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Lesson 1 Problem Set

1. Use the following directions to draw a figure in the box to the right.
   a. Draw two points, $A$ and $B$.
   b. Use a straightedge to draw $\overline{AB}$.
   c. Draw a new point that is not on $\overline{AB}$. Label it $C$.
   d. Draw segment $\overline{AC}$.
   e. Draw a point not on $\overline{AB}$ or $\overline{AC}$. Call it $D$.
   f. Construct line $\overline{CD}$.
   g. Use the points you’ve already labeled to name one angle. ____________

2. Use the following directions to draw a figure in the box to the right.
   a. Draw two points, $A$ and $B$.
   b. Use a straightedge to draw $\overline{AB}$.
   c. Draw a new point that is not on $\overline{AB}$. Label it $C$.
   d. Draw $\overline{BC}$.
   e. Draw a new point that is not on $\overline{AB}$ or $\overline{BC}$. Label it $D$.
   f. Construct $\overline{AD}$.
   g. Identify $\angle DAB$ by drawing an arc to indicate the position of the angle.
   h. Identify another angle by referencing points that you have already drawn. ____________
3. 
   a. Observe the familiar figures below.
   b. Label points on each figure and then use those points to label and name representations of each of the following in the table below: ray, line, line segment, and angle. Extend segments to show lines and rays.

BONUS: Draw a familiar figure. Label it with points and then identify rays, lines, line segments, and angles as applicable.

<table>
<thead>
<tr>
<th></th>
<th>house</th>
<th>flash drive</th>
<th>compass rose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>line segment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>angle</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Draw a line segment to connect the word to its picture.

2. How is a line different from a line segment?
1. Use the following directions to draw a figure in the box to the right.

   a. Draw two points, $W$ and $X$.
   b. Use a straightedge to draw $\overline{WX}$.
   c. Draw a new point that is not on $\overline{WX}$. Label it $Y$.
   d. Draw segment $\overline{WY}$.
   e. Draw a point not on $\overline{WX}$ or $\overline{WY}$. Call it $Z$.
   f. Construct line $\overrightarrow{YZ}$.
   g. Use the points you’ve already labeled to name one angle. __________

2. Use the following directions to draw a figure in the box to the right.

   a. Draw two points, $W$ and $X$.
   b. Use a straightedge to draw $\overline{WX}$.
   c. Draw a new point that is not on $\overline{WX}$. Label it $Y$.
   d. Draw $\overline{WY}$.
   e. Draw a new point that is not on $\overline{WX}$ or $\overline{WY}$. Label it $Z$.
   f. Construct $\overrightarrow{WZ}$.
   g. Identify $\angle ZWX$ by drawing an arc to indicate the position of the angle.
   h. Identify another angle by referencing points that you have already drawn. __________
3. a. Observe the familiar figures below.
   b. Label points on each figure and then use those points to label and name representations of each of the following in the table below: ray, line, line segment, and angle. Extend segments to show lines and rays.

<table>
<thead>
<tr>
<th>clock</th>
<th>die</th>
<th>number line</th>
</tr>
</thead>
<tbody>
<tr>
<td>ray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>line segment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>angle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BONUS: Draw a familiar figure. Label it with points and then identify rays, lines, line segments, and angles as applicable.
Lesson 2: Use right angles to determine whether angles are equal to, greater than, or less than right angles. Draw right, obtuse, and acute angles.

Date: 10/16/13
1. Use the right angle template that you made in class to determine if each of the following angles is greater than, less than, or equal to a right angle. Label each as greater than, less than, or equal to, and then connect each angle to the correct label of acute, right, or obtuse. The first one has been completed for you.

   a. 
   
   b. 
   
   c. less than
   
   d. 
   
   e. 
   
   f. 
   
   g. 
   
   h. 
   
   i. 
   
   j. 
   
   a. less than
   
   b. equal to
   
   c. less than
   
   d. greater than
   
   e. less than
   
   f. greater than
   
   g. less than
   
   h. greater than
   
   i. less than
   
   j. greater than
2. Use your right angle template to identify acute, obtuse, and right angles within Picasso’s painting Factory, Horta de Ebbo. Trace at least two of each, label with points, and then name them in the table below the painting.

<table>
<thead>
<tr>
<th>acute angle</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>obtuse angle</td>
<td></td>
</tr>
<tr>
<td>right angle</td>
<td></td>
</tr>
</tbody>
</table>
3. Construct each of the following using a straightedge and/or the right angle template that you created. Explain the characteristics of each by comparing the angle to a right angle. Use the words greater than, less than, or equal to in your explanations.

   a. acute angle

   b. right angle

   c. obtuse angle
1. Fill in the blanks to make true statements using one of the following words: *acute, obtuse, right, straight*.

   a. In class we made an ___________ angle when we folded paper twice.

   b. An ___________ angle is smaller than a right angle.

   c. An ___________ angle is larger than a right angle but smaller than a straight angle.

2. Look at the following angles.

   a. Which angles are right angles? ________________________________

   b. Which angles are obtuse angles? ________________________________

   c. Which angles are acute angles? ________________________________

   d. Which angles are straight angles? ________________________________
Name ________________________________ Date __________________

1. Use the right angle template that you made in class to determine if each of the following angles is greater than, less than, or equal to a right angle. Label each as greater than, less than, or equal to, and then connect each angle to the correct label of acute, right, or obtuse. The first one has been completed for you.

   a. 
   b. 
   c. less than
   d. 
   e. 
   f. 
   g. 
   h. 
   i. 
   j. 

Lesson 2: Homework

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2. Use your right angle template to identify acute, obtuse, and right angles within Tommervik’s *Geometric Elephant Painting*. Trace at least two of each, label with points, and then name them in the table below the painting.

![Image of Geometric Elephant Painting](image-url)

<table>
<thead>
<tr>
<th>acute angle</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>obtuse angle</td>
<td></td>
</tr>
<tr>
<td>right angle</td>
<td></td>
</tr>
</tbody>
</table>
3. Construct each of the following using a straightedge and/or the right angle template that you created. Explain the characteristics of each by comparing the angle to a right angle. Use the words greater than, less than, or equal to in your explanations.

a. acute angle

b. right angle

c. obtuse angle
Lesson 3 Problem Set

Name ___________________________________________ Date _________________

1. On each object, trace at least one pair of lines that appear to be perpendicular.

   ![Images of various objects with lines]

2. How do you know if two lines are perpendicular?

3. In the square and triangular grids below, use the given segments in each grid to draw a line that is perpendicular using a straightedge.

   ![Images of grid with lines drawn]
4. Use the right angle template that you created in class to determine which of the following have a right angle. Mark each right angle with a small square. For each right angle you find, name the corresponding pair of perpendicular lines. (See 4(a) for one example of this.)

a. 

\[ \overline{AB} \perp \overline{BD} \]

b. 

![Diagram of a pentagon with right angles marked at I, J, K, L, and H.]

c. 

![Diagram of a triangle with right angles marked at E and G.]

d. 

![Diagram of an ellipse with right angles marked.]

e. 

![Diagram of a parallelogram with right angles marked at A, B, W, and Z.]

f. 

![Diagram of a triangle with right angles marked at M and N.]

g. 

![Diagram of a hexagon with right angles marked at S, R, Q, and T.]

h. 

![Diagram of a trapezoid with right angles marked at X, Y, U, and V.]}
5. Mark each right angle in the following figure with a small square. (Note that a right angle does not have to be inside the figure.) How many pairs of perpendicular sides does this figure have?

6. True or false? Shapes that have at least one right angle also have at least one pair of perpendicular sides. Explain your thinking.
Find all of the pairs of perpendicular lines in each figure. Mark with the right angle symbol then name them. Use your right angle template as a guide.

1. \( \overline{BC} \perp \) ______

2. \( \overline{MN} \perp \) ______
Lesson 3 Homework

Name ___________________________ Date ________________

1. On each object, trace at least one pair of lines that appear to be perpendicular.

![Objects with lines](image)

2. How do you know if two lines are perpendicular?

3. In the square and triangular grids below, use the given segments in each grid to draw a line that is perpendicular using a straightedge.

![Grids with lines](image)
4. Use the right angle template that you created in class to determine which of the following have a right angle. Mark each right angle with a small square. For each right angle you find, name the corresponding pair of perpendicular lines. (See 4(a) for one example of this.)

   a. \[ \overline{AB} \perp \overline{BD} \]
   
   b. 
   
   c. 
   
   d. 
   
   e. 
   
   f. 
   
   g. 
   
   h. 

---

Lesson 3 Homework 4A.44

Identify, define, and draw perpendicular lines.

Date: 10/16/13

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5. Use your right angle template as a guide and mark each right angle in the following figure with a small square. (Note that a right angle does not have to be inside the figure.) How many pairs of perpendicular sides does this figure have?

6. True or false? Shapes that have no right angles also have no perpendicular segments. Draw some figures to help explain your thinking.
1. On each object, trace at least one pair of lines that appear to be parallel.

2. How do you know if two lines are parallel?

3. In the square and triangular grids below, use the given segments in each grid to draw a line that is parallel using a straightedge.
4. Determine which of the following figures have lines that are parallel by using a straightedge and the right angle template that you created. Circle the letter of the shapes that have at least one pair of parallel lines. Mark each pair of parallel lines with arrows and then identify the parallel lines with a statement modeled after the one in 4(a).

(a)

AB // CD

(b)

c.

d.

e.

f.

g.

h.
5. True or false? A triangle cannot have sides that are parallel. Explain your thinking.

6. Explain why $\overline{AB}$ and $\overline{CD}$ are parallel but $\overline{EF}$ and $\overline{GH}$ are not.

7. Draw a line using your straightedge. Now use your right angle template and straightedge to construct a line parallel to the first line you drew.
Lesson 4 Exit Ticket

1. Look at the following pairs of lines. Identify if they are parallel, perpendicular, or intersecting.

   a. ____________________  
   b. ____________________  
   c. ____________________  
   d. ____________________
1. On each object, trace at least one pair of lines that appear to be parallel.

   ![Objects](image)

2. How do you know if two lines are parallel?

3. In the square and triangular grids below, use the given segments in each grid to draw a line that is parallel using a straightedge.

   ![Grids](image)
4. Determine which of the following figures have lines that are parallel by using a straightedge and the right angle template that you created. Circle the letter of the shapes that have at least one pair of parallel lines. Mark each pair of parallel lines with arrows and then identify the parallel lines with a statement modeled after the one in 4(a).

   a. \( \overline{AB} \parallel \overline{BD} \)

   b.

   c.

   d.

   e.

   f.

   g.

   h.
5. True or false? All shapes with a right angle have sides that are parallel. Explain your thinking.

6. Explain why $\overline{AB}$ and $\overline{CD}$ are parallel but $\overline{EF}$ and $\overline{GH}$ are not.

7. Draw a line using your straightedge. Now use your right angle template and straightedge to construct a line parallel to the first line you drew.
Lesson 5 Problem Set

1. Make a list of the measures of the benchmark angles you drew starting with Set A. Round each angle measure to the nearest 5 degrees. Both sets are started for you.

   a. Set A: 45 degrees, 90 degrees,

   b. Set B: 30 degrees, 60 degrees

2. Circle any angle measures that appear on both lists. What do you notice about them?

3. List the angle measures from Problem 1 that are acute. Trace each angle with your finger as you say its measurement.

4. List the angle measures from Problem 1 that are obtuse. Trace each angle with your finger as you say its measurement.
5. We found out today that 1 degree is $\frac{1}{360}$ of a whole turn. It is 1 out of 360 degrees. That means a 2-degree angle is $\frac{2}{360}$ of a whole turn. What fraction of a whole turn is each of the benchmark angles you listed in Problem 1?

6. How many 45-degree angles does it take to make a full turn?

7. How many 30-degree angles does it take to make a full turn?

8. If you didn’t have a protractor, how could you reconstruct the quarter of it from 0 degrees to 90 degrees?
1. How many right angles make a full turn?

2. What is the measurement of a right angle?

3. What fraction of a full turn is 1 degree?

4. Name at least four benchmark angle measurements.
1. Identify the measures of the following angles.

   a.  
   b.  
   c.  
   d.  

   Use a circular protractor to understand a 1-degree angle as 1/360 of a turn. Explore benchmark angles using the protractor.
2. If you didn’t have a protractor, how could you construct one? Use words, pictures, and numbers to explain in the space below.
Lesson 6:
Use varied protractors to distinguish angle measure from length measurement.

Date: 10/16/13
1. Use a protractor to measure the angles and then record the measurements in degrees.
   a. 
   b. 
   c. 
   d.
Lesson 6: Use varied protractors to distinguish angle measure from length measurement.

Date: 10/16/13
2.  
   a. Use three different-size protractors to measure the angle. Extend the lines as needed using a straightedge.
      
      Protractor #1: ________°
      Protractor #2: ________°
      Protractor #3: ________°

   b. What do you notice about the measurement of the above angle using each of the protractors?

3. Use a protractor to measure each angle. Extend the length of the lines if you need to. When you extend the lines, does the angle measure stay the same? Explain how you know.

   a.

   b.
1. Use any protractor to measure the angles and then record the measurements in degrees.

   a. 
   b. 
   c. 
   d.
Name ____________________________ Date ________________

1. Use a protractor to measure the angles and then record the measurements in degrees.
   a. 
   b. 
   c. 
   d. 

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Lesson 6: Use varied protractors to distinguish angle measure from length measurement.

Date: 10/16/13
2. Using the green and red circle cutouts from today’s lesson, explain to someone at home how the cutouts can be used to show that the angle measures are the same even though the circles are different sizes. Write words to explain what you told him/her.

3. Use a protractor to measure each angle. Extend the length of the lines if you need to. When you extend the lines, does the angle measure stay the same? Explain how you know.

   a.

   b.
Lesson 7: Measure and draw angles. Sketch given angle measures and verify with a protractor.

Date: 10/16/13
1. Construct angles that measure the given number of degrees. For (a)–(d), use the ray shown as one of the rays of the angle with its endpoint as the vertex of the angle. Draw an arc to indicate the angle that was measured.

   a. 30°
   b. 65°
   c. 115°
   d. 135°
Lesson 7: Measure and draw angles. Sketch given angle measures and verify with a protractor.

Date: 10/16/13

4.43

Lesson 7 Problem Set

NYS COMMON CORE MATHEMATICS CURRICULUM

- e. 5°
- f. 175°
- g. 27°
- h. 117°
- i. 48°
- j. 132°
Lesson 7 Exit Ticket

Name ________________________________ Date ________________

1. Construct angles that measure the given number of degrees. Draw an arc to indicate the angle that was measured.

   a. 75°   

   b. 105°   

   c. 81°   

   d. 99°   

   Draw an arc to indicate the angle that was measured.

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Lesson 7 Homework

Name ____________________________ Date ________________

1. Construct angles that measure the given number of degrees. For (a)–(d), use the ray shown as one of the rays of the angle with its endpoint as the vertex of the angle. Draw an arc to indicate the angle that was measured.

   a. 25°  
   b. 85°  
   c. 140°  
   d. 83°
Lesson 7: Measure and draw angles. Sketch given angle measures and verify with a protractor.

Date: 10/16/13

Lesson 7 Homework

NYS COMMON CORE MATHEMATICS CURRICULUM

4 • 4

e. 108°

f. 72°

g. 25°

h. 155°

i. 45°

j. 135°
Name _________________________________ Date ________________

1. Joe, Steve, and Bob stood in the middle of the yard and faced the house. Joe turned 90° to the right. Steve turned 180° to the right. Bob turned 270° to the right. To what was each boy now facing?
   
   Joe ____________________
   Steve __________________
   Bob ____________________

2. Monique looked at the clock at the beginning of class and at the end of class. How many degrees did the minute hand turn from the beginning of class until the end?

   Beginning
   End

3. The skater jumped into the air and did a 360. What does that mean?

4. Mr. Martin drove away from his house without his wallet. He did a 180. Where was he heading now?
5. John turned the knob of the shower 270° to the right. Draw a picture showing the position of the knob after he turned it.

Before

After

6. Barb used her scissors to cut out a coupon from the newspaper. How many quarter-turns does she need to turn the paper in order to stay on the lines?

SAVE $1.00

7. How many quarter-turns does the picture need to be rotated in order for it to be upright?

8. Meredith faced north. She turned 90° to the right and then 180° more. In what direction was she now facing?
1. Marty was doing a handstand. Describe how many degrees his body will turn to be upright again.

2. Jeffrey started riding his bike at the blue star. He travelled north for 3 blocks, then turned 90° to the right and rode for 2 blocks. What direction was he headed? Sketch his route on the grid below. Each square unit represents 1 block.
Lesson 8 Homework

Name ___________________________________________ Date __________________________

1. Jill, Shyan, and Barb stood in the middle of the yard and faced the barn. Jill turned 90° to the right. Shyan turned 180° to the left. Barb turned 270° to the left. To what was each girl now facing?

   Jill ____________________
   Shyan __________________
   Barb ____________________

   ![Diagram showing the yard with the house, barn, fence, tree, and yard]

2. Allison looked at the clock at the beginning of class and at the end of class. How many degrees did the minute hand turn from the beginning of class until the end?

   ![Two clocks showing the beginning and end of class]

3. The snowboarder went off a jump and did a 180. In which direction was the snowboarder facing when he landed? How do you know?

4. As she drove down the icy road, Mrs. Campbell slammed on her brakes. Her car did a 360. What does this mean?
Lesson 8 Homework

5. Jonah turned the knob of the stove two quarter-turns. Draw a picture showing the position of the knob after he turned it.

Before          After

6. Betsy used her scissors to cut out a coupon from the newspaper. How many total quarter-turns will she need to rotate the paper in order to cut out the entire coupon?

SAVE
$1.00

7. How many quarter-turns does the picture need to be rotated in order for it to be upright?

8. David faced north. He turned 180° to the right and then 270° degrees to the left. In what direction was he now facing?
Lesson 8: Identify and measure angles as turns and recognize them in various contexts.

Date: 10/16/13
Lesson 9 Problem Set

NYS COMMON CORE MATHEMATICS CURRICULUM

Lesson 9
Decompose angles using pattern blocks.

Name ____________________________ Date __________________

1. Complete the table.

<table>
<thead>
<tr>
<th>Pattern Block</th>
<th>Total number that fit around 1 vertex</th>
<th>One interior angle measures…</th>
<th>Sum of the angles around a vertex</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td>360° ÷ _____ = _____</td>
<td>_____ + _____ + _____ + _____ = 360°</td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
<td>_____ + _____ + _____ = 360°</td>
</tr>
<tr>
<td>d. (acute angle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. (obtuse angle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. (acute angle)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Find the measurements of the angles indicated by the arcs.

<table>
<thead>
<tr>
<th>Pattern Blocks</th>
<th>Angle Measure</th>
<th>Addition Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image2.png" alt="Diagram" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image3.png" alt="Diagram" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Use two or more pattern blocks to figure out the measurements of the angles indicated by the arcs.

<table>
<thead>
<tr>
<th>Pattern Blocks</th>
<th>Angle Measure</th>
<th>Addition Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Diagram" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image5.png" alt="Diagram" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image6.png" alt="Diagram" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson 9 Exit Ticket

Name ___________________________________________  Date _______________________

1. Describe and sketch two combinations of the blue rhombus pattern block that create a straight angle.

2. Describe and sketch two combinations of the green triangle and yellow hexagon pattern block that create a straight angle.
Name ______________________________          Date ________________

Sketch two different ways to compose the given angles using two or more pattern blocks.

Write an addition sentence to show how you composed the given angle.

1. \( \angle ABC \) is a straight line.

\[ \begin{align*}
\angle ABC &= \underline{\text{______________________________}} & \angle ABC &= \underline{\text{______________________________}}
\end{align*} \]

2. \( \angle DEF = 90^\circ \)

\[ \begin{align*}
\angle DEF &= \underline{\text{______________________________}} & \angle DEF &= \underline{\text{______________________________}}
\end{align*} \]
3. \( \angle GHI = 120^\circ \)

\[
\begin{align*}
120^\circ & = \text{ } \\
120^\circ & = \text{ }
\end{align*}
\]

4. \( x^\circ = 270^\circ \)

\[
\begin{align*}
270^\circ & = \text{ } \\
270^\circ & = \text{ }
\end{align*}
\]

5. Micah built the following shape with his pattern blocks. Write an addition sentence for each angle indicated by an arc and solve. The first one is done for you as an example.

a. \( y^\circ = 120^\circ + 90^\circ \)
   
   \[ y^\circ = 210^\circ \]

b. \( z^\circ = \text{ } \)
   
   \[ z^\circ = \text{ } \]

c. \( x^\circ = \text{ } \)
   
   \[ x^\circ = \text{ } \]
Lesson 10: Use the addition of adjacent angle measures to solve problems using a symbol for the unknown angle measure.

Date: 10/16/13

Write an equation and solve for the measure of $\angle x$. Verify the measurement using a protractor.

1. $\angle CBA$ is a right angle.

2. $\angle GFE$ is a right angle.

3. $\angle IJK$ is a straight angle.

4. $\angle MNO$ is a straight angle.
Lesson 10 Problem Set

Directions: Solve for the unknown angle measurements. Write an equation to solve.

5. Solve for the measurement of $\angle TRU$.
$\angle QRS$ is a straight angle.

6. Solve for the measurement of $\angle ZYV$.
$\angle XYZ$ is a straight angle.

7. In the following figure $ACDE$ is a rectangle. Without using a protractor, determine the measurement of $\angle DEB$. Write an equation that could be used to solve the problem.

8. Complete the following directions in the space to the right.

   a. Draw 2 points $M$ and $N$. Using a straightedge, draw $\overline{MN}$.
   b. Plot a point $O$ somewhere between points $M$ and $N$.
   c. Plot a point $P$, which is not on $\overline{MN}$.
   d. Draw $\overline{OP}$.
   e. Find the measure of $\angle MOP$ and $\angle NOP$.
   f. Write an equation to show that the angles add to the measure of a straight-angle.
Write an equation and solve for $x$. $\angle TUV$ is a straight angle.

Equation: ________________________________

$x^\circ = \underline{\text{_________}}$
Write an equation and solve for the measurement of \( \angle x \). Verify the measurement using a protractor.

1. \( \angle DCB \) is a right angle.

\[
\angle DCB = 90^\circ
\]

2. \( \angle HGF \) is a right angle.

\[
\angle HGF = 90^\circ
\]

3. \( \angle JKL \) is a straight angle.

\[
\angle JKL = 180^\circ
\]

4. \( \angle PQR \) is a straight angle.

\[
\angle PQR = 180^\circ
\]
Directions: Write an equation and solve for the unknown angle measurements.

5. Solve for the measurement of $\angle USW$. $\angle RST$ is a straight angle.

6. Solve for the measurement of $\angle OML$. $\angle LMN$ is a straight angle.

7. In the following figure $DEFH$ is a rectangle. Without using a protractor, determine the measurement of $\angle GEF$. Write an equation that could be used to solve the problem.

8. Complete the following directions in the space to the right.
   a. Draw 2 points $Q$ and $R$. Using a straightedge, draw $\overline{QR}$.
   b. Plot a point $S$ somewhere between points $Q$ and $R$.
   c. Plot a point $T$, which is not on $\overline{QR}$.
   d. Draw $\overline{TS}$.
   e. Find the measure of $\angle QST$ and $\angle RST$.
   f. Write an equation to show that the angles add to the measure of a straight angle.
Write an equation and solve for the unknown angle measurements numerically.

1. \[ \_\_\_\_\_\_ + 20^\circ = 360^\circ \]
   \[ d^\circ = \_\_\_\_\_\_^\circ \]

2. \[ \_\_\_\_\_\_ + \_\_\_\_\_\_ = 360^\circ \]
   \[ c^\circ = \_\_\_\_\_\_^\circ \]

3. \[ \_\_\_\_\_\_ + 74^\circ + \_\_\_\_\_\_ = \_\_\_\_\_\_^\circ \]
   \[ e^\circ = \_\_\_\_\_\_^\circ \]

4. \[ \_\_\_\_\_\_ + \_\_\_\_\_\_ + 160^\circ = \_\_\_\_\_\_\_\_\_ \]
   \[ f^\circ = \_\_\_\_\_\_ \]
Write an equation and solve for the unknown angles numerically.

5. $O$ is the intersection of $\overline{AB}$ and $\overline{CD}$.
   $\angle DOA$ is $160^\circ$ and $\angle AOC$ is $20^\circ$.
   \[ x^\circ = \quad y^\circ = \]
   
   \[ \begin{align*}
   A & \quad 160^\circ \\
   C & \quad 20^\circ \\
   O & \quad x^\circ \\
   y^\circ & \quad D \\
   B
   \end{align*} \]

6. $O$ is the intersection of $\overline{RS}$ and $\overline{TV}$.
   $\angle TOS$ is $125^\circ$.
   \[ g^\circ = \quad h^\circ = \quad i^\circ = \]
   
   \[ \begin{align*}
   R & \quad h^\circ \\
   V & \quad g^\circ \\
   O & \quad i^\circ \\
   T & \quad 125^\circ \\
   S
   \end{align*} \]

7. $O$ is the intersection of $\overline{WX}$, $\overline{YZ}$, and $\overline{UO}$.
   $\angle XOZ$ is $36^\circ$.
   \[ k^\circ = \quad m^\circ = \quad n^\circ = \]
   
   \[ \begin{align*}
   U & \quad k^\circ \\
   Z & \quad m^\circ \\
   O & \quad 36^\circ \\
   X \\
   W & \quad n^\circ \\
   Y
   \end{align*} \]
Write equations using variables to represent the unknown angle measurements. Find the unknown angle measurements numerically.

1. \( \angle x^\circ = \)

2. \( \angle y^\circ = \)

3. \( \angle z^\circ = \)
Lesson 11: Use the addition of adjacent angle measures to solve problems using a symbol for the unknown angle measure.

Date: 10/16/13

Name ________________________________ Date ______________________

Write an equation and solve for the unknown angle measurements numerically.

1. \[a^\circ + 320^\circ = 360^\circ\]
   \[a^\circ = \_\_\_\_\_\_^\circ\]

2. \[____^\circ + _____^\circ = 360^\circ\]
   \[b^\circ = \_\_\_\_\_\_^\circ\]

3. \[\_\_\_\_\_\_^\circ + \_\_\_\_\_\_^\circ + \_\_\_\_\_\_^\circ = \_\_\_\_\_\_^\circ\]
   \[c^\circ = \_\_\_\_\_\_^\circ\]

4. \[\_\_\_\_\_\_^\circ + \_\_\_\_\_\_^\circ + \_\_\_\_\_\_^\circ = \_\_\_\_\_\_^\circ\]
   \[d^\circ = \_\_\_\_\_\_^\circ\]
Write an equation and solve for the unknown angles numerically.

5. $O$ is the intersection of $AB$ and $CD$. 
\[ \angle COB = 145^\circ \text{ and } \angle AOC = 35^\circ \]
\[ e^\circ = \underline{\hspace{1cm}} \quad f^\circ = \underline{\hspace{1cm}} \]

6. $O$ is the intersection of $QR$ and $ST$.
\[ \angle QOS = 55^\circ \]
\[ g^\circ = \underline{\hspace{1cm}} \quad h^\circ = \underline{\hspace{1cm}} \quad i^\circ = \underline{\hspace{1cm}} \]

7. $O$ is the intersection of $UV$, $WX$, and $YO$.
\[ \angle VOX = 46^\circ \]
\[ j^\circ = \underline{\hspace{1cm}} \quad k^\circ = \underline{\hspace{1cm}} \quad \text{and } m^\circ = \underline{\hspace{1cm}} \]
Lesson 12 Problem Set

1. Circle the figures that have a correct line of symmetry drawn.
   a. 
   b. 
   c. 
   d. 

2. Find and draw all lines of symmetry for the following figures. Write the number of lines of symmetry that you found in the blank underneath the shape.
   a. 
   b. 
   c. 
   d. 
   e. 
   f. 
   g. 
   h. 
   i. 

Name __________________________________________ Date __________ + __________

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3. Half of each figure below has been drawn. Use the line of symmetry, represented by the dashed line, to complete each figure.

![Figures a, b, c, d with dashed lines indicating symmetry](image)

4. The figure below is a circle. How many lines of symmetry does the figure have? Explain.

![Circle with dashed line indicating symmetry](image)
Lesson 12 Exit Ticket

1. Is the line drawn a line of symmetry? Circle your choice.

   ![Line drawings]

   Yes   No   Yes   No   Yes   No

2. Draw as many lines of symmetry as you can find in the figure below.

   ![Figure with lines of symmetry]
Lesson 12 Homework

1. Circle the figures that have a correct line of symmetry drawn.

   a.  
   b.  
   c.  
   d.  

2. Find and draw all lines of symmetry for the following figures. Write the number of lines of symmetry that you found in the blank underneath the shape.

   a.   
   b.   
   c.   
   d.   
   e.   
   f.   
   g.   
   h.   
   i.   

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3. Half of each figure below has been drawn. Use the line of symmetry, represented by the dashed line, to complete each figure.

4. Is there another shape that has the same number of lines of symmetry as a circle? Explain.
Lesson 12: Recognize lines of symmetry for given two-dimensional figures; identify line-symmetric figures and draw lines of symmetry.

Date: 10/16/13

Figure 1
Lesson 12: Recognize lines of symmetry for given two-dimensional figures; identify line-symmetric figures and draw lines of symmetry.

Date: 10/16/13
<table>
<thead>
<tr>
<th>Sketch of Triangle</th>
<th>Attributes (Include side lengths, angle measures.)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson 13: Analyze and classify triangles based on side length, angle measure, or both.

Date: 10/16/13

4.D.26

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Lesson 13 Problem Set

NYS COMMON CORE MATHEMATICS CURRICULUM

Name ____________________________ Date ______________

1. Classify each triangle by its side lengths and angle measurements. Circle the correct names.

<table>
<thead>
<tr>
<th>a.</th>
<th>Classify Using Side Lengths</th>
<th>Classify Using Angle Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equilateral Isosceles Scalene</td>
<td>Acute Right Obtuse</td>
</tr>
</tbody>
</table>

| b. |                                  |                                   |
|    | Equilateral Isosceles Scalene    | Acute Right Obtuse                |

| c. |                                  |                                   |
|    | Equilateral Isosceles Scalene    | Acute Right Obtuse                |

| d. |                                  |                                   |
|    | Equilateral Isosceles Scalene    | Acute Right Obtuse                |

2. \( \Delta ABC \) has one line of symmetry as shown. What does this tell you about the measures of \( \angle A \) and \( \angle C \)?

3. \( \Delta DEF \) has three lines of symmetry as shown.
   a. How can the lines of symmetry help you figure out which angles are equal?

   b. \( \Delta DEF \) has a perimeter of 30 cm. Label the side lengths.
Lesson 13 Problem Set

4. Use a ruler to connect points to form 2 other triangles. Use each point only once. None of the triangles may overlap. One or two points will be unused. Name and classify the 3 triangles below.

<table>
<thead>
<tr>
<th>Name the Triangles Using Vertices</th>
<th>Classify by Side Length</th>
<th>Classify by Angle Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔFJK</td>
<td>scalene</td>
<td>obtuse</td>
</tr>
</tbody>
</table>

5.

a. List three points from the grid above that, when connected by segments, do not result in a triangle.

b. Why didn’t the three points you listed result in a triangle when connected by segments?

c. Can a triangle have 2 right angles? Explain.
Lesson 13 Exit Ticket

Name _____________________________ Date ______________

Use appropriate tools to solve the following problems.

1. The triangles below have been sorted by shared attributes (side length or angle type). Use the words acute, right, obtuse, scalene, isosceles, or equilateral to label the headings to identify the way the triangles have been sorted.

2. Draw a line to identify each triangle according to angle type and side length.

   Acute
   Obtuse
   Right
   Isosceles
   Equilateral
   Scalene

3. Identify and draw any lines of symmetry in the triangles in Problem 2.
1. Classify each triangle by its side lengths and angle measurements. Circle the correct names. Use a ruler and a right angle template to prove your classifications.

<table>
<thead>
<tr>
<th></th>
<th>Classify Using Side Lengths</th>
<th>Classify Using Angle Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Equilateral Isosceles Scalene</td>
<td>Acute Right Obtuse</td>
</tr>
<tr>
<td>b.</td>
<td>Equilateral Isosceles Scalene</td>
<td>Acute Right Obtuse</td>
</tr>
<tr>
<td>c.</td>
<td>Equilateral Isosceles Scalene</td>
<td>Acute Right Obtuse</td>
</tr>
<tr>
<td>d.</td>
<td>Equilateral Isosceles Scalene</td>
<td>Acute Right Obtuse</td>
</tr>
</tbody>
</table>

2. a. $\triangle ABC$ has one line of symmetry as shown. Is the measure of $\angle A$ greater than, less than, or equal to $\angle C$?

![Triangle ABC with line of symmetry]

b. $\triangle DEF$ is scalene. What do you observe about its angles? Explain.

![Triangle DEF]
3. Use a ruler to connect points to form two other triangles. Use each point only once. None of the triangles may overlap. Two points will be unused. Name and classify the three triangles below.

![Diagram of points A, B, C, D, E, F, G, H, I, J, K]

<table>
<thead>
<tr>
<th>Name the Triangles Using Vertices</th>
<th>Classify by Side Length</th>
<th>Classify by Angle Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔIJK</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. If the perimeter of an equilateral triangle is 15 cm, what is the length of each side?

5. Can a triangle have more than one obtuse angle? Explain.

6. Can a triangle have one obtuse angle and one right angle? Explain.
Lesson 13: Analyze and classify triangles based on side length, angle measure, or both.

Date: 10/16/13
Lesson 13:
Analyze and classify triangles based on side length, angle measure, or both.

Date: 10/16/13
Lesson 13: Analyze and classify triangles based on side length, angle measure, or both.

Date: 10/16/13
Lesson 14 Problem Set

Name ___________________________________________ Date ______________

1. Draw triangles that fit the following classifications. Use a ruler and protractor. Label the side lengths and angles.
   a. right and isosceles
   b. obtuse and scalene
   c. acute and scalene
   d. acute and isosceles

2. Draw all possible lines of symmetry in the triangles above. Explain why some of the triangles do not have lines of symmetry.
Are the following statements true or false? Explain using pictures or words.

3. If $\triangle ABC$ is an equilateral triangle, $BC$ must be 2 cm. True or False?

4. A triangle cannot have one obtuse angle and one right angle. True or False?

5. $\triangle EFG$ can be described as a right triangle and an isosceles triangle. True or False?

6. An equilateral triangle is isosceles. True or False?

Extension: In $\triangle HIJ$, $a = b$. True or False?
1. Draw an obtuse isosceles triangle, and then draw any lines of symmetry if they exist.

2. Draw a right scalene triangle, and then draw any lines of symmetry if they exist.

3. Every triangle has at least ____ acute angles.
1. Draw triangles that fit the following classifications. Use a ruler and protractor. Label the side lengths and angles.
   a. right and isosceles
   b. right and scalene
   c. obtuse and isosceles
   d. acute and scalene

2. Draw all possible lines of symmetry in the triangles above. Explain why some of the triangles do not have lines of symmetry.
Are the following statements true or false? Explain.

3. ΔABC is an isosceles triangle. \( AB \) must be 2 cm. True or False?

4. A triangle cannot have both an acute angle and a right angle. True or False?

5. ΔXYZ can be described as both equilateral and acute. True or False?

6. A right triangle is always scalene. True or False?

Extension: In ΔABC, \( x = y \). True or False?
Lesson 15: Classify quadrilaterals based on parallel and perpendicular lines and the presence or absence of angles of a specified size.

Date: 10/16/13

Name ___________________________ Date __________________

Construct the figures with given attributes. Name the shape you created. Be as specific as possible. Use extra blank paper as needed.

1. Construct quadrilaterals with at least one set of parallel sides.

2. Construct a quadrilateral with two sets of parallel sides.

3. Construct a parallelogram with four right angles.

4. Construct a rectangle with all sides the same length.
5. Use the word bank to name each shape, being as specific as possible.

<table>
<thead>
<tr>
<th>parallelogram</th>
<th>trapezoid</th>
<th>rectangle</th>
<th>square</th>
</tr>
</thead>
</table>

a. [Diagram of a parallelogram]

b. [Diagram of a trapezoid]

c. [Diagram of a rectangle]

d. [Diagram of a square]

6. Explain the attribute that makes a square a special rectangle.

7. Explain the attribute that makes a rectangle a special parallelogram.

8. Explain the attribute that makes a parallelogram a special trapezoid.
Lesson 15 Exit Ticket

1. In the space below, draw a parallelogram.

2. Explain why a rectangle is a special parallelogram.

Name ___________________________ Date _________________
Lesson 15: Classify quadrilaterals based on parallel and perpendicular lines and the presence or absence of angles of a specified size.

Date: 10/16/13

1. Use the word bank to name each shape, being as specific as possible.

   parallelogram  trapezoid  rectangle  square

   a.

   ___________________

   b.

   ___________________

   c.

   ___________________

   d.

   ___________________

2. Explain the attribute that makes a square a special rectangle.

3. Explain the attribute that makes a rectangle a special parallelogram.

4. Explain the attribute that makes a parallelogram a special trapezoid.
5. Construct the following figures based on the given attributes.
   Give a name to the figure you construct. Be as specific as possible.

   a. A quadrilateral with four sides the same length and four right angles.
   b. A quadrilateral with two sets of parallel sides.

   c. A trapezoid with only one pair of parallel sides.
   d. A parallelogram with four right angles.
1. On the grid paper, draw at least one quadrilateral to fit the description. Use the given segment as one segment of the quadrilateral. Name the figure you drew using one of the terms below.

<table>
<thead>
<tr>
<th>parallelogram</th>
<th>trapezoid</th>
<th>rectangle</th>
</tr>
</thead>
<tbody>
<tr>
<td>square</td>
<td></td>
<td>rhombus</td>
</tr>
</tbody>
</table>

a. A quadrilateral that has at least one pair of parallel sides.

b. A quadrilateral that has four right angles.

c. A quadrilateral that has two pairs of parallel sides.

d. A quadrilateral that has at least one pair of perpendicular sides and at least one pair of parallel sides.
2. On the grid paper, draw at least one quadrilateral to fit the description. Use the given segment as one segment of the quadrilateral. Name the figure you drew using one of the terms below.

<table>
<thead>
<tr>
<th>parallelogram</th>
<th>trapezoid</th>
<th>rectangle</th>
</tr>
</thead>
<tbody>
<tr>
<td>square</td>
<td></td>
<td>rhombus</td>
</tr>
</tbody>
</table>

a. A quadrilateral that has two sets of parallel sides.

b. A quadrilateral that has four right angles.

3. Explain the attributes that makes a rhombus different from a rectangle.

4. Explain the attribute that makes a square different from a rhombus.
Lesson 16 Exit Ticket

1. Construct a parallelogram that does not have any right angles on a rectangular grid.

2. Construct a rectangle on a triangular grid.
Lesson 16: Reason about attributes to construct quadrilaterals on square or triangular grid paper.

**Name** ____________________________  **Date** ______________

Use the grid to construct the following. Name the figure you drew using one of the terms in the word box.

1. **Construct a quadrilateral with only one set of perpendicular sides.**
   What shape did you create?

   ![Grid for construction]

2. **Construct a quadrilateral with one set of parallel sides and two right angles.**
   What shape did you create?

   ![Grid for construction]

3. **Construct a quadrilateral with two sets of parallel sides.**
   What shape did you create?

   ![Grid for construction]
4. Construct a quadrilateral with all sides of equal length.
   What shape did you create?

5. Construct a rectangle with all sides of equal length.
   What shape did you create?
1. Follow the directions below to draw a figure in the box below. Use a straightedge.

   a. Draw 2 points. Label one point as \( A \) and the other point as \( B \).
   
   b. Draw \( \overline{AB} \).
   
   c. Draw point \( D \) that is not on \( \overline{AB} \).
   
   d. Draw \( \overline{BD} \).
   
   e. Draw \( \overline{AD} \).
   
   f. Name an acute angle.

   ________________________________

   g. Name an obtuse angle. You may have to draw and label another point.

   ________________________________

2. Use your protractor to measure the angle indicated by the arc. Classify each angle as right, acute, or obtuse. Explain how you know each angle’s classification.

   a. 

   \[ \angle \]
3. In the box below, follow the instructions to draw a figure.

- Using a straightedge, draw a line. Label it \( \overline{KL} \).
- Label a point \( A \) on \( \overline{KL} \).
- Using your protractor and ruler, draw a line perpendicular to \( \overline{KL} \) through point \( A \).
- Label the perpendicular line \( \overline{PQ} \).
- Label a point \( B \) on \( \overline{PQ} \), other than point \( A \).
- Using your protractor and straightedge, draw a line, \( \overline{ST} \), perpendicular to \( \overline{PQ} \) through point \( B \).

Which lines are parallel in your drawing? Explain why.
4. Use the clock to answer Parts (a), (b), (c), and (d) below.
   
a. Use a straightedge to draw the hands as they would appear at 3:00.
   
b. What kind of angle is formed by the clock hands at 3:00?
   
c. What time will it be when the minute hand has turned 180°?
   
d. How many 90° turns will the minute hand make between 3:00 and 4:00?

5. Use the compass rose to answer Parts (a) and (b) below.

   a. Maddy faced East. She turned to her right until she was facing North. How many degrees did she turn?

   b. Quanisha was facing North. She turned toward her right until she faced East. Alisha was facing South. She turned toward her right until she faced West. What fraction of a full turn did each girl complete? Through how many degrees did each girl turn?
6. The town of Seaford has a large rectangular park with a biking path around its perimeter and two straight-line biking paths that cut across it as shown in the diagram below.

![Diagram of a rectangular park with biking paths]

- Find the measure of the following angles using a protractor.
  - \( \angle FGD: \)
  - \( \angle DGK: \)
  - \( \angle KGN: \)

b. In the space below, use a protractor to draw an angle with the same measure as \( \angle DGK. \)
c. Below is a sign that bikers may encounter while riding in the park. Using the points in the figure below, identify a line segment, a right angle, an obtuse angle, a set of parallel lines, and a set of perpendicular lines in the table below.

<table>
<thead>
<tr>
<th>Line Segment</th>
<th>Right Angle</th>
<th>Obtuse Angle</th>
<th>Parallel Lines</th>
<th>Perpendicular Lines</th>
</tr>
</thead>
</table>

STOP

A B C D E F G H J K L
1. Find and draw all lines of symmetry in the following figures. If there are none, write “none.”

a. 

b. 

c. 

d. 

e. 

f. 

g. For each triangle above, state whether it is acute, obtuse, or right and whether it is isosceles, equilateral, or scalene.

Triangle a: _________________________    _________________________

Triangle c: _________________________   _________________________

Triangle e: _________________________   _________________________

h. How many lines of symmetry does a circle have? What point do all lines of symmetry for a given circle have in common?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
2. In the following figure QRST is a rectangle. Without using a protractor, determine the measure of \( \angle RQS \).

Write an equation that could be used to solve the problem.

![Diagram of rectangle QRST with angle 24°](image)

3. For each part below, explain how the measure of the unknown angle can be found without using a protractor.

a. Find the measure of \( \angle D \).

![Diagram of angle 83°](image)

b. In this figure, Q, R, and S lie on a line. Find the measure of \( \angle QRT \).

![Diagram of angle 58°](image)
c. Q, R, and S lie on a line, as do P, R, and T. Find the measure of \( \angle PRS \).

\[
\begin{align*}
\text{Q} & \quad 48^\circ \\
\text{R} & \quad 74^\circ \\
\text{Q} & \quad \text{S} \\
\text{P} & \quad \text{T}
\end{align*}
\]

4. Mike drew some two-dimensional figures.

Sketch the figures and answer each part about the figures that Mike drew.

a. He drew a four-sided figure with four right angles. It is 4 cm long and 3 cm wide.

What type of quadrilateral did Mike draw?

How many lines of symmetry does it have?

b. He drew a quadrilateral with four equal sides and no right angles.

What type of quadrilateral did Mike draw?

How many lines of symmetry does it have?

c. He drew a triangle with one right angle and sides that measure 6 cm, 8 cm, and 10 cm.

Classify the type of triangle Mike drew based on side length and angle measure.

How many lines of symmetry does it have?
d. Using the dimensions given, draw the same shape Mike drew in Part (c).

e. Mike drew this figure. Without using a protractor, find the sum of \( \angle FJK, \angle KJH, \text{ and } \angle HJG \).

f. Points F, J, and H lie on a line. What is the measure of \( \angle KJH \) if \( \angle FJK \) measures 45 degrees? Write an equation that could be used to determine the measure of \( \angle KJH \).
g. Mike used a protractor to measure $\angle ABC$ as shown below and said the result was exactly 130°. Do you agree or disagree? Explain your thinking.

h. Below is half of a line-symmetric figure and its line of symmetry. Use a ruler to complete Mike’s drawing.
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