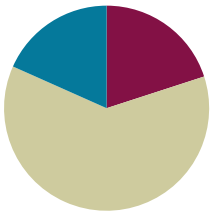
Lesson 1

Objective: Identify and draw points, lines, line segments, rays, and angles. Recognize them in various contexts and familiar figures.

Suggested Lesson Structure

Fluency Practice	(12 minutes)
Concept Development	(37 minutes)
Student Debrief	(11 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

- Multiply Mentally **4.OA.4** (4 minutes)
- Add and Subtract **4.NBT.4** (4 minutes)
- Sides, Angles, and Vertices **3.G.1** (4 minutes)

Multiply Mentally (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Grade 4 Module 3 content.

T: (Write 43 × 2 =____.) Say the multiplication sentence.
S: 43 × 2 = 86.
T: (Write 43 × 2 = 86. Below it, write 43 × 20 =____.) Say the multiplication sentence.
S: 43 × 20 = 860.
T: (Write 43 × 20 = 860. Below it, write 43 × 22 =____.) On your personal white boards, solve 43 × 22.
S: (Write 43 × 22 = 946.)

Continue with the following possible sequence: 32 × 3, 32 × 20, 32 × 23, 21 × 4, 21 × 30, and 21 × 34.

Add and Subtract (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews the yearlong Grade 4 fluency standard for adding and subtracting using the standard algorithm.

T: (Write 654 thousands 289 ones.) On your personal white boards, write this number in standard form.
S: (Write 654,289.)
T: (Write 245 thousands 164 ones.) Add this number to 654,289 using the standard algorithm.
S: (Write 654,289 + 245,164 = 899,453 using the standard algorithm.)

Continue the process for 591,848 + 364,786.

T: (Write 918 thousands 670 ones.) On your board, write this number in standard form.
S: (Write 918,670.)
T: (Write 537 thousands 159 ones.) Subtract this number from 918,670 using the standard algorithm.
S: (Write 918,670 – 537,159 = 381,511 using the standard algorithm.)

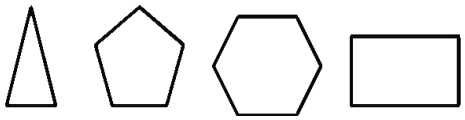
Continue the process for 784,182 – 154,919 and 700,000 – 537,632.

Sides, Angles, and Vertices (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews features of various figures learned in previous grades.

T: (Project triangle.) Say the name of the shape.
S: Triangle.
T: How many sides are in a triangle?
S: Three.
T: How many angles are in a triangle?
S: Three.
T: (Point at one of the corners.) How many corners are in a triangle?
S: Three.



Continue the process for pentagon, hexagon, and rectangle.

Concept Development (37 minutes)

Materials: (T) Straightedge (S) Straightedge, blank paper

Problem 1: Draw, identify, and label points, a line segment, and a line.

T: I'd like to use my pencil to mark a specific location on my paper. How do you think I could do that?
S: You could put an X.
T: (Draw an X.) Okay, so, is this the location that I've marked? (Point to the upper right corner of the X.)
S: No! You marked the middle, where it crosses.

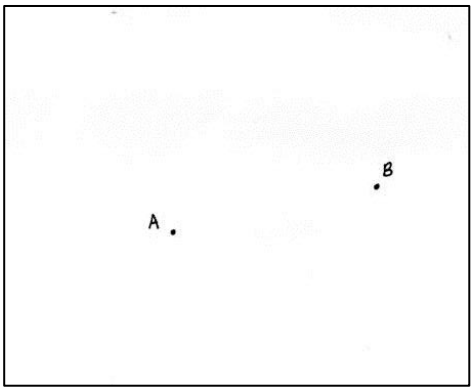
NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Teachers may choose to provide square grid paper or triangle grid paper to students for today's Concept Development. If not providing grid paper, consider providing red markers for students to assist visual discrimination between the grid lines and lines they construct.

T: Oh, I see. Well, if that's all I want to mark, I don't really need all of these extra marks. Let's just mark the point with a small dot.

T: Let's try it. Mark a very specific location on your paper by drawing a small dot with your pencil tip.

T: Place your pencil tip in another location on your paper. Draw another small dot. The dots are a representation of a location.



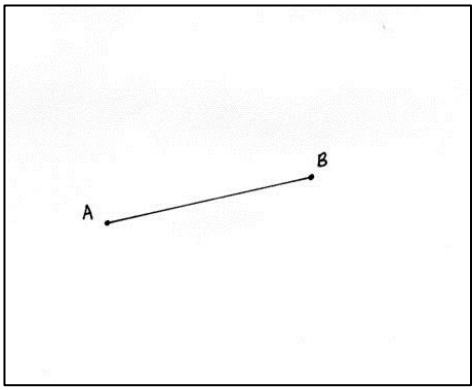
T: Notice that the dots, or **points**, that you and your neighbor drew are probably in different locations.

T: How many points could you draw on this paper?

S: A lot! → Too many to count. → I could draw points until my whole paper is filled with points.

T: When we draw our dots, they have size. However, we are trying to imagine and mark a location so precise that you couldn't even find it with the world's most powerful microscope.

T: To identify your two points, label each with a letter. (Label points A and B.)



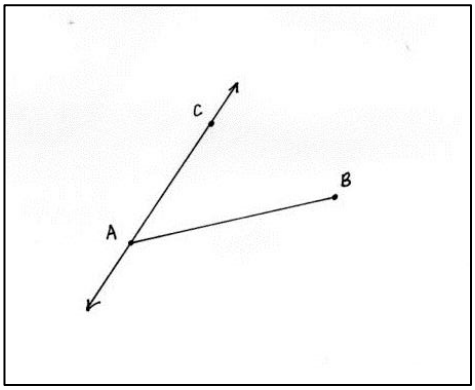
T: Use your straightedge to connect point A to point B. Compare what you drew to what your partner drew. Are your drawings the same? What is different about them?

S: One is longer than the other. → This one is horizontal, and this one looks more diagonal. → They are both straight. → They both begin at point A and end with point B.

T: Let's identify what we drew using the endpoints. We will call this **line segment** AB. (Write $\overline{AB}$.) Line segments have two endpoints.

T: We can also identify this line segment, or segment, as $\overline{BA}$.

T: Draw point C on your paper. Point C should not be located on $\overline{AB}$.



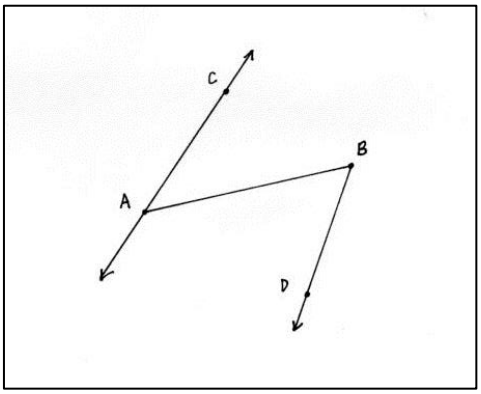
T: Using your straightedge, draw $\overline{AC}$. (Allow students time to draw.)

T: Could you extend $\overline{AC}$ to make it longer if you wanted to? If you had a really big piece of paper, could you continue to extend the segment in both directions? What if your paper extended forever? Could the segment go on forever? Let's extend $\overline{AC}$ just a bit on both ends, and draw an arrow on both ends to indicate that the line could continue going in either direction forever. We call this **line** AC. (Write $\overleftrightarrow{AC}$.)

T: What is different about $\overleftrightarrow{AC}$ and $\overline{AB}$?

S: This one is longer. → This one is shorter. → This one doesn't have points on the ends. Instead, it has arrows. → The line goes past points A and C. I guess the arrows mean that it's really longer than what we can see.

T: Yes, a line extends in both directions without an end. We show that by drawing arrows on the ends of a line. We can also represent it as line CA. (Write $\overleftrightarrow{CA}$.) We couldn't actually show a line that goes on forever. It's like trying to list every number. You just can't do it. What we actually drew is a representation of a line. A real line has no thickness, and it extends forever without end in both directions.

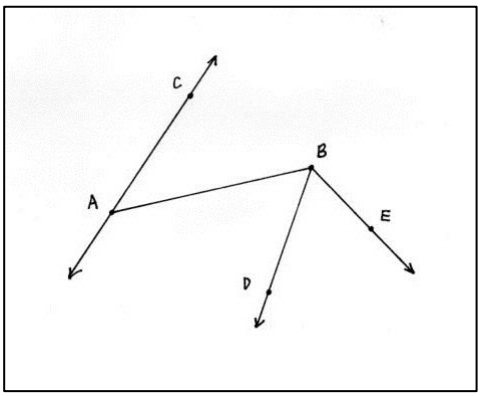


T: Compare the notation we used to identify line segment AB and line AC.

S: We can write them as $\overline{AB}$ or $\overline{BA}$, or $\overleftrightarrow{AC}$ or $\overleftrightarrow{CA}$. → We put a segment over the letters for a segment and a line with arrows for the line that goes on forever in both directions.

Problem 2: Draw, identify, and label rays and angles.

T: Draw point D. Point D should not be located on $\overline{AB}$ or anywhere on $\overleftrightarrow{AC}$ (including the parts where it might extend).

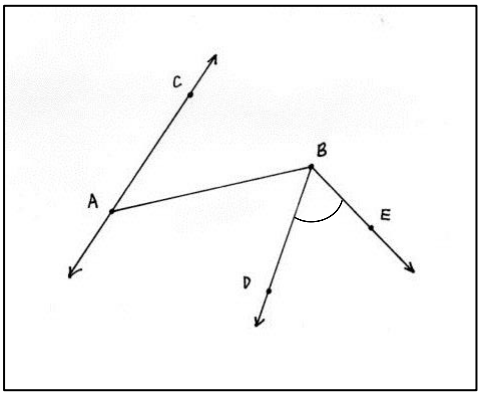


T: Using a straightedge, connect point B to point D. Use point B as the endpoint, and extend your line past point D. Draw an arrow at the end of this line.

Students draw. Observe their work.

T: Compare this part of the drawing, or **figure**, to the others you have drawn.

S: This one is longer. → This one is shorter. → They are all straight because I used a straightedge. → They all have two points. → This line has an endpoint and arrow.



T: Because it has an endpoint and arrow, we don't call this a line. We call it a **ray**. It has one endpoint that we think of as a starting point, and goes on forever in one direction. (Write $\overrightarrow{BD}$.) We record the letters in that order because the ray begins at point B and extends past point D. The ray symbol shows the direction of the line above the letters. Unlike before, we can't call it $\overrightarrow{DB}$ because that would imply that the ray starts at point D, which it does not.

T: Draw point E. Make sure point E does not lie in line with $\overrightarrow{BD}$, $\overline{AB}$, or $\overleftrightarrow{AC}$. Draw $\overrightarrow{BE}$.

Students draw. Observe their work.

T: Touch point B with your pencil. Trace along the line to point D. Now, touch point B. Trace along the line to point E. Discuss the connection of $\overrightarrow{BD}$ and $\overrightarrow{BE}$.

S: Both rays have the same endpoint. → Both rays are connected. → Mine looks like a corner of a rectangle.

T: Both rays originate at point B and extend out. Any two rays sharing the same endpoint create an **angle**.

T: We can call this angle DBE. (Write $\angle DBE$.)

S: Or $\angle EBD$!

T: To identify this angle in the figure, we will draw an **arc**. (Draw an arc to identify $\angle DBE$.) With your partner, identify two other angles in your figures.

Problem 3: Draw, identify, and label points, line segments, and angles in a familiar figure.

T: Quickly sketch a rectangle. Use your straightedge. Do you see any lines or line segments? Do you see any angles?

S: I see four line segments, four points where the line segments meet, and four angles!

T: Identify the line segments with your partner using the correct notation.

S: $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$. There are four of them!

T: How many line segments are there in a square? A rhombus?

S: There are four in each one.

T: You mentioned angles earlier. I thought an angle was made of two rays. Where do you see rays in this picture?

S: I don't see any. → But that still looks like an angle where $\overline{AD}$ and $\overline{AB}$ meet. → I could draw an arrow on the end of $\overline{AB}$ and $\overline{AD}$ to make rays.

T: You're right. Each of the segments is part of a larger ray. However, we don't have to draw them to imagine that they're there. So, do the segments $\overline{AB}$ and $\overline{AD}$ meet to form an angle?

S: Yes!

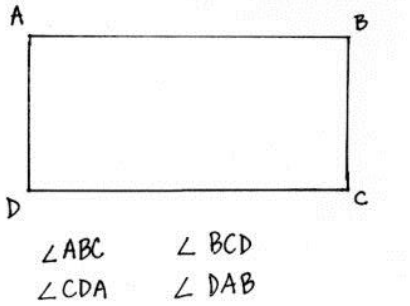
T: Name each of the angles that lie inside of the rectangle. Identify the angles using the correct notation.

S: $\angle ABC$, $\angle BCD$, $\angle CDA$, and $\angle DAB$.

NOTE TO TEACHERS ABOUT RAYS:

Traditionally, elementary school textbooks use a line with a single arrowhead to denote rays, for example, $\overrightarrow{BD}$. In some middle and high school texts, however, this same notation is sometimes used instead for vectors, resulting in an alternate notation for rays, a line with a half arrowhead, for example, $\overrightarrow{BD}$.

To alleviate confusion when observing the consistency and coherence of the curriculum as a whole, *A Story of Units* uses a half arrowhead as the notation for a ray, and *A Story of Ratios* uses the notation of a single arrowhead for a vector. Though the typed notation in Grade 4 always uses the half arrowhead, sample student work depicts both variations in representing rays, some with a half arrowhead, and some with the full arrowhead notation. Both representations for a *ray* can be viewed as correct. Individual classrooms may choose to adopt either convention for the *ray* notation.



Problem 4: Analyze a familiar figure.

T: With a partner, make a list of the new terms that we learned today.

S: Point, line segment (segment), line, ray, angle, arc, and figure.

T: Let's look at the first figure that we drew. What do you see?

S: Points, line segments, lines, rays, and angles.

T: Did we create a figure that looks familiar?

S: No! It doesn't really look like anything that I've seen.

T: Look at the second figure that we drew. What do you see?

S: That looks familiar! → It has points, line segments (rays), and angles. Combined, they make a rectangle!

T: Here's another familiar figure. (Draw or project the figure of a kite.)

S: It's a kite!

T: Let's see if we can find points, line segments, lines, rays, and angles. Are there any points?

S: There are lots of points. → There are too many points to count.

MP.6

T: Let's identify the points that show the corners.

S: (Label points A, B, C, D, and E.)

T: What else do you see? How about segments and angles?

S: (Identify segments and angles by name, working first with a partner to identify, and then share with the whole group.)

T: Are there any rays or lines?

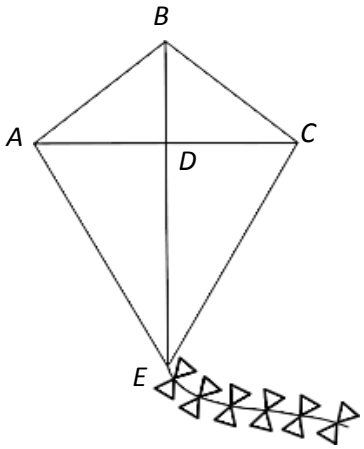
S: No!

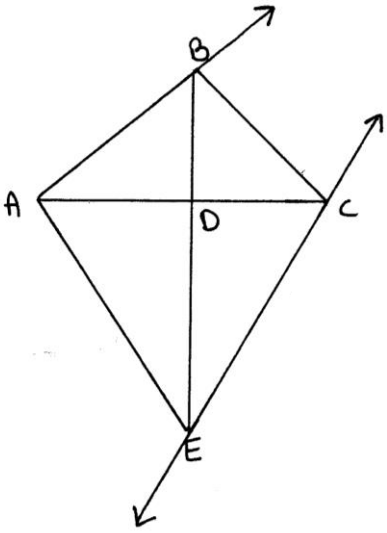
T: Think again! Segments, or line segments, are just a part of a line. If we extend $\overline{AB}$ in one direction, we represent $\overrightarrow{AB}$. And if we extend $\overline{AB}$ in both directions, we represent $\overleftrightarrow{AB}$, which includes $\overline{AB}$ and $\overrightarrow{AB}$.

S: I get it! Lines, rays, and segments are all related!

T: Draw the kite and then extend the segments to represent a ray and a line. (Demonstrate how to draw the kite, starting with a *t* shape and then joining the endpoints with a straightedge.)

S: (Draw the kite, and then represent a ray and a line.)

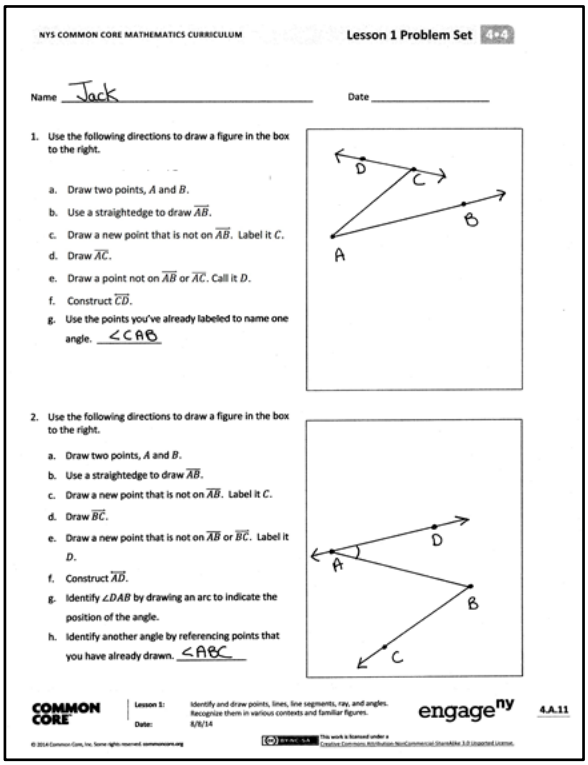




Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. Some problems do not specify a method for solving. This is an intentional reduction of scaffolding that invokes MP.5, Use Appropriate Tools Strategically. Students should solve these problems using the RDW approach used for Application Problems.

For some classes, it may be appropriate to modify the assignment by specifying which problems students should work on first. With this option, let the purposeful sequencing of the Problem Set guide your selections so that problems continue to be scaffolded. Balance word problems with other problem types to ensure a range of practice. Consider assigning incomplete problems for homework or at another time during the day.



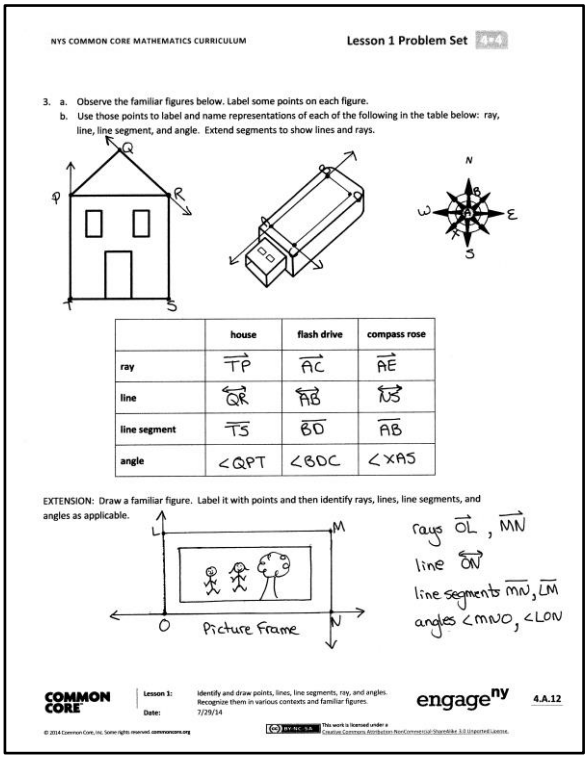
NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 4•4

Name Jack Date

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 $\overline{AC}$.
   e. Draw a point not on $\overline{AB}$ or $\overline{AC}$. Call it D.
   f. Construct $\overline{CD}$.
   g. Use the points you've already labeled to name one angle. ∠CAB

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. ∠ABC

COMMON CORE Lesson 1: Date: 8/8/14 Identify and draw points, lines, line segments, ray, and angles. Recognize them in various contexts and familiar figures. engage^ny 4.A.11



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 4•4

3. a. Observe the familiar figures below. Label some points on each figure.
   b. 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.

	house	flash drive	compass rose
ray	$\overrightarrow{TP}$	$\overrightarrow{AC}$	$\overrightarrow{AE}$
line	$\overleftrightarrow{QR}$	$\overleftrightarrow{AB}$	$\overleftrightarrow{NS}$
line segment	$\overline{TS}$	$\overline{BD}$	$\overline{AB}$
angle	∠QPT	∠BDC	∠XAS

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

rays $\overrightarrow{OL}$, $\overrightarrow{MN}$
line $\overleftrightarrow{ON}$
line segments $\overline{MN}$, $\overline{LM}$
angles ∠MNO, ∠LON

COMMON CORE Lesson 1: Date: 7/29/14 Identify and draw points, lines, line segments, ray, and angles. Recognize them in various contexts and familiar figures. engage^ny 4.A.12

Student Debrief (11 minutes)

Lesson Objective: Identify and draw points, lines, line segments, rays, and angles. Recognize them in various contexts and familiar figures.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- In Problem 3, the image of the USB drive has several lines with curved edges. We often talk about curved lines and straight lines. How are those lines different from the lines we learned about today?
- Compare your **figure** to your partner's for Problem 1. How are they alike? How are they different?

- A **point** indicates a precise location with no size, only position. Points are infinitely small. Why do we mark them with a dot? Won't our pencil marks have width? Won't our pencil marks actually cover many points since the dots we draw have width and points do not?
- Just like a point, a **line** has no thickness. Can we draw a line that has no thickness, or will we always have to imagine that particular attribute? Why do we draw it on paper with thickness?
- How is a **line segment** different from a line?
- How many corners does a triangle have? A square? A quadrilateral? How does that relate to the number of angles a polygon has?
- How are a **ray** and a line similar? How are they different?
- How are **angles** formed? Where have you seen angles before? How does an **arc** help to identify an angle?
- Why is it hard to find real life examples of lines, points, and rays?
- How does your understanding of a number line connect to this lesson on lines?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name _____ Date _____

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 $\overrightarrow{AB}$.

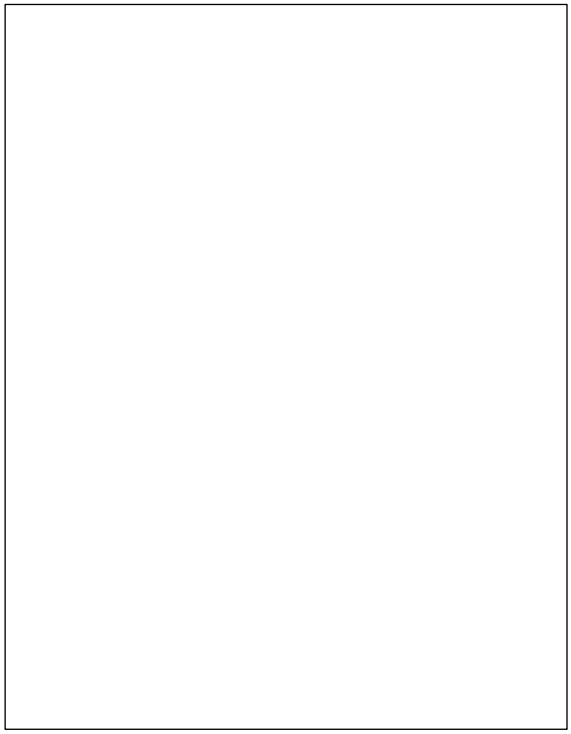
   c. Draw a new point that is not on $\overrightarrow{AB}$. Label it C.

   d. Draw $\overline{AC}$.

   e. Draw a point not on $\overrightarrow{AB}$ or $\overline{AC}$. Call it D.

   f. Construct $\overleftrightarrow{CD}$.

   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.

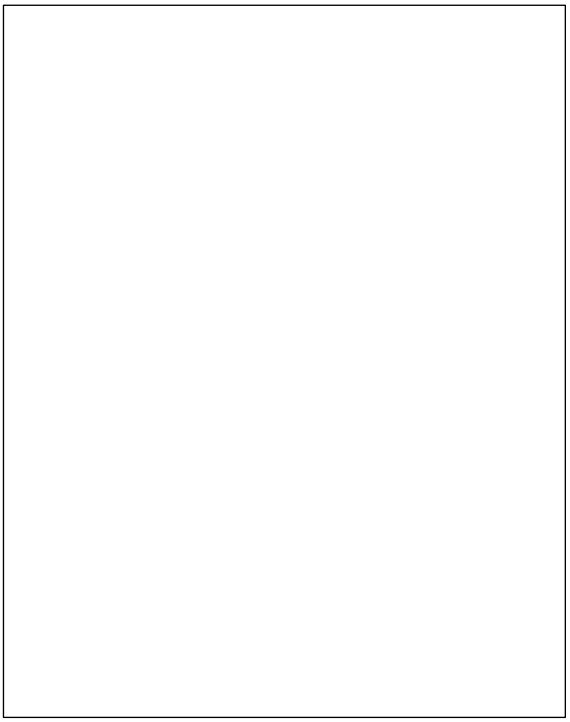
   d. Draw $\overrightarrow{BC}$.

   e. Draw a new point that is not on $\overline{AB}$ or $\overrightarrow{BC}$. Label it D.

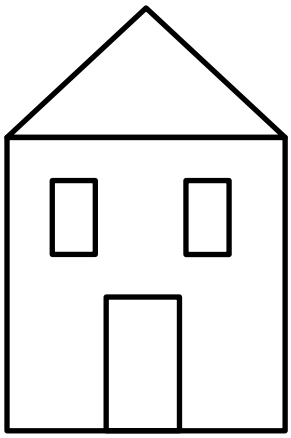
   f. Construct $\overleftrightarrow{AD}$.

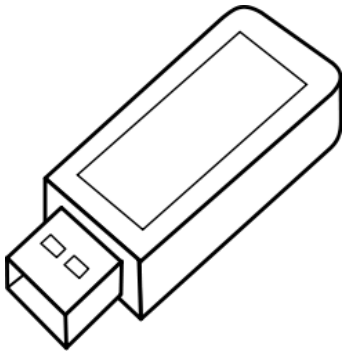
   g. Identify $\angle DAB$ by drawing an arc to indicate the position of the angle.

   h. Identify another angle by referencing points that you have already drawn. _____



3. a. Observe the familiar figures below. Label some points on each figure.
   b. 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.



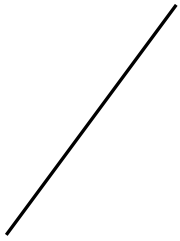


	House	Flash drive	Compass rose
Ray			
Line			
Line segment			
Angle			

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

Name _____ Date _____

1. Draw a line segment to connect the word to its picture.

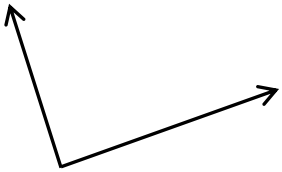


Ray

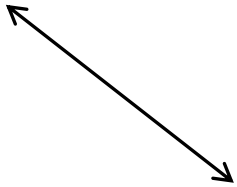
Line

Line segment

Point



Angle



2. How is a line different from a line segment?

Name _____ Date _____

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

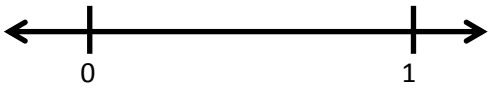
   a. Draw two points: W and X.
   b. Use a straightedge to draw $\overrightarrow{WX}$.
   c. Draw a new point that is not on $\overrightarrow{WX}$. Label it Y.
   d. Draw $\overline{WY}$.
   e. Draw a point not on $\overrightarrow{WX}$ or $\overline{WY}$. Call it Z.
   f. Construct $\overleftrightarrow{YZ}$.
   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 $\overrightarrow{WY}$.
   e. Draw a new point that is not on $\overrightarrow{WY}$ or on the line containing $\overline{WX}$. Label it Z.
   f. Construct $\overleftrightarrow{WZ}$.
   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. Label some points on each figure.

   b. 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.



	Clock	Die	Number line
Ray			
Line			
Line segment			
Angle			

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