



GRADE 5 SUPPLEMENT

Set C4 Geometry: Line Segments, Rays & More

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Skills & Concepts

- ★ draw, label, and describe line segments, rays, lines, parallel lines, and perpendicular lines
- ★ draw, label, and define an angle as two rays sharing a common endpoint (vertex)
- ★ measure angles and describe angles in degrees
- ★ construct polygons

Bridges in Mathematics Grade 5 Supplement

Set C4 Geometry: Line Segments, Rays & More

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Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set C4 ★ Activity 1



ACTIVITY

Point, Line Segment, Ray, Angle

Overview

The teacher leads the class through a series of drawings. As students progress from one task to the next, they construct and discuss points, line segments, lines, rays, and angles. Then they practice drawing parallel and perpendicular lines. Students review these key terms by creating vocabulary cards that can be displayed at the conclusion of the activity.

Skills & Concepts

- ★ draw, label, and describe line segments, rays, lines, parallel lines, and perpendicular lines
- ★ draw, label, and define an angle as two rays sharing a common endpoint (vertex)
- ★ measure angles and describe angles in degrees

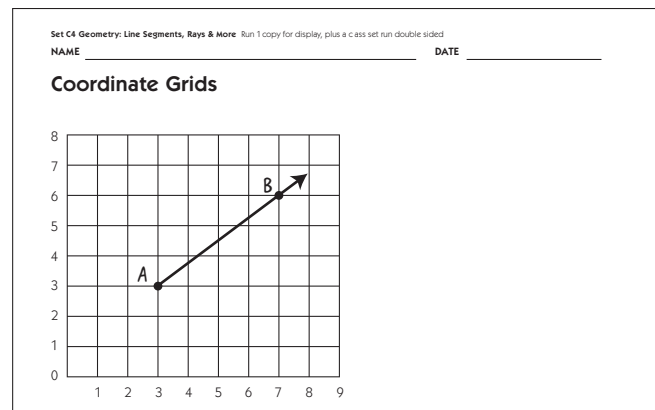
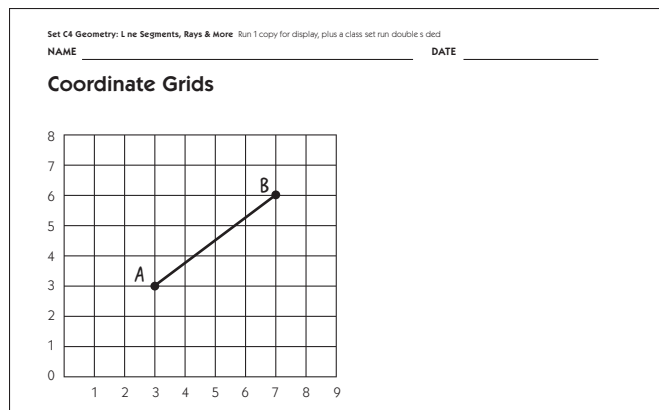
You'll need

- ★ Coordinate Grids (page C4.5, 1 copy for display plus a class set run double-sided)
- ★ Vocabulary Cards, pages 1–7 (pages C4.6–C4.12, 1 copy of each sheet, cut apart on lines; keep terms, pictures, and definitions grouped together)
- ★ rulers (class set)
- ★ pattern blocks (class set)
- ★ a piece of paper to mask parts of the display

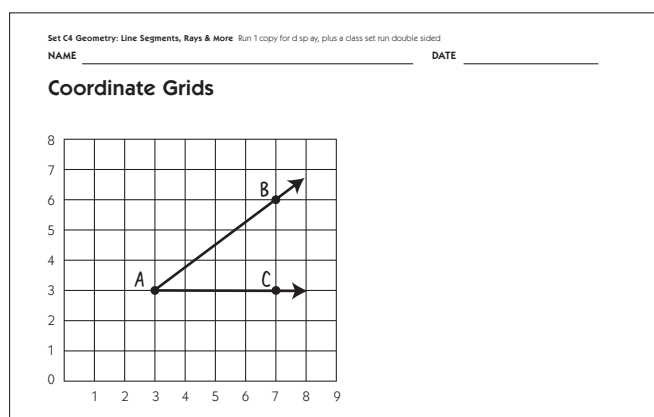
Instructions for Point, Line Segment, Ray, Angle

1. Ask students to get their pencils and rulers out. Give students each a Coordinate Grid sheet, and explain that they are going to follow a set of instructions to draw some geometric figures today. (Students can turn their papers over for two additional grids if they make a mistake in their drawings and need to start over.)
2. Ask students to make a small dot at point (3, 3). Invite a volunteer to show (3, 3) on the display Coordinate Grid. You may need to remind students to count along the x -axis first and then along the y -axis to locate the point. Explain that this dot is what mathematicians call a *point*. A point is an exact location in space. Points are usually marked with letter names, and this is point A. Label the point with an A.
3. Now ask students to make another small dot, this time at (7, 6). Then ask them to use their rulers to connect the dots with a straight line. Explain that they have just drawn what is called a *line segment*. A line segment is part of a line that is named by using its two endpoints, so this one would be called line segment \overline{AB} . Draw line segment \overline{AB} on your display.
4. On your display, extend line segment \overline{AB} beyond point B and draw an arrow at the end to transform it into a ray. Explain that this arrow now indicates that this is a *ray*. A ray is part of a line. It has one endpoint and goes on forever in one direction, the direction indicated by the arrow. Students might find it helpful to think of a ray of light that shines out of a flashlight. Ask them to change their line segments into rays too.

Activity 1 Point, Line Segment, Ray, Angle (cont.)



5. Now ask students to make a point at (7, 3) and label it C. Have them draw a ray from point A to point C. Then ask them to share what they notice.



Students Now it's two rays.

You only need three points to make two rays if the rays start at the same point.

That new ray would be ray \overrightarrow{AC} .

The two rays make an angle at the corner where A is.

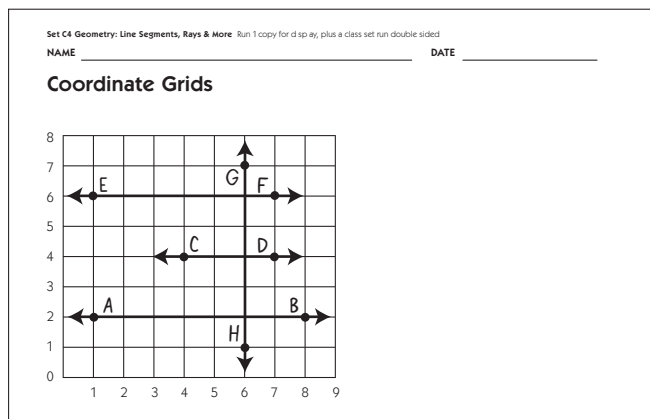
6. Explain that an angle is formed at the shared point where two rays come together. We would call this angle $\angle BAC$. (Point to B, A, and C as you explain this.) Now ask students to use a pattern block to measure this angle. (They should be able to use the white rhombus to see that this angle is roughly 30° .)

7. Now ask students to draw two points on the second grid, one at (1, 2) and one at (8, 2). Ask them to label the points A and B, as you do the same on the display sheet.

8. Explain that while a ray goes on forever in one direction, a line is a path in space that never bends or turns, and goes on forever in both directions. Ask students to talk quietly in pairs for a moment about how they think they might draw a line that passes through points A and B. Then solicit their ideas. Students are likely to suggest, based on how a ray is drawn, that a line should be labeled with an arrow at both ends. Then, based on their suggestions, draw a line that passes through A and B, and draw arrows at either end.

Activity 1 Point, Line Segment, Ray, Angle (cont.)

9. Remind students that parallel lines never cross. They go on forever, but never cross each other, because they are always the same distance apart. Now ask them to work quietly on their own or in pairs to draw a line \overleftrightarrow{CD} that is parallel to line \overleftrightarrow{AB} .
10. After they have had a minute or so to work, invite two volunteers to recreate their lines on your display grid. Ask the second volunteer to label his or her line \overleftrightarrow{EF} instead of \overleftrightarrow{CD} . Invite the class to confirm that each is parallel to \overleftrightarrow{AB} and then copy the lines on their own grids as well.
11. Now draw a line that passes through and is perpendicular to all three lines.



12. Explain that the line you've drawn is perpendicular to line \overleftrightarrow{AB} . Invite students to recall or conjecture what the definition of perpendicular lines is. They might recall, or you may have to remind them, that perpendicular lines cross each other at right angles.
13. Now have students draw this perpendicular line on their grids and talk in pairs about where they see the right angles. Challenge them to prove or show that this line is also perpendicular to the two lines that are parallel to \overleftrightarrow{AB} . Invite them to discuss whether line \overleftrightarrow{GH} would be perpendicular to every line that is parallel to line \overleftrightarrow{AB} and why (it would be). You might also ask them to think about lines that are parallel to \overleftrightarrow{GH} : what do they know must be true about those lines? (They would be perpendicular to line \overleftrightarrow{AB} and all lines parallel to line \overleftrightarrow{AB} .)
14. Now post all the pictures and terms from the Vocabulary Cards. There are 7 of each. Call students one at a time to come match a picture to the term it illustrates, soliciting input from their classmates if needed. After the pictures and terms have been paired, read each definition aloud and ask students to identify which term it defines.
15. At another time, ask a few volunteers to tape the terms, pictures, and definitions together (or mount them on construction paper) so that they can be displayed in the classroom.

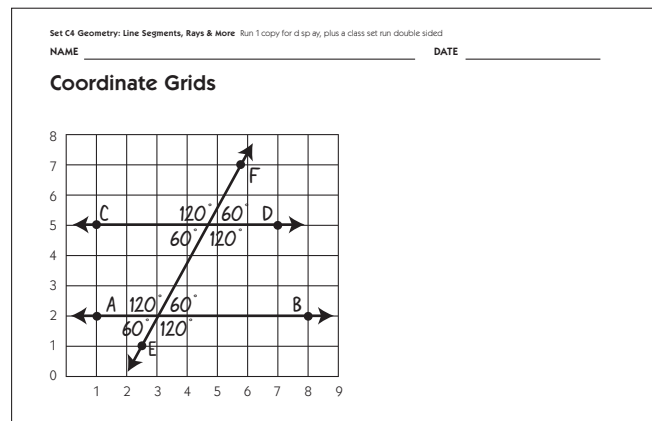
Extensions

- Play a quick game of geometric vocabulary charades. Invite a volunteer to act out a term silently until his or her classmates guess the term. Then have the volunteer lead the class in making a motion

Activity 1 Point, Line Segment, Ray, Angle (cont.)

or sign that represents that word. Some of your students may find the terms easier to remember after acting them out with their bodies. Here are some examples:

- *point*: a closed fist; point with finger to one point in space
 - *line segment*: arm outstretched with closed fist
 - *ray*: arm outstretched with hand pointing in one direction
 - *line*: both arms outstretched with hands pointing in either direction
 - *angle*: angle formed by both arms, stretched in different directions with hands pointing
 - *parallel*: arms held parallel to each other
 - *perpendicular*: arms held at right angles to each other
- Have students draw two parallel lines on their grids and a third line that passes through both of those lines at a 60° angle. Invite students to explore the relationships among these lines and angles. What do they notice about the line and angles? Why is this true? Students can use pattern blocks to draw and measure the angles on their grids. (The angles on the green triangle are all 60° .)



Students will notice or discover the relationships shown on the picture above. Ask them to explain why the angles where line \overleftrightarrow{EF} crosses \overleftrightarrow{AB} and \overleftrightarrow{CD} are equal. Students will have a variety of informal ways of explaining why this is so.

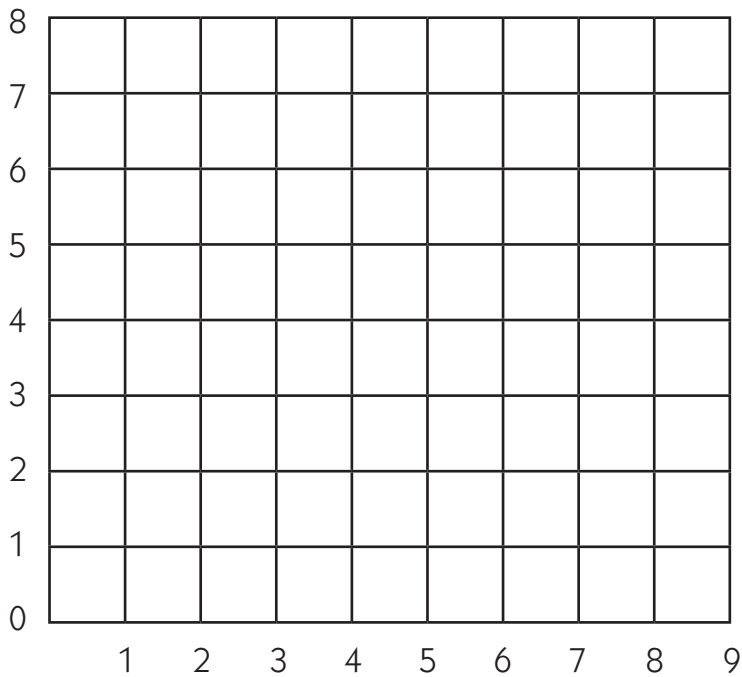
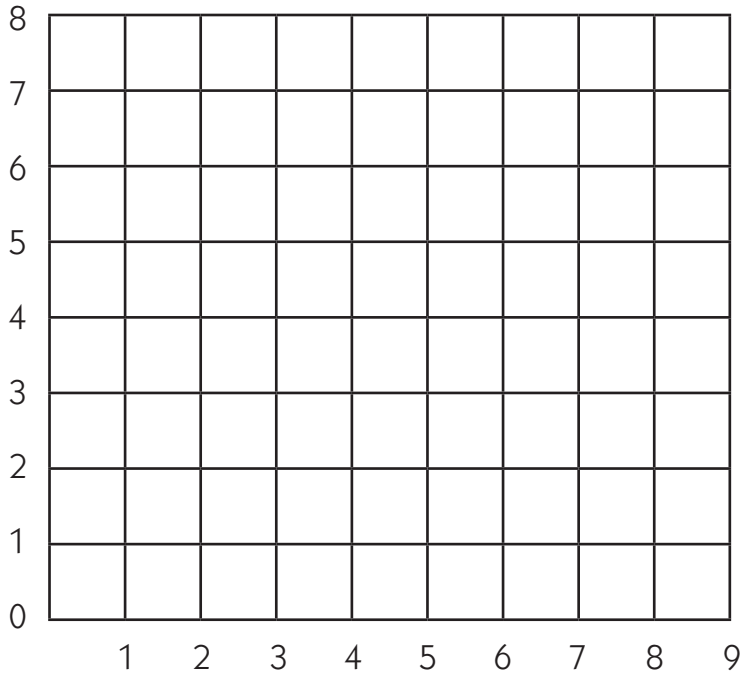
**INDEPENDENT WORKSHEET**

Use Set C4 Independent Worksheets 1–3 (pages C4.13–C4.18) to provide students with more practice constructing and identifying points, line segments, lines, rays, angles, and polygons.

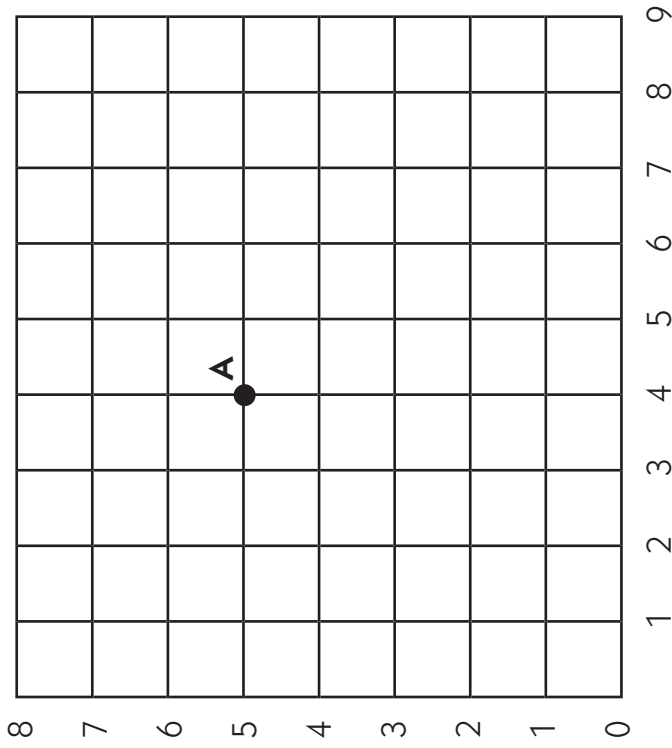
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Coordinate Grids

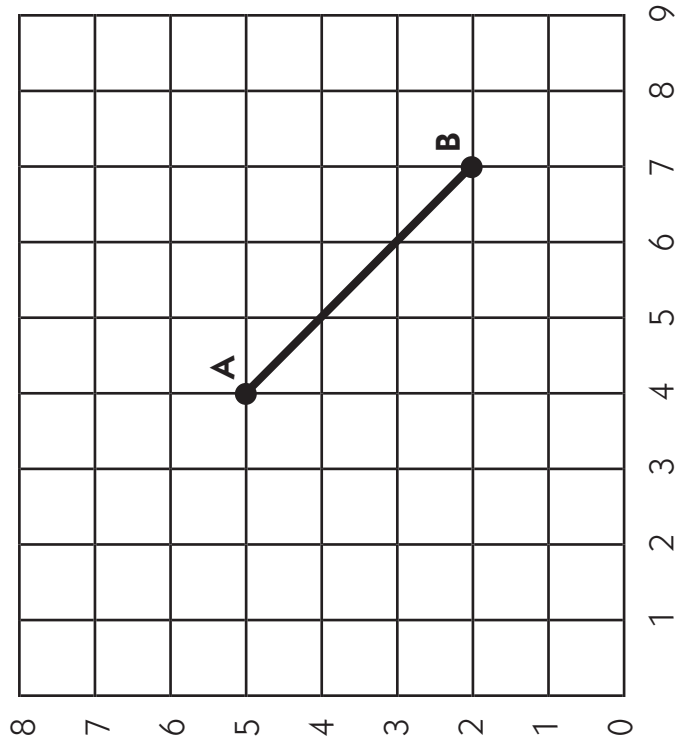


point



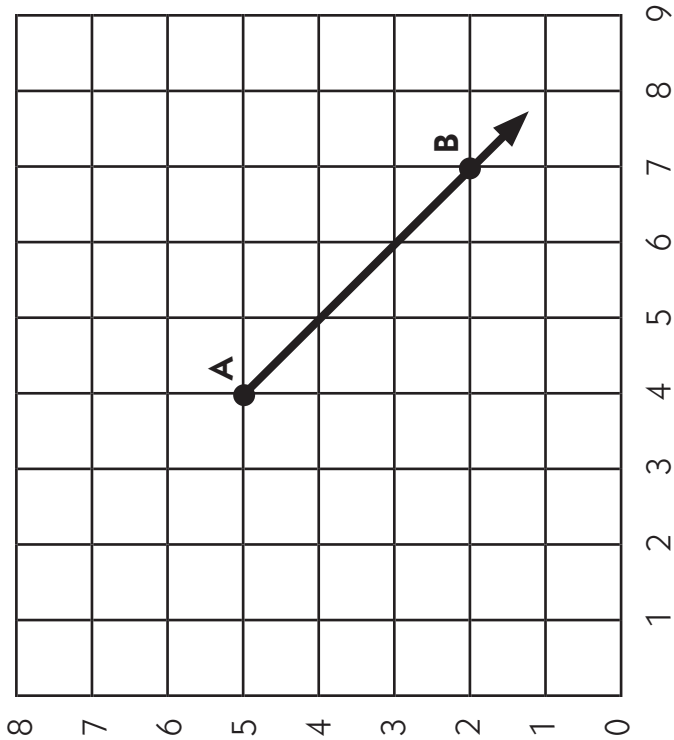
a location in space

line segment



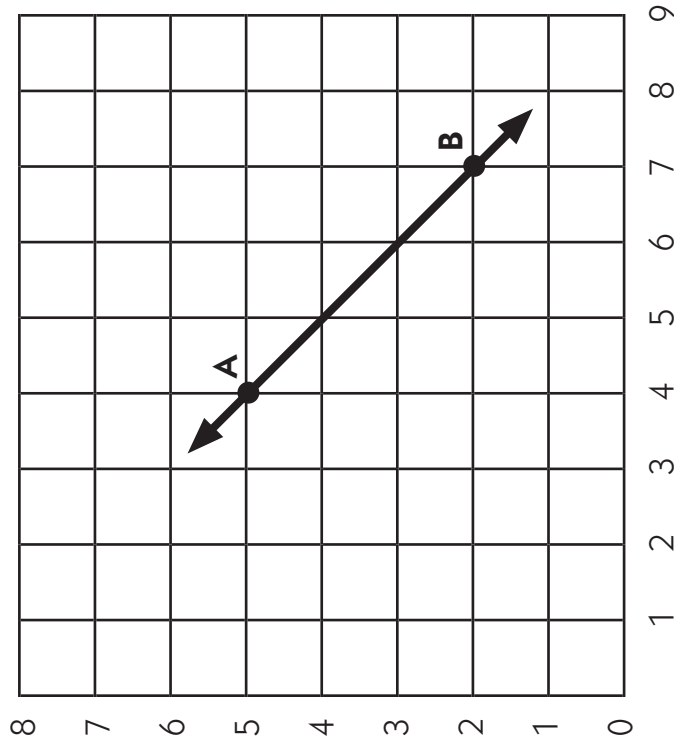
part of a line identified by two end points

ray



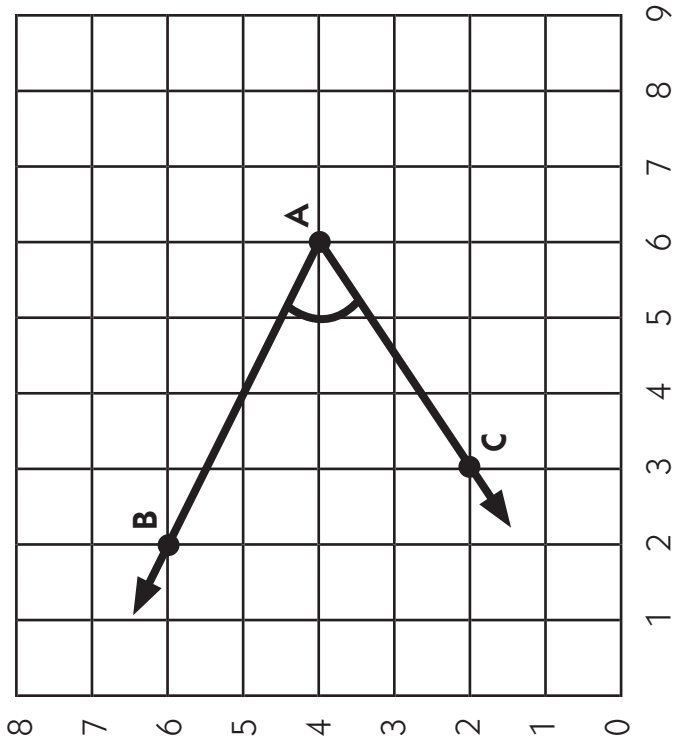
part of a line that goes on forever in one direction and has an endpoint at the other end

line



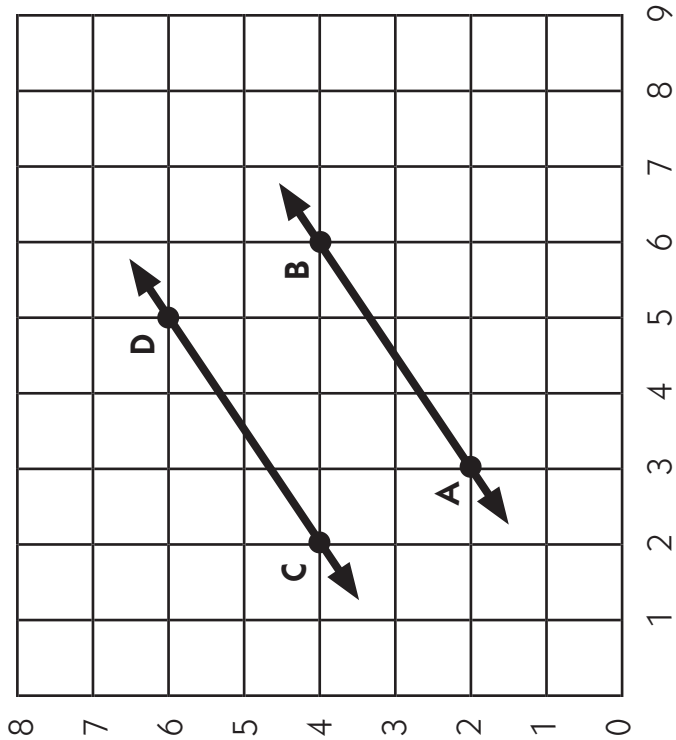
**a path in space that doesn't bend or turn and
extends forever in both directions**

angle



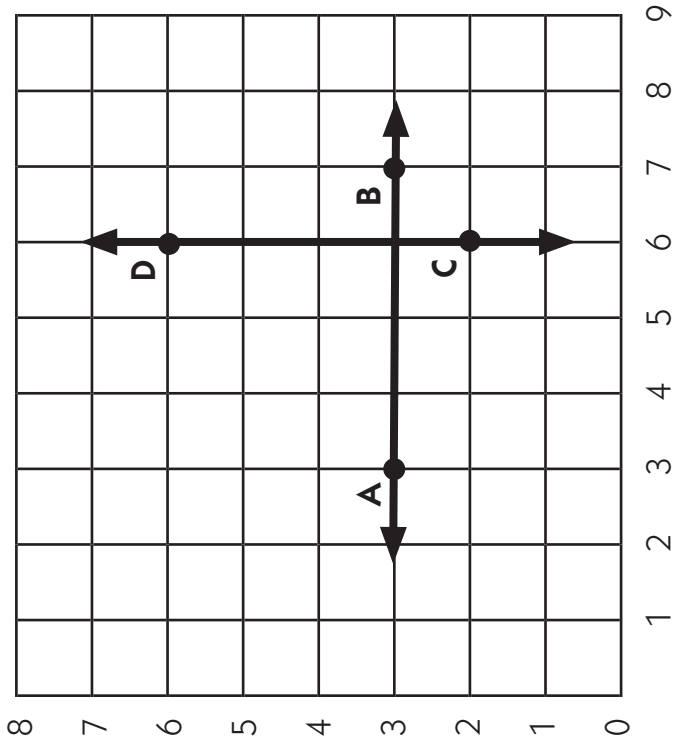
**the space between two rays, line segments
or lines diverging from a common point**

parallel



never cross

perpendicular



intersect at right angles

NAME _____

DATE _____

Set C4 ★ Independent Worksheet 1



INDEPENDENT WORKSHEET

Drawing & Measuring Line Segments & Angles

1a Draw and label a line that passes through point A (1,1) and point B (5,8).

b Draw and label a line that passes through point C (2,5) and point D (7,5).

c Now draw and label a line \overleftrightarrow{BE} that passes through point B and is perpendicular to line \overleftrightarrow{CD} .

d What are the angle measures where line \overleftrightarrow{BE} intersects line \overleftrightarrow{CD} ?

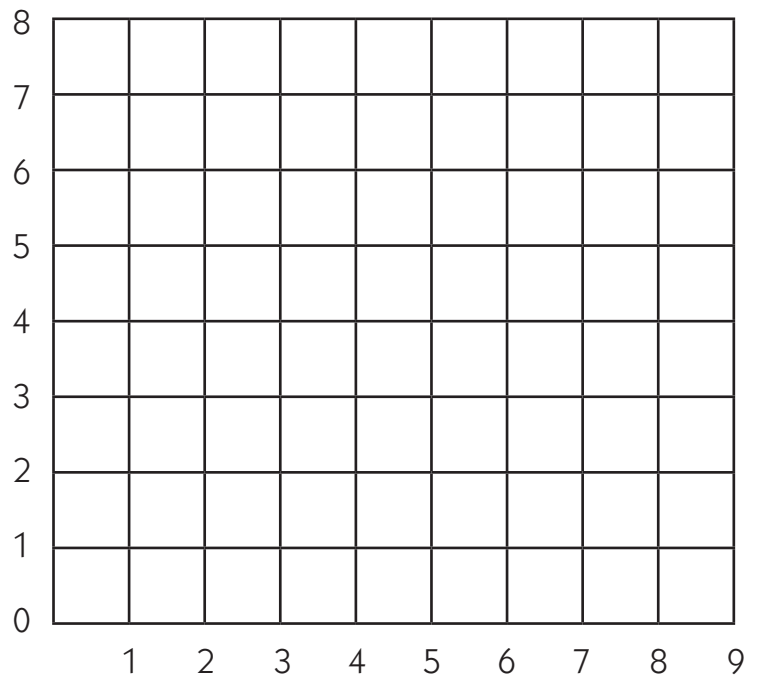
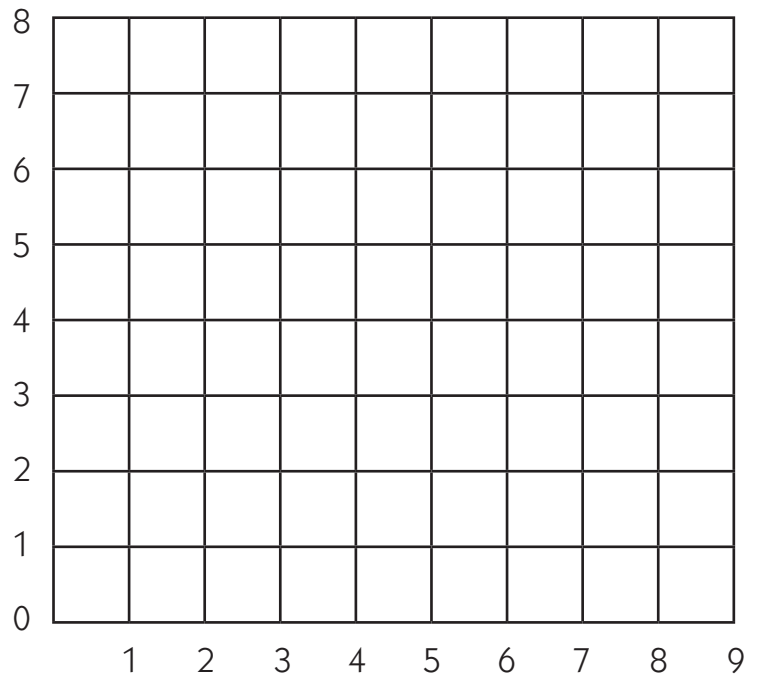
e What are the angle measures where line \overleftrightarrow{AB} intersects line \overleftrightarrow{CD} ?

f What are the angle measures where lines \overleftrightarrow{AB} and \overleftrightarrow{BE} intersect at point B?

2a Draw and label a line segment that connects point A at (2,7) and point B at (6,4).

b Draw and label a ray that starts at point C (4,4) and passes through point D (1,2).

c What is the length of line segment \overline{AB} , measured to the nearest millimeter?



NAME _____

DATE _____

Set C4 ★ Independent Worksheet 2



INDEPENDENT WORKSHEET

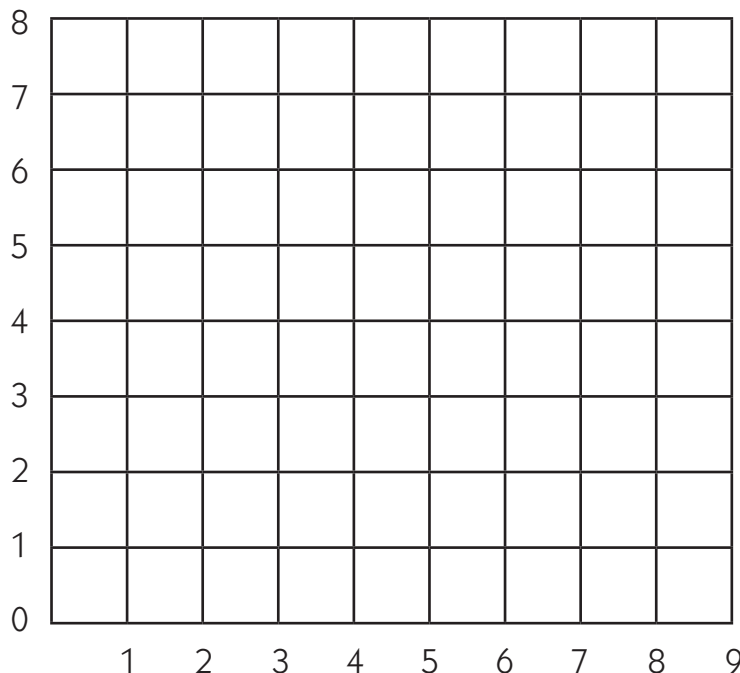
Parallel & Perpendicular

1a Draw a line segment that connects point A (3,1) and point B (7,5).

b Draw and label a line segment \overline{CD} that is parallel to line segment \overline{AB} .

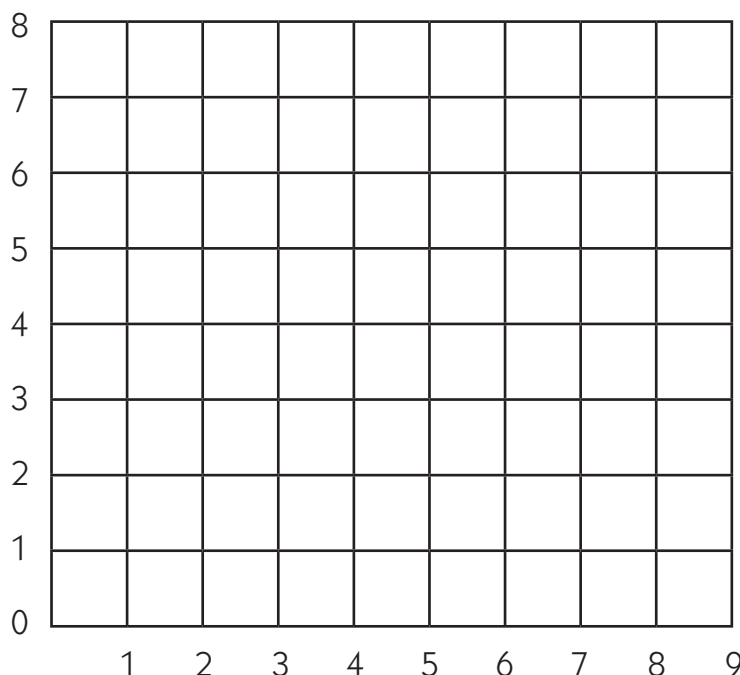
c Draw and label a line segment \overline{EF} that is perpendicular to both \overline{AB} and \overline{CD} .

d Explain how you know for sure that line segment \overline{EF} is perpendicular to \overline{AB} and \overline{CD} .



2a Draw and label a ray starting at point A (2,4) and passing through point B (6,6).

b Draw and label a ray \overrightarrow{BC} that forms a 60° angle with ray \overrightarrow{AB} .



NAME _____

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Set C4 ★ Independent Worksheet 3



INDEPENDENT WORKSHEET

Constructing Polygons

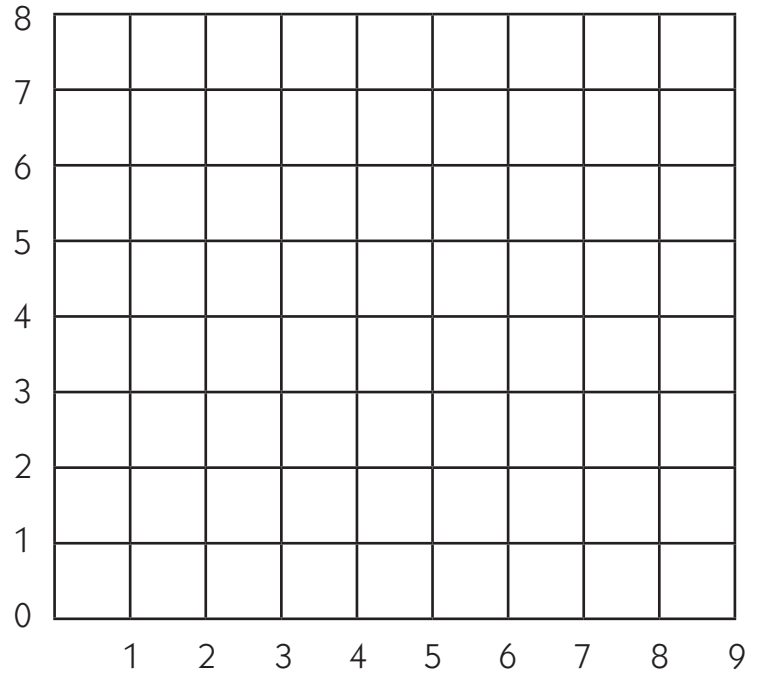
1a Draw and label the following points on the coordinate grid.

A (2, 2) B (5, 7) C (8, 4)

b Draw the following line segments to connect the points on the grid.

\overline{AB} \overline{BC} \overline{CA}

c What is the name of the polygon you just drew?



d Write 2 geometric observations about this polygon.

Constructing Polygons (cont.)

2a Draw and label the following points on the coordinate grid.

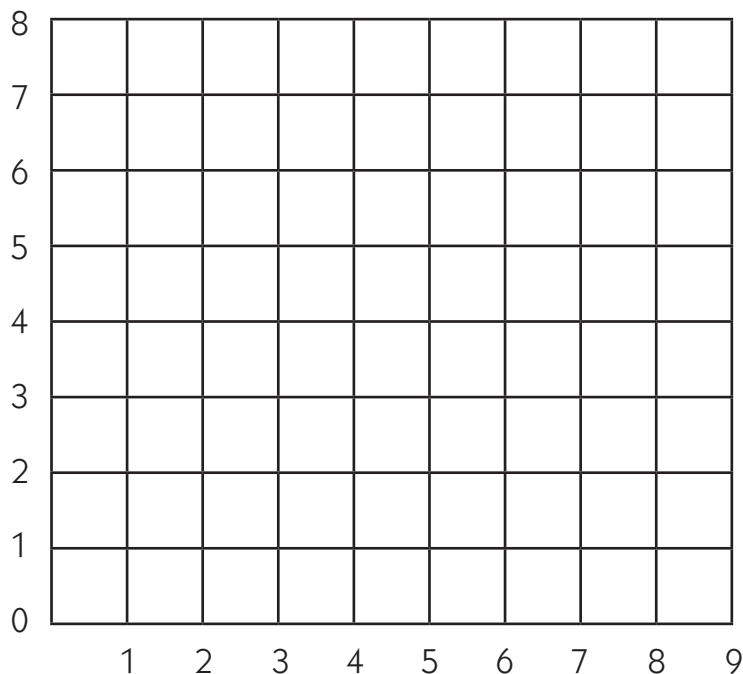
A (1,2) B (3,5) C (8,5) D (6,2)

b What shape will you get when you connect the points with line segments? How do you know?

c Draw the following line segments to connect the points on the grid.

\overline{AB} \overline{BC} \overline{CD} \overline{DA}

d Ryan says that this polygon is a rhombus. Do you agree? Why or why not?



e Write 2 geometric observations about this polygon.