluate each of the following expressions.
   a. \(\sqrt[3]{64}\)
   b. \(\sqrt[3]{16}\)
   c. \(\sqrt[3]{-8}\)
   d. \(\sqrt[3]{125}\)

1-36. Solve the following linear equations.
   a. \(8x + 1 = -x - 1\)
   b. \(-4x - 3 = 3x - 4 - 7x\)
   c. \(4 - 5x = 1 + 6x\)
   d. \(7 - x + 3 = 9x + 10\)

1-37. Examine the tile pattern shown at right.
   a. On graph paper, draw Figure 0 and Figure 4.

   b. How many tiles will Figure 10 have? How do you know?
Lesson 1.2.1 Day 2

1-38. Chari performed a series of jumps on a trampoline. Her coach measured the height of each jump. The coach’s data was recorded in the table at right.
   a. Make a graph of the data.
   b. Fully describe the graph.
   c. If this pattern continues, what are a reasonable maximum and minimum for the graph?
   d. Which family of functions could model this data? Review the Lesson 1.1.2 Math Note if you need help.

1-39. Use the idea of cube root from problem 1-35 to evaluate the following expressions.
   a. $\sqrt[3]{1}$
   b. $\sqrt[3]{0}$
   c. $\sqrt[3]{2^3}$
   d. $\sqrt[3]{7^3}$

1-40. Solve the equations below for $x$ and check your solutions.
   a. $-6 + 10x = x + 12$
   b. $10 + 5x = 2x - 11$
   c. $-9x = -3x + 18$
   d. $2x - 9 = -7x$

1-41. Find $y$ in each equation if $x = 16$.
   a. $y = 3 + \sqrt[3]{x} - 8$
   b. $y = \sqrt{x} - 7$
   c. $y = 4 + |9 - x|$

1-42. Use your graph investigation questions from problem 1-32 to describe the graph of the quadratic equation $y = x^2 + 8x + 7$ shown below.
Lesson 1.2.2

1-47. Use your list of graph investigation questions from your Learning Log to answer questions about the graph shown at right.

1-48. Calculate the value of each expression below.
   a. \(|-4| - 3\)
   b. \(|6 - 11 + 3|\)
   c. \(-9 - |-2|\)
   d. \(5|6| - 2\)

1-49. Throughout this book, key problems have been selected as “checkpoints.” Each checkpoint problem is marked with an icon like the one at right. These checkpoint problems are provided so that you can check to be sure you are building skills at the expected level. When you have trouble with checkpoint problems, refer to the review materials and practice problems that are available in the “Checkpoint Materials” section at the back of your book.

This problem is a checkpoint for solving linear equations without parentheses. It will be referred to as Checkpoint 1.

**Solve each equation.**
   a. \(3x + 7 = -x - 1\)
   b. \(1 - 2x + 5 = 4x - 3\)
   c. \(4x - 2 + x = -2 + 2x\)
   d. \(3x - 4 + 1 = -2x - 5 + 5x\)

Check your answers by referring to the **Checkpoint 1 materials**.

If you needed help solving these problems correctly, then you need more practice. Review the **Checkpoint 1 materials** and try the practice problems. Also consider getting help outside of class time. From this point on, you will be expected to do problems like this one quickly and easily.

1-50. Graph the points \((-3, 4)\) and \((1, 1)\). If you drew a line through the points, name 3 other points that would be on the line. How did you find them?

1-51. Copy and complete each of the Diamond Problems below. The pattern used in the Diamond Problems is shown at right.
   a. \(\frac{1}{2} \ \frac{1}{2}\)
   b. \(\frac{1}{3} \ \frac{1}{4}\)
   c. \(x \ x\)
   d. \(a \ b\)
Lesson 1.2.3

1-57. If \( f(x) = x^2 \), then \( f(4) = 4^2 = 16 \). Find:
   a. \( f(1) \)
   b. \( f(-3) \)
   c. \( f(t) \)

1-58. Evaluate each expression.
   a. \( \sqrt[3]{27} \)
   b. \( \sqrt{144} \)
   c. \( \sqrt{3^2} \)
   d. \( \sqrt[4]{2^4} \)

1-59. Graph and fully describe the function \( y = \sqrt[3]{x} - 2 \).

1-60. A line passes through the points A(–3, –2) and B(2, 1). Does it also pass through the point C(5, 3)? Justify your conclusion.

1-61. Find the following absolute values.
   a. \( |0.75| \)
   b. \( |-99| \)
   c. \( |4 - 2 \cdot 3| \)
   d. \( |\pi| \)
Lesson 1.2.4

1-66. If \( g(x) = \sqrt{x - 7} \) find \( g(8) \), \( g(32) \), and \( g(80) \).

1-67. Solve each equation below. Check each solution.
   a. \( 6 - x - 3 = 10 \)
   b. \( 100x + 300 = 200 \)
   c. \( \frac{1}{3}x + 4 = x - 2 \)
   d. \( 36 - 2x = -x + 2 \)

1-68. Find \( f(-4) \) for each function below.
   a. \( f(x) = |x - 3| \)
   b. \( f(x) = -5|x| \)
   c. \( f(x) = |x + 1| \)
   d. \( f(x) = |x + 3| - 6 \)

1-69. Graph and fully describe the function \( f(x) = -x^2 + 3 \). Graph values of \( x \) from \(-3\) to \(3\).

1-70. Find the corresponding inputs or outputs for the following functions. If there is no solution, explain why not. Be careful: In some cases, there may be no solution or more than one possible solution.
   a.  
   
   b.  

   c.  

   d.  

Lesson 1.2.5

1-78. Which of the relationships below are functions? If a relationship is not a function, give a reason to support your conclusion.

a. 

b. 

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-3</td>
</tr>
</tbody>
</table>

c. 

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>-2</td>
</tr>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

d. 

1-79. Find the x- and y-intercepts for the graphs of the relationships in problem 1-78.

1-80. Find the inputs for the following functions with the given outputs. If there is no possible input for the given output, explain why not.

a. 

b. 

\[ f(x) = \sqrt{2x - 6}\]

1-81. Use the relationship graphed at right to answer the questions below.

a. Is the relation a function?

b. What is the domain?

c. What is the range?

1-82. What value(s) of \(x\) will make each equation true?

a. \(\sqrt{x} = -2\)  

b. \(\sqrt{x} = 12\)  

c. \(|x + 1| = 4\)
Chapter 1 Closure Problems

CL 1-83. Use the Order of Operations to simplify the following expressions.

a. $5 - 2 \cdot 3^2$  

b. $(-2)^2$  

c. $18 \div 3 \cdot 6$  

d. $-2^2$  

e. $(5 - 3)(5 + 3)$  

f. $24 \cdot \frac{1}{4} \div -2$  

g. Why are your answers for parts (b) and (d) different?

CL 1-84. Copy the pattern below onto graph paper. Draw the 1st and 5th figures on your paper.

![Figure 2]  

![Figure 3]  

![Figure 4]  

a. How many tiles are in each figure?  

b. Describe how the pattern is changing.  

c. How many tiles would the 6th figure have? The 10th figure?

CL 1-85. Copy and complete each of the Diamond Problems below. The pattern used in the Diamond Problems is shown at right.

![Diamond Problems]

a. 

b. 

c. 

d. 

CL 1-86. Graph and fully describe the function $y = 2\sqrt{x - 1} + 3$.

CL 1-87. Solve each equation. Check your solution.

a. $3x - 1 = 4x + 8 - x$  

b. $-10 + 5x = 7x - 4$  

c. $28 - 6x + 4 = 30 - 3x$  

d. $4x - 1 = 9x - 1 - 5x$

CL 1-88. Find $f(4)$ for each function below.

a. $f(x) = -|x - 7| + 3$  

b. $f(x) = \frac{\sqrt{x + 12}}{4}$  

c. $f(x) = 2 - \sqrt[3]{x + 23}$

CL 1-89. Evaluate each expression

a. $2 \div |3 - 4|$  

b. $11|6| + 15$  

c. $-19 + \sqrt[3]{-8}$  

d. $-11 - \sqrt{16}$

CL 1-90. Use the function machine shown at right to answer the following questions.

a. If the input is $-8$, what is the output?  

b. If the output was 21, what was the input? 