Lines, Rays, and Angles

<table>
<thead>
<tr>
<th>Name</th>
<th>What it looks like</th>
<th>Think</th>
</tr>
</thead>
<tbody>
<tr>
<td>point $D$</td>
<td>$D$</td>
<td>A point names a location in space.</td>
</tr>
<tr>
<td>line $\overline{AB}$; $\overline{BA}$</td>
<td>$A \rightarrow B$</td>
<td>A line extends without end in opposite directions.</td>
</tr>
<tr>
<td>line segment $\overline{AB}$; $\overline{BA}$</td>
<td>$A \rightarrow B$</td>
<td>“Segment” means part. A line segment is part of a line. It is named by its two endpoints.</td>
</tr>
<tr>
<td>ray $\overline{MN}$; $\overline{NM}$</td>
<td>$M \rightarrow N$</td>
<td>A ray has one endpoint and extends without end in one direction. A ray is named using two points. The endpoint is always named first.</td>
</tr>
<tr>
<td>angle $\angle XYZ$; $\angle ZYX$; $\angle YZX$; $\angle YXZ$</td>
<td>$X \rightarrow Y \rightarrow Z$</td>
<td>Two rays or line segments that share an endpoint form an angle. The shared point is the vertex of the angle.</td>
</tr>
</tbody>
</table>

A right angle forms a square corner.

An acute angle opens less than a right angle.

An obtuse angle opens more than a right angle and less than a straight angle.

A straight angle forms a line.

Draw and label an example of the figure.

1. $\overline{PQ}$

2. $\overline{KJ}$

3. obtuse $\angle FGH$
**Classify Triangles by Angles**

**A triangle** is a polygon with **3** sides and **3** angles. Each pair of sides joins at a vertex.

You can name a triangle by its vertices.

\[
\triangle PQR \quad \triangle QRP \quad \triangle RPQ
\]

\[
\triangle PRQ \quad \triangle QPR \quad \triangle RQP
\]

There are **3** types of triangles. All triangles have at least **2** acute angles.

**Obtuse triangle**
- one obtuse angle

**Right triangle**
- one right angle

**Acute triangle**
- three acute angles

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1. Name the triangle. Tell whether each angle is **acute**, **right**, or **obtuse**. A name for the triangle is ____________.

   \[\angle X \text{ is } \_\_\_\_\_\_\]  
   \[\angle Y \text{ is } \_\_\_\_\_\_\]  
   \[\angle Z \text{ is } \_\_\_\_\_\_\]

Classify each triangle. Write **acute**, **right**, or **obtuse**.

2. ____________

3. ____________

4. ____________
Classify Triangles by Sides

One way to classify triangles is to compare the lengths of their sides.

First, decide how many sides of the triangle are the same length. Then classify the triangle based on the number.

- **Equilateral triangle**: 3 sides have the same length
- **Isosceles triangle**: 2 sides have the same length
- **Scalene triangle**: no sides have the same length

Name the triangle. Write *equilateral*, *isosceles*, or *scalene*.

1. 
   ![Equilateral triangle with sides 5 cm, 5 cm, 5 cm]

2. 
   ![Isosceles triangle with sides 9 in., 6 in., 4 in.]

3. 
   ![Scalene triangle with sides 12 cm, 9 cm, 12 cm]

4. 
   ![Scalene triangle with sides 7 cm, 8 cm, 3 cm]
Parallel Lines and Perpendicular Lines

**Parallel lines** are lines in a plane that are always the same distance apart. Parallel lines or line segments never meet.

In the figure, lines \( AB \) and \( CD \), even if extended, will never meet. The lines are parallel. Write \( AB \parallel CD \).

Lines \( AD \) and \( BC \) are also parallel. So, \( AD \parallel BC \).

**Intersecting lines** cross at exactly one point. Intersecting lines that form right angles are **perpendicular**.

In the figure, lines \( AD \) and \( AB \) are perpendicular because they form right angles at vertex \( A \). Write \( AD \perp AB \).

Lines \( BC \) and \( CD \) are also perpendicular. So, \( BC \perp CD \).

Use the figure for 1–3.

1. Name two sides that appear to be parallel.

2. Name two sides that appear to be perpendicular.

3. Name two sides that appear to be intersecting, but not perpendicular.
Classify Quadrilaterals

A quadrilateral is a polygon with 4 sides and 4 angles. Some quadrilaterals have special names:

- **Quadrilateral**
  - 4 sides
  - 4 angles

- **Parallelogram**
  - 2 pairs of parallel sides

- **Trapezoid**
  - Exactly 1 pair of parallel sides

- **Rectangle**
  - 4 right angles
  - 2 pairs of parallel sides

- **Rhombus**
  - 4 sides of equal length

- **Square**
  - 4 right angles
  - 4 sides of equal length

Classify each figure as many ways as possible. Write quadrilateral, trapezoid, parallelogram, rhombus, rectangle, or square.

1. 

2. 

3. 

   ____________________  ____________________  ____________________
   ____________________  ____________________  ____________________
   ____________________  ____________________  ____________________
   ____________________  ____________________  ____________________
   ____________________  ____________________  ____________________
   ____________________  ____________________  ____________________
Line Symmetry

Tell whether the parts on each side of the line match. Is the line a line of symmetry?

**Step 1** Trace and cut out the shape.
Fold the shape along the dashed line.

**Step 2** Tell whether the parts on each side match.
Compare the parts on each side.

**Step 3** Decide if the line is a line of symmetry.
The parts on each side of the line do not match.
So, the line is not a line of symmetry.

The parts do not match.

Tell if the line appears to be a line of symmetry. Write yes or no.

1. 

2. 

3. 

4. 

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Reteach
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Find and Draw Lines of Symmetry

Tell whether the shape appears to have zero lines, 1 line, or more than 1 line of symmetry. Write zero, 1, or more than 1.

Step 1 Decide if the shape has a line of symmetry.
Trace and cut out the shape. Fold the shape along a vertical line.

Do the two parts match exactly? ___________

Step 2 Decide if the shape has another line of symmetry.
Open the shape and fold it along a horizontal line.

Do the two parts match exactly? ___________

Step 3 Find any other lines of symmetry.
Think: Can I fold the shape in other ways so that the two parts match exactly?

I can fold the paper diagonally two different ways, and the parts match exactly.

So, the shape appears to have _______ line of symmetry.

Tell whether the shape appears to have zero lines, 1 line, or more than 1 line of symmetry. Write zero, 1, or more than 1.

1. 
2. 
3. 

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**Problem Solving • Shape Patterns**

Use the strategy act it out to solve pattern problems.

What might be the next three figures in the pattern below?

![Pattern of shapes](image)

<table>
<thead>
<tr>
<th>What do I need to find?</th>
<th>What information do I need to use?</th>
<th>How will I use the information?</th>
</tr>
</thead>
<tbody>
<tr>
<td>I need to find the next three figures in the pattern.</td>
<td>I need to look for a group of figures that repeat.</td>
<td>I will use pattern blocks to model the pattern and act out the problem.</td>
</tr>
</tbody>
</table>

**Solve the Problem**

Look for a group of figures that repeat and circle that group.

The repeating group is **triangle**, **triangle**, **square**, **triangle**, **square**.

I used **triangles** and **squares** to model and continue the pattern by repeating the figures in the group.

These are the next three figures in the pattern:

![Next three figures](image)

1. Describe the pattern shown at right. Draw what might be the next figure in the pattern.

![Pattern of circles](image)

2. Use the pattern. How many circles will be in the sixth figure?