Incoming
7th Grade
Summer Math Packet
Winton Woods
City Schools
Candy Dilemma

I bought a box of candy for myself last week. However, by the time I got home I had eaten \( \frac{1}{4} \) of the candies. As I was putting the groceries away, I ate \( \frac{1}{2} \) of what was left. There are now 6 chocolates left in the box.

How many chocolates were in the box to begin with?

Be sure to show and explain all of your reasoning.
Look at the set of gears. Gear B has 12 teeth and Gear C has 20 teeth. Find the number of teeth that Gear A has to have so that when it rotates once, Gear B and Gear C have rotated some whole number of times.

Be sure to explain your reasoning clearly. Connect as much mathematics and use as much math language as you can.
Sink or Swim?

In New Zealand there is a river known as the Kaituna. On it, there exists a 23-foot waterfall; some people like to go over the waterfall on a raft. A group of 6 people decide to give it a try; they consist of four adults and two teenagers.

The raft MUST be traveling at least 30 miles per hour in order to successfully go over the falls; otherwise it will tip over. The river flows at one-sixth of the needed speed. An adult can paddle the raft at a speed of 5 miles per hour. Three teenagers can paddle the same speed as two adults.

How fast is the raft traveling?
Will the group be able to make it over the falls without tipping over?
Molly Mathematician can’t remember her gym locker combination. The Physical Education teacher won’t provide her with the combination, but did give her the following clues about the combination:

1. The 3 numbers in the combination are between the numbers 15 and 30.
2. The sum of the numbers is 70.
3. When you square each number in her locker combination the digits 1 – 9 will appear only once in the digits of the 3 square numbers.

What is the combination to Molly’s locker?

Show all of your work and tell how you achieved a solution by labeling all that you do.
Find the perimeter of a train of 100 equilateral triangles if the triangles are joined side to side.

Each side is one inch long.

Write an equation to determine the perimeter of the triangle train.
Reasoning with Fractions

Mr. Larson is planning the seating for a school recital. He needs to reserve \( \frac{1}{3} \) of the seats for students and \( \frac{1}{6} \) of the seats for parents.

a. After reserving seats for students and parents, what fraction of the seats in the auditorium are left?

b. Mr. Larson’s principal tells him that he also needs to reserve \( \frac{1}{8} \) of the seats for teachers and school officials. The remainder can be used for open seating. What fraction of the seats are now left for open seating?

c. Later, Mr. Larson’s principal says he should reserve \( \frac{1}{4} \) of the seats for students from other middle schools. Are there enough seats left? If not, explain why not; otherwise, state what fraction of the seats will be available for open seating.
Adding and Subtracting Fractions

Find each sum or difference.

1. \( \frac{1}{4} + \frac{2}{4} \)  
2. \( \frac{7}{10} - \frac{4}{10} \)  
3. \( \frac{5}{8} - \frac{3}{8} \)  
4. \( \frac{1}{8} + \frac{5}{8} \)  
5. \( \frac{5}{8} + \frac{2}{8} \)  
6. \( \frac{3}{10} + \frac{6}{10} \)  
7. \( \frac{2}{5} - \frac{1}{10} \)  
8. \( \frac{5}{8} - \frac{1}{4} \)  
9. \( \frac{3}{10} + \frac{4}{5} \)  
10. \( \frac{11}{16} + \frac{5}{8} \)  
11. \( \frac{2}{3} - \frac{1}{6} \)  
12. \( \frac{3}{5} + \frac{7}{10} \)  

13. What is the total amount of sugar in the recipe at the right?

<table>
<thead>
<tr>
<th>Martha's Cookie Recipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cup shortening</td>
</tr>
<tr>
<td>2 eggs</td>
</tr>
<tr>
<td>( \frac{1}{4} ) cup white sugar</td>
</tr>
<tr>
<td>( \frac{1}{4} ) cup brown sugar</td>
</tr>
<tr>
<td>1 1/2 cups flour</td>
</tr>
<tr>
<td>1 teaspoon vanilla</td>
</tr>
</tbody>
</table>

14. Martha decides to double the recipe. How much brown sugar will she use?
Three groups of students are sharing leftover pizza (all the same size originally). In which group does each student get the most pizza? Explain your choice.

A. Six students equally share $\frac{3}{4}$ of a pizza.

B. Three students equally share $\frac{1}{3}$ of a pizza.

C. Four students equally share $\frac{2}{3}$ of a pizza.

**Find each quotient.**

2. $\frac{1}{12} \div \frac{5}{6}$
3. $4 \div \frac{1}{3}$
4. $6 \div \frac{3}{4}$

5. $5 \div \frac{9}{10}$
6. $8 \div \frac{2}{3}$
7. $\frac{4}{5} \div 2$

8. $\frac{7}{8} \div 3$
9. $\frac{5}{6} \div 5$
10. $\frac{4}{9} \div 8$

**Find Each Product**

11. $\frac{3}{5}$ of $\frac{3}{4}$
12. $\frac{1}{2} \times \frac{1}{3}$
13. $\frac{1}{8} \times \frac{3}{4}$
14. $\frac{2}{5} \times \frac{7}{11}$

15. $\frac{2}{3}$ of $\frac{1}{4}$
16. $\frac{2}{5} \times \frac{1}{2}$
17. $\frac{1}{4}$ of $\frac{4}{5}$
18. $\frac{5}{6} \times \frac{2}{5}$
1. The student council at Metropolis Middle School conducted a survey to see whether students would prefer blue, red, or green as the new color for the school logo. The results of the survey are shown in the bar graph below.

![Bar Graph]

Number of Students

- Blue
- Red
- Green

Preferred Color for Logo

a. What is the total number of students who were surveyed?

b. What percent of students surveyed preferred blue?

c. What percent of students surveyed preferred red?

d. What percent of students surveyed preferred green?

e. If 970 students attend Metropolis Middle School, what percent of the students were surveyed?

2. What percent of 75 is 40?

3. What percent of 45 is 135? Explain your reasoning.
1. Assuming that it is equally likely for a person to be born a boy or a girl, answer the following questions.
   a. What are all the possible outcomes (that is, each child being a boy or girl) of having two children? List the outcomes in the form (gender of first child, gender of second child).
   b. What is the probability that both children are girls?
   c. What is the probability that one child is a boy and the other is a girl?
   d. What is the probability that the oldest child is a boy?

2. Assuming that it is equally likely for a child to be born a girl or a boy, answer the following questions.
   a. Suppose a family has three children. List all the possible outcomes for the genders of the children.
   b. If a family has three children, what is the probability that all three children are girls? That all three children are boys?
   c. What is the probability of having two girls and one boy?
   d. What is the probability of having two boys and one girl?
   e. Josh has a younger brother. What is the probability that a third child will be another boy? Explain.

3. Here are two spinners. Suppose you spin both spinners.
   a. Make a chart or other diagram to show all of the outcomes.

b. Are the outcomes equally likely? If not, which ones are most likely and which ones are least likely? Explain your thinking.
Probability Darts

Find the portion of the dart board that each panel occupies and use your knowledge of degrees and fractions to answer the following questions about probability.

REMEMBER: Probability is the likelihood a given outcome will occur. It is expressed as a fraction.

Use the information above to answer the questions below.

1. Is the next dart more likely to hit panel C, E, or F? Why?

2. What is the probability that the next dart thrown hits a panel with a letter that comes after C alphabetically?

3. Write the letters of the panel in the order of most to least probable of being hit.

____   _____   _______   _______   _______   _______
### Review: Fractions

#### Add or subtract.

<table>
<thead>
<tr>
<th>A. (\frac{5}{6} + \frac{5}{8} = )</th>
<th>(\frac{13}{21} + \frac{5}{7} = )</th>
<th>(\frac{5}{6} + \frac{10}{18} = )</th>
<th>(\frac{6}{7} + \frac{8}{9} = )</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. (\frac{4}{5} + \frac{9}{15} = )</td>
<td>(\frac{5}{16} + \frac{17}{8} = )</td>
<td>(\frac{13}{12} + \frac{7}{8} = )</td>
<td>(\frac{14}{24} + \frac{7}{12} = )</td>
</tr>
<tr>
<td>C. (\frac{27}{30} - \frac{5}{6} = )</td>
<td>(\frac{5}{6} - \frac{1}{5} = )</td>
<td>(\frac{7}{8} - \frac{1}{2} = )</td>
<td>(\frac{5}{6} - \frac{2}{9} = )</td>
</tr>
<tr>
<td>D. (\frac{9}{16} - \frac{3}{8} = )</td>
<td>(\frac{4}{5} - \frac{2}{8} = )</td>
<td>(\frac{4}{7} - \frac{3}{14} = )</td>
<td>(\frac{3}{4} - \frac{1}{5} = )</td>
</tr>
<tr>
<td>E. (\frac{3}{6} - \frac{2}{15} = )</td>
<td>(\frac{5}{8} - \frac{1}{6} = )</td>
<td>(\frac{7}{9} - \frac{2}{6} = )</td>
<td>(\frac{7}{24} - \frac{3}{12} = )</td>
</tr>
<tr>
<td>F. (\frac{2}{8} + 4\frac{1}{2} = )</td>
<td>(3\frac{1}{2} + 5\frac{3}{6} = )</td>
<td>(3\frac{9}{10} + 2\frac{4}{15} = )</td>
<td>(2\frac{2}{3} + 3\frac{1}{6} = )</td>
</tr>
<tr>
<td>G. (\frac{7}{9} + 2\frac{3}{27} = )</td>
<td>(4\frac{2}{8} + 3\frac{4}{16} = )</td>
<td>(3\frac{2}{12} + 3\frac{1}{3} = )</td>
<td>(6\frac{4}{9} + 2\frac{2}{3} = )</td>
</tr>
<tr>
<td>H. (6\frac{7}{8} + \frac{2}{6} = )</td>
<td>(6 + 3\frac{5}{9} = )</td>
<td>(3 + 5\frac{9}{12} = )</td>
<td>(12\frac{4}{8} + \frac{2}{4} = )</td>
</tr>
</tbody>
</table>

#### Compare. Use >, <, or =.

<table>
<thead>
<tr>
<th>I. (\frac{5}{4} - \frac{1}{8} \square \frac{5}{6} - \frac{1}{3} = )</th>
<th>(\frac{6}{18} + \frac{1}{9} \square \frac{3}{4} + \frac{3}{6} = )</th>
<th>(\frac{6}{12} \square \frac{9}{24} = )</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. (\frac{7}{2} - 4 \square 9 - \frac{7}{10} = )</td>
<td>(\frac{8}{9} - \frac{4}{3} \square \frac{5}{6} + \frac{5}{3} = )</td>
<td>(\frac{10}{21} \square \frac{5}{7} = )</td>
</tr>
<tr>
<td>K. (\frac{9}{5} + 3\frac{4}{5} \square 15 - \frac{2}{3} = )</td>
<td>(\frac{9}{10} + 2\frac{3}{5} \square \frac{10}{5} + 3\frac{4}{9} = )</td>
<td>(\frac{5}{15} \square \frac{2}{3} = )</td>
</tr>
<tr>
<td>L. (\frac{7}{4} - 2\frac{2}{8} \square \frac{3}{8} - \frac{1}{3} = )</td>
<td>(\frac{4}{18} + \frac{3}{9} \square \frac{2}{2} + 3\frac{1}{2} = )</td>
<td>(\frac{3}{12} \square \frac{4}{8} = )</td>
</tr>
</tbody>
</table>

#### Write the missing number.

<table>
<thead>
<tr>
<th>M. (\frac{2}{9} + \square = 11 )</th>
<th>(\square - 3\frac{2}{7} = 7\frac{5}{21} )</th>
<th>(\square + 2\frac{2}{3} = 5\frac{5}{6} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. (\square - 6\frac{3}{5} = 3\frac{1}{3} )</td>
<td>(\square - \frac{1}{6} = 4\frac{2}{3} )</td>
<td>(\square - 5\frac{3}{4} = 9\frac{5}{8} )</td>
</tr>
</tbody>
</table>
Determine the value of the variable in each equation.

1. \( 6 + a = 12 \) 
   \[ a = 6 \]

2. \( 7 - b = 2 \) 
   \[ b = 5 \]

3. \( 11 + 14 = c \) 
   \[ c = 25 \]

4. \( \frac{24}{d} = 3 \) 
   \[ d = 8 \]

5. \( 10e = 110 \) 
   \[ e = 11 \]

6. \( \frac{f}{7} = 7 \) 
   \[ f = 49 \]

7. \( 13g = 26 \) 
   \[ g = 2 \]

8. \( 35 - h = 10 \) 
   \[ h = 25 \]

9. \( 6 + i = 23 \) 
   \[ i = 17 \]

10. \( j - 17 = 7 \) 
    \[ j = 24 \]

11. \( \frac{42}{7} = k \) 
    \[ k = 6 \]

12. \( 4m = 32 \) 
    \[ m = 8 \]

13. \( \frac{72}{n} = 9 \) 
    \[ n = 8 \]

14. \( 33 + 66 = p \) 
    \[ p = 99 \]

15. \( \frac{q}{5} = 5 \) 
    \[ q = 25 \]  

\[
\star 5 + r = 14 + 3 
\]
\[ r = 12 \]  

\[
\star 11 + 4 = 3s 
\]
\[ s = 5 \]
Algebraic Expressions

Tell whether each algebraic equation is correct. Write true or not true on the line next to each.

1. \( a - 6 = 4, a = 10 \) \hspace{1cm} 2. \( \frac{c}{12} = 2, c = 6 \)

3. \( \frac{d}{6} = 2, d = 18 \) \hspace{1cm} 4. \( 8z = 48, z = 7 \)

5. \( x + x + 7 = 16, x = 4 \) \hspace{1cm} 6. \( \frac{30}{5} = h, h = 6 \)

7. \( \frac{8}{j} = 1, j = 8 \) \hspace{1cm} 8. \( 13 - z = 8, z = 4 \)

If the algebraic expression shown is true, write true on the line. If the algebraic expression is not true, cross out the value for the variable and write a new value on the line to make it true.

**Example:**

\[ a - 1 = 6, a = 8 \]

Since this is not true, cross out the 8 and write \( a = 7 \) on the line.

9. \( 9 - w = 1, w = 9 \) \hspace{1cm} 10. \( \frac{p}{2} = 5, c = 10 \)

11. \( \frac{18}{k} = 2, k = 9 \) \hspace{1cm} 12. \( 12 + j = 21, j = 6 \)

13. \( 7a = 28, a = 3 \) \hspace{1cm} 14. \( \frac{24}{y} = 4, y = 8 \)

15. \( \frac{36}{6} = b, b = 3 \) \hspace{1cm} 16. \( 17 - v = 5, v = 12 \)

17. Is this equation in the box to the right always false, no matter what value you give the variable? Explain your answer.

\( 0b = 4 \)
Complete the tables. Write a full equation in each empty box.

<table>
<thead>
<tr>
<th>(18 - x)</th>
<th>(3x)</th>
<th>(\frac{40}{x})</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x = 2)</td>
<td>(18 - 2 = 16)</td>
<td></td>
</tr>
<tr>
<td>(x = 5)</td>
<td></td>
<td>(3 \times 5 = 15)</td>
</tr>
<tr>
<td>(x = 8)</td>
<td></td>
<td>(40 \div 8 = 5)</td>
</tr>
<tr>
<td>(x = 10)</td>
<td>(18 - 10 = 8)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(9y)</th>
<th>(\frac{y}{3})</th>
<th>(y + y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y = 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(y = 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(y = 9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(y = 12)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete the table. Write equations in the empty white boxes. Also, write three algebraic expressions in the gray boxes along the top.

<table>
<thead>
<tr>
<th>(z = 1)</th>
<th>(1 \times 3 = 3)</th>
<th>(28 \div 1 = 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(z = 4)</td>
<td>(4 \times 3 = 12)</td>
<td>(4 + 8 = 12)</td>
</tr>
<tr>
<td>(z = 7)</td>
<td></td>
<td>(7 + 8 = 12)</td>
</tr>
</tbody>
</table>
Ordered Pairs

Tell what point is located at each ordered pair.

1. (5,8) ______  2. (12,2) ______  3. (8,7) ______
4. (12,10) ______ 5. (7,7) ______  6. (0,10) ______

Write the ordered pair for each given point.


Plot the following points on the coordinate grid.

13. S (6,11)  14. T (3,5)  15. U (9,12)
Find the perimeter and area of each rectangle.

1.  
   8 cm  
   15 cm

2.  
   12 in.  
   20 in.

3.  
   6 cm

4. \( \ell = 5 \text{ in.}, w = 13 \text{ in.} \)

5. \( \ell = 18 \text{ m}, w = 12 \text{ m} \)

6. \( \ell = 3 \text{ ft}, w = 8 \text{ ft} \)

7. rectangle: \( l = 16 \text{ mm}, w = 12 \text{ mm} \)

8. rectangle: \( l = 65 \text{ mi}, w = 48 \text{ mi} \)

9. The length of a rectangle is 8 centimeters. The width is 6 centimeters.
   a. What is the area?

   b. What is the perimeter?

10. The area of a rectangle is 45 square inches.
    One dimension is 5 inches. What is the perimeter?
Skill: Area of Circles

Find the area of each circle. Round to the nearest tenth.

1. \[3 \text{ cm} \]
2. \[2 \text{ cm} \]
3. \[4 \text{ cm} \]

Find the area of each circle. Round to the nearest unit. Use \( \frac{22}{7} \) for \( \pi \).

4. \[7 \text{ in.} \]
5. \[24 \text{ km} \]
6. \[1\frac{3}{4} \text{ m} \]

Find the area of each shaded region to the nearest tenth.

7. \[8 \text{ m} \]
   \[8 \text{ m} \]
   \[12 \text{ m} \]

8. \[3 \text{ in.} \]
   \[4 \text{ in.} \]

9. \[10 \text{ ft} \]
   \[5 \text{ ft} \]
Skill: Area of Triangles

Find the area of each triangle.

1.  
   \[
   \text{3 cm} \quad \text{8 cm}
   \]

2.  
   \[
   \text{3 ft} \quad \text{4 ft}
   \]

Tell whether each statement is true or false.

3. Two triangles that have the same base always have the same area.

4. Any obtuse triangle has a greater area than any acute triangle.

Find the area of each triangle.

5.  
   \[
   \begin{array}{c}
   \text{21 cm} \\
   \text{13 cm} \\
   \text{32 cm} \\
   \text{46 cm}
   \end{array}
   \]

6.  
   \[
   \begin{array}{c}
   \text{9.4 mi} \\
   \text{15.7 mi} \\
   \text{12.6 mi}
   \end{array}
   \]

7.  
   \[
   \begin{array}{c}
   \text{12.9 km} \\
   \text{8.0 km} \\
   \text{8.7 km} \\
   \text{6.7 km} \\
   \text{3.4 km}
   \end{array}
   \]

8.  
   \[
   \begin{array}{c}
   \text{50 yd} \\
   \text{54 yd} \\
   \text{53 yd}
   \end{array}
   \]

Solve.

9. The area of a triangle is 6 square units. Both the height and the length of the base are whole numbers. What are the possible lengths and heights?