Kenmore-Town of Tonawanda UFSD

We educate, prepare, and inspire all students to achieve their highest potential

Grade 5 Module 6
Parent Handbook

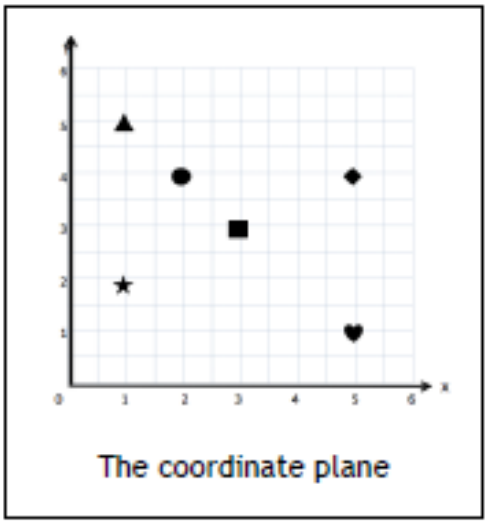
The materials contained within this packet have been taken from the Great Minds curriculum Eureka Math.

Eureka Math™ Tips for Parents

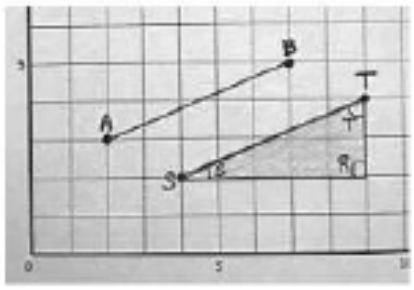
Grade 5 Module 6

Problem Solving with the Coordinate Plane

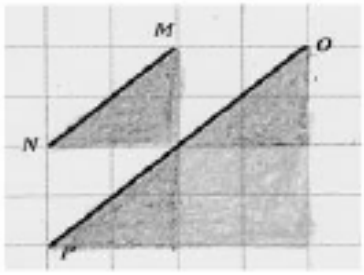
In Module 6, students develop a coordinate system for the first quadrant of the coordinate plane and use it to solve problems. They explore the relationship between points, ordered pairs, patterns, and lines. The module finishes with an exploration of the coordinate plane in real world applications.



The coordinate plane



Drawing figures on the coordinate plane



What Came Before this Module:

Students worked with three-dimensional shapes and explored cubic units and volumes of rectangular prisms. They also calculated area for figures with fractional side lengths.

New Terms in this Module:

Axis: fixed reference line for the measurement of coordinates

Coordinate: number that identifies a point on a plane

Coordinate pair: two numbers that are used to identify a point on a plane; written (*x*, *y*) where *x* represents a distance from 0 on the *x*-axis and *y* represents a distance from 0 on the *y*-axis

Coordinate plane: plane spanned by the *x*-axis and *y*-axis in which the coordinates of a point are distances from the two perpendicular axes

Ordered pair: two quantities written in a given fixed order, usually written as (*x*, *y*)

Origin: fixed point from which coordinates are measured; the point at which the *x*-axis and *y*-axis intersect

Quadrant: any of the four equal areas created by dividing a plane by an *x*-axis and *y*-axis

How You Can Help at Home:

- Play the game Battleship, if you have it! It gives good practice with locating points on a coordinate plane.
- Practice following rules to find ordered pairs, e.g. if the rule is *y* = double *x* plus 1, what is *y* if *x* is 3? 4? 5? (Answers are 7, 9, 11.)

Key Common Core Standards:

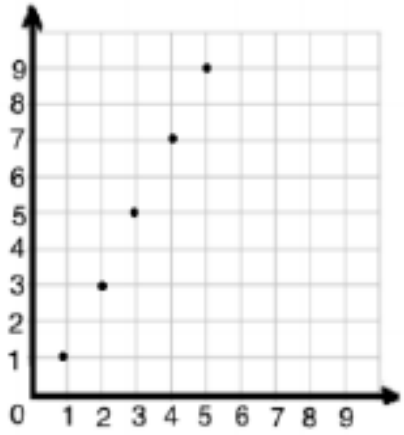
- *Write and interpret numerical expressions.*
  - Write simple expressions that record calculations with numbers, and interpret numerical expressions.
- *Analyze patterns and relationships.*
  - Generate two numerical patterns using two given rules, and identify apparent relationships between corresponding terms.
- *Graph points on the coordinate plane to solve real-world and mathematical problems.*
  - Use a pair of perpendicular number lines, called axes, to define a coordinate system.
  - Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Prepared by Erin Schweng, Math Coach

Rule: Double x, then subtract 1.

x	y	(x, y)
1	1	(1,1)
2	3	(2,3)
3	5	(3,5)
4	7	(4,7)
5	9	(5,9)

The rule table and the plotted points for the rule "Double x, then subtract 1"



Spotlight on Math Skills:

Graphing Lines

Students learn this important skill in Module 6 of *A Story of Units*.

A Story of Units teaches students key mathematical skills that will be used throughout a student's elementary years and beyond.

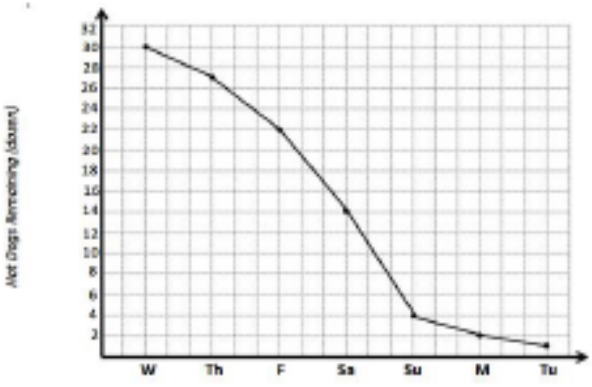
Module 6, the final module of Grade 5, is a very important link to the algebraic skills students will need in later years. Students begin by investigating patterns, relating the x- and y-coordinates of the points on the line and reasoning about the patterns in the ordered pairs, which lays groundwork for Grade 6 work with proportional reasoning.

Students use given rules (e.g., "multiply by 2, then add 3") to generate coordinate pairs, plot points, and investigate relationships. Finally, students generate two number patterns from two given rules, plot the points, and analyze the relationships within the sequences of the ordered pairs and the graphs of the two lines.

Sample Problem from Module 6:
(Example taken from Module 6, Lesson 20)

Harry runs a hot dog stand at the county fair. When he arrived on Wednesday, he had 38 dozen hot dogs on his stand. The graph shows the number of hot dogs (in dozens) that remained unsold at the end of each day of sales.

1. How many dozen hot dogs did Harry sell on Wednesday? How do you know?
2. Between which two-day period did the number of hot dogs sold change the most? Explain how you determined your answer.



Grade 5 • Module 6

Problem Solving with the Coordinate Plane

OVERVIEW

In this 40-day module, students develop a coordinate system for the first quadrant of the coordinate plane and use it to solve problems. Students use the familiar number line as an introduction to the idea of a coordinate and construct two perpendicular number lines to create a coordinate system on the plane. They see that just as points on the line can be located by their distance from 0, the plane's coordinate system can be used to locate and plot points using two coordinates. They then use the coordinate system to explore relationships between points, ordered pairs, patterns, lines and, more abstractly, the rules that generate them. This study culminates in an exploration of the coordinate plane in real world applications.

In Topic A, students come to realize that *any* line, regardless of orientation, can be made into a number line by first locating zero, choosing a unit length, and partitioning the length-unit into fractional lengths as desired. They are introduced to the concept of a coordinate as describing the distance of a point on the line from zero. As students construct these number lines in various orientations on a plane, they explore ways to describe the position of points *not* located on the lines. This discussion leads to the discovery that a second number line, perpendicular to the first, creates an efficient, precise way to describe the location of these points. Thus, points can be located using coordinate pairs, $(aa,)$, by starting at the origin, traveling a distance of aa units along the xx-axis, and traveling a distance of bb units along a line parallel to the yy-axis. Students describe given points using coordinate pairs and, conversely, use given coordinate pairs to plot points (**5.G.1**). The topic concludes with an investigation of patterns in coordinate pairs along lines parallel to the axes, which leads to the discovery that these lines consist of the set of points whose distance from the xx- or yy-axis is constant.

Students move into plotting points and using them to draw lines in the plane in Topic B (**5.G.1**). They investigate patterns relating the xx- and yy-coordinates of the points on the line and reason about the patterns in the ordered pairs, laying important groundwork for Grade 6 proportional reasoning. Topic B continues as students use given rules (e.g., multiply by 2, then add 3) to generate coordinate pairs, plot points, and investigate relationships. Patterns in the

resultant coordinate pairs are analyzed, leading students to discover that such rules produce collinear sets of points. Students next generate two number patterns from two given rules, plot the points, and analyze the relationships within the sequences of the ordered pairs (**5.OA.3**). Patterns continue to be the focus as students analyze the effect on the steepness of the line when the second coordinate is produced through an addition rule as opposed to a multiplication rule (**5.OA.2**, **5.OA.3**). Students also create rules to generate number patterns, plot the points, connect those points with lines, and look for intersections.

Topic C finds students drawing figures in the coordinate plane by plotting points to create parallel, perpendicular, and intersecting lines. They reason about what points are needed to produce such lines and angles, and then investigate the resultant points and their relationships. Students also reason about the relationships among coordinate pairs that are symmetric about a line (**5.G.1**).

Problem solving in the coordinate plane is the focus of Topic D. Students draw symmetric figures using both angle size and distance from a given line of symmetry (**5.G.2**). Line graphs are also used to explore patterns and make predictions based on those patterns (**5.G.2, 5.OA.3**). To round out the topic, students use coordinate planes to solve real world problems.

Topic E provides an opportunity for students to encounter complex, multi-step problems requiring the application of concepts and skills mastered throughout the Grade 5 curriculum. They use all four operations with both whole numbers and fractions in varied contexts. The problems in Topic E are designed to be non-routine, requiring students to persevere to solve them. While wrestling with complexity is an important part of Topic E, the true strength of this topic is derived from the time allocated for students to construct arguments and critique the reasoning of their classmates. After students have been given adequate time to ponder and solve the problems, two lessons are devoted to sharing approaches and solutions. Students will partner to justify their conclusions, communicate them to others, and respond to the arguments of their peers.

In the final topic of Module 6, and in fact, *A Story of Units*, students spend time producing a compendium of their learning. They not only reach back to recall learning from the very beginning of Grade 5, but they also expand their thinking by exploring such concepts as the Fibonacci sequence. Students solidify the year's learning by creating and playing games, exploring patterns as they reflect on their elementary years. All materials for the games and activities are then housed for summer use in boxes created in the final two lessons of the year.

Terminology

New or Recently Introduced Terms

- Axis (fixed reference line for the measurement of coordinates)
- Coordinate (number that identifies a point on a plane)
- Coordinate pair (two numbers that are used to identify a point on a plane; written (xx, yy) where xxrepresents a distance from 0 on the xx-axis and yy represents a distance from 0 on the yy-axis)
- Coordinate plane (plane spanned by the xx-axis and yy-axis in which the coordinates of a point aredistances from the two perpendicular axes)
- Ordered pair (two quantities written in a given fixed order, usually written as (xx, yy)
- Origin (fixed point from which coordinates are measured; the point at which the xx-axis and yy-axisintersect, labeled (0, 0) on the coordinate plane)
- Quadrant (any of the four equal areas created by dividing a plane by an xx-axis and yy-axis)

Familiar Terms and Symbols[1]

- Angle (union of two different rays sharing a common vertex)
- Angle measure (number of degrees in an angle)
- Degree (unit used to measure angles)
- Horizontal (parallel to the xx-axis)
- Line (two-dimensional object that has no endpoints and continues on forever in a plane)
- Parallel lines (two lines in a plane that do not intersect)
- Perpendicular lines (two lines are *perpendicular* if they intersect and any of the angles formed between the lines are 90-degree angles)
- Point (zero-dimensional figure that satisfies the location of an ordered pair)
- Rule (procedure or operation(s) that affects the value of an ordered pair)
- Vertical (parallel to the yy-axis)

Suggested Tools and Representations

- Protractor
- Ruler
- Set square
- Tape diagrams

Grade 5 Module 6 Topic A

Coordinate Systems

Focus Standard:

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., xx-axis and xx-coordinate, yy-axis and yy-coordinate).

Instructional Days Recommended: 6

In Topic A, students revisit a Grade 3 activity in which lined paper is used to subdivide a length into *n* equal parts. In Grade 5, this activity is extended as students explore that *any* line, regardless of orientation, can be made into a number line by first locating zero, choosing a unit length, and partitioning the length-unit into fractional lengths. Students are introduced to the concept of a coordinate as describing the distance of a point on the line from zero.

As they construct number lines in various orientations on a plane, students explore ways to describe the position of points *not* located on the lines. This discussion leads to the discovery that a second number line, perpendicular to the first, creates an efficient, precise way to describe the location of these points. Thus, points can be located using coordinate pairs, $(aa,)$, by traveling a distance of aa units from the origin along the xx-axis and bb units along a line parallel to the y-axis.

Students describe given points using coordinate pairs, and then use given coordinate pairs to plot points (**5.G.1**). The topic concludes with an investigation of the patterns in coordinate pairs along vertical or horizontal lines, which leads to the discovery that these lines consist of the set of points whose distance from the xx- or yy-axis is constant.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 1

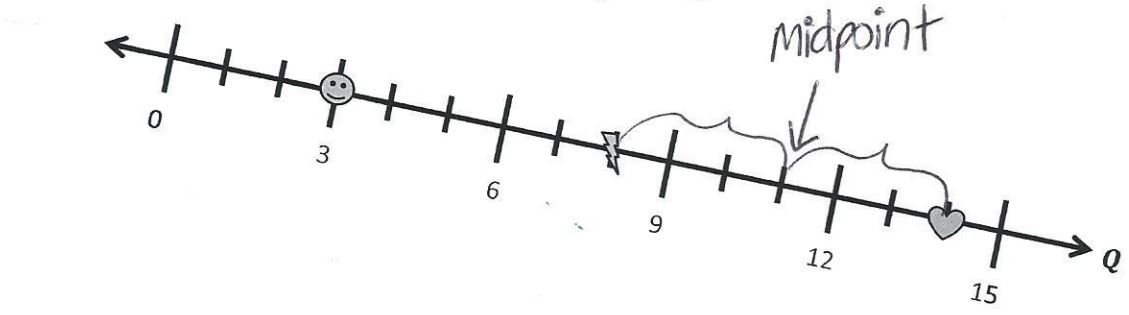
Objective: Construct a coordinate system on a line.

Homework Key

1. a. 3
   b. 8
   c. 14
   d. 11
2. 10 tick marks from the left
   11 tick marks from the left
   3 tick marks from the right
   1 tick mark from the right
3. a. Second tick mark left of 0
   b. 7 tick marks left of 0
   c. $11\frac{1}{2}$
   d. $\frac{1}{2}$
   e. 9
   f. 5
4. Explanations will vary.

Homework Sample

1. Answer the following questions using number line Q, below.
   a. What is the coordinate, or the distance from the origin, of the ☺? 3
   b. What is the coordinate of ⚡? 8
   c. What is the coordinate of ♥? 14
   d. What is the coordinate at the midpoint of ⚡ and ♥? 11



Lesson 2

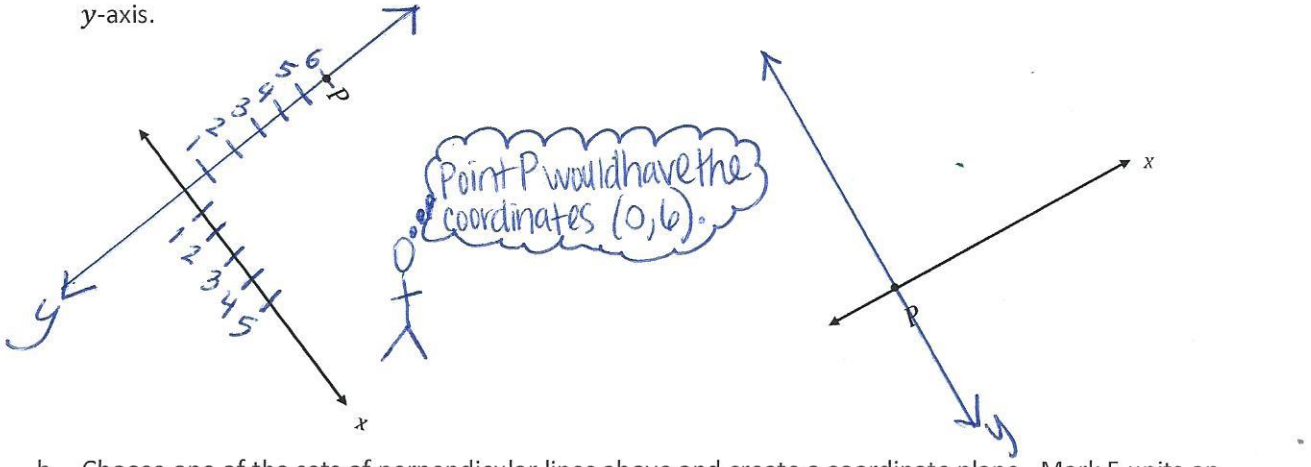
Objective: Construct a coordinate system on a plane.

Homework Key

1. a. Answers will vary.
   b. Answers may vary.
2. a. Circle; diamond; triangle; heart
   b. Star
   c. Square
3. a. $2\frac{1}{2}$, 4; 4, 3; 1, 2; 0, $4\frac{1}{2}$; $3\frac{1}{2}$, $5\frac{1}{2}$
   b. Heart and star
   c. X plotted correctly
   d. Square plotted correctly
   e. Triangle plotted correctly
4. Explanations will vary.

Homework Sample

1. a. Use a set square to draw a line perpendicular to the x-axis through point P. Label the new line as the y-axis.



   b. Choose one of the sets of perpendicular lines above and create a coordinate plane. Mark 5 units on each axis, and label them as whole numbers.

Lesson 3 - 4

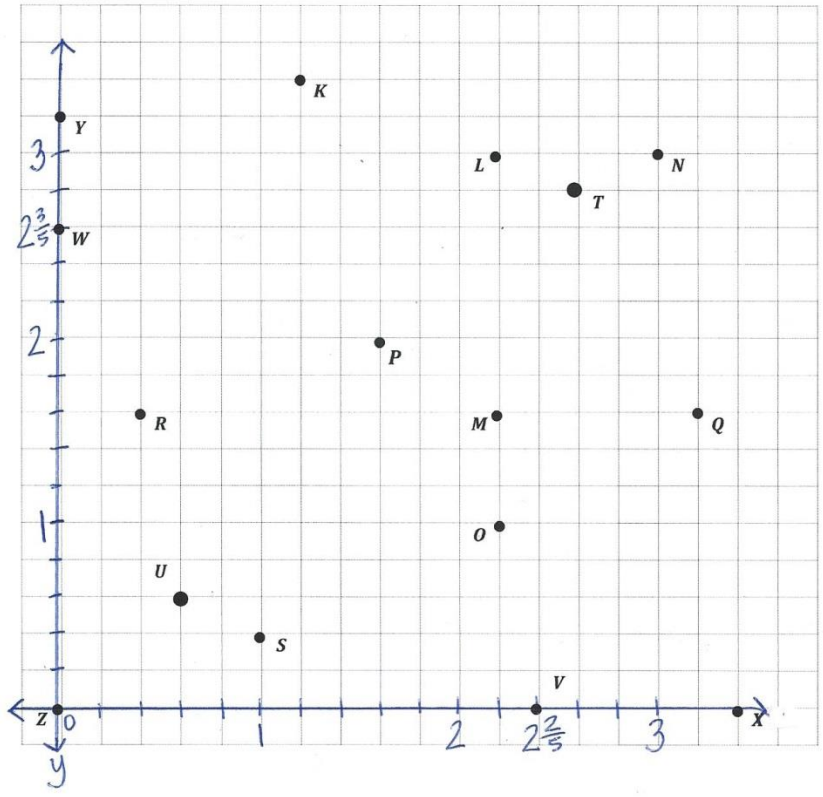
Objective: Name points using coordinate pairs, and use the coordinate pairs to plot points.

Homework Key (3)

1. Constructions match given parameters
2. a. R, M, Q
   b. O, M, L
   c. Q $(3\frac{1}{5}, 1\frac{3}{5})$
   d. K
   e. R
   f. $(2\frac{3}{5}, 2\frac{4}{5})$; $(\frac{3}{5}, \frac{3}{5})$; $(1, \frac{2}{5})$; $(1\frac{1}{5}, 3\frac{2}{5})$
   g. U; X; L; W
   h. Point with equal x and y coordinates plotted
   i. Origin; (0 , 0)
   j. Points plotted correctly
   k. $\frac{4}{5}$
   l. 1
   m. Equal to
   n. Explanations will vary.

Homework Sample

1. Use the grid below to complete the following tasks.
   a. Construct a y-axis that passes through points Y and Z.
   b. Construct a perpendicular x-axis that passes through points Z and X.
   c. Label the origin as 0.
   d. The y-coordinate of W is $2\frac{3}{5}$. Label the whole numbers along the y-axis.
   e. The x-coordinate of V is $2\frac{2}{5}$. Label the whole numbers along the x-axis.



Lesson 4

Homework Key

1. Answers will vary.
2. Explanations will vary.
3. Explanations will vary.

Homework Sample

Your homework is to play at least one game of *Battleship* with a friend or family member. You can use the directions from class to teach your opponent. You and your opponent should record your guesses, hits, and misses on the sheet as you did in class.

When you have finished your game, answer these questions.

1. When you guess a point that is a hit, how do you decide which points to guess next?

Answers vary.

I would guess a coordinate that is one more or one less than the x value that was a hit. If neither are a hit, then I would guess a coordinate with the y value one more or one less.

Lesson 5 - 6

Objective: Investiage pattenrs in vertical and horizontal llines, and interpret points on the plane as distances from the axes.

Homework Key (5)

1. a. Line g drawn and labeled
   b. x-axis, y-axis
   c. Answers will vary.
   d. A (4, 8); B (9, 8); points C and D will vary.
   e. y-value
   f. Answers will vary.
2. Points plotted correctly
   a. Line f drawn and labeled
   b. $\frac{3}{4}$
   c. perpendicular, parallel
   d. Answers will vary.
3. (a) circled; explanations will vary.
4. (b) circled; answers will vary.
5. Answers will vary.
6. Answers will vary.
7. Answers will vary.

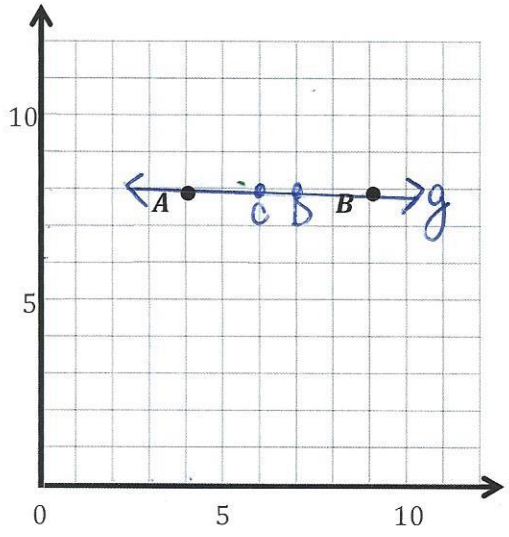
Homework Sample

1. Use the coordinate plane to answer the questions.
   a. Use a straightedge to construct a line that goes through points A and B. Label the line g.
   b. Line g is parallel to the X -axis and is perpendicular to the y -axis.
   c. Draw two more points on line g. Name them C and D.
   d. Give the coordinates of each point below.

answers vary.

A: (4,8) B: (9,8)

C: (6,8) D: (7,8)



   e. What do all of the points on line g have in common?

They all have the same y value.

   f. Give the coordinates of another point that falls on line g with an x-coordinate greater than 25.

(26,8)

Lesson 6

Homework Key

1. Points plotted and labeled correctly.
   a. Lines drawn through given points
   b. $\overline{ST}$
   c. $\overline{CA}$
   d. Answers will vary.
   e. Answers will vary.

2. a. $1\frac{1}{2}$
   b. $(2, 1\frac{1}{2})$
   c. Appropriate section shaded
   d. $5\frac{1}{2}$
   e. $(5\frac{1}{2}, 3\frac{1}{2})$
   f. Appropriate section shaded
3. (a–d) Lines constructed and labeled on plane
4. (a–c) Tasks completed on plane

Homework Sample

1. Plot and label the following points on the coordinate plane.

   C: (0.4, 0.4) A: (1.1, 0.4) S: (0.9, 0.5) T: (0.9, 1.1)

   a. Use a straightedge to construct line segments $\overline{CA}$ and $\overline{ST}$.

   b. Name the line segment that is perpendicular to the x-axis and parallel to the y-axis. $\overleftrightarrow{ST}$

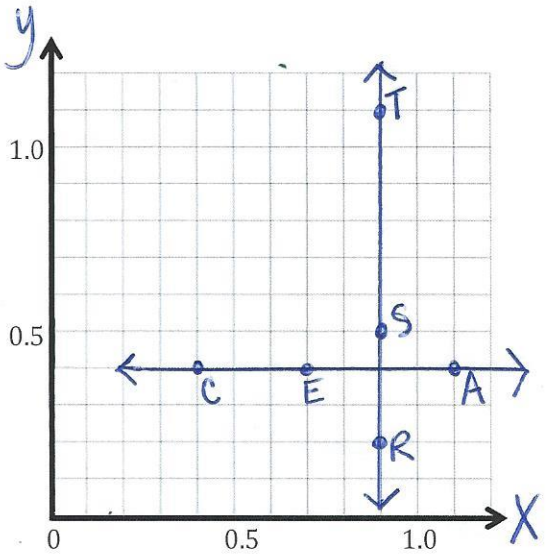
   c. Name the line segment that is parallel to the x-axis and perpendicular to the y-axis. $\overleftrightarrow{CA}$

   d. Plot a point on $\overline{CA}$ and name it E. Plot a point on line segment $\overline{ST}$ and name it R.

   e. Write the coordinates of points E and R.

   E (0.7 , 0.4) R (0.9 , 0.2)

   Answers vary.



Grade 5 Module 6 Topic B

Patterns in the Coordinate Plane and Graphing Number Patterns from Rules

Focus Standards:

5.OA.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.
5.OA.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.
5.G.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., xx-axis and xx-coordinate, yy-axis and yy-coordinate).

Instructional Days Recommended: 6

In Topic B, students plot points and use them to draw lines on the plane (**5.G.1**). Students begin by investigating patterns relating the xx- and yy-coordinates of the points on the line and reasoning about the patterns in the ordered pairs, which lays important groundwork for Grade 6 work with proportional reasoning**.** Topic B continues as students use given rules (e.g., *multiply by 2, then add 3*) to generate coordinate pairs, plot points, and investigate relationships. Patterns in the resultant coordinate pairs are analyzed to discover that such rules produce collinear sets of points, or lines. Students next generate two number patterns from two given rules, plot the points, and analyze the relationships within the sequences of the ordered pairs and graphs (**5.OA.3**). Patterns continue to be the focus as students analyze

the effect on the steepness of the line when the second coordinate is produced through an addition rule as opposed to a multiplication rule (**5.OA.3**). They also create rules to generate number patterns, plot the points, connect those points with lines, and look for intersections.

Lesson 7

Objective: Plot points, use them to draw lines in the plane, and describe patterns within the coordinate pairs.

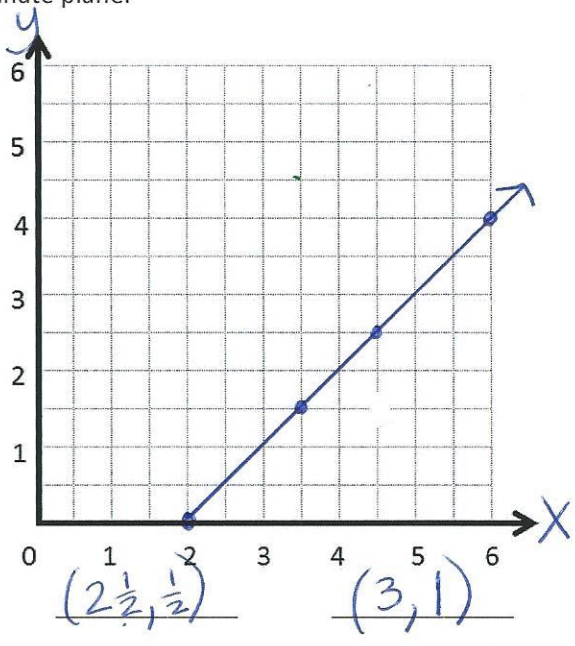
Homework Key

1. $(2, 0); (3\frac{1}{2}, 1\frac{1}{2}); (4\frac{1}{2}, 2\frac{1}{2}); (6, 4)$
   a. Line drawn correctly
   b. Answers will vary.
   c. Answers may vary.
2. $(0, 0); (\frac{1}{4}, \frac{3}{4}); (\frac{1}{2}, 1\frac{1}{2}); (1, 3)$
   a. Line drawn correctly
   b. Answers will vary.
   c. Answers will vary.
3. a. 10
   b. Answers may vary.
   c. Answers will vary.
   d. Answers will vary.
   e. $y = \frac{x}{2}$
   f. $m; n; \ell; q$

Homework Sample

1. Complete the chart. Then, plot the points on the coordinate plane.

x	y	(x, y)
2	0	(2,0)
$3\frac{1}{2}$	$1\frac{1}{2}$	$(3\frac{1}{2}, 1\frac{1}{2})$
$4\frac{1}{2}$	$2\frac{1}{2}$	$(4\frac{1}{2}, 2\frac{1}{2})$
6	4	(6,4)



   a. Use a straightedge to draw a line connecting these points.
   b. Write a rule showing the relationship between the x- and y-coordinates of points on this line.
      X is 2 more than y.
   c. Name two other points that are also on this line.

Lesson 8

Objective: Generate a number pattern from a given rule, and plot the points.

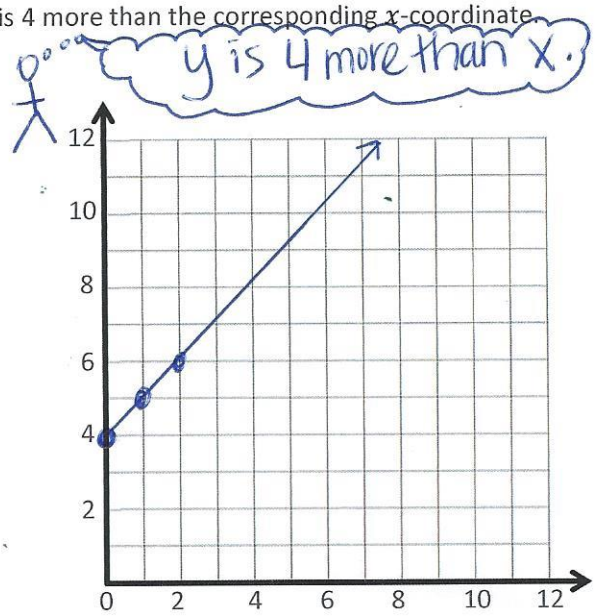
Homework Key

1. Answers will vary.
   a. Points accurately plotted
   b. Accurate line drawn
   c. Answers will vary.
2. Answers will vary.
   a. Points accurately plotted.
   b. Accurate line drawn
   c. Answers will vary.
3. Coordinates will vary.
   a. Accurate lines drawn
   b. Lines n and ℓ; (1, 1)
   c. Lines ℓ and m
   d. Answers will vary.

Homework Sample

1. Complete this table such that each y-coordinate is 4 more than the corresponding x-coordinate.

x	y	(x, y)
0	4	(0,4)
1	5	(1,5)
2	6	(2,6)



   a. Plot each point on the coordinate plane.

   b. Use a straightedge to construct a line connecting these points.

   c. Give the coordinates of 2 other points that fall on this line with x-coordinates greater than 18.
   (20, 24) and (22, 26)

Lesson 9

Objective: Generate two number patterns from given rules, plot the points, and analyze the patterns.

Homework Key

1. a: 0, (1, 0); 3, (4, 3); 8, (9, 8); 15, (16, 15)
   b: 0, (5, 0); 3, (8, 3); 9, (14, 9); 15, (20, 15)
   a. Accurate lines drawn
   b. Answers will vary.
   c. Answers will vary.

2. e: 0, (0,0); 3, (1,3); 12, (4,12); 18, (6,18)
   f: 0, (0,0); 3, (1, (3, 1); 3, (9,3); 5, (15,5)
   a. Accurate lines drawn
   b. Answers will vary.
   c. Answers will vary.

Homework Sample

1. Complete the table for the given rules.

Line a

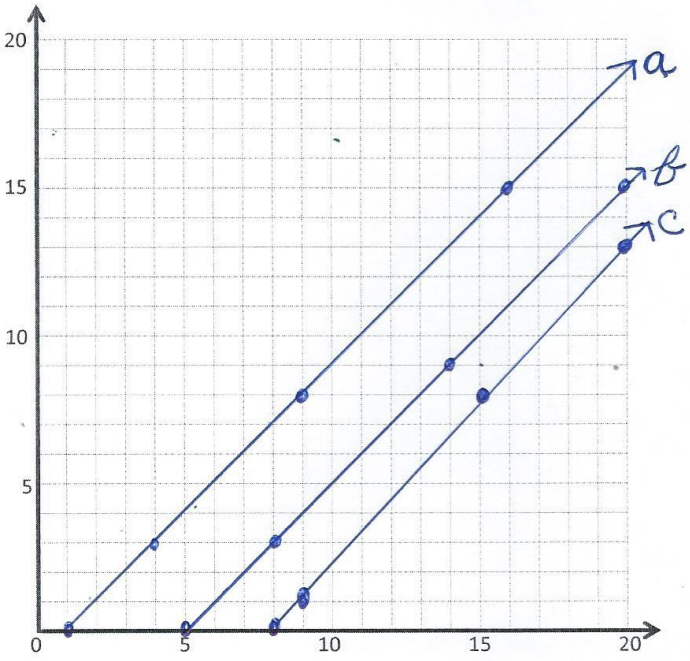
Rule: y is 1 less than x

x	y	(x, y)
1	0	(1,0)
4	3	(4,3)
9	8	(9,8)
16	15	(16,15)

Line b

Rule: y is 5 less than x

x	y	(x, y)
5	0	(5,0)
8	3	(8,3)
14	9	(14,9)
20	15	(20,15)



a. Construct each line on the coordinate plane.

b. Compare and contrast these lines.

Lines a and b look very similar. The lines are parallel. Line b seems to be going up faster. Both lines have y values that are less than X.

c. Based on the patterns you see, predict what line c, whose rule is *y is 7 less than x*, would look like. Draw your prediction on the plane above.

Line C would also be parallel to lines a & b.

Points (7,0), (8,1), (15,8), (20,13)

Lesson 10

Objective: Compare the lines and patterns generated by addition rules and multiplication rules.

Homework Key

1. a. Answer provided.
   b. Accurate line drawn.
   c. Answers will vary.
   d. Answers will vary.
   e. Accurate line drawn.
   f. Answers will vary.
   g. Answers will vary.
   h. Answers will vary.
2. Answers will vary.
3. a. Use $y = x$
   b. Accurate line drawn.
   c. Answers will vary.
   d. Answers will vary (e.g., y is x doubled).
   e. Accurate line drawn.
   f. Answers will vary.
   g. Answers will vary (e.g., y is half of x).
   h. Answers will vary.
   i. Answers will vary.

Homework Sample

1. Use the coordinate plane to complete the following tasks.

   a. Line p represents the rule *x and y are equal.*

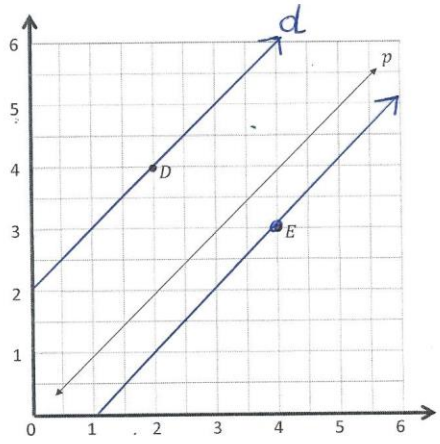
   b. Construct a line, d, that is parallel to line p and contains point D.

   c. Name 3 coordinate pairs on line d.

   $(\frac{1}{2}, 2\frac{1}{2})$
   $(1, 3)$
   $(2\frac{1}{2}, 4\frac{1}{2})$

   d. Identify a rule to describe line d.

   y is 2 more than x.



   e. Construct a line, e, that is parallel to line p and contains point E.

   f. Name 3 points on line e.

   $(1,0), (2,1), (2\frac{1}{2}, 1\frac{1}{2})$

   g. Identify a rule to describe line e.

   y is 1 less than x.

   h. Compare and contrast lines d and e in terms of their relationship to line p. All 3 lines are parallel. The y values in line d make it go above line p and the y values in line e are less than the x values and that line is below line p.

Lesson 11

Objective: Analyze number patterns created from mixed operations.

Homework Key

1. ℓ: 2, (1, 2); 4, (2, 4); 6, (3, 6)

   m: 1, (1, 1); 3, (2, 3); 5, (3, 5)

   a. Accurate lines drawn

   b. Answers will vary.

   c. Answers will vary.

2. (2, 2) circled

   a. Answers will vary.

   b. Answers will vary.

3. ℓ: 1, (0, 1); $1\frac{1}{2}$, $(1, 1\frac{1}{2})$; 2, (2, 2); $2\frac{1}{2}$, $(3, 2\frac{1}{2})$

   m: $1\frac{1}{4}$, $(0, 1\frac{1}{4})$; $1\frac{3}{4}$, $(1, 1\frac{3}{4})$; $2\frac{1}{4}$, $(2, 2\frac{1}{4})$; $2\frac{3}{4}$, $(3, 2\frac{3}{4})$

   a. Accurate lines drawn

   b. Answers will vary.

   c. Answers will vary.

4. $(1, \frac{1}{4})$ and $(3, 1\frac{3}{4})$ circled

   a. Answers will vary.

   b. Answers will vary.

Homework Sample

1. Complete the tables for the given rules.

Line ℓ

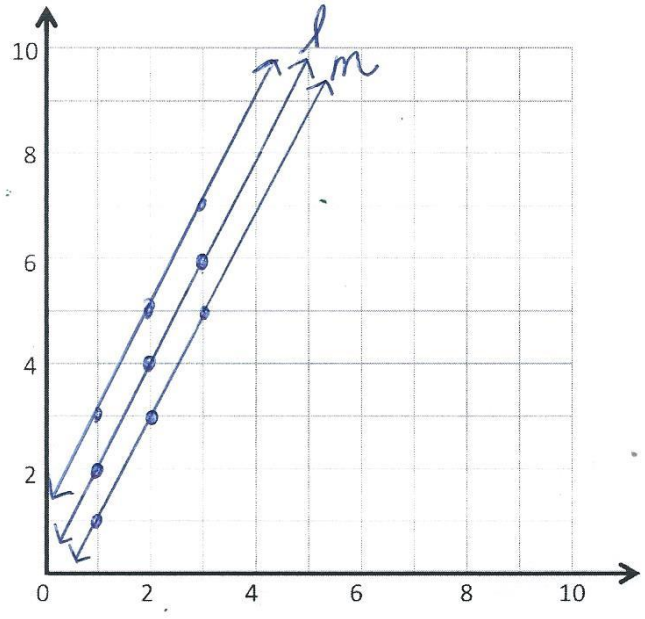
Rule: *Double x*

x	y	(x, y)
1	2	(1, 2)
2	4	(2, 4)
3	6	(3, 6)

Line m

Rule: *Double x, and then subtract 1*

x	y	(x, y)
1	1	(1, 1)
2	3	(2, 3)
3	5	(3, 5)



a. Draw each line on the coordinate plane above.

b. Compare and contrast these lines.

The lines are parallel. Line ℓ has greater y coordinates so it's above Line m.

c. Based on the patterns you see, predict what the line for the rule *double x, and then add 1* would look like. Draw your prediction on the plane above.

The line would be parallel to ℓ and m and have a greater y value than line ℓ.

Lesson 12

Objective: Create a rule to generate a number pattern, and plot the points.

Homework Key

1. a. Answers will vary.
   b. Answers will vary.
2. a. Answers will vary.
   b. Answers will vary.
3. a. Answers will vary.
   b. Answers will vary.
   c. Answers will vary.
   d. Answers will vary.
   e. Answers will vary.
4. Answers will vary.

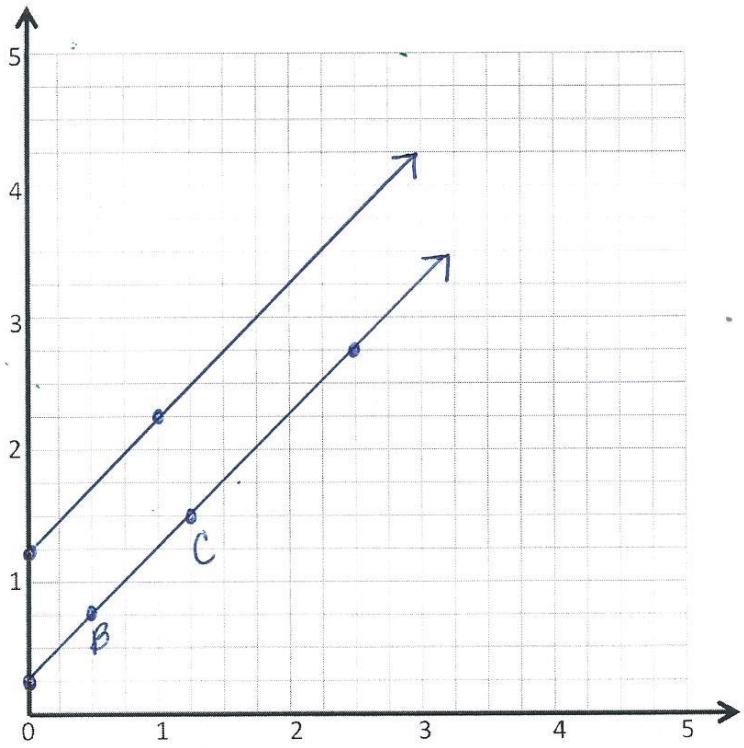
Homework Sample

1. Write a rule for the line that contains the points $(0, \frac{1}{4})$ and $(2\frac{1}{2}, 2\frac{3}{4})$.

   $X + \frac{1}{4} = y$

   a. Identify 2 more points on this line. Draw the line on the grid below.

Point	x	y	(x, y)
B	$\frac{1}{2}$	$\frac{3}{4}$	$(\frac{1}{2}, \frac{3}{4})$
C	$1\frac{1}{4}$	$1\frac{1}{2}$	$(1\frac{1}{4}, 1\frac{1}{2})$



   b. Write a rule for a line that is parallel to $\overleftrightarrow{BC}$ and goes through point $(1, 2\frac{1}{4})$.

   $X + 1\frac{1}{4} = y$

2. Give the rule for the line that contains the points $(1, 2\frac{1}{2})$ and $(2\frac{1}{2}, 2\frac{1}{2})$.

Grade 5 Module 6 Topic C

Drawing Figures in the Coordinate Plane

Focus Standards:

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., xx-axis and xx-coordinate, yy-axis and yy-coordinate).

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Instructional Days Recommended: 5

In Topic C, students draw figures in the coordinate plane by plotting points to create parallel, perpendicular, and intersecting lines. They reason about what points are needed to produce such lines and angles, and they investigate the resultant points and their relationships. In preparation for Topic D, students recall Grade 4 concepts such as angles on a line, angles at a point, and vertical angles—all produced by plotting points and drawing figures on the coordinate plane (**5.G.1**). To conclude the topic, students draw symmetric figures using both angle size and distance from a given line of symmetry (**5.G.2**).

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 13

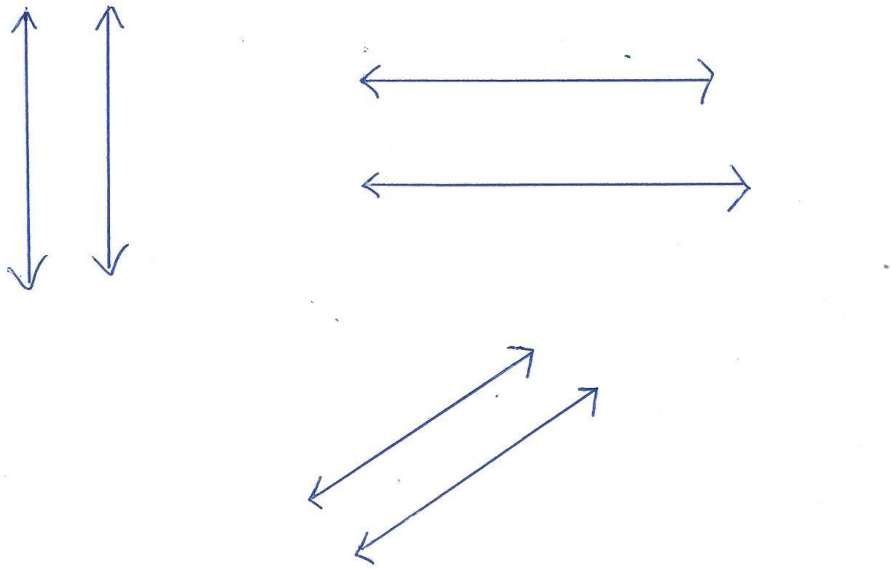
Objective: Construct parallel line segments on a rectangular grid.

Homework Key

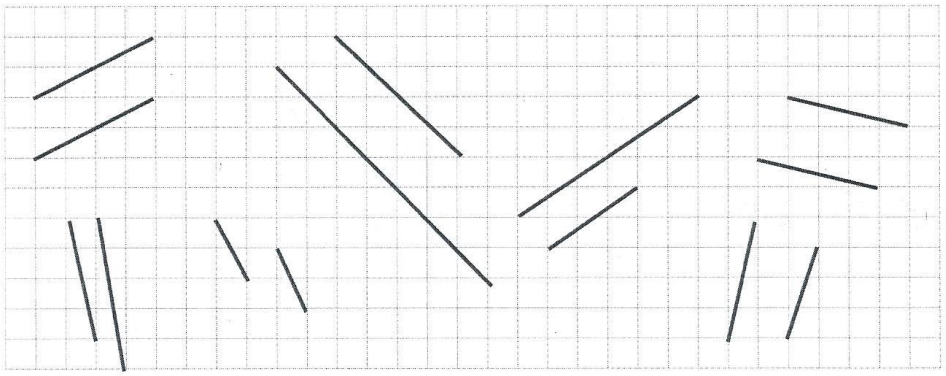
1. At least 3 sets of parallel lines drawn
2. Five sets of parallel segments circled
3. a. Parallel segment drawn through point S
   b. Parallel segment drawn through point T
   c. Parallel segment drawn through point U
   d. Parallel segment drawn through point V
   e. Parallel segment drawn through point W
   f. Parallel segment drawn through point Z
4. Parallel lines drawn

Homework Sample

1. Use your right angle template and straightedge to draw at least three sets of parallel lines in the space below.



2. Circle the segments that are parallel.



Lesson 14

Objective: Construct parallel line segments, and analyze relationships of the coordinate pairs.

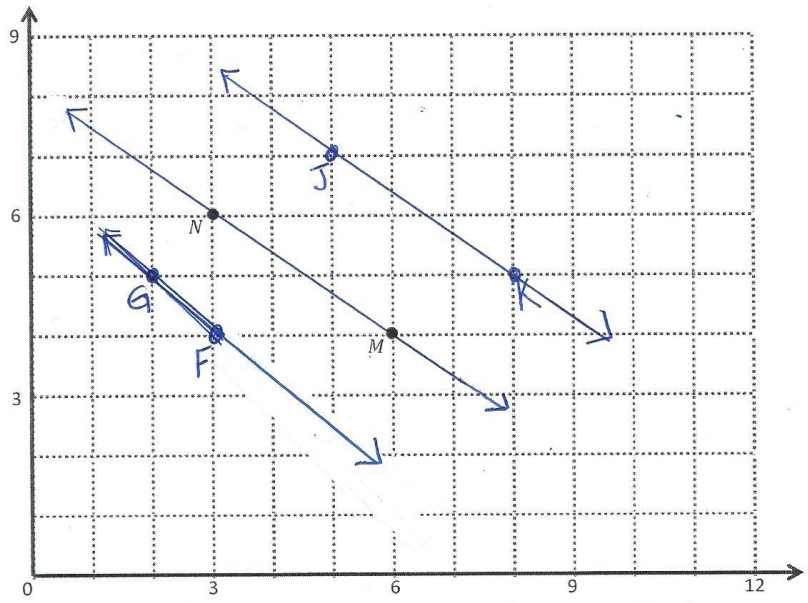
Homework Key

1. a. (6, 4); (3, 6)
   b. Accurate $\overleftrightarrow{MN}$ drawn
   c. Accurate coordinate pairs plotted
   d. Accurate $\overleftrightarrow{JK}$ drawn
   e. $\overleftrightarrow{MN} \parallel \overleftrightarrow{JK}$ circled
   f. Answers will vary.
   g. Accurate $\overleftrightarrow{FG}$ drawn

2. a. (4, $3\frac{1}{2}$ or 3.5); (2, 3)
   b. Accurate $\overleftrightarrow{AB}$ drawn
   c. Answers will vary.
   d. Accurate $\overleftrightarrow{CD}$ drawn
   e. Explanations will vary.
   f. Answers will vary.
   g. Explanations will vary.

Homework Sample

1. Use the coordinate plane below to complete the following tasks.



a. Identify the locations of M and N. M: (6, 4) N: (3, 6)

b. Draw $\overleftrightarrow{MN}$.

c. Plot the following coordinate pairs on the plane.

J: (5, 7) K: (8, 5)

d. Draw $\overleftrightarrow{JK}$.

e. Circle the relationship between $\overleftrightarrow{MN}$ and $\overleftrightarrow{JK}$. $\overleftrightarrow{MN} \perp \overleftrightarrow{JK}$ $\overleftrightarrow{MN} \parallel \overleftrightarrow{JK}$

The lines are parallel.

f. Give the coordinates of a pair of points, F and G, such that $\overleftrightarrow{FG} \parallel \overleftrightarrow{MN}$.

F: (3, 4) G: (2, 5)

g. Draw $\overleftrightarrow{FG}$.

Lesson 15

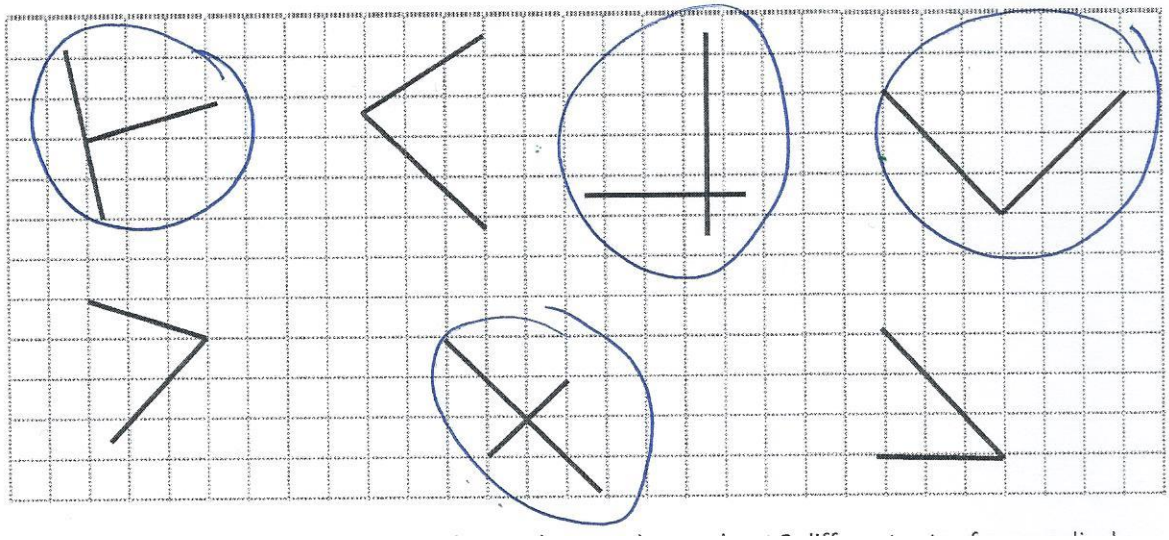
Objective: Construct perpendicular line segments on a rectangular grid.

Homework Key

1. 4 pairs circled
2. Perpendicular lines drawn
3. a. Perpendicular segment drawn
   b. Perpendicular segment drawn
   c. Perpendicular segment drawn
   d. Perpendicular segment drawn
4. Perpendicular lines drawn

Homework Sample

1. Circle the pairs of segments that are perpendicular.



Lesson 16

Objective: Construct perpendiular lien segments, and analyze relationships of the coordinate pairs.

Homework Key

1. a. $\overline{PQ}$ drawn
   b. Point R plotted
   c. $\overline{PR}$ drawn
   d. Explanations will vary.
   e. x-coordinates: 4; y-coordinates: 1
   f. x-coordinates: 1; y-coordinates: 4
   g. Explanations will vary.

2. a. $\overline{CB}$ drawn
   b. Point D plotted
   c. $\overline{CD}$ drawn
   d. Explanations will vary.
   e. x-coordinates: $1\frac{1}{2}$; y-coordinates: 1
   f. x-coordinates: 1; y-coordinates: $1\frac{1}{2}$
   g. Explanations will vary.

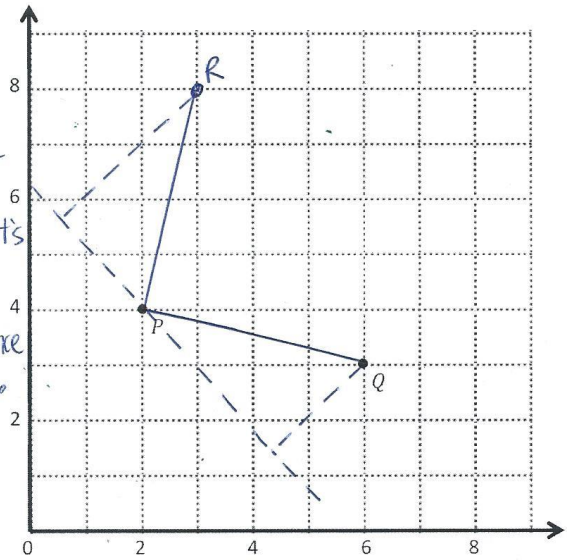
3. Answers will vary.

Homework Sample

1. Use the coordinate plane below to complete the following tasks.

   a. Draw $\overline{PQ}$.
   b. Plot point R (3, 8).
   c. Draw $\overline{PR}$.
   d. Explain how you know $\angle RPQ$ is a right angle without measuring it.

I can draw a triangle that has $\overline{PQ}$ as one of it's sides, and a triangle that has $\overline{PR}$ as one of it's sides. If I slide those two triangles together, the 2 acute angles would form a right angle, since the 3 angles form a straight line.



   e. Compare the coordinates of points P and Q. What is the difference of the x-coordinates? The y-coordinates?

x: difference of 4
y: difference of 1

   f. Compare the coordinates of points P and R. What is the difference of the x-coordinates? The y-coordinates?

x: difference of 1
y: difference of 4

   g. What is the relationship of the differences you found in parts (e) and (f) to the triangles of which these two segments are a part?

The difference of the x cordinates for P and Q was the same difference as the y coordinates of P and R; same with the y cordinates of P and Q and the x cordinates of P and R. The numbers flipped.

Lesson 17

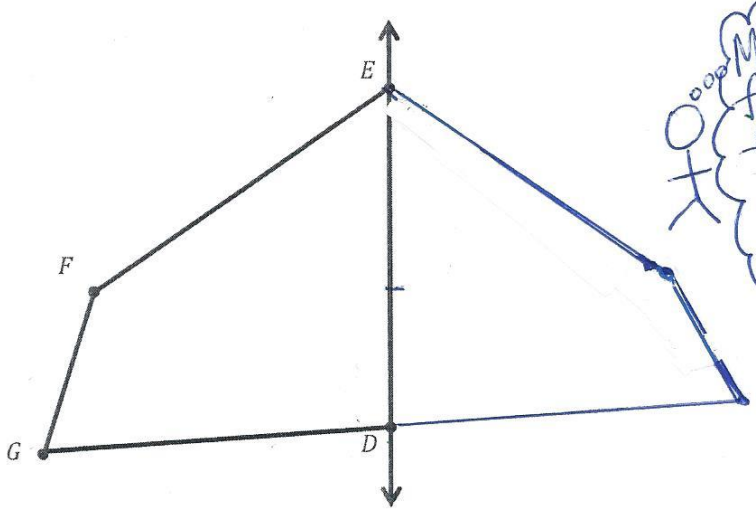
Objective: Draw symmetric figures using distance and angle measure from the line of symmetry.

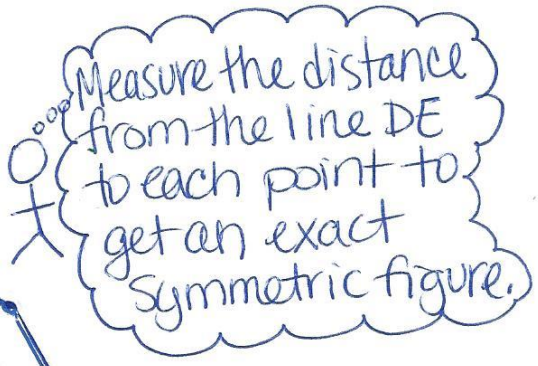
Homework Key

1. Symmetric figure drawn
2. Symmetric figure drawn
3. a. Answers will vary.
   b. $\overline{GH}, \overline{HI}, \overleftrightarrow{IG}$ drawn.
   c. Answers will vary.
4. Explanations will vary.

Homework Sample

1. Draw to create a figure that is symmetric about $\overleftrightarrow{DE}$.





Grade 5 Module 6 Topic D

Problem Solving in the Coordinate Plane

Focus Standards:

5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Instructional Days Recommended: 3

Applications of the coordinate plane in the real world are the focus of Topic D. Students use the coordinate plane to show locations, movement, and distance on maps. Line graphs are also used to explore patterns in the coordinate plane and make predictions based on those patterns (**5.G.2**, **5.OA.3**). To close their work with the coordinate plane, students solve real world problems.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 18

Objective: Draw symmetric figures on the coordinate plane.

Homework Key

1. a. Line drawn
   b. Points plotted; figure drawn
   c. Symmetric figure drawn;
   (9, 13); (9, 12); (8, 10); (6, 9); (6, 3); (9, 2); (5, 2)
   d. Answers will vary.
   e. Answers will vary.

2. a. Line drawn
   b. Points plotted; figure drawn
   c. Symmetric figure drawn;
   $(\frac{1}{2}, \frac{1}{2})$; (2, 1); $(1\frac{1}{2}, 1\frac{1}{2})$; (4, 2); $(3\frac{1}{2}, 3\frac{1}{2})$; $(4\frac{1}{2}, 4)$; (5, 5)
   d. Answers will vary.
   e. Answers will vary.

Homework Sample

1. Use the plane to the right to complete the following tasks.
   a. Draw a line s whose rule is x *is always 5*.
   b. Plot the points from Table A on the grid in order. Then, draw line segments to connect the points in order.

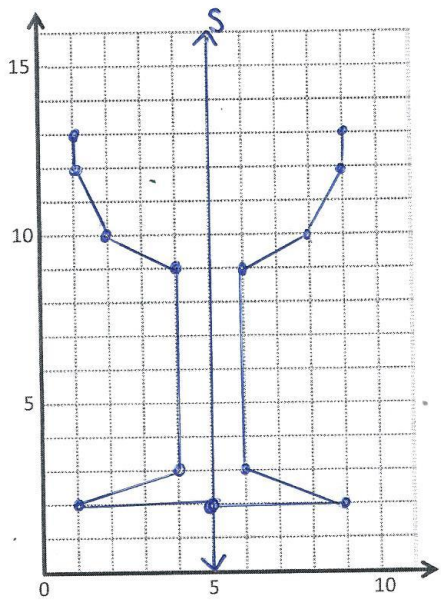


Table A

(x, y)
(1, 13)
(1, 12)
(2, 10)
(4, 9)
(4, 3)
(1, 2)
(5, 2)

Table B

(x, y)
(9,13)
(9,12)
(8,10)
(6,9)
(6,3)
(9,2)
(5,2)

   c. Complete the drawing to create a figure that is symmetric about line s. For each point in Table A, record the symmetric point on the other side of s.

   d. Compare the y-coordinates in Table A with those in Table B. What do you notice?
   The y coordinates are the same in Table A & B.

   e. Compare the x-coordinates in Table A with those in Table B. What do you notice?
   The x coordinates are different from Table A to B. Both are the same distance from the Line S.

Lesson 19

Objective: Plot data on line graphs and analyze trends.

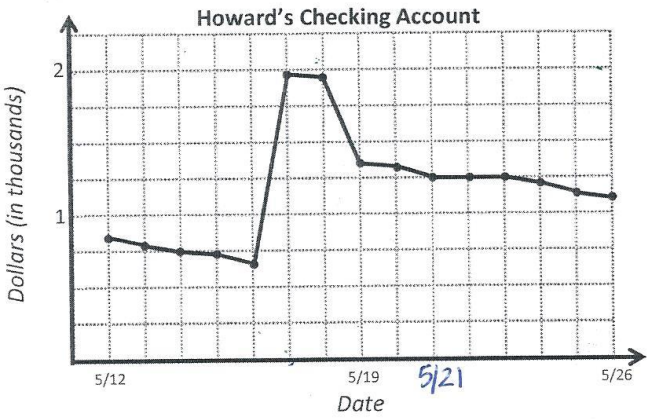
Homework Key

1. a. $1,250
   b. approximately $875
   c. Answers will vary.
   d. May 16; answers will vary.
   e. May 18; answers will vary.

2. a. 1 hour 50 minutes
   b. 5 km
   c. approximately 1:15–1:17 and 2:14–2:20; answers will vary.
   d. Swimming portion; answers will vary.
   e. Biking portion; line is steepest at bike race

Homework Sample

1. The line graph below tracks the balance of Howard's checking account, at the end of each day, between May 12 and May 26. Use the information in the graph to answer the questions that follow.



a. About how much money does Howard have in his checking account on May 21?

$1,250

b. If Howard spends $250 from his checking account on May 26, about how much money will he have left in his account?

about $875

c. Explain what happened with Howard's money between May 21 and May 23.

The amount stayed the same.

d. Howard received a payment from his job that went directly into his checking account. On which day did this most likely occur? Explain how you know.

5/17 because the line graph shows a large jump on 5/17

e. Howard bought a new television during the time shown in the graph. On which day did this most likely occur? Explain how you know.

5/19 because the amount of money decreased by about $500.

Lesson 20

Objective: Use coordinate systems to solve real-world problems.

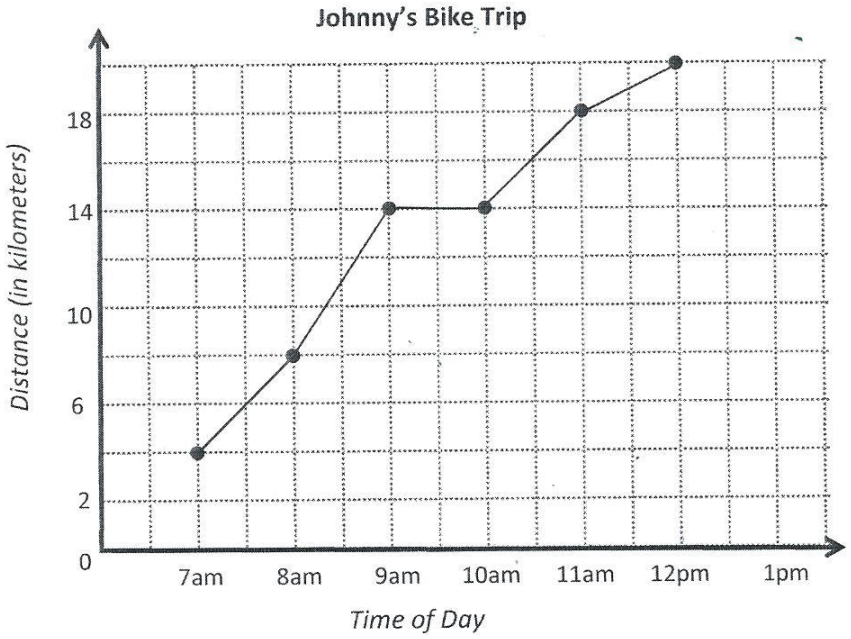
Homework Key

a. 16 km; 5 hr
b. 9 a.m.; answers will vary.
c. Before; answers will vary.
d. 7 a.m.–8 a.m. and 10 a.m.–11 a.m.
e. 8 a.m.–9 a.m.; answers will vary.

Homework Sample

Use the graph to answer the questions.

Johnny left his home at 6 a.m. and kept track of the number of kilometers he traveled at the end of each hour of his trip. He recorded the data in a line graph.



a. How far did Johnny travel in all? How long did it take?

Johnny traveled 16 km. (He started at 4km and ended at 20km.) It took him 5 hours. (started at 7:00am and ended at 12:00pm.)

b. Johnny took a one-hour break to have a snack and take some pictures. What time did he stop? How do you know?

Johnny stopped and took a break from 9:00am to 10:00am. I know this because the line graph stayed at 14 km which means he didn't travel.

Grade 5 Module 6 Topic E

Multi-Step Word Problems

Focus Standards:

5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $2/5 + 1/2 = 3/7$, by observing that $3/7 < 1/2$.

5.NF.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students capable of multiplying fractions can generally develop strategies to divide fractions by reasoning about the relationship between multiplication and division. However, division of a fraction by a fraction is not a requirement at this grade level.)

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?

Instructional Days Recommended: 5

Topic E provides an opportunity for students to encounter complex, multi-step problems requiring the application of the concepts and skills mastered throughout the Grade 5 curriculum. Students use all four operations with both whole and fractional numbers in varied contexts. The problems in Topic E are designed to be non-routine problems that require students to persevere to solve them.

While wrestling with complexity is an important part of Topic E, the true strength of this topic is derived from the time allocated for students to construct arguments and critique the reasoning of their classmates. After students have been given adequate time to ponder and solve the problems, two lessons are devoted to the sharing of approaches and solutions. Students will partner to justify their conclusions, communicate them to others, and respond to the arguments of their peers.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 21 - 25

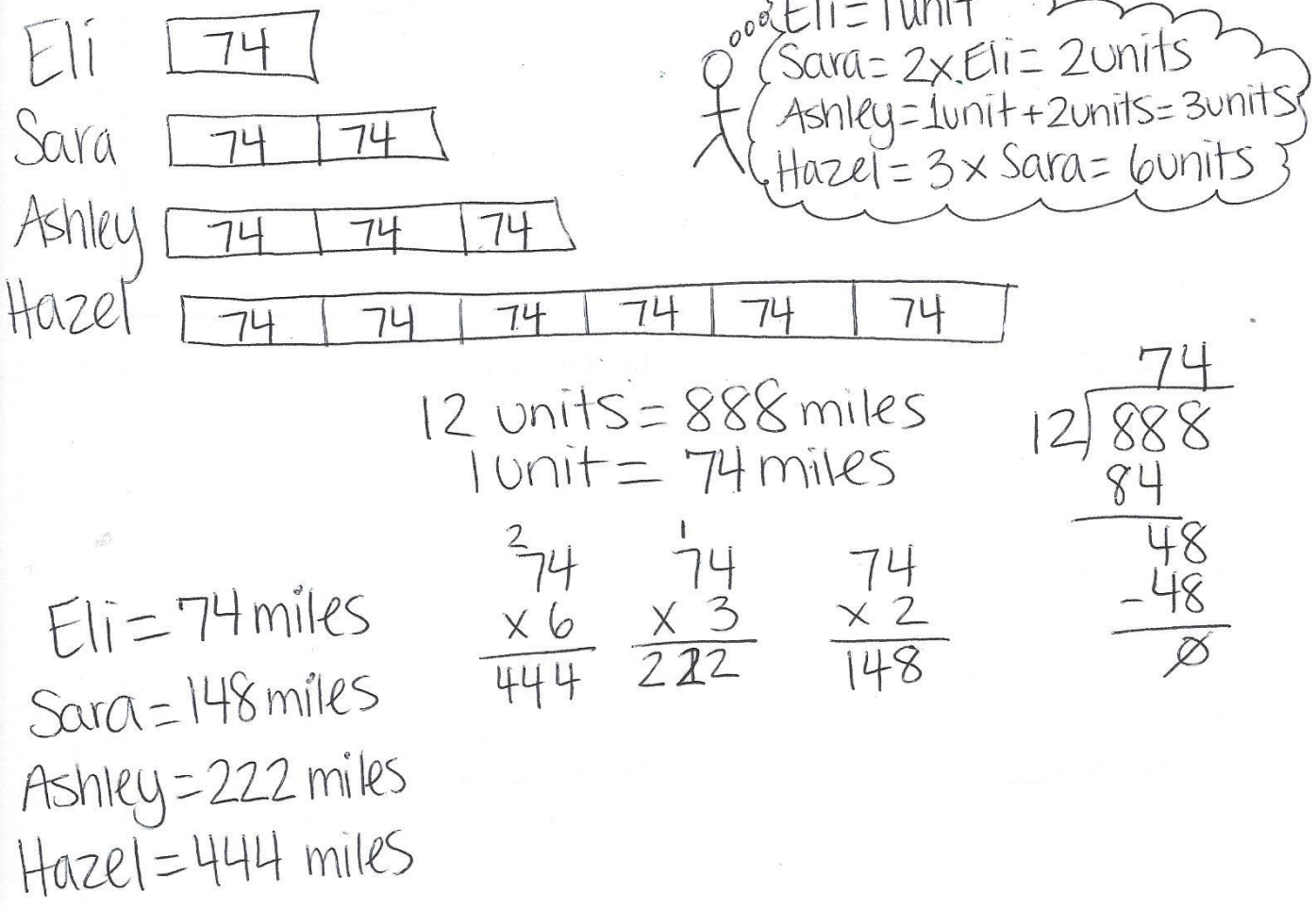
Objective: Make sense of complex, multi-step problems and persevere in solving them. Share and critique peer solutions.

Homework Key (21)

1. Sara: 148 miles; Eli: 74 miles; Ashley: 222 miles; Hazel: 444 miles
2. Answers will vary.

Homework Sample

1. Sara travels twice as far as Eli when going to camp. Ashley travels as far as Sara and Eli together. Hazel travels 3 times as far as Sara. In total, all four travel 888 miles to camp. How far does each of them travel?



Lesson 22

Homework Key

1. Answer provided.

   9 ft²

   4 ft²

   Answer provided.

   1 ft²

   Answer provided.

   25 ft²

   16 ft²

   4 ft²

   9 ft²

   16 ft²

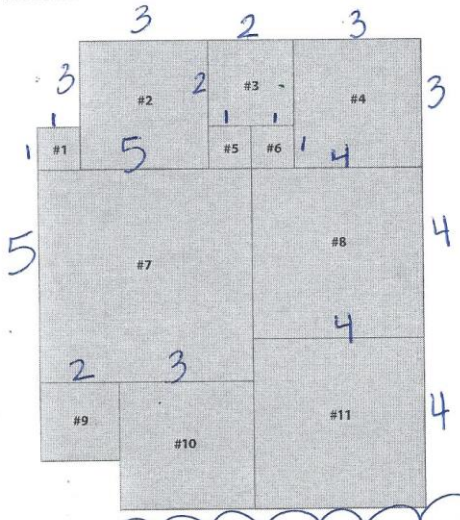
2. Answers will vary.

Homework Sample

Solve using any method. Show all your thinking.

1. Study this diagram showing all squares. Fill in the table.

Figure	Area in Square Feet
1	1 ft²
2	9 ft²
3	4 ft²
4	9 ft²
5	1 ft²
6	1 ft²
7	25 ft²
8	16 ft²
9	4 ft²
10	9 ft²
11	16 ft²



#4=#2

#3=2x2=4ft²

The width of the whole object is 9 (1+3+2+3). So that helps me find the dimensions of squares 7-11. #8 is the same width as squares #4 & 6, 3ft and 1ft so that makes 4ft. The whole width of the objects is 9ft, so the width of square #7 must be 5ft.

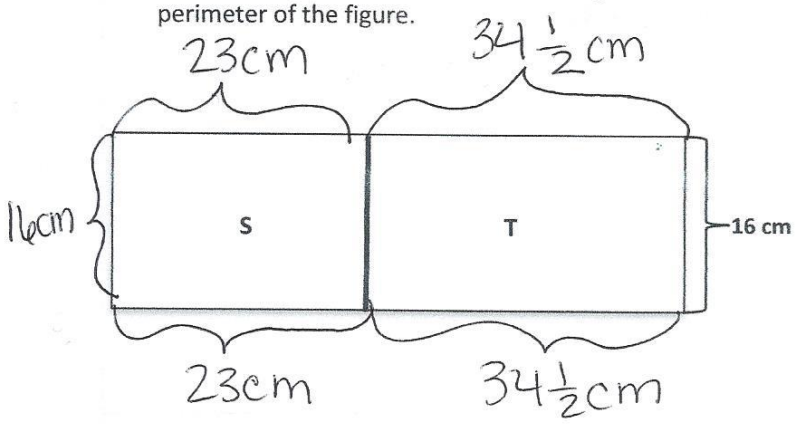
Lesson 23

Homework Key

1. 147 cm
2. Answers will vary.
3. Answers will vary.

Homework Sample

1. In the diagram, the length of Figure S is $\frac{2}{3}$ the length of Figure T. If S has an area of 368 cm^2, find the perimeter of the figure.



$A = l \times w$

$368 = l \times 16$

$\frac{368}{16} = l$

$23\text{cm} = l$

$P = [2 \times (23 + 34\frac{1}{2})] + (2 \times 16)$

$= (2 \times 57\frac{1}{2}) + (32)$

$= 115 + 32$

$= 147\text{cm}$

The perimeter of the figure is 147cm.

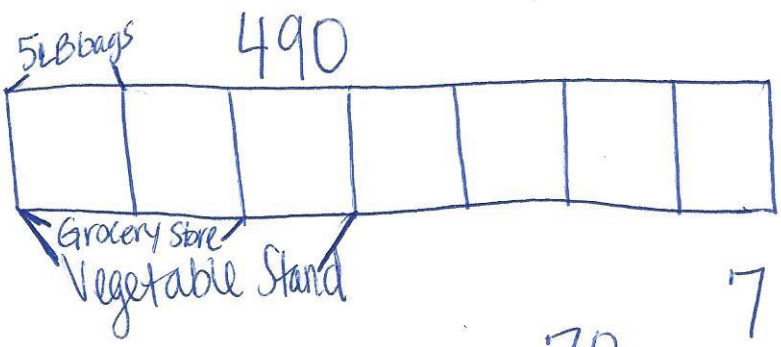
Lesson 24

Homework Key

1. 14 bags
2. Answers will vary. (*Hint: Think three-dimensionally.*)
3. Answers will vary.

Homework Sample

1. Pat's Potato Farm grew 490 pounds of potatoes. Pat delivered $\frac{3}{7}$ of the potatoes to a vegetable stand. The owner of the vegetable stand delivered $\frac{2}{3}$ of the potatoes he bought to a local grocery store, which packaged half of the potatoes that were delivered into 5-pound bags. How many 5-pound bags did the grocery store package?



7 units = 490 pounds

1 unit = 70 pounds

$$7\overline{)490}\quad 70$$

$$5\overline{)70}\quad 14,\ -5,\ 20$$

The grocery store packaged 14, five pound bags of potatoes.

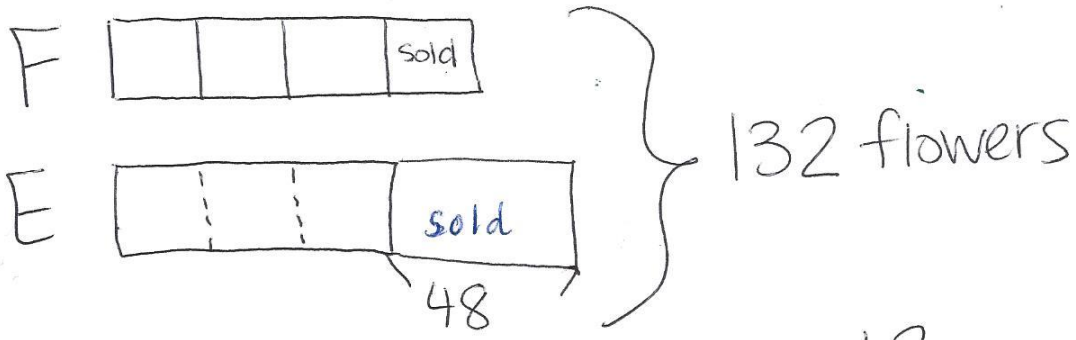
Lesson 25

Homework Key

1. Fred: 48 flowers; Ethyl: 84 flowers
2. Answers will vary.
3. Answers will vary

Homework Sample

1. Fred and Ethyl had 132 flowers altogether at first. After Fred sold $\frac{1}{4}$ of his flowers and Ethyl sold 48 of her flowers, they had the same number of flowers left. How many flowers did each of them have at first?



132-48=84

7units=84

1unit=12

$$7\overline{)84} \quad 12$$
$$-7$$
$$14$$
$$-14$$
$$0$$

Fred had 4 units of 12 = 48 flowers.
Ethyl had 3 units of 12 + 48 (36+48)=84 flowers.

The Years In Review: A Reflection on *A Story of Units*

In this final topic of Module 6 and, in fact, the final topic of *A Story of Units*, students spend time producing a compendium of their learning. They not only reach back to recall learning from the very beginning of Grade 5, but they also expand their thinking by exploring concepts such as the Fibonacci sequence. Students solidify the year's learning by creating and playing games and exploring patterns as they reflect on their elementary years. All materials for the games and activities are then housed for summer use in boxes created by students in the final two lessons of the year.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 26 - 27

Objective: Solidify writing and interpreting numerical expressions.

Homework Key (26)

1. a. Expressions will vary; 4,000
   b. Expressions will vary; $87\frac{1}{2}$
   c. Expressions will vary; 5
   d. Expressions will vary; $\frac{5}{48}$
2. a. Expressions will vary; $4\frac{1}{5}$
   b. Expressions will vary; $5\frac{1}{3}$
3. a. <; explanations will vary.
   b. =; explanations will vary.
   c. <; explanations will vary.

Homework Sample

1. For each written phrase, write a numerical expression, and then evaluate your expression.
   a. Forty times the sum of forty-three and fifty-seven

Numerical expression:

$40 \times (43+57)$

Solution:

40×100

$4,000$

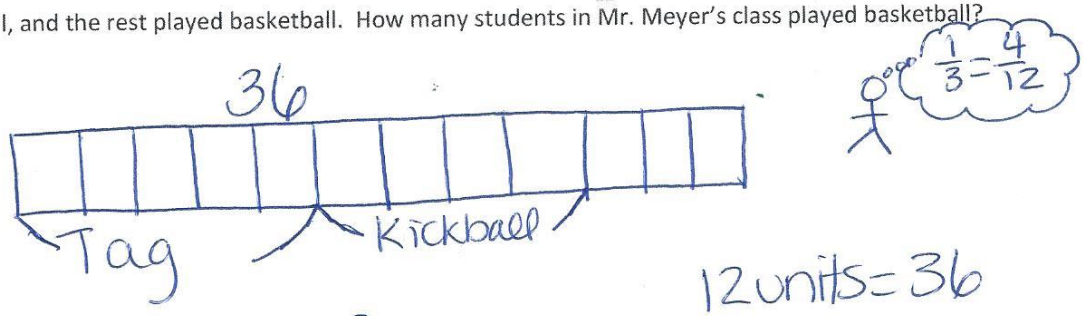
Lesson 27

Homework Key

1. a. Model drawn; 9 students
   b. Model drawn; 8 apples
2. Word problems will vary; 84
   Word problems will vary; $8\frac{2}{9}$
   Word problems will vary; 36

Homework Sample

1. Use the RDW process to solve the word problems below.
   a. There are 36 students in Mr. Meyer's class. Of those students, $\frac{5}{12}$ played tag at recess, $\frac{1}{3}$ played kickball, and the rest played basketball. How many students in Mr. Meyer's class played basketball?



Tag = 5units x 3
= 15

Kickball = 4units x 3
= 12

Basketball = 3units x 3 = 9

12units = 36
1unit = 3

9 students played basketball.

Lesson 28

Objective: Solidify fluency with Grade 5 skills.

Homework Key

Answers will vary.

Homework Sample

1. Use what you learned about your fluency skills today to answer the questions below.
   a. Which skills should you practice this summer to maintain and build your fluency? Why?

Answers will vary.

Lesson 29 - 30

Objective: Solidify the vocabulary of geometry.

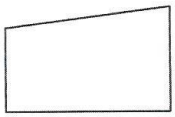
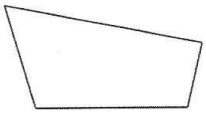
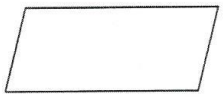
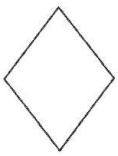
Homework Key (29)

1. a. Quadrilateral, trapezoid; answers will vary.
   b. Quadrilateral; answers will vary.
   c. Quadrilateral, trapezoid, parallelogram; answers will vary.
   d. Quadrilateral, trapezoid, parallelogram, rhombus, kite; answers will vary.

2. a. Figure drawn
   b. Quadrilateral, trapezoid, parallelogram, rhombus, kite; answers will vary.
   c. Quadrilateral, trapezoid, parallelogram, rhombus, kite; answers will vary.

Homework Sample

1. Use your ruler, protractor, and set square to help you give as many names as possible for each figure below. Then, explain your reasoning for how you named each figure.

Figure	Names	Reasoning for Names
a. 	Quadrilateral Trapezoid	four sided figure one pair of parallel sides
b. 	Quadrilateral	four-sided shape
c. 	Quadrilateral Trapezoid Parallelogram	four sided figure at least one set of parallel sides opposite sides parallel
d. 	Quadrilateral trapezoid parallelogram rhombus kite	four sided figure at least one set of parallel sides opposite sides parallel equal sides opposite equal acute angles opposite equal obtuse angles two adjacent sides are equal

Lesson 30

Homework Key

Answers will vary.

Homework Sample

Teach someone at home how to play one of the games you played today with your pictorial vocabulary cards. Then, answer the questions below.

1. What games did you play?

Answers will vary.

Lesson 31

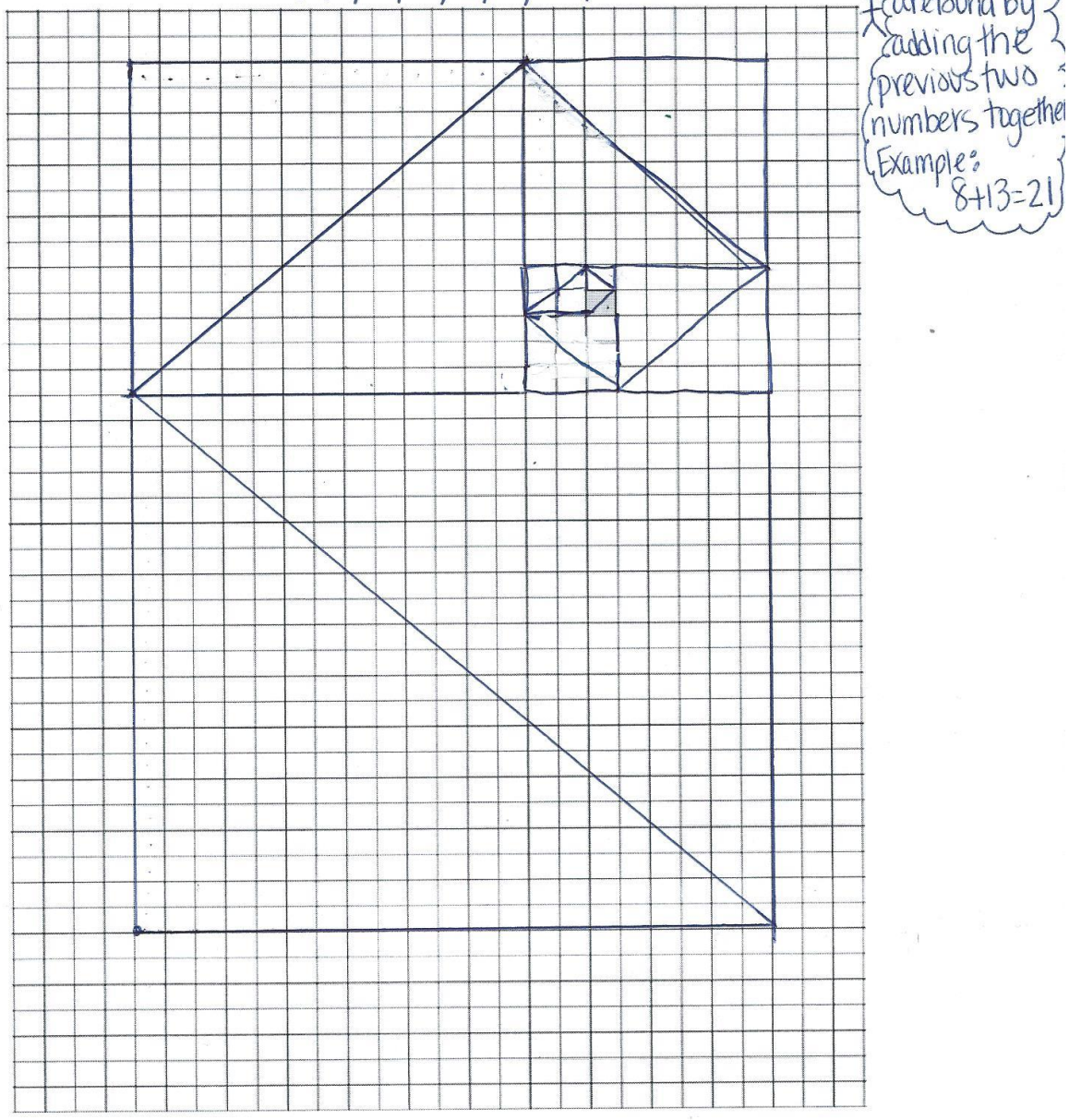
Objective: Explore the Fibonacci sequence.

Homework Key

1. Spiral drawn
2. Answers will vary.
3. 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377

Homework Sample

1. List the Fibonacci numbers up to 21, and create, on the graph below, a spiral of squares corresponding to each of the numbers you write. 0, 1, 1, 2, 3, 5, 8, 13, 21



Lesson 32

Objective: Explore patterns in saving money.

Homework Key

1. 13; 21; 34; 55; 89; 144; 233; 377; 610; 987; 1,597; 2,584; 4,181; 6,765
2. Jonas was correct; examples will vary.
3. Answers will vary.

Homework Sample

1. Jonas played with the Fibonacci sequence he learned in class. Complete the table he started.

1	2	3	4	5	6	7	8	9	10
1	1	2	3	5	8	13	21	34	55

11	12	13	14	15	16	17	18	19	20
89	144	233	377	610	987	1,597	2,584	4,181	6,765

2. As he looked at the numbers, Jonas realized he could play with them. He took two consecutive numbers in the pattern and multiplied them by themselves and then added them together. He found they made another number in the pattern. For example, $(3 \times 3) + (2 \times 2) = 13$, another number in the pattern. Jonas said this was true for any two consecutive Fibonacci numbers. Was Jonas correct? Show your reasoning by giving at least two examples of why he was or was not correct.

Yes, Jonas is correct. If you multiply (5x5) and add that to (3x3) it would be 25+9=34 which would be another sequence in Fibonacci's numbers.
(5x5)+(8x8) = 25+64=89
(8x8)+(13x13)=64+169=233

Lesson 33 - 34

Objective: Design and construct boxes to house materials for summer use.

Homework Key (33)

1. 110 cm^3; answers will vary.
2. Answers will vary; V = 616 cm^3

Homework Sample

1. Find various rectangular boxes at your home. Use a ruler to measure the dimensions of each box to the nearest centimeter. Then, calculate the volume of each box. The first one is partially done for you.

Item	Length	Width	Height	Volume
Juice Box	11 cm	2 cm	5 cm	110cm^3
	Answers vary.			

Lesson 34

Reflection

Answers will vary.

No Homework